THE RELATIONSHIP BETWEEN ECONOMIC WELL-BEING AND STATE LEVEL ECONOMIC DIVERSITY

By

ROWENA DIANE AHERN

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University of Tulsa

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Thesis Approved:

James W. Stine
Thesis Adviser

John F. Rooney

Orley M. Amos Jr

Norman N. Durham
Dean of Graduate College

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CHAPTER I

INTRODUCTION

The relationship between economic well-being and economic diversity is studied at the state level for the census year 1980. Conventional wisdom suggests a positive relationship between economic diversity and economic well-being. Although there is variation in the scale and method of analysis, the majority of studies show that diversification is advantageous to an economy.

There is a large body of literature on the measurement and effects of diversification. Research which is temporal, or conducted at a different scale contributes to the understanding of diversity. Although the terms "economic diversity", "industrial diversity", and "industry mix" are widely used, they are not clearly defined. As a result, the literature must be evaluated in general terms.

Most studies show the positive effects of diversity on various aspects of the economy. The majority of research has considered the effects of diversification on unemployment, income levels, economic growth, and economic stability. In addition to the academic literature, the popular literature shows overwhelming support for the concept of diversification at the state level.

In agreement with the vast majority of literature, this

study was based on the hypothesis that there is a positive relationship between economic diversity and economic well-being. To study this relationship, several different measures of diversity were considered as the independent variable. Economic well-being is the dependent variable in this study.

There is no standard procedure for measuring economic well-being. Although there are numerous variables which can represent well-being, three variables are thought to be good indicators. Per capita income, percentage of unemployment, and percentage of people for whom poverty status is determined, are indicators of economic well-being in this study. Percent of people with poverty status is used in addition to per capita income because these data better represent the distribution of income.

Diversification of the labor force is the independent variable of this study. It is evaluated by the distribution of the labor force among the twelve major economic sectors identified by the 1980 United States Census. States which have their labor force distributed among many economic sectors are diverse. Those states with higher concentrations of the labor force in one or a few sectors are considered more specialized. Diversity is a relative measure, and states can be ranked from the least to the greatest level of diversification.

Several diversity measures can be applied to the Census data. A variety of diversity measures are evaluated for their

applicability at the state level. Both conventional and new approaches to the measurement of diversity are investigated. Each of the diversity measures was used in regression with each of the three dependent variables.

As a major field in the discipline of geography, the spatial science, economic geography is concerned with the location and interaction of economic activities. It is possible to consider both the causes and consequences of spatial location. Understanding why economic activities are located where they are is an important theme in economic geography. The social and economic implications of the location of economic activities are also important topics. This study addresses the consequences of the location of economic activities.

Literature Review

Measuring Diversity

The technique of using the division of the labor force to estimate economic diversity has been widely used. Many studies have been limited to diversity in manufacturing, and do not consider all economic sectors. There is considerable variation in the number of economic sectors studied. The number of sectors used depends on the application. Shear (1965) suggested that with many measures of diversity, as few as three sectors are necessary. The three largest sectors show variation between regions and too many sectors can actually decrease the sensitivity of the measure. Keinath

(1985) confirms that for most studies, results would probably be very similar if only the three largest sectors had been used.

Most studies were not conducted at the state level and used regions, counties, or cities as the study area. In geography all generalizations are scale dependent, the various perceptions gained through observation at one scale may not be valid at another (Stine, 1986). However research conducted at a different scale, and studies of manufacturing diversity are relevant to the study of state level economic diversity because they present and evaluate the relevant methodology in the field.

Economic diversity, the independent variable in this study, is well discussed in the literature. Rodgers (1957) suggested that any measure of diversity is a compromise. However if a measure is statistically sound and its limitations are clearly defined, it can be an effective tool. For comparative purposes, a number of authors have evaluated different diversity measures on one set of data. A brief summary of their findings is given in Table I.

Conroy (1975) classified the various measures of industrial diversity into four conceptually different categories. These include measures based on the national average, equal percent distribution, minimum requirements, and percentage employed in durable goods manufacturing. In general the last category has been shown to be inferior and will not be elaborated upon. Bahl et al. (1971) evaluated one

TABLE I

SUMMARY OF THE LITERATURE ON THE MEASUREMENT OF ECONOMIC DIVERSITY

AUTHOR	STUDY UNIT AND DATE	MEASURES EVALUATED	CONCLUSIONS
Brewer (1985)	52 SMSA's 1960-70	Portfolio, Ogive, National Average, Percent Durable	The portfolio approach, with a correction for heteroscadasticity, is the best industrial diversity measure.
Conroy (1975)	52 SMSA's 1960-70	Portfolio, Ogive, National Average, Percent Durable	The portfolio is best for measuring industrial diversity in terms of stability. Ogive is next best, then national average.
Brewer & Moomaw (1982)	56 cities 1982	Portfolio, Ogive, Entorpy	Ogive and entropy measures partially explain REI, the portfolio measure is better, should correct for city size.
Kort (1981)	106 SMSA's 1970	Ogive, Entropy, National Average, Percent Durable	With an adjustment for heteroscadasticity, the entropy measure is best for showing economic stability. The ogive is next best.
Bahl et al. (1971)	212 SMSA's 1960	Min. Requirements, Adjusted M.R. Ogive National Average,	Adjusted minimum requirements is most appropriate for measuring industrial diversity. N.A. is fair, Ogive is poor.
Keinath (1985)	183 BEA areas 1971-78	Ogive, Coefficient of Specialization	Ogive or absolute measures are better for studying economic growth because of conceptual problems with national averages.

measure from each of the first three categories. Each type of measure produced different results, indicating the importance of selecting an appropriate measure.

The first category outlined by Conroy includes national average measures. Such measures use the national average as a base level or norm and measure regional variation from the national norm. According to the national average measure, a region would have maximum diversity if its labor force distribution was identical to the nation's distribution.

There are several methods of calculating diversity based upon national averages. Perhaps the most widely referenced is the coefficient of specialization. This measure gives states a rating between zero and one. Zero shows diversification equivalent to the national average. As the values approach one, regions are more specialized than the nation as a whole (Isard, 1960). This measure is conceptually similar, but somewhat more refined than the coefficient of specialization proposed by Leser (1949).

A second type of national average measure is the specialization or diversification curve. This measure is based on the Lorenz curve and offers a graphic representation of diversity (Isard, 1960). A number of studies have used variance from the national norm as an indicator of diversity (Bahl et al., 1971).

Florence et al. (1942) are credited with first using the national average as a base level for measuring industrial diversity. These authors did a state level study of

employment in 34 industrial sectors. Diversity was derived by determining how much a state varied from the national average in each sector. Florence et al. showed how each state differed from the national average, and how the specialization in each industrial sector varied from state to state. Although these authors were able to show relative diversity, they did not relate the diversity values to any other variables.

Marshall (1975) found national average measures preferable to any other type of diversification measure. Bahl et al. (1971) suggest that national average measures are less sophisticated than the minimum requirements measures but are superior to the equal percent distribution type of measure. Wasylenko and Erickson (1978) confirm that a national average measure is superior to a equal percent distribution type of measure. These authors caution that there are problems with using the national average as a benchmark. Keinarh (1985) delineated some of the problems with the national average measure of diversity. This measure profiles a spatial and temporal economy. It is not well suited to dynamic applications. A second drawback is that a specialization coefficient does not account for regions which are diversified in different economic sectors than the national distribution. Such a region may be no more specialized than the nation as a whole.

Using national averages to provide a base level for measuring state level economic diversity is thought to be

conceptually weak. Although it would be possible for a state to have a broader labor force distribution than the nation as a whole, such a state would be measured as more specialized than the nation, by a national average measure. As mentioned above, this type of measure does not account for states that are diversified in different sectors than the nation. Although this type of measure is well accepted at the city scale, it does not appear to be appropriate for state level applications.

The second industrial diversification measurement category outlined by Conroy is the equal percent distribution classification. Also called "absolute diversification", this type of measure uses equal percentages of the labor force in each sector as the base level. Thus with 12 economic sectors, absolute diversity would exist if each sector contained one twelfth of the labor force. Variation from this norm indicates specialization. There are basically two approaches to measuring absolute diversity.

The first method is the "ogive" approach, named by Bahl et al. (1971). This technique involves ranking the percent of the labor force in each economic sector in descending order, progressive totals are then summed to form a crude diversity index. The cumulative percents can also be plotted in a similar fashion to the Lorenz curve. Diversity curves for each region studied can be compared graphically (Tress, 1939).

Rodgers (1957) used Tress' method with only slight modifications. Rodgers was able to show changes in diversity

over time in the United States. Over 80 percent of the 90 industrial areas identified by Rodgers showed significant change in the level of diversity between the years 1940 and 1950. Conkling (1963) discussed various measures of diversity and used the ogive measure to study South Wales. Using this method Conkling was able to show significant change over time and analyzed the effects of increased diversity.

Keinath (1985) suggested that the greatest drawback of the ogive approach is that the data cannot be disaggregated. There is no easy way to evaluate the performance of individual sectors. A second criticism of this approach is that "...the concept of equal shares is an unrealistic basis on which to measure industrial diversification" (Marshall, 1975). This point was also made by Conroy (1975) but has been refuted by Kort (1981). Using an equal distribution of the labor force is a definition, not a goal, for diversity. Those who use the absolute diversity type of measure do not claim that there should be an equal distribution. Kort's argument is valid for the ogive index and for the second type of absolute diversity measure, the entropy measure.

The Shannon entropy function, most often used in scientific disciplines, has been applied to the sectoral division of the labor force (Hackbart and Anderson, 1975). Entropy has been used to evaluate the geographic concentration of industry. This measure is formulated such that it increases with increased dispersion of the labor force among economic sectors. This provides a relative measure allowing

comparisons among regions (Garrison and Paulson, 1973).

Kort (1981) evaluated the entropy, ogive, national average, and percent durable measures, for the purpose of analyzing regional economic instability over time. This evaluation showed that entropy performed the best in this application. Hackbart and Anderson (1975) state that the entropy measure "...provides a precise definition of economic diversity... The measure provides a direct measure of comparing diversity in different regions, or changes in diversity over time." (Hackbart and Anderson, 1975)

Wasylenko and Erickson (1978) tested the entropy and the ogive measures. These authors found that the two measures produced almost identical results. They concluded that "...while entropy is a comparatively new diversity measure, it cannot be expected to produce different results from the long established ogive index." These authors are highly critical of the concept of using an equal percent distribution as the base level for measuring diversity. In agreement with Bahl et al. they suggest that national average measures are superior.

Minimum requirements measures are the third basic type of measure identified by Conroy. He states that this is the most empirically sophisticated class of measures (Conroy, 1975). This method was designed by Ullman and Dacey (1960) to study basic to non-basic ratios in cities. It is based on the concept that "normal employment" is the percentage in each sector which exactly meets local needs. Bahl et al. used the minimum requirements approach, national average, and absolute

diversity measures to study the diversity of American cities. Their results showed that the minimum requirements method was the most promising technique for measuring urban industrial diversification.

Although minimum requirements measures have generally received positive reviews, Pratt (1968) attempted to discredit the concept. Pratt showed that the premise of minimum requirements, where every city exports most commodities but no city imports goods of services, is an absurd notion. These results were confirmed by Marshall (1975) who suggested that minimum requirements should be abandoned as a technique of measuring diversity.

The three categories of diversity measures have been tested and debated in the literature. Each has advantages and disadvantages and the appropriate choice of measure is largely dependent on the application. To study state level economic diversity, an absolute measure of diversity is most appropriate. This technique provides the required information, and is much more practical than the minimum requirements approach. There is no justification for normalizing state level data by national averages.

In addition to presenting traditional measures of diversification, Conroy (1975) presented a conceptually different "portfolio" approach to the problem. The industrial portfolio approach is similar to an individual financial portfolio. To determine an appropriate industrial portfolio the expected return, and the risk involved with different

industries, must be calculated (Conroy, 1975). The data required severely limits the application of this approach. However the portfolio measure has been applied to the study of city level regional economic instability with very promising results (Brewer 1975, Brewer and Moomaw 1984, Conroy 1975). Barth et al. (1975) used the portfolio approach to study the relationship between industrial diversity and regional employment. These authors also reviewed the portfolio method positively.

Effects of Diversity

In addition to the body of literature which presents diversification methodology, there are many studies of the effects of diversity. Studies show the positive effects of diversity on various aspects of the economy. The majority of research has considered the effects of diversification on unemployment, income levels, economic growth, or economic stability. The effects of economic diversity, according to the academic literature, are summarized in Table II.

Richardson (1969) suggested that although diversification makes a region more cyclically stable, it has drawbacks. Most importantly, a diverse region loses the advantages of economies of scale that occur with specialization. Since diverse regions would tend to import less, they cannot simply reduce importation in times of economic hardship. However Moore (1985) suggests that as states become increasingly self-sufficient they are more prosperous, due to the

TABLE II

SUMMARY OF THE LITERATURE ON THE EFFECTS OF ECONOMIC DIVERSITY

AUTHOR	STUDY UNIT	DATE	FINDINGS
Conroy (1974)	3 cities	1970	For the three cities studied, unemployment could be reduced significantly by selective diversification.
Tress (1939)	14 towns	1931-37	This is a preliminary study showing that, in theory, diversity helps reduce unemployment.
Brewer (1985)	52 SMSA's	1960-70	Over 56 percent of the variation in regional economic instability can be explained by regional diversification.
Conroy (1975)	52 SMSA's	1960-70	Industrial diversification can explain over forty-two percent of observed instability, and reduces economic instability.
Brewer & Moomaw (1982)	56 cities	1982	Industrial diversification and economic stability increase with city size. Selective diversification promotes stability.
Kort (1981)	106 SMSA's	1970	Diversification is a factor in accounting for differences in economic instability.
Conkling (1963)	South Wales 52 areas	1931-59	Diversification of the region resulted in higher levels of income and employment, and greater economic stability.
Rodgers (1957)	90 industrial areas	1919-39	For effective industrial planning, diversification should be considered. Is a preliminary work which makes no assumptions.
Keinath (1985)	183 BEA areas	1971-78	Economic diversity is positively associated with economic growth and higher income levels.
Rosen (1984)	counties	1970-82	In the study of unemployment, the types of activities, and the performance of individual sectors must be considered.
Barth et al. (1975)	1 state	1952-71	Employment stability is important to the welfare of a region's economy. Greater industrial mix promotes stability.
Brown (1978)	9 Census divisions	1958-76	Diverse regions suffer fewer of the economic problems caused by recession and the business cycle.
Brown (1978)	9 Census divisions	1960-76	Labor force composition is related to unemployment levels. Industry mix contributes to income levels.

multiplier effect of income earned from exports. Hildebrand and Mace (1950) showed how the employment multiplier made regional exports highly advantageous for regional income and employment.

Roepke and Feudenberg (1981) conducted a study of the employment structure of nonmetropolitan counties. The county data were grouped into eight regions for analysis. The minimum requirements approach was used to study 14 economic sectors. This study used Census labor force divisions and evaluated change between 1960 and 1970. Roepke and Feudenberg (1981), in agreement with Shear (1965), Ullman et al. (1971), and Keinath (1985), note that 14 sectors can produce more satisfactory results than a more detailed breakdown of the labor force.

In a study of industrial diversification of South Wales, Conkling (1963) found that increased diversity was definitely advantageous. Conkling concluded that the increase in the number and variety of jobs caused by industrial diversity improved the quality of life. The economy of South Wales was made more stable and secure by employment in a variety of industries. The author also concluded that industrial diversification of this region would have been "especially unlikely" if the government had not intervened (Conkling, 1963).

Using labor force data, Browne has conducted regional studies. The paper entitled "Regional Unemployment Rates-Why are they so Different?" deals with the relationship between

differences in regional unemployment and economic diversity between 1960 and 1976. The United States was divided into the four main Census regions with a total of nine sub-regions. Browne found that differences in labor force composition do not totally explain regional differences in unemployment, but they are the major factor. The author stated that "All regions are affected by the national business cycle. However, because of differences in industry mix, some regions are more vulnerable than others to these cyclical swings." (Browne, 1978)

Hyclak and Lynch (1980) had similar results in their study of state unemployment. Industry mix was found to be a key factor in a state's ability to survive downturns in the economy. These authors confirmed earlier findings that states which depend heavily on manufacturing, in particular durable manufacturing, are much more sensitive to recessions in the national economy. Taking this one step further, Richardson (1969) classified durable industries as unstable and non-durable as stable industries. At the other extreme Rosen (1984) found that service-related employment was the least vulnerable to recession because it was basically unaffected until unemployment caused a decline in consumer spending. Not only is economic diversity important, but also individual sectors are significant in maintaining acceptable levels of unemployment (Rosen 1984).

In addition to the relationship between unemployment and diversity, Browne (1978) found a significant relationship

between income levels and diversity. The paper entitled "Regional Industry Mix and the Business Cycle" discusses industry mix and personal income in each economic sector. The areal units used in this study are the nine region established by the United States Census. The author found that "...industry mix has been a contributing factor to cyclical fluctuations in income in eight of the nine divisions." (Browne, 1978) This author suggests that a multiplier effect accounts for this. A region in which a vulnerable sector like durable manufacturing is important will have a greater than expected decline during recession. This is because other sectors like trade, construction, and services rely on the income of those employed in the durable manufacturing sector. Conversely a diverse region will not have one vulnerable sector pulling down the prosperity of the whole region (Browne, 1978).

A study of change in the United States between 1971 and 1978 was conducted by Keinath (1985). This research was based on 183 economic areas established by the Bureau of Economic Analysis. Using an ogive measure of diversity, Keinath did not find a direct cause and effect relationship between diversity and economic growth. However, he did conclude that there is a positive relationship between high income production and diverse economies. Diverse regions or regions that were diversifying could also expect a better growth record. The positive relationship between growth and economic diversity has strengthened between 1971 and 1978. The

probability of economic success of a region increased with diversity and decreased with specialization. While growing regions were becoming more diversified, stagnating regions were becoming increasingly specialized (Keinath, 1985).

Once a region has undergone a recession, the rate of its recovery depends on its economic base. Sectors like construction, finance, and trade have tended to recover relatively quickly, while transportation has been slow to reemploy workers (Stamas, 1984).

A region or state must be diverse to enjoy the economic advantages of self-sufficiency. The greater the self-sufficiency the larger the regional multiplier. A region that can meet its own needs and export to other regions will enjoy a substantial multiplier effect. Income from goods sold outside of the region generates even more income because part of it is spent on local goods and services (Moore, 1985). Additional income caused by the multiplier effect will be spent locally and increase localized employment (Hildebrand and Mace, 1950).

A multiplier effect also occurs between the different economic sectors. For example Ohio provides 12 percent of the country's jobs in manufacturing motor vehicles, as well as 10 percent of the jobs in related industries and 25 percent of the jobs in tire and rubber manufacturing. As a result, a decline in the demand for domestic cars will have a large, negative multiplier effect on Ohio. In fact a decline in car sales will have a direct adverse affect on four sectors of

Ohio's economy (Rosen 1984).

The ability of a state to survive changes in market demands depends on its economic diversity. For example in 1979 both California and Oregon employed about the same share of the nation's lumber industry labor force. However this constituted less than one percent of California's labor force and almost eight percent of Oregon's labor force. After a decline in the demand for lumber products Oregon's unemployment rate had increased about two percent more than California's (Rosen, 1984).

Support for diversity as an economic goal is overwhelming in the popular literature. In the State of Oklahoma, the importance of this topic is indicated in a newspaper article which states that "Everybody talks about the need for Oklahoma to diversify its economy so it will not again be trapped by future plunges in the fortunes of the dominant energy and agriculture sectors." ("Recovery") The amount and emphasis of discussion on diversification in Oklahoma suggests that it is almost viewed as a panacea for the state's economic problems. "Diversification not higher crude oil and wheat prices is the key to Oklahoma's economic recovery." ("Diversify Economy") This message was "hammered home" by numerous speakers at a recent Economic Outlook Conference. Diversity is viewed not only as a cure for current economic problems, but also a basis for economic growth. "Oklahoma's growth will depend almost entirely on industrial diversification..." (Bayless, 1987) Although these examples are limited to Oklahoma, such views

are shared by many other economically troubled states, notably the oil producing states.

Measuring Economic Well-Being

Unemployment along with per capita income, and percentage of people below the poverty line are here regarded as representing economic well-being, the dependent variable in this study. These variables have social implications, however they are primarily economic indicators. Strictly social indicators are not used in this study partly because they can be unrelated to economic conditions. In addition, an accepted measurement of social well-being has not been well established in the literature. Agreement on the measurement of social well-being has not been reached because of the difficulty in collecting and evaluating data, and the often contradictory nature of the data. Some of the major difficulties of measuring social well-being are presented by Dale (1980).

Perhaps the most fundamentally sound measure of well-being is "level of living". This is a relatively well defined measure based on seven components representing different classes of human needs. However it has been shown to be more effective in measuring well-being in under-developed regions. Level of living is less effective at measuring the quality of life in industrialized societies (Knox, 1974). Because most basic human needs are met in Western societies, a more refined technique would be necessary to indicate differences between states.

Numerous methods of determining social well-being have been developed for the United States (Coates, Johnson, and Knox, 1977). Social well-being in the United States has been measured by Smith (1973) using fairly elaborate statistical techniques. Smith found "...two major independent dimensions of inter-state variation in social well-being" (Smith, 1973). The predominate dimension is based largely on income, which is associated with a number of fundamental variables of social well-being. This type of measure reflects general affluence and poverty trends. The second dimension is based on social disorganization or social pathologies. States with large cities are identified by this type of measure because social disorganization is associated with population instability instead of poverty.

These two dimensions of social well-being are independent and can be very contradictory. An example of this is New York which is affluent, scoring highly in the first measurement, but is at the bottom of the social pathology measure. Similar states include California, Massachusetts, and New Jersey. Conversely many farm states have relatively low levels of affluence but score highly in the social pathology dimension.

Social pathologies, which reflect population instabilities, are of little concern to the study of economic diversification. As a result this dimension of social well-being is disregarded. Numerous social and economic variables make up the predominant dimension which shows affluence and poverty. Variations in this measure are

primarily attributed to income, one of the independent variables of this study.

While income is relatively easy to measure, other indicators of quality of life can be extremely difficult to assess. UNESCO (1981) did a study on assessing and measuring social well-being. However they conclude that quality of life is best measured by personal satisfaction. This requires a comprehensive survey which has not yet been formulated by the Census Bureau or any other agency. Even if such data were available it would be difficult to analyze because "...there is often little correspondence between people's perception of their own well-being and the 'objective circumstances'." (Dale, 1980)

Liu (1976) discussed a whole range of quality of life indicators. The basis for his study was U.S. metropolitan areas, however the techniques discussed are valid for other spatial units. Liu suggests that quality of life has as many different definitions as there are people. One approach is to use indirect variables to measure social well-being. Different variables can be used to formulate a variety of composite indices.

Economic models are among the earliest and most used measures of social well-being. Growth in the gross national product and per capita income have had near universal support since the 1930's. (Liu 1976) For this study the per capita income measure will be used with unemployment and poverty variables, to measure economic well-being.

Hirsch (1976) is explicit in pointing out the limits and detriments of economic growth with respect to quality of life. His points are well taken and should be considered before the implementation of economic development plans. Improvements in quality of life should be universal for a system. Social or economic gains should not be made for some, or even most of the population at the expense of a few.

Policy and Economic Well-Being

Economic growth helps to reduce unemployment and causes an increase in the standard of living. However economic growth does not, in itself, solve the problem of poverty. Only about one third of all poor people can be expected to work. Therefore, economic improvements can eliminate only one third of the existing poverty at the most (Danzigerz & Gottschalk, 1983).

Although economic planning cannot solve the problem of poverty it should be optimized to eliminate as much poverty as possible. Even the lowest estimates indicate that poverty is still a serious problem in the United States (Danziger, 1982). In addition there is evidence that what is considered to be the poverty line is much too low. It has been shown that "...the income level associated with making ends meet lies considerably above the U.S. poverty level." (Danziger et al., 1983). Chambers (1982) also points out many shortcomings and failures in the measurement of the present poverty line.

Different levels of government have established transfer

or welfare payments to combat personal poverty. In addition to these payments there are considerable welfare payments made to private industry. These government outlays include tax expenditures, subsidies, grants, and awarding of government contracts. Such transfer payments are extremely costly and much less noticeable than social welfare payments.

Perhaps the most discrete form of welfare to business is in the form of tax expenditures which are often considered to be loopholes. These result in lower tax rates or exemptions from paying taxes. This type of aid is easier to get, lasts longer, and is less visible than other transfer payments. In addition, tax expenditures are given automatically to companies that fit the requirements. An example of this type of spending is the American Broadcasting Corporation which received a total of 32 million dollars of government aid and exemptions in 1977 and 1978. These were years of record profits for ABC.

Government economic spending is not being used to its best socioeconomic advantage (Abromovitz, 1983). In reference to economic planning, Richardson (1969) suggests that the national government must take full responsibility. "Local governments lack the necessary financial resources, and firms and individuals can, in extreme cases, avoid the measures of sub-national governments by moving outside their jurisdiction." (Richardson, 1969) The author suggests that local and state governments have some economic functions, but should be controlled by a central authority. It is apparent

that this was not adequate for states who, 16 years later, are actively pursuing independent economic policies (Hyden et al., 1985). Although state level economic planning may not be optimal it has become necessary.

CHAPTER II

THE RESEARCH PROBLEM

Statement of the Problem

This study was designed to investigate the relationship between economic diversity and economic well-being. The dependent variables, which represent economic well-being are; percentage of unemployment, per capita income, and percentage of people for whom poverty status is determined. Diversity, the independent variable, is determined by the distribution of the labor force among 12 economic sectors. The divisions of the labor force were established by the United States Bureau of the Census, and include the following economic sectors: agriculture; forestry, and fishing; mining; construction; nondurable manufacturing; durable manufacturing; transportation, communication, and other public utilities; wholesale trade; retail trade; finance, insurance, and real estate; services; and public administration.

The 12 economic sectors can be used to produce many different indicators of diversity. These measures must be evaluated as indicators of state level diversification. Each acceptable diversity measure can then be used in simple regression with each of the dependent variables.

The implications of specialization are also important

considerations. Each sector can be used in regression with the dependent variables to reveal the performance of individual sectors. If specialization in various sectors can be associated with levels of unemployment, income, and poverty, the relationship is worthy of consideration.

Justification for the Study

This study is concerned with information about economic diversity which could be used for macroeconomic planning. Both unemployment and poverty are domestic economic problems. There is evidence that current economic policies tend to be ineffective, and the problems of unemployment and poverty are not being properly addressed (Danziger, 1982). A better understanding of the relationship between economic well-being and economic diversity may contribute to the body of knowledge on which economic planning decisions are based.

Establishing a link between economic well-being and labor force diversity might lead policy makers to develop programs which would optimize levels of diversity in certain states. A study by Hyclak and Lynch (1980) concluded that "...especially with the prospect of limited federal funds for manpower programs, targeting of funds at states with particular problems will be increasingly more important in the future." There is also a current trend for states to develop independent industrial policies (Hyclak and Lynch, 1980). Such policies should consider the industrial mix of the state. The increase in economic planning by states makes it appropriate

to conduct this study at the state level. Although regional studies have been conducted with interesting results, the reliance upon Census regions is a disadvantage because there are no governing bodies which could act on the findings of such research. In contrast, state level information could be utilized by both federal and state governments. Browne (1978) suggests that "At the state and local levels consideration should be given to regulatory and tax policies affecting industry." This study should provide guidance for state regulation and taxation.

Similarities in the economic structures of various states may permit the states to be grouped into appropriate regions. It is quite likely that if regions are derived from this study they will be different than those established by the Census Bureau. Both state and regional data would be valid in economic planning at the Federal level. It is possible that no distinguishable regions exist. This knowledge is also significant for economic planning.

Existing evidence indicates that economic diversity should be given more consideration in macroeconomic planning. In 1981 General Motors was granted 440 million dollars in government aid. These funds were used to construct an assembly plant near Detroit (Abromovitz, 1983). In 1980 the state of Michigan employed a larger percent of its labor force in durable manufacturing than any other state in the union. Note Appendix A. With the existence of such a strong specialization in this economic activity it is possible that

the 440 million dollars might have been better spent in a different economic sector, or in a region that lacks durable industry.

The variables used to measure economic well-being were chosen because they are useful for determining where to spend development funds. Per capita income, unemployment figures, and percentage of people below the poverty level are fundamental measures of economic need. Perhaps the best economic indicator is unemployment information. "Measures of employment and unemployment are key barometers of the economic well-being of an area." (Rosen, 1984)

Hypotheses

This study will investigate three main hypotheses. First it is hypothesized that there is a positive relationship between a state's diversity and its level of economic well-being. Over time, higher diversity should promote greater stability for both wage levels and employment, resulting in a high level of economic well-being. A more stable tax base should also result from economic diversification. These positive effects are expected because a diverse region is more stable and less susceptible to economic fluctuations (Conkling, 1963). This is especially true for employment stability (Browne, 1978; Hyclak and Lynch, 1980; Rosen, 1984). Diversity also has a positive effect on income levels (Browne, 1978; Keinath, 1985).

High diversity should result in greater opportunities for

workers. Competition for workers among employers in different industries, generates higher wages (Stratton, 1985). In areas with one dominant type of employment, like the textile industry in parts of the south, wages tend to be low.

Diversity should create more employment opportunities to accommodate the whole labor force. There would be potential for different levels of education and skill, for all ages and both sexes. This notion is reasonable in the short term, however in the long run the geographic mobility of labor may negate these effects.

Finally, a positive relationship is expected between economic well-being and diversity because a diverse state can be more self-sufficient. Greater self-sufficiency leads to greater prosperity (Moore, 1985). Self-sufficiency permits a region to meet its own needs and export. This results in a larger, very beneficial regional multiplier effect (Moore, 1985; Hildebrand and Mace, 1950).

The first hypothesis could be tested by determining whether or not there is a significant relationship between the independent and dependent variables. Using simple regression, it could be determined it there is a positive relationship between per capita income and diversity, a negative relationship between unemployment and diversity, and a negative relationship between poverty and diversity. Many factors, in addition to diversity, could affect economic well-being. As a result, the extent to which diversity would explain the variation in the data is impossible to evaluate a

priori.

The second hypothesis for this study is that there is a point after which increased diversity does not have a corresponding increase in economic well-being. It is thought that the resource base, including natural, capital, and labor resources, sets a practical limit to the positive effects of diversification. The infrastructure may only be able to support a limited number of different types of enterprises. The increased business costs and taxation required to expand the infrastructure may curb the positive results of diversity (1986 Oklahoma Economic Outlook). This would cause the regression line to level off or decline. In addition, too much diversity may cause a loss of efficiency and the advantages of economies of scale could be lost (Richardson, 1969).

A second possible reason for a nonlinear relationship between economic well-being and economic diversity is that economic well-being could be some what self regulating. A diverse and prosperous state would tend to draw workers from other areas. At some point the increase in the labor force would exceed the number of jobs available. This could cause both unemployment and a decline in income levels.

The third and perhaps the most likely explanation for a nonlinear relationship between economic well-being and economic diversity stems from the fact that each economic sector is associated with different wage levels. If diversification requires workers to move to lower wage paying

sectors, the result would be a leveling of the positive effects of diversity on per capita income and poverty figures (Isard, 1975).

To test this hypothesis a nonlinear function must be applied to the data. The regression line may decline or take the form of a monotonic curve, increasing at a decreasing rate. The line may even take on a polytonic curve, with a negative slope at the higher end. Fifty data points are not enough to expect a strong relationship, or a well defined curve in the plotted data points.

The final hypothesis of this study is that it will be possible to identify a pattern of areal differentiation, or a set of regions, based on levels of diversification. Regional similarities in the natural resources, labor force, capital resources, and proximity to markets of various states will result in similar levels of economic development and diversity. This hypothesis could be tested by determining if there is more variation between regions than within them.

Definition of Terms

Economic well-being

Per capita income, percentage of unemployment, and percentage of people for whom poverty status is determined are the components of economic well-being.

Diversity

The relative importance of different kinds of economic activities in a state determine its diversity. Diversity is

derived from the division of the labor force in each of the 12 Census Bureau categories. These include: agriculture; forestry and fisheries; mining; construction; nondurable manufacturing; durable manufacturing; transportation, communication, and other public utilities; wholesale trade; retail trade; finance, insurance and real estate; services; and public administration. The level of diversity of each state is represented by its diversity index, where greater diversity is represented by lower index numbers.

Diversity index

To measure economic diversity an index is established on the basis of the percentage of the labor force employed in each economic sector. Sectors are ranked in descending order and cumulative percentages are calculated. These percentages are then summed up to create an index. A high total represents specialization and lower totals represent greater diversity.

Specialization

A specialized state is one with a concentration of the labor force in one or a few economic sectors. Concentration is evaluated in terms of the diversity index. This is a relative, rather than an absolute measure. The specialization of a state is evaluated in terms of how the distribution of its labor force compares to the distribution of other states.

Economic sector

Each of the 12 Census categories is an economic sector. Each sector is made up of many subgroups and some economic sectors are in themselves quite diverse. This is especially

true for the manufacturing sectors.

Labor force

All persons employed or unemployed and seeking employment constitute the labor force. (U.S. Bureau of Labor Statistics, 1976) For the purpose of this study the division of the labor force is the basis for determining diversity.

Economic Growth

The economic growth for a state is defined in the same manner as it is for a country. "A country's economic growth may be defined as a long-term rise in capacity to supply increasingly diverse economic goods to its population, this growing capacity based on advancing technology and the institutional and ideological adjustments that it demands." (Kuznets, 1973)

Industry mix

The number of different kinds of economic activities in a state constitute its industry mix. Diverse states have a greater industry mix, with many different types of industry. Specialized states have a little industry mix.

Multiplier effect

A multiplier is the result of linkages between different economic groups. A change in one group which has a corresponding change in associated groups is a multiplier effect. The results of a multiplier can be positive, for example when some income generates more income, or negative as is the case when a decline in one economic sector causes unemployment in associated sectors.

Tax expenditures

Often considered tax loopholes, tax exemptions or expenditures are "...those revenue losses attributable to provisions of Federal tax laws which allow a special exclusion, exemption or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability." (Congressional Budget Office, 1981)

Corporate welfare

Corporate welfare includes any government transfers to business. Such outlays include; grants, subsidies, tax expenditures, and government contracts.

Limitations of Study

Both diversity and economic well-being data will consist of 1980 averages. Analyzing a single year makes this a synoptic study with no longitudinal, or dynamic component. This study is limited to analyzing the performance of economic sectors in different states and regions at a particular time rather than over time. The biggest limitation of this approach is that the data are dependent of the state of the economy in the sample year. The performance of an economic sector in 1980 may not be representative of its normal or traditional performance.

In a similar manner the economic well-being indicators may not be typical for each state. This measure is limited to three components and is not in itself a comprehensive measure

of economic prosperity. Rather the economic well-being variables give a general picture of economic conditions in a state.

The measurement of diversity is also generalized. The categories used are those established by the Census Bureau. It should be noted that within any economic sector there may be subgroups which perform quite differently than the sector as a whole. Such anomalies will not be apparent in this study. However variations within sectors are worthy of consideration and could be investigated.

In addition, the Census groups industries which are closely related or interdependent in different economic sectors. For example if trade and service industries are based on one industry or sector they are strongly interdependent. Although a state may show a certain level of diversity, it could in fact rely largely on one product. A notable example of this is the dependence of states like Oklahoma on the oil industry. Although the labor force may be distributed among economic sectors, many of the sectors provide goods and services for the oil industry. It is not possible to study these inter-sector linkages within the framework of this study.

CHAPTER III

METHODOLOGY

Many techniques for measuring economic diversity have been developed and evaluated. Most studies have taken place at the city level. Numerous publications compare and evaluate the different methods of measuring metropolitan diversity. However no evaluation has been presented for the measurement of state level diversity. As a result, a variety of techniques were examined in order to determine the most efficient method of measuring state level diversity.

National Average Measures of Diversity

Coefficient of Specialization

The national average method of measuring diversity is an accepted technique, at the city level. Florence (1942) compared states to national averages in various economic sectors. He was able to show relative levels of state level diversification with this method. The coefficient of specialization which Florence used, has become an established measure which is calculated as follows:

$$D_j = \sum_{i=1}^{n} |N_i - S_i| \qquad (1)$$

where: D_j = diversity for state j
N_i = national percent employed in sector i
S_{ij} = percent employed by state j in sector i
n = number of economic sectors

The result is a value between zero, which is greatest diversity, and one, which is greatest specialization. A value of zero would occur if a state had a labor force distribution which was identical to the nation's. This technique was tested on the 1980 state Census data used in this study. The coefficient of specialization method was used to evaluate the national average type of measure at the state level.

There is no reason to assume that a state's labor force distribution should approximate the nation's. Rogers (1950) notes that the method is questionable because no area can be expected to be a microcosm of the whole nation. Although the national average is only used as a base level, it is thought to be an illogical standard for evaluating state level diversity. However the success and general acceptance of the national average type of diversity measure warrants its evaluation at the state level.

Standard Deviation Measure

A second national average type of measure was introduced to more completely evaluate the national average approach to measuring economic diversity. The percentage employed in the various sectors for each state were normalized by the national average. The standard deviation among the various normalized sectors was then calculated for each state.

$$Dj = \sqrt{\frac{\Sigma\ (S_{ij}-N_i)}{n-1}} \qquad (2)$$

where: D_j = diversity for state j
S_{ij} = percent employed by state j in sector i
N_i = percent employed by the nation in sector i

Little variation among the sectors indicated diversity, and larger standard deviations represented specialization. This is not a commonly accepted diversity measure, however it does represent the distribution of the labor force. Standard deviations were implemented to further test the national average approach to measuring state level diversity.

Absolute Measures of Diversity

Ogive Measure

More appropriate for measuring the economic diversity of states are absolute measures of diversity. The most widely tested and used absolute measure is the ogive. This procedure involves ranking the percentage employed in each economic sector, for each state, in descending order. Cumulative percents are then summed to produce a number which represents the level of diversity for each state. Figure 1 illustrates the construction of the ogive measure. The measure is formulated as follows:

$$D_j = \sum_{i=1}^{n} E_{ij}[(n+1)-i] \qquad (3)$$

where: D_j = diversity for state j
E_{ij} = economic sectors in state j

ranked in descending order
n = number of sectors

The data set used in this analysis includes the 12 major economic sectors determined by the Census. These sectors can be aggregated, and input into the ogive equation. The ogive measure was applied with; n = 12, n = 10, and n = 3 sectors. Aggregation of the data is shown in Table III. Aggregation of the sectors into primary, secondary and tertiary activities is not conventional and was introduced experimentally. This approach measures the distribution of the labor force and therefore, to at least some extent, represents diversity. However it must be acknowledged that this measure may be a better indicator of economic factors other than diversity.

Initially 12 sectors were used, and thought to be an appropriate number (Roepke and Feudenberg, 1981; Ullman et al., 1971). As indicated in Table III, each of the primary sectors employ a small percentage of the labor force. As a result, above average employment in any or all of the primary sectors contributes considerably to a state's measured level of diversity. Figure 1 shows the relative size or each sector for Oklahoma. Because the agriculture, forestry and fisheries, and mining sectors are so small, and represent the initial stages of production, they were aggregated in the second stage of analysis. On the average, the primary sectors combined still employ a smaller percentage of the labor force than wholesale trade, the next largest sector.

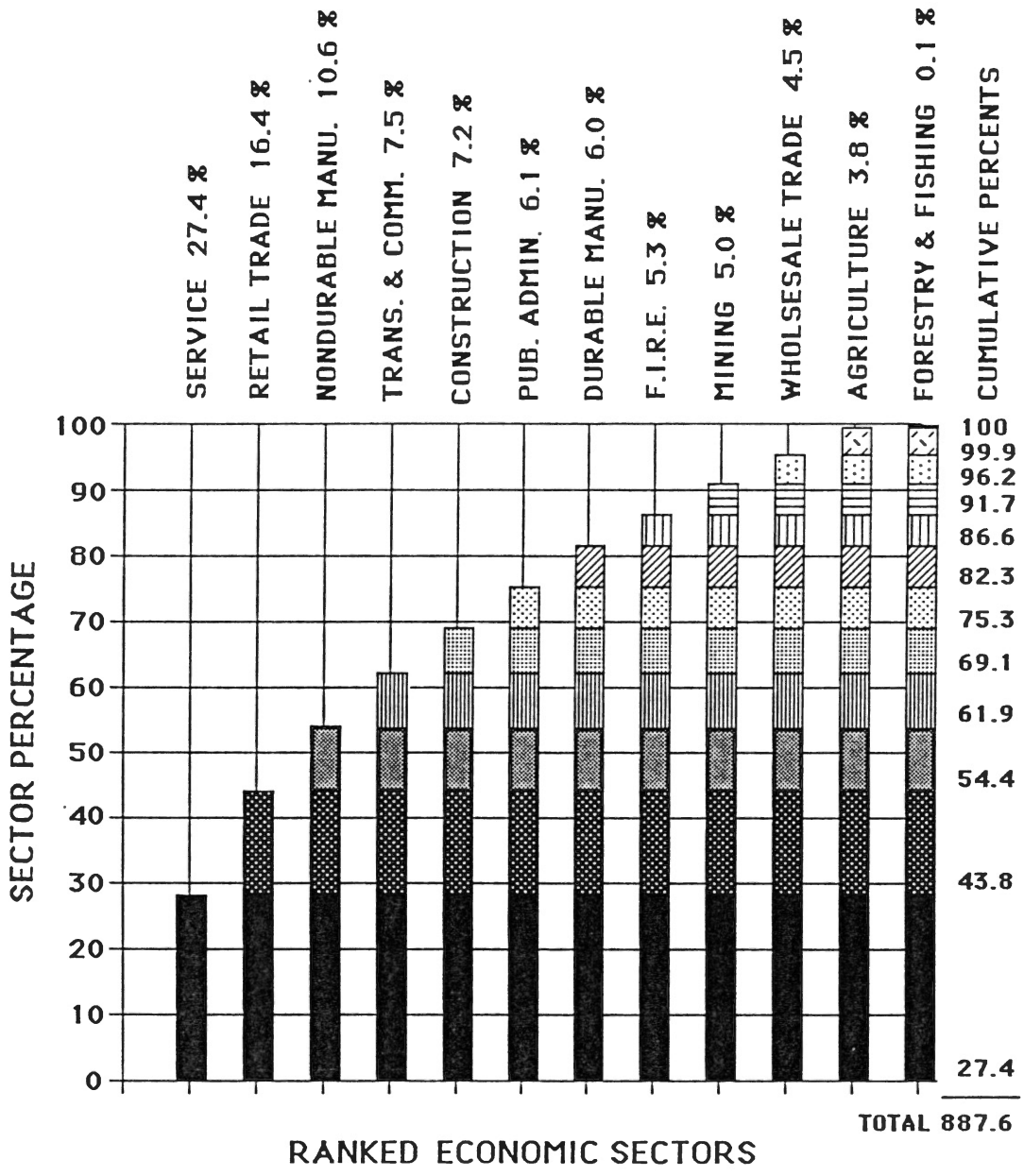


Figure 1. Example of Ogive Construction for Oklahoma

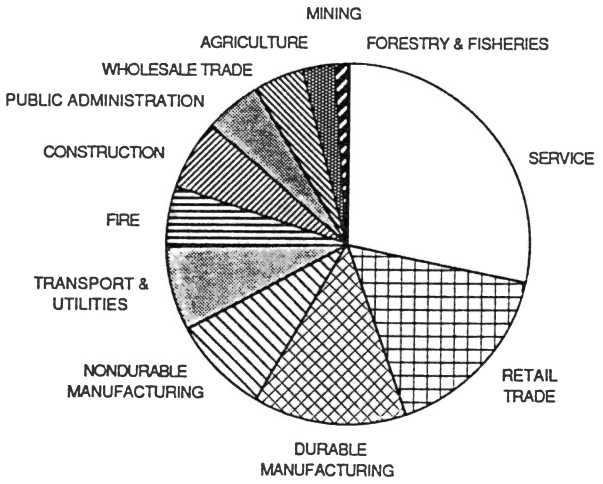
TABLE III

PERCENTAGE OF THE NATIONAL LABOR FORCE EMPLOYED IN EACH ECONOMIC SECTOR, STAGES OF AGGREGATION OF THE ECONOMIC SECTORS

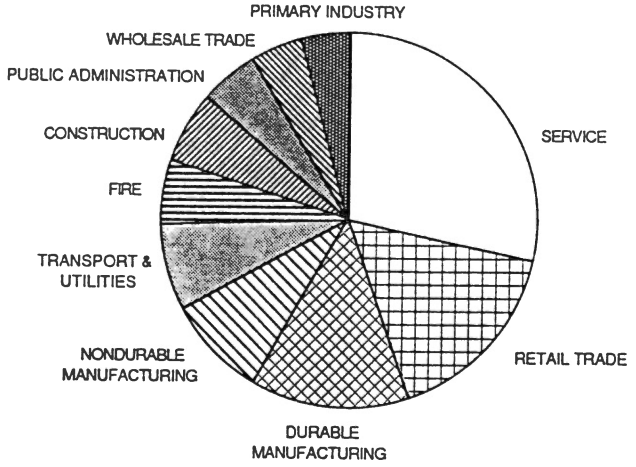
Aggregation level	A1	A2	A3
Number of sectors (n=)	12	10	3
Agriculture	2.83		
Forestry and fisheries	0.16	4.05	4.05
Mining	1.06		
Construction	5.89	5.89	
Nondurable manufacturing	8.66	8.66	28.39
Durable manufacturing	13.84	13.84	
Transport and utilities	7.26	7.26	
Wholesale trade	4.35	4.35	
Retail trade	16.12	16.12	67.59
Finance, insurance, realty	6.04	6.04	
Services	28.61	28.61	
Public administration	5.21	5.21	

Further aggregation of the data resulted in the breakdown of the labor force into the primary, secondary, and tertiary sectors. The three levels of aggregation of the ogive measure are illustrated in Figure 2. The dominance of the tertiary sector, which employs an average of over 67 percent of the labor force, is evident. Figure 3 shows the three ogive measures for all 50 states. It is apparent that aggregating the primary sectors has little effect on the relative levels of diversity for each state. To show variations in the three sector ogive it had to be plotted at a larger scale. This plot does not follow the trends of the 10 and 12 sector ogives.

12 SECTORS



10 SECTORS



3 SECTORS

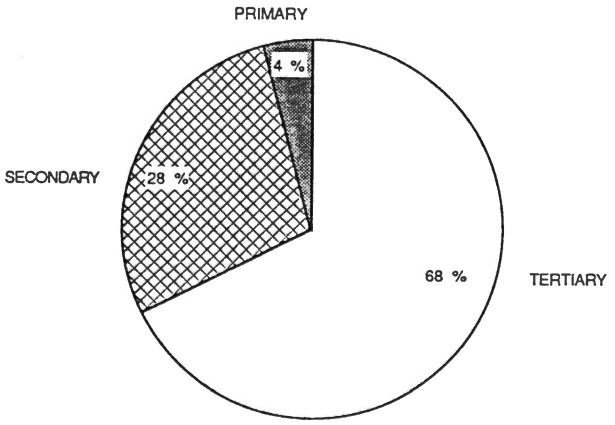


Figure 2. Pie Graphs of Ogive Aggregation using National Averages

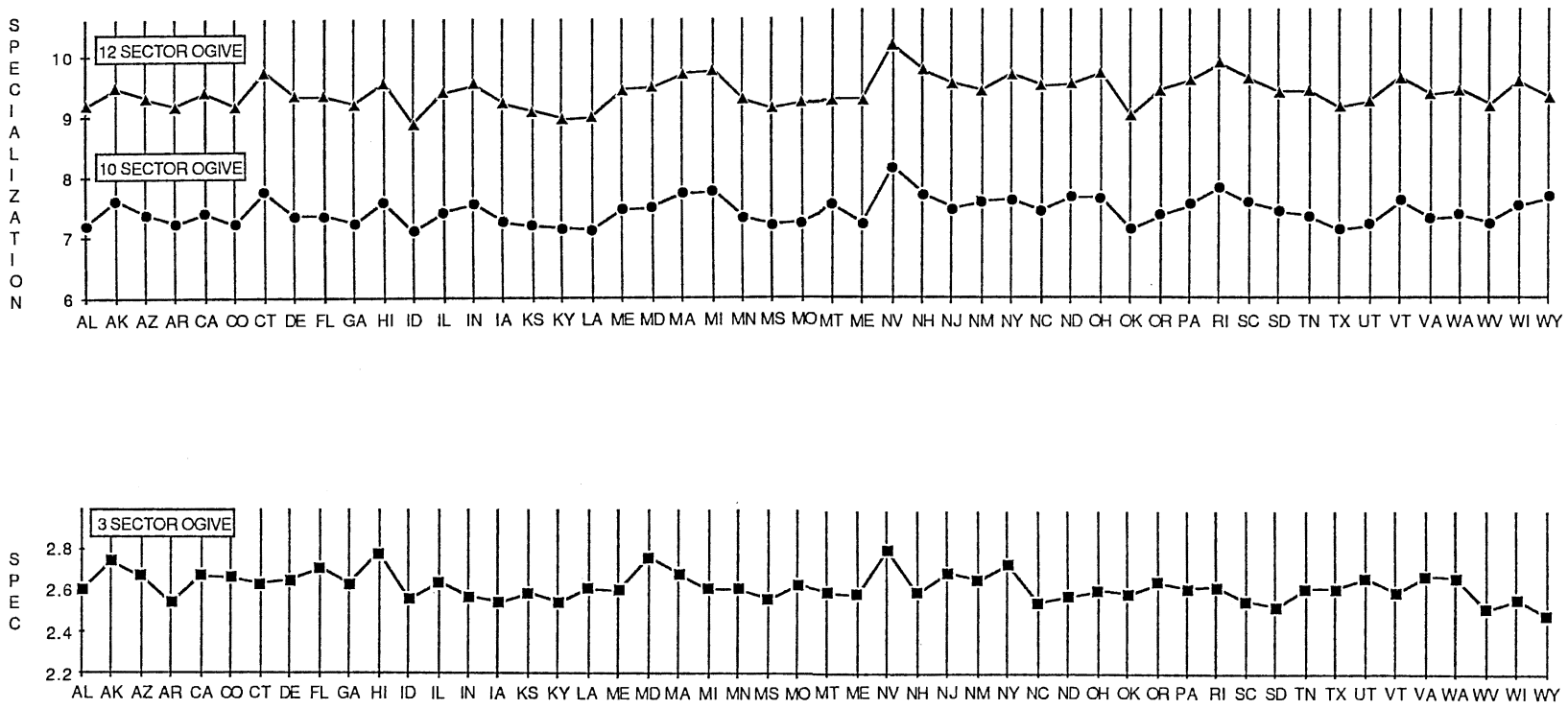


Figure 3. Ogive Comparison Plots

Threshold Measure

The aggregation of the economic sectors was both inspired and justified by a new measure of economic diversity. The "threshold approach" is a different way of analysing absolute diversity. This method involves setting a percentage of the labor force as a threshold. Similar to the way the ogive is calculated, the sectors are first ranked in descending order. To determine the number of sectors required to meet the threshold, a Pascal program was written. Economic sectors were added until the threshold was reached. The program then calculated what percentage of the last sector was needed to exactly meet a predetermined threshold. The 12 economic sectors established by the Census were used as input for this measure.

Figure 4 shows the Lorenz curves which represent greatest diversity and greatest specialization, based on the 12 sector ogive. Absolute diversity, which would have one twelfth of the labor force employed in each sector, is also shown. The 50 and 90 percent thresholds are also shown. The 50 percent threshold intersects the plot for Nevada at 1.35, indicating specialization as almost half of the labor force is employed in one sector.

Table IV shows the greatest and smallest number of sectors required to meet each threshold. As this table is read, it requires between 1.35 and 2.74 sectors to make up fifty percent of the labor force. With this measure the state requiring more sectors to meet the threshold would be

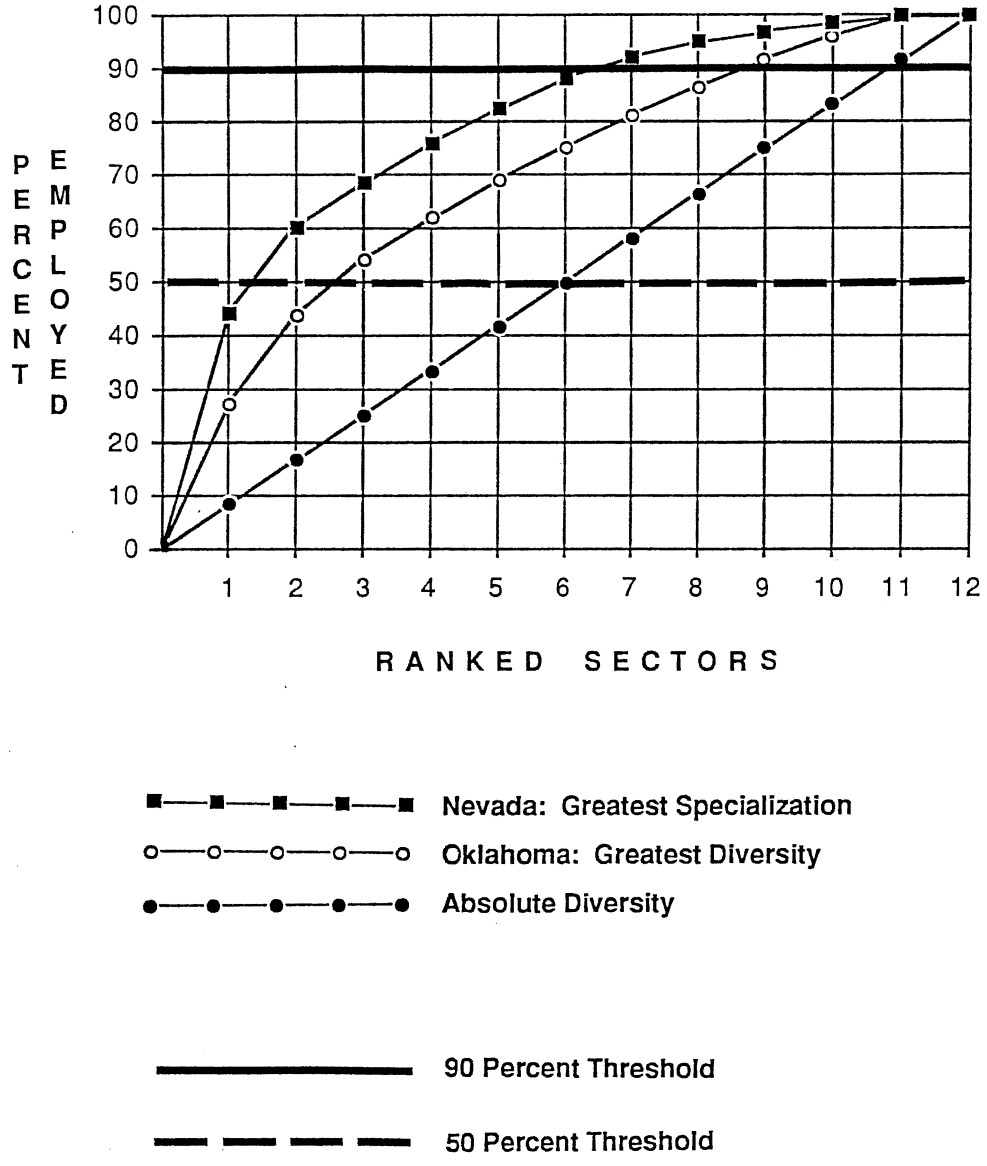


Figure 4. Examples of the 12 Sector Ogive and Threshold Diversity Measures

specialized state, Nevada, requires all of its largest sector, and 35 percent of its second largest sector, to reach the 50 percent threshold. West Virginia, the most diverse state, requires the two largest sectors and 74 percent of its third largest sector to reach the same 50 percent threshold. Clearly West Virginia's labor force is much more widely distributed among sectors. A breakdown of the percentage employed in each economic sector, is shown in Appendix A.

TABLE IV

THRESHOLD MEASURE OF DIVERSITY, RANGE OF SECTORS REQUIRED TO REACH EACH THRESHOLD, CORRELATION BETWEEN THRESHOLDS AND THE OGIVE MEASURES

Threshold %	Number of sectors min.*	max.**	correlation r^2	p
50	1.35	2.74	0.980	0.0000
60	1.97	3.88	0.977	0.0000
70	3.10	5.28	0.979	0.0000
80	4.60	6.80	0.985	0.0000
90	6.41	8.67	0.990	0.0000
95	7.89	9.77	0.993	0.0000

* denotes greatest specialization at each threshold
** denotes greatest diversity at each threshold

Stine (1986) suggested the use of a threshold approach. To some extent this notion was inspired by Weaver's 1954 study of crop combinations.

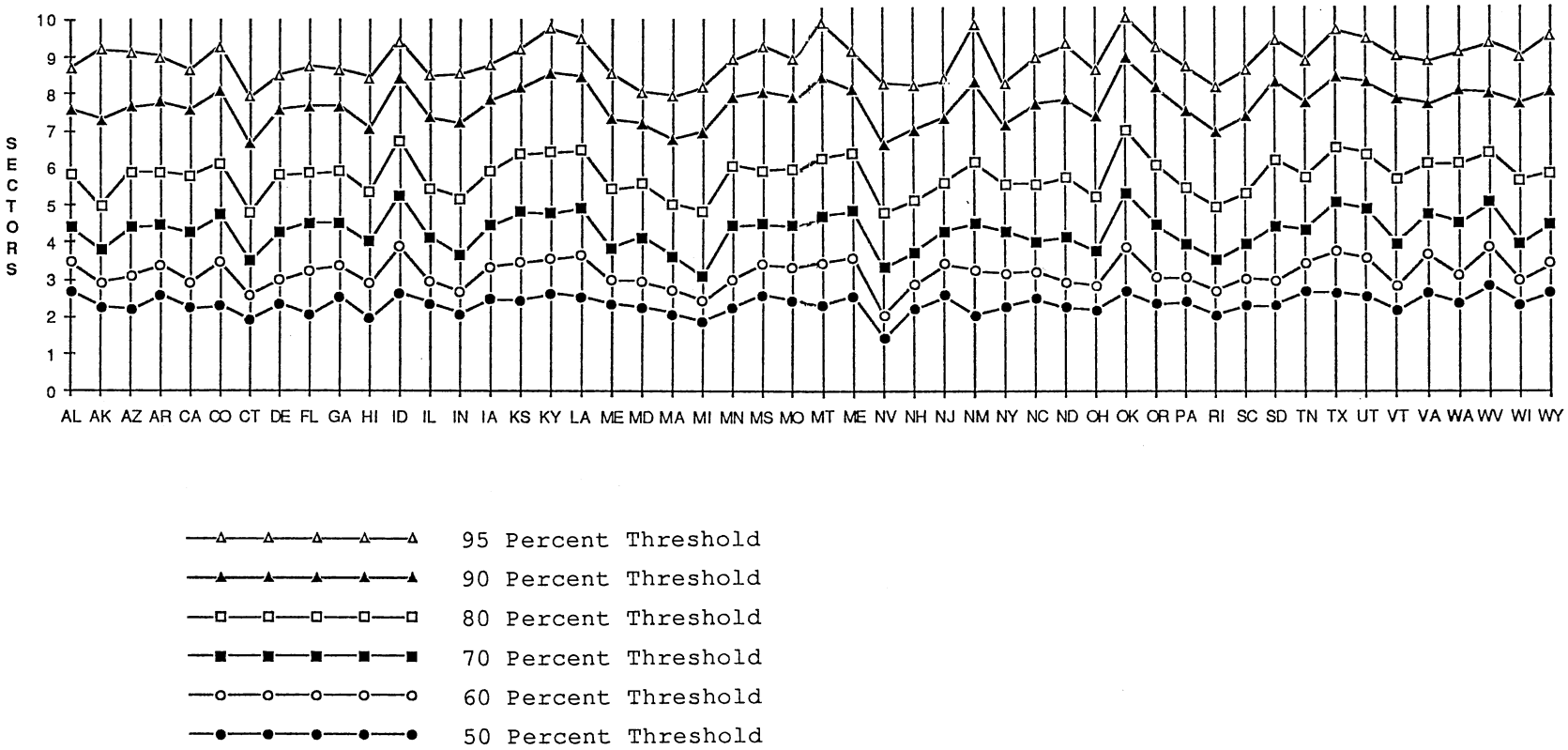


Figure 5. Threshold Comparison Plot

Because the threshold approach is based on the same principle as the ogive measure, it was not expected to provide significantly different results. Table IV shows that the two measures have a strong correlation which is highly significant. The contribution of this new technique can also be seen in Table IV. It is clear that when less than three sectors are evaluated, as in the case of the 50 percent threshold, the results are very similar to the 12 sector ogive. Figure 5 shows several threshold measures for all states. The various thresholds follow the same trends, and the relative differences between states are rather constant. Various levels of diversity are evident in the first, or 50 percent threshold. This suggests that it may not be necessary to study a large number of sectors. Analysis based on the three or four largest sectors is likely to be as informative as analysis based on 12 sectors. This confirms assertions made be Shear (1965), and Keinath (1985).

An advantage of Stine's threshold approach is that it provides useful information about the employment structure of the states. With closer analysis, the impact of individual economic sectors on a state's labor force can be identified. Although the threshold approach is not expected to replace the long established ogive method, it has contributed to the measurement of diversity.

Summary of Diversity Measures

Appendix B summarizes the performance of each state

according to the various diversity measures used. To permit comparison between the different diversity estimates, each measure was normalized in the following manner:

$$Dn = \frac{D_{max} - D_j}{D_{max} - D_{min}} \quad (4)$$

where: D_n = normalized diversity
D_j = diversity of state j
D_{max} = state with greatest diversity
D_{min} = state with least diversity

Normalizing the data produced a number between zero and one. Zero, representing the lowest level of diversity, was in all five cases Nevada. No single state consistently showed greatest diversity, being represented by one on the normalized scale. Also shown in Appendix B is the number of standard deviations each state is above or below the mean, according to each of the diversity measures. The standard deviations show that Nevada is exceptional, being far more specialized than any other state. Both the standard deviations and normalizing the data show the relative levels of diversity and specialization.

Weighting by Labor Force

Regardless of the diversity measure used, when standard regression analysis is done, each state is one data point. Therefore each state has equal influence on the slope of the regression line. There is huge variation among the size of the labor forces of the fifty states. For example California

has the largest labor force, which is almost 65 times the size of Alaska's labor force. Note Appendix A. With standard regression techniques, these states have equal input. To give the states proportional input into the regression equation, weighting by the labor force was considered for the diversity and economic well-being data.

Residuals were studied to determine if weighting was appropriate. The residuals of the three dependent variables and the 12 sector ogive measure of diversity were plotted and are shown in Appendix C. The student residual was used to determine that there was some heteroscadasticity in two of the dependent variables. The unemployment and poverty variables display a tendency to have larger residuals for smaller labor forces. If heteroscadasticity exists, the plots of weighted residuals should display a more random distribution of data points. The plots of weighted student residuals, also shown in Appendix C, indicate that weighting does affect the plots for unemployment and poverty. The tendency for smaller labor forces to have larger residuals is removed in the weighted residual plots. Weighting was used to correct for heteroscadasticity in the unemployment and poverty data. Weighting according to the size of the labor force was introduced into the regression equation.

Regression with Dependent Variables

Each of the weighted and unweighted diversity measures was used in simple regression with the three dependent

variables, percent unemployment, per capita income, and percent with poverty status. Oklahoma State University's IBM mainframe computer was used to calculate the three ogive measures. Weighted regression, unweighted regression, and the residuals were calculated for each of the ogive measures. A SAS program was written for this analysis. The unweighted ogive analysis was duplicated on a micro computing system. In addition, the coefficient of specialization, standard deviation, and threshold measures were analysed on a Macintosh micro computer. The spreadsheet program, Microsoft Excel, was used to calculate the diversity measures. Statsoft, a statistical package, was used for regression with the dependent variables.

Duplication of a major portion of the analysis provided a useful error check. The data input, numerical calculations, and technique could be tested by duplication. Two different programming approaches were used to calculate ogive diversity. Both methods produced the same results, verifying that the data processing was done correctly.

CHAPTER IV

REGRESSION RESULTS

Diversity Measures

The dependent variables, percent unemployment, per capita income, and percentage with poverty status, were studied with respect to state level diversity using the methodologies described in Chapter III. Each of the dependent variables, which represent economic well-being, was used in regression with a variety of diversity measures.

Both the coefficient of specialization and the standard deviation measures of diversity allowed distinctions among states to be made. However no relationships were found when the results of these national average measures were used in regression with the three dependent variables; percent unemployed, per capita income, and percent below the poverty level.

Based on the results of these two measures, it has been concluded that the national average approach does not produce useful measures of diversity for evaluating state level economic well-being. It is possible that these techniques are scale dependent. National average diversity measures have been shown to be valid, and are generally thought to be superior at the city level (Marshall, 1975; Bahl et al.,

TABLE V

SUMMARY OF REGRESSION RESULTS

Technique	Unemployment			Per Capita Income			Poverty		
	r	r^2	p	r	r^2	p	r	r^2	p
Absolute Measures									
Ogive 12	0.127	0.016	0.384	-0.418	0.174	0.003	0.475	0.226	0.001
Ogive 10	0.143	0.020	0.325	-0.415	0.172	0.003	0.478	0.229	0.001
Ogive 3	0.010	0.000	0.904	-0.614	0.377	0.000	0.316	0.100	0.024
Thresh. 90	-0.103	0.011	0.482	-0.398	0.158	0.004	0.449	0.202	0.001
Thresh. 50	-0.039	0.002	0.778	-0.392	0.153	0.005	0.452	0.204	0.001
Weighted by the Labor Force									
Wt. Ogive 12	-0.468	0.219	0.000	-0.391	0.153	0.000	0.535	0.286	0.000
Wt. Ogive 10	-0.487	0.238	0.000	-0.354	0.126	0.000	0.521	0.271	0.000
Wt. Ogive 3	0.065	0.004	0.428	-0.605	0.366	0.000	0.231	0.053	0.005
National Average Measures									
Coef. of Spec.	-0.029	0.001	0.823	0.155	0.024	0.282	-0.109	0.012	0.456
Stand. Dev.	0.182	0.033	0.203	0.186	0.035	0.193	0.047	0.002	0.741
Dependent Variables									
Unemploy.	1.000	1.000	0.000	0.010	0.000	0.903	0.166	0.028	0.248
Income	0.010	0.000	0.903	1.000	1.000	0.000	0.721	0.520	0.000
Poverty	0.166	0.028	0.248	0.721	0.520	0.000	1.000	1.000	0.000
Non Linear Regression									
Quadratic	0.117	0.014	0.419	-0.311	0.097	0.028	0.385	0.148	0.006
Cubic	0.116	0.013	0.424	-0.312	0.097	0.028	0.382	0.146	0.006

1971). However the technique is not appropriate at the state scale. The coefficient of specialization and the standard deviation methods were abandoned as state level diversity measures.

Several diversity measures were identified as being superior for explaining economic well-being. However the explaining power of any one diversity measure was not consistent for all three dependent variables. For example, the three sector ogive was far superior to any other measure for explaining per capita income. The same measure explained little of the variation in poverty levels, and none of the variation in state level unemployment. A summary of the regression results, for all diversity measures evaluated, is shown in Table V.

The initial regression analysis with the dependent variables indicated that the 50 and 90 percent thresholds were informative. Although they produced similar results, both levels were studied to evaluate the technique. In addition to the two threshold measures, three ogive measures, including 3, 10, and 12 sectors, were used to represent state level economic diversity. The aggregation of sectors to produce these ogives is shown in Table III.

The amount of variation between diversity measures for each state is striking. Appendix B shows that for some states, the five estimates of diversity are very different. In general there is agreement between the 10 and 12 sector

ogives. This further supports the notion that diversity can be effectivity measured by considering only the three or four largest sectors. Aggregation of the three smallest sectors had virtually no impact on the measure. The three sector ogive performs quite differently than the other measures. Because this measure is based on only three aggregated sectors, it is not a traditional diversity measure, and was not expected to perform like one.

It is interesting to note that the 50 and 90 percent threshold measures produced rather different results. Although the same technique was used, the difference in the setting of the labor force threshold has a big impact on the results. This can be explained by the huge variation in the percentages employed in the various sectors. Referring to Table III, where the national averages for each sector are shown, the dominance of the service sector and the insignificance of the three primary sectors is evident. Therefore adding the first few larger sectors, to meet a low threshold, will create a very different profile than adding the many small sectors necessary to reach a high threshold. Given the fact that the two threshold measures, shown in Appendix B, do not identify the same states as being specialized and diverse, it is surprising that they produce almost identical results in regression with the dependent variables. Note Table V.

Unemployment and Diversity

None of the diversity measures explained any of the variation in unemployment when simple unweighted regression was used. Residuals of the regression of the 12 ogive and the percentage of unemployment are presented in Appendix C. These plots indicate that some heteroscadasticity is present in the data. As the variation about the mean tended to increase with smaller labor forces, weighting was justified.

Weighted regression can explain a significant portion of the unemployment data. When the 10 sector ogive measure was weighted by the size of the labor force, the relationship between unemployment and diversity was significant (r^2=0.238, p=0.000). The results of the weighted 12 sector ogive are similar, however the weighted three sector ogive does not produce meaningful results. The correlation and significance of the relationship between diversity and the dependent variables are shown in Table V.

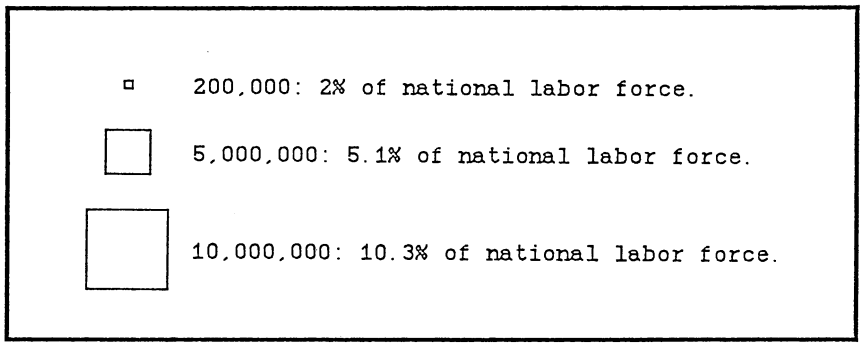


Figure 6. Legend for Plots of Regression Weighted by the Labor Force. The Square Size is Proportional to the State's Labor Force

The fact that weighting improves the regression results significantly implies that some of the states, with smaller labor forces, have exceptional relationships between diversity and unemployment. Such states are de-emphasize by weighting, allowing the more general relationship between diversity and unemployment to be identified. Figure 6 shows the labor force represented by graduated squares which indicate the weight of each point.

Figures 7 and 8 are plots of weighted regression between unemployment and diversity measured by the 12 and 10 sector ogives. The small, outlying squares are data points which, prior to weighting, confused the relationship between diversity and unemployment. The advantage of weighting is also illustrated by the fact that the larger squares tend to fall on or near the regression line.

The results of weighted regression support the hypothesis that there would be an inverse relationship between levels of unemployment and diversity. Increased diversity tends to result in lower levels of unemployment. This relationship is generally accepted, as high levels of employment are associated with economic stability, and stability is associated with diversity. However, given the results of related studies, a closer relationship between unemployment and diversity was expected (Browne, 1978; Hyclak and Lynch, 1980; Brewer, 1985). It was expected that unweighted regression would show a significant relationship between diversity and unemployment.

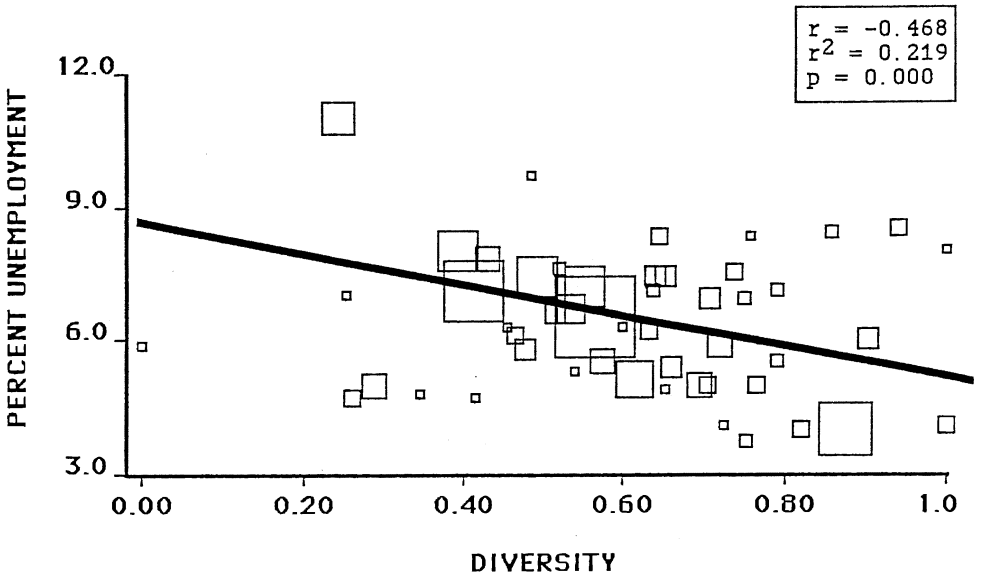


Figure 7. Plot of Unemployment and 12 Sector Ogive Diversity: Regression is Weighted by the Size of the Labor Force

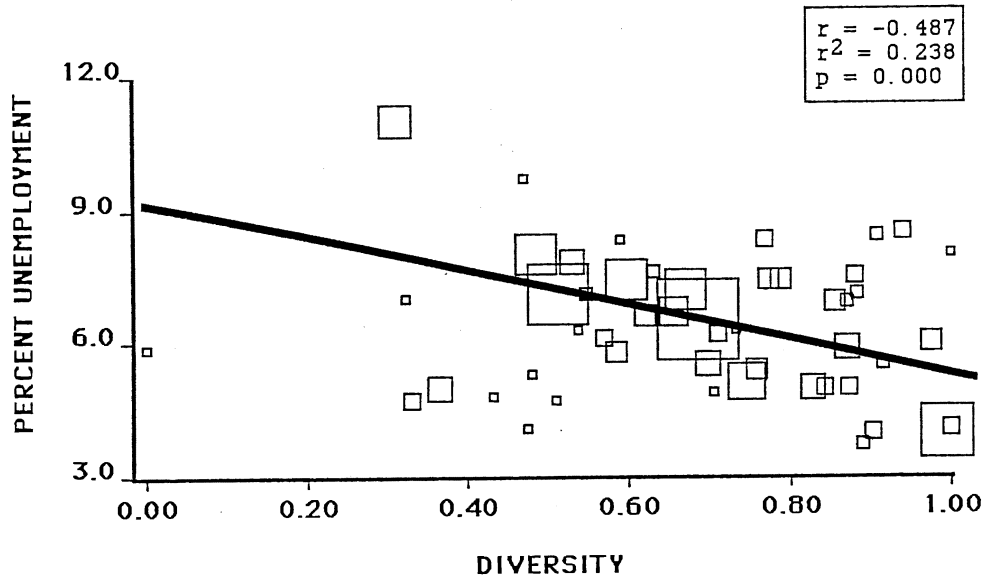


Figure 8. Plot of Unemployment and 10 Sector Ogive Diversity: Regression is Weighted by the Size of the Labor Force

Per Capita Income and Diversity

Weighting was not necessary to establish a significant relationship between per capita income and several different measures of diversity. The residuals in Appendix C show that weighting is not appropriate for this variable. The amount of variation in levels of income is independent of the size of the labor force. Because heteroscadasticity is not apparent in the residuals, weighting would not be expected to improve the relationship between diversity and income. Table VI ranks the significant diversity measures by their ability to explain variation in per capita income.

TABLE VI

SUMMARY OF REGRESSION RESULTS BETWEEN PER CAPITA INCOME AND MEASURES OF DIVERSITY

DIVERSITY MEASURE	r	r^2	p
Ogive: 3 economic sectors	-0.61	0.377	0.000
Weighted ogive: 3 economic sectors	-0.61	0.366	0.000
Ogive: 12 economic sectors	-0.42	0.174	0.003
Ogive: 10 economic sectors	-0.41	0.172	0.003
Threshold 90: 12 economic sectors	-0.40	0.160	0.004
Weighted ogive: 12 economic sectors	-0.39	0.153	0.000
Threshold 50: 12 economic sectors	-0.39	0.152	0.005
weighted ogive: 10 economic sectors	-0.35	0.126	0.000

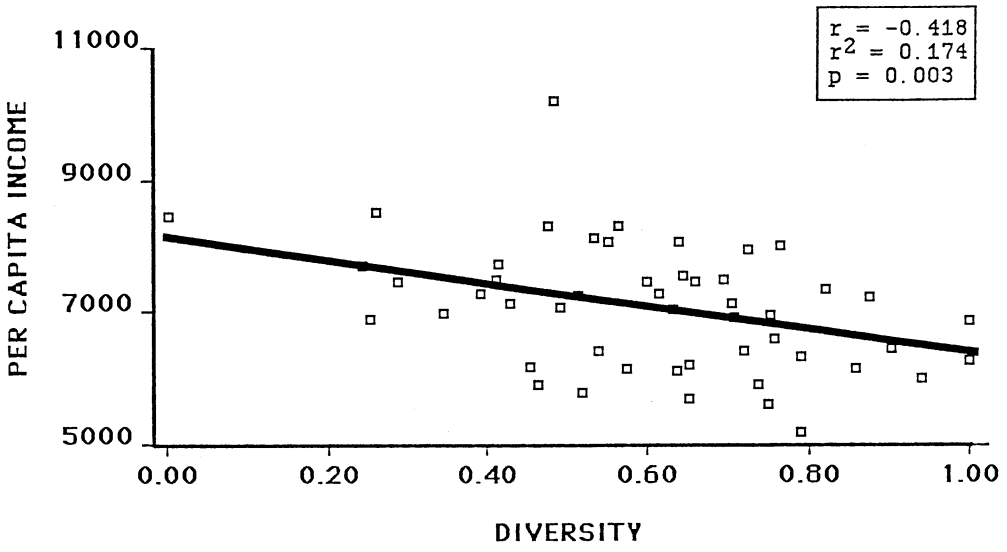


Figure 9. Regression Plot of Per Capita Income and 12 Sector Ogive Diversity

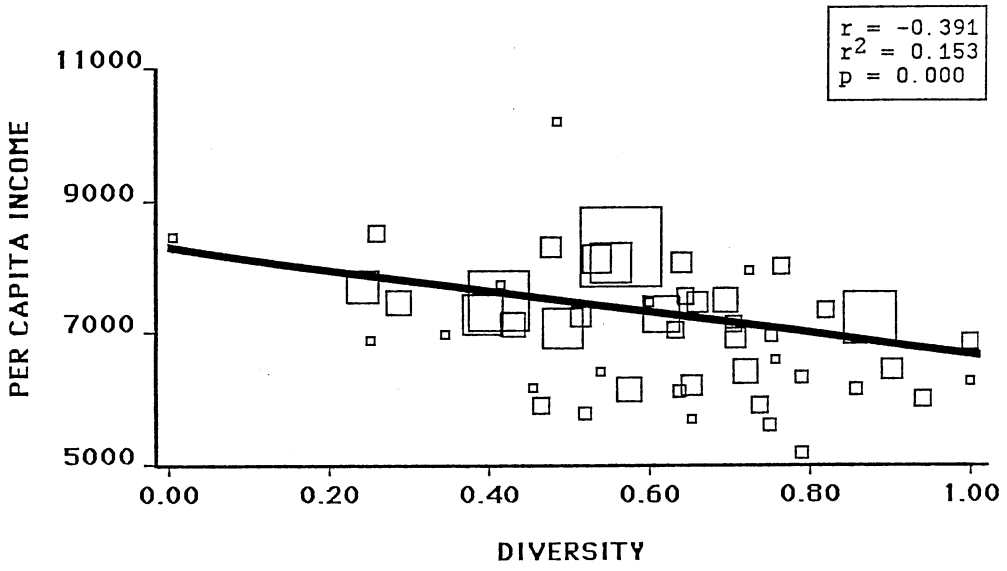


Figure 10. Plot of Per Capita Income and 12 Sector Ogive Diversity: Regression is Weighted by the Size of the Labor Force

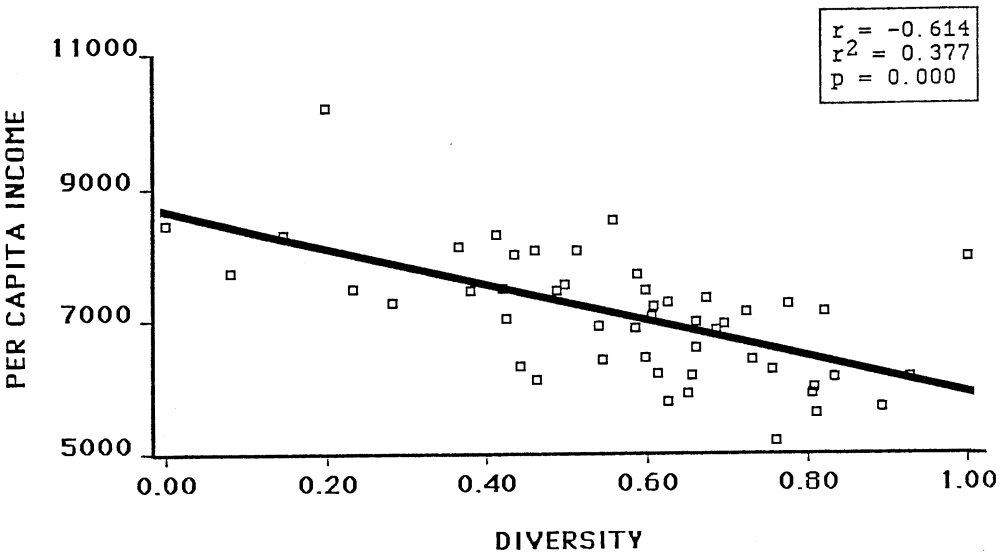


Figure 11. Regression Plot of Per Capita Income and 3 Sector Ogive Diversity

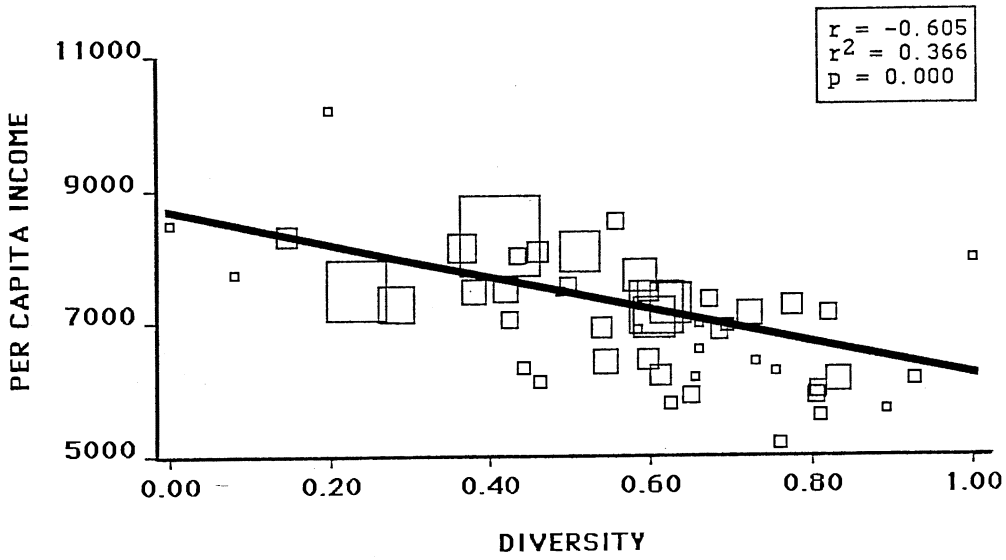


Figure 12. Plot of Per Capita Income and 3 Sector Ogive Diversity: Regression is Weighted by the Size of the Labor Force

Figures 9 and 10 show unweighted and weighted regression results of diversity, measured by the traditional 12 sector ogive, and per capita income. The 12 sector measure explains less than one half as much of the variation in levels of income as the three sector ogive. The three sector ogive, based on the aggregation of the 12 economic sectors into primary, secondary, and tertiary activities best explains income variation. This measure is far superior to any other measure of diversity.

Weighting the three sector ogive does not have a significant affect on the regression results. Figures 11 and 12 show the unweighted and weighted regression results for the three sector ogive. Based on the residual plots, weighting was not expected to improve the regression analysis. Figures 9 through 12 illustrate the relationship between the two types of regression. For income data the large squares do not fall as close to the regression line as they do in the unemployment plots. This helps to explain why per capita income regression is not improved be weighting.

The three sector ogive explains more than twice as much of the variation in per capita income as the next best measure. The traditional ogive measure of diversity, which considers many sectors, is inferior for explaining variations in per capita income. Considering types of activities, rather than individual Census defined sectors appears to be superior for showing variation in income levels at this scale. Although the three sector ogive may prove to be a useful tool

for studying per capita income, it is not necessarily just an indicator of diversity. It may actually be reflecting other economic factors like the stage of economic development.

The threshold measure proved to be sightly inferior to the ogive approach in measuring diversity, for the purpose of explaining various income levels. However the results are similar, as was expected due to their conceptual similarity, and the strong correlation between the two measures. The 50 percent threshold, which is calculated with only the three largest sectors, explains almost as much of the variation in per capita income as measures using up to 12 economic sectors.

This study was conducted to determine the relationship between economic well-being and economic diversity. It was hypothesized that there was a positive relationship between the variables representing well-being and diversity. The most outstanding result of the regression between per capita income and diversity is that a significant inverse relationship exists. All measures confirm that increased diversity is associated with lower per capita income. This is contrary to the hypothesis that diversity is positively associated with per capita income. It is also contrary to both the professional and popular literature outlined in Chapter I.

To explain the unexpected, inverse relationship, individual sectors and activities were studied. Because the three sector ogive was so superior, consideration was given to individual sectors and economic activities. It was thought that specialization in some sectors may explain more of the

variation in per capita income than the diversity measures. Table V summarizes the significant regression results of this inquiry.

Six of the 12 economic sectors used in this study revealed some information about state level per capita income. According to the regression results, the percentage of the labor force employed in the finance, insurance, and real estate (FIRE) sector has a huge impact on income. This sector alone, which on the average employs only about six percent of the labor force, explains almost 32 percent of the variation in state level per capita income. In fact it is a more revealing indicator than anything but the three sector ogive, based on primary, secondary, and tertiary activities.

Tertiary activities, in general, appear to have a significant effect on state level per capita income. The aggregate of these six sectors explains about 28 percent of the income variation. Tertiary activities, which constitute about 68 percent of the labor force, explain less of the data than the FIRE sector alone. Tables IV and V indicate that the tertiary aggregate still explains over ten percent more of the variation in state per capita income than traditional diversity measures. The only tertiary activities which do not appear to be significant are the wholesale and retail trade sectors. The trade sectors may be what Florence (1942) refers to as the "residentiary" industries which serve the region. The proportion of the labor force employed in residentiary industries tends to remain fairly constant. The trade sectors

are not closely related to income levels which could explain why the FIRE sector alone, explains more than the aggregate of tertiary activities.

The performance of the tertiary sector helps to explain the superior results of the three sector ogive. This diversity measure is based on the distribution of the labor force among aggregated primary, secondary, and tertiary activities. Because the tertiary activities are positively associated with per capita income, specialization in this aggregated sector is advantageous. Diversification into primary and secondary activities tends to lower per capita income levels.

One individual economic sector in each of the primary and secondary categories proved to be revealing. Table VII shows the inverse relationships between employment in agriculture, and nondurable manufacturing, and per capita income. Although these sectors do not explain a great deal of the variation in per capita income, 12 and 15 percent respectively, the relationship is worthy of consideration. To some extent, an increase in a state's employment in agriculture and nondurable manufacturing is associated with a decline in per capita income.

Maximum diversity is represented by an equal distribution of the labor force among all economic sectors. When 12 economic sectors are considered, 8.3 percent employment in each sector indicates absolute diversity. Agriculture employs an average of less than three percent of the labor force.

TABLE VII

REGRESSION RESULTS OF INDIVIDUAL SECTORS AND ACTIVITIES WITH PER CAPITA INCOME

ECONOMIC SECTOR*	% employed	r	r2	p
Finance, insurance, realty	6.0	+0.563	0.317	0.000
All tertiary activities**	67.6	+0.530	0.281	0.000
Public administration	5.2	+0.390	0.152	0.005
Services	28.6	+0.386	0.149	0.005
Nondurable manufacturing	8.7	-0.385	0.148	0.005
Agriculture	2.8	-0.342	0.117	0.014
Transportation & utilities	7.3	+0.338	0.115	0.015

*Only sectors explaining at least ten percent of the data are presented, employment is based on national averages.
**including transportation and utilities; wholesale trade;retail trade; finance, insurance, and realty; services; and public administration

Therefore most states could diversify by employing a greater percent of their labor force in agriculture. However these data suggest that this type of diversification would result in lower per capita income. Increased employment in the nondurable manufacturing sector would have similar results. These relationships illustrate the results of increased employment in lower wage-paying sectors (Isard, 1975).

Only general relationships can be drawn from this analysis, as there is no provision for determining cause and effect. The results indicate that if increased individual

income is the goal of a state government, specialization in certain economic activities will produce the best results. Finance, insurance, and real estate are by far the most beneficial activities. Public administration, services, transportation, communication, and other utilities are also advantageous. It is important to note that determining which sectors cause higher personal income, and which sectors grow as a result of increased income, is beyond the scope of this study. For example public administration is likely to be a result of, or at least require, high per capita income. If this is the case, this activity reflects prosperity, but cannot be promoted to generate higher levels of income.

Poverty and Diversity

The third dependent variable in this study is the percentage of people for whom poverty status is determined. It was hypothesized that this variable would have an inverse relationship with diversity, where increased diversity would result in a reduction of the number of people living in poverty. Figures 13 and 14 show the results of unweighted and weighted regression between poverty and diversity. The 12 sector ogive, which is the best diversity measure for explaining variations in poverty levels, is used for these plots. The results show a fairly strong positive relationship. These findings agree with the results of the per capita income and diversity regression. Again the tendency for greater poverty to be associated with

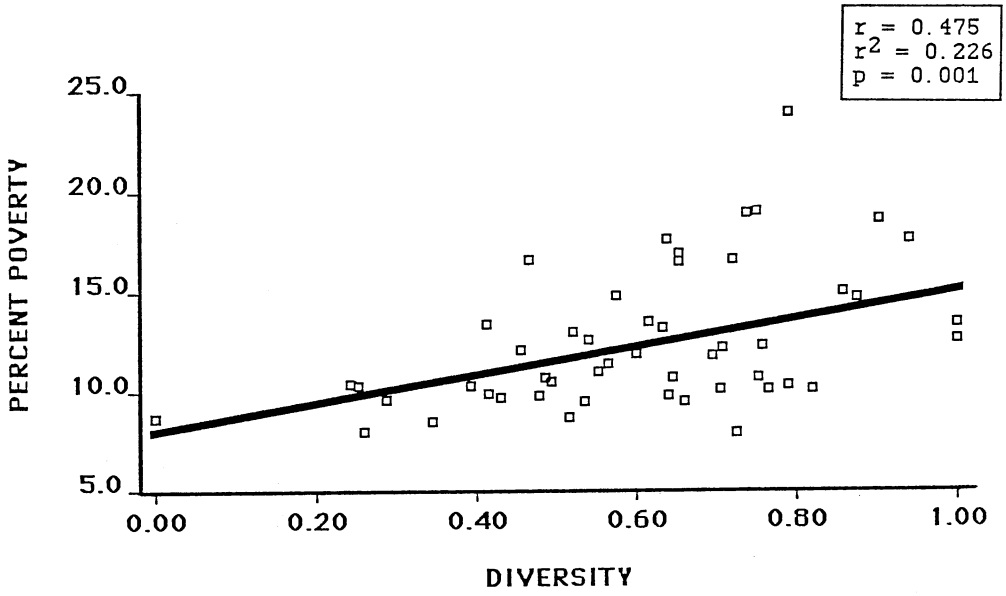


Figure 13. Regression Plot of Poverty and 12 Sector Ogive Diversity

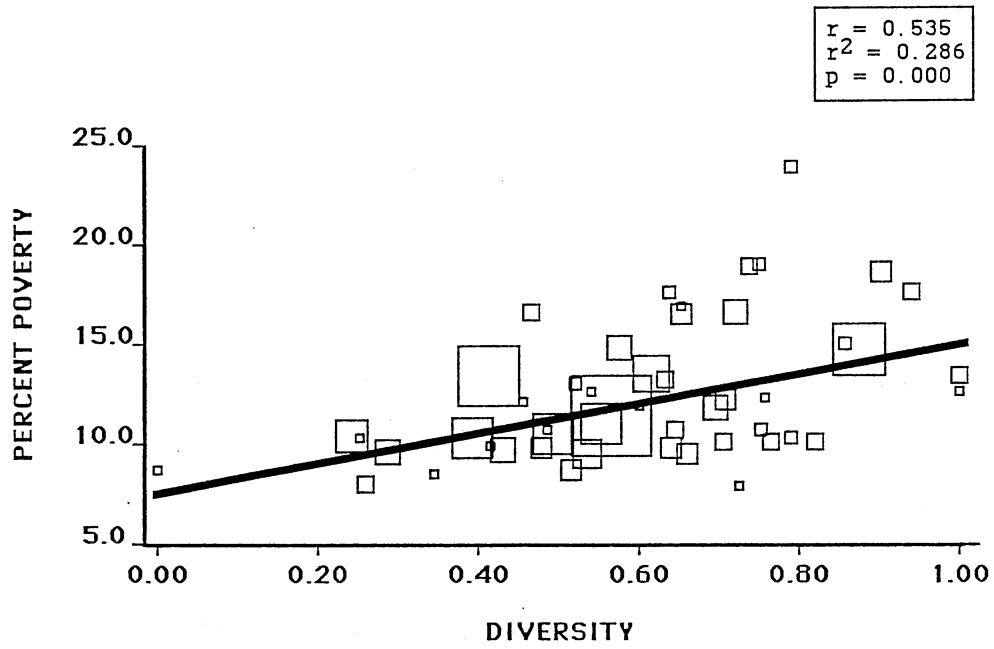


Figure 14. Plot of Poverty and 12 Sector Ogive Diversity: Regression is Weighted by the Size of the Labor Force

greater diversity is contrary to the relationship which was hypothesized and supported in the literature.

Table V shows the relationship between poverty and per capita income. Although the two variables are associated (r^2=0.520, p=0.000), the poverty variable performs quite differently from per capita income in regression analysis with various diversity measures. Unlike per capita income, weighted regression, is superior to unweighted regression for studying the poverty variable. The unweighted and weighted regression results are shown in Figures 13 and 14 respectively. The residuals in Appendix C suggest that some heteroscadasticity does exist for poverty, and thus weighting should improve the regression results. Regression results were ranked by the diversity measure's ability to explain variations in the poverty variable, and are shown in Table VIII.

The three sector ogive measure, which best explained the variation in per capita income, is poor for analyzing poverty data and accounts for only about ten percent of the variation. The results of the two other ogive measures are similar, aggregation of the primary sectors is no improvement over the 12 sector ogive. The threshold measures explained slightly less of the variation in poverty.

It is significant that the two different threshold measures produced the same results. Up to 2.7 sectors are required to reach the 50 percent threshold, and up to 8.7 sectors are needed to meet the 90 percent threshold. The six

additional sectors required to reach the 90 percent threshold, do not improve the measure's ability to explain the poverty data. This suggests that the smaller economic sectors contribute little to the understanding of state level poverty.

TABLE VIII

SUMMARY OF REGRESSION RESULTS BETWEEN PERCENT BELOW POVERTY LEVEL, AND MEASURES OF DIVERSITY

DIVERSITY MEASURES	r	r^2	p
Weighted ogive: 12 economic sectors	+0.54	0.286	0.000
Weighted ogive: 10 economic sectors	+0.52	0.271	0.000
Ogive: 10 economic sectors	+0.48	0.229	0.001
Ogive: 12 economic sectors	+0.48	0.226	0.001
Threshold 50: 12 economic sectors	+0.45	0.204	0.001
Threshold 90: 12 economic sectors	+0.45	0.202	0.001
Ogive: 3 economic sectors	+0.32	0.102	0.024

To some extent individual sectors explain differences in the percent of people living in poverty. However there are no exceptionally strong relationships, as was the case for per capita income data. It is note worthy that the tertiary sector has no significant relationship with poverty. Although tertiary activities are fairly closely associated income levels, employment in these sectors does not necessarily reduce poverty. Table IX shows the economic sectors which do help explain the variation in the poverty data.

TABLE IX

REGRESSION RESULTS OF INDIVIDUAL SECTORS
AND PERCENT WITH POVERTY STATUS

ECONOMIC SECTOR*	% employed	r	r^2	p
Finance, insurance, realty	6.0	-0.398	0.158	0.004
Nondurable manufacturing	8.7	+0.334	0.112	0.168
Construction	5.9	+0.315	0.099	0.025

*Only sectors explaining at least ten percent of the data are presented, employment is based on national averages.

The finance, insurance, and real estate sector is more closely associated with poverty than any other sector. However, as Tables V and VII suggest, it explains much less of the variation in poverty than the variation in income. Employment in the FIRE sector is directly related to per capita income, and inversely related to poverty. Nondurable manufacturing is also consistent for the two dependent variables. It is directly related to poverty and inversely associated with income. Employment in the construction sector is positively associated with the percentage of the population living in poverty. This may be more a reflection of the level of economic development than a property of the construction sector. However inquiry into this relationship is beyond the scope of this study.

CHAPTER V

EVALUATING THE HYPOTHESES

The Relationship Between Diversity and Unemployment

It was hypothesized that economic well-being would be directly associated with economic diversity. Specifically that per capita income would be positively related to diversity, and unemployment and poverty would be inversely related to diversity.

As hypothesized, the percentage of unemployment has been shown to be inversely associated with diversity. Unemployment decreased with increased diversity. The relationship between diversity and unemployment could only be identified using weighted regression. Based on the findings in the professional and popular literature, which are summarized in Chapter I, a much stronger relationship was expected.

It was further hypothesized that there would be a limit to the positive influence of diversity on unemployment figures. Because a prosperous state would tend to attract workers, immigration could over supply the job market, causing unemployment. Should this occur, a leveling off, or decline in the regression line between unemployment and diversity would exist.

This relationship was not found. Quadratic and cubic functions were fitted to the data as a test of non-linearity. This was not a rigorous test of the hypothesis, however it is adequate to show that a simple non-linear relationship does not appear to exist (McNew, 1987). Table V. shows the results of this regression. The 50 states may represent too small a sample to identify trends in the data. A curvilinear relationship is thought to be unlikely on the basis of evaluating the quadratic and cubic functions, making further investigation into the relationship unnecessary.

The Relationships Between Diversity; Per Capita Income and Poverty

The income and poverty variables are discussed together because they perform in a similar manner. The hypothesis that diversity would have a beneficial influence on these variables could not be accepted. Based on conventional wisdom, it was thought that economic diversity would be associated with higher levels of personal income, and lower levels of poverty. Results showed that diversity was associated with lower income and higher percentages of poverty.

The adverse effects of economic diversity can be partially explained by the beneficial effects of specialization in certain economic sectors, as discussed in Chapter IV. In addition, reasoning originally used to support a secondary hypothesis may be relevant. The secondary hypothesis stated that there would be a point after which

increased diversity would not have a corresponding increase in economic well-being. It was hypothesized that the regression line may form a monotonic curve, increasing at a decreasing rate, or form a polytonic curve, with a negative slope at the higher end. The actual data show a linear relationship with a negative slope throughout. As shown in Table V, non-linear regression does not explain more of the data than linear regression. The quadratic and cubic functions explain none of the per capita income data, and less than 15 percent of the variation in levels of poverty. These results are very inferior to the linear regression results.

The secondary hypothesis, that a curvilinear relationship would exist, could not be accepted. However some of the reasoning and literature used to support the notion of a leveling off, or decline in the slope of the regression line, may help to explain the overall inverse relationship between the measures of well-being and diversity.

One possible explanation for the adverse effects of diversity stems from the various wage levels associated with each sector. Isard (1975) suggested that greater per capita income would be generated by movement of the labor force into higher wage paying sectors. Therefore, if diversifying a state's labor force requires greater employment in sectors that pay less, the result would be overall lower personal income, and more people living in poverty. This relationship is discussed more completely in Chapter IV.

It was also hypothesized that the positive effects of

diversity may be limited by the natural and human resource base. However, with this type of inquiry, it is not possible to determine whether natural, capital, or labor resources are limiting factors. Diverse states, which tend to have lower per capita income and higher levels of poverty, may have more limited resource bases. However this type of evaluation is beyond the scope of this study.

In a similar manner it is not possible to evaluate whether the loss of economies of scale cause diverse regions to be less prosperous (Richardson, 1960). Although there is a positive relationship between specialized and prosperous states, it is not possible to determine how much, if any, of the prosperity is a result of the beneficial effects of economies of scale.

The suggestions that the positive effects of diversity would be curbed by limitations of the infrastructure, and by immigration, are shown to be without merit. Diversity does not have a positive effect on per capita income and poverty, as hypothesized. Therefore diverse states would not attract workers and it is illogical to expect immigration. There would be no need to expand the infrastructure to facilitate a greater variety of industries, as specialization is shown to be associated with prosperity.

Spatial Variation of Diversity

It was hypothesized that it would be possible to identify a set of regions, or some other orderly pattern of areal

differentiation, based on levels of diversification. Relative levels of diversity were mapped in an attempt to identify any such spatial patterns. Each diversity measure produced different results. Figures 15, 16, and 17 map the three ogive diversity measures.

Each state's level of diversity or specialization is determined by considering its standard deviation from the mean. States which are more than one standard deviation above the mean are diverse and those which are more than one standard deviation below the mean are specialized. Moderate diversity or specialization is determined for those states which are between one half, and one standard deviation above or below the mean. States which are within one half of a standard deviation of the mean are considered intermediate, displaying neither diversity nor specialization.

Nevada ranges from 2.6 to 3.0 standard deviations below the mean. This state is exceptionally specialized because of the strong service base of its economy. When only the most specialized and diverse states are considered, the 10 and 12 sector ogives produce similar results. Of the 15 states identified, the two diversity measures agree on all but two. The maps of these extremes indicate that, with the exception of Nevada, specialization tends to exist in the northeast, and the south central states form a relatively diverse region.

However, when moderate levels of diversity and specialization are considered, the 10 and 12 sector ogives produce somewhat different results. Figure 15 indicates that

diversity based on 12 sectors exists only in the south and central states, and none of the central states display specialization. The map of 10 sector diversity, Figure 16, shows that three central states are moderately specialized. This indicates that aggregating the primary sectors has a significant effect. This is especially true in the case of Wyoming which changes from moderately diverse, for the 12 sector measure, to moderately specialized when only 10 sectors are considered. In addition to Wyoming, New Mexico and North Dakota appear to be moderately specialized according to the 10 sector map. All three of these states have exceptionally high employment in at least two of the primary sectors. As a result, when the three sectors are aggregated, each state becomes relatively specialized in the primary sector.

The results of the three sector ogive, shown in Figure 17, are rather different than the spatial patterns formed by the 10 and 12 sector diversity measures. The most notable difference is the relative specialization of western states. The three sector ogive shows that both the eastern and western portions of the country are specialized, while the central region is relatively diverse.

In general the three maps agree that the north east is relatively specialized and the central states tend to be diverse. Because of the lack of more specific agreement between measures, it is not possible to identify well formed spatial patterns.

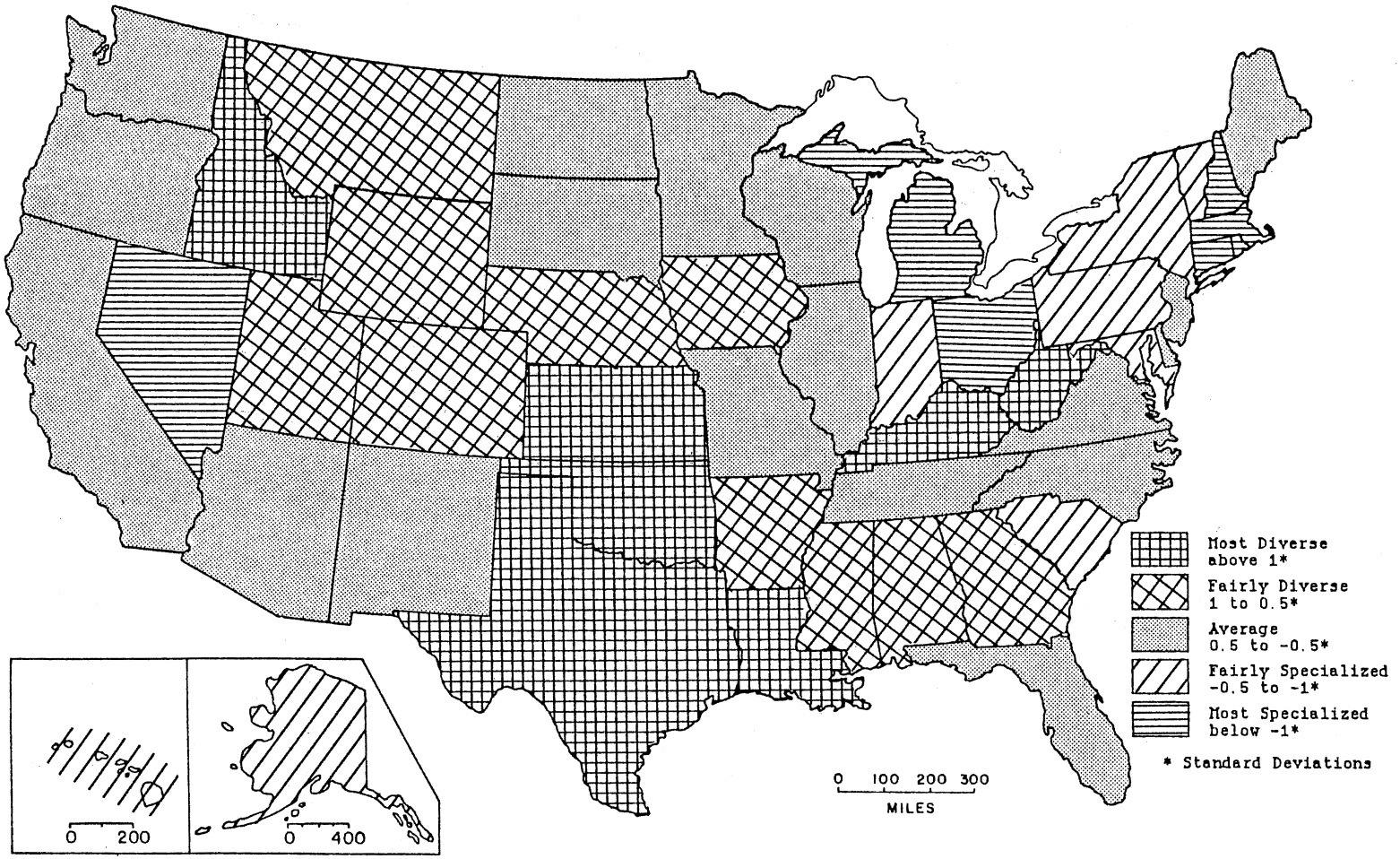


Figure 15. Map of 12 Sector Ogive Diversity

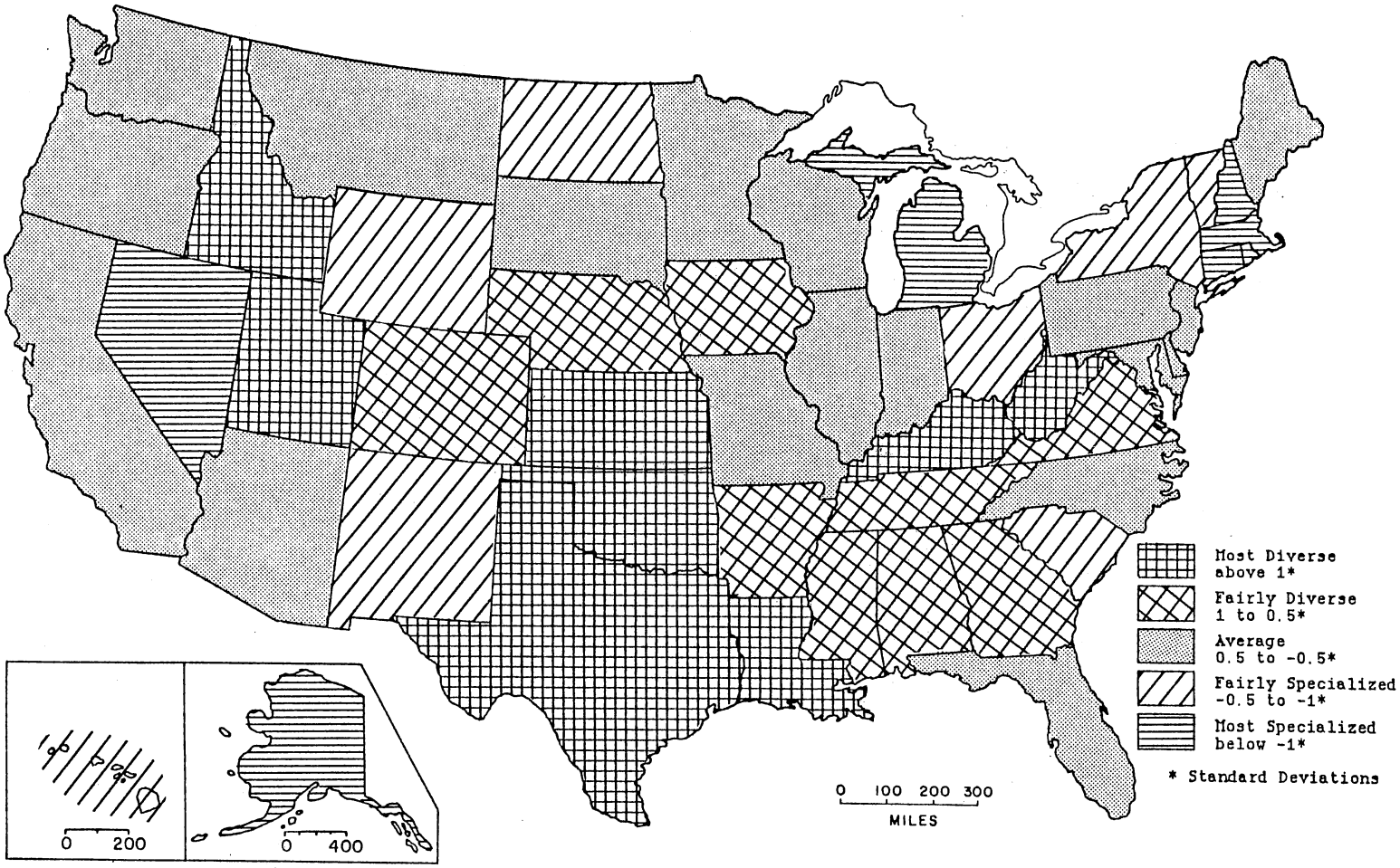


Figure 16. Map of 10 Sector Ogive Diversity

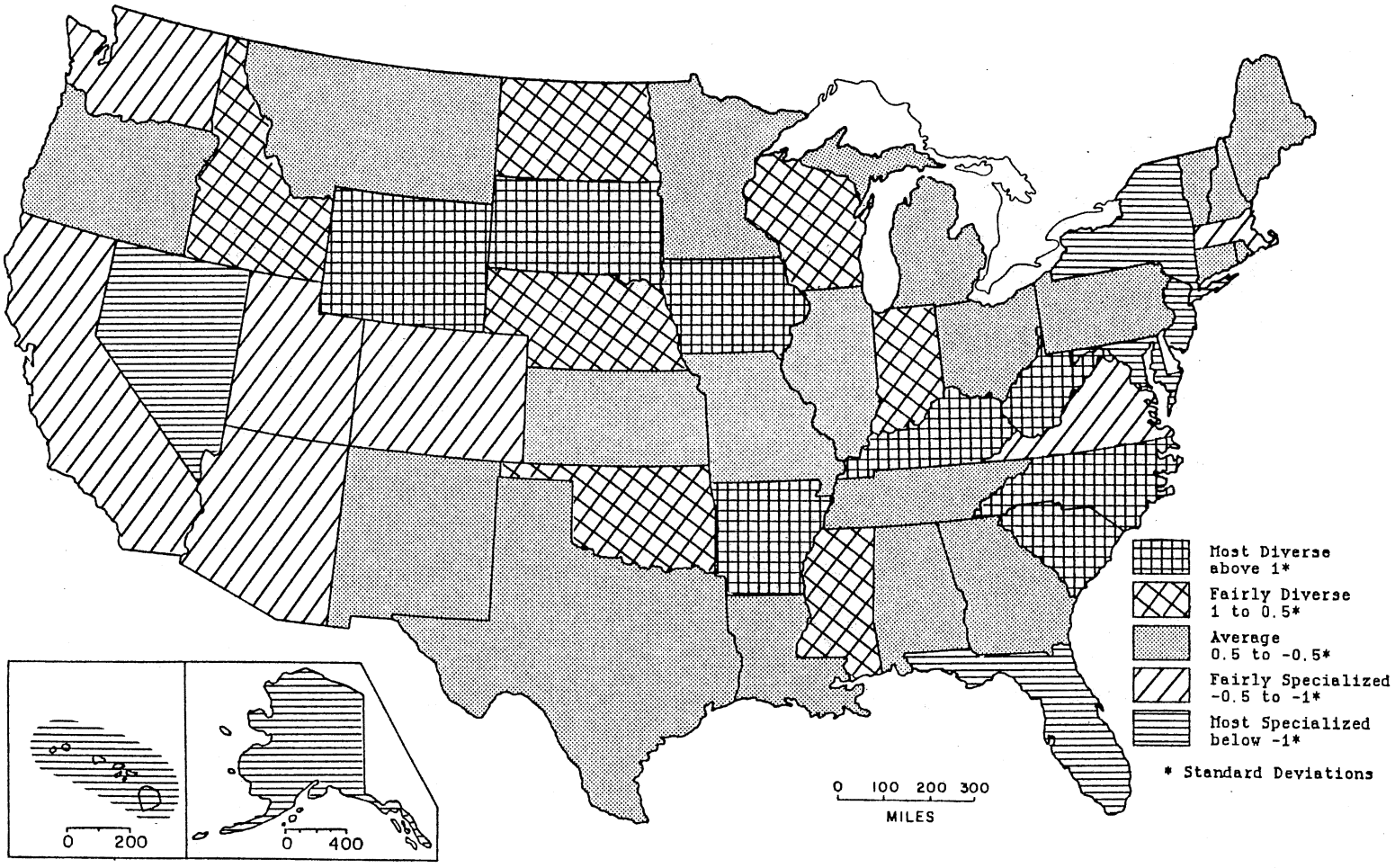


Figure 17. Map of 3 Sector Ogive Diversity

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

A variety of diversity measures were evaluated and the relationship between state level diversity and economic well-being was studied. Percent unemployment, per capita income, and percent of people for whom poverty status is determined, were the dependent variables. Each of these variables was used in unweighted and weighted regression with diversity, the independent variable.

Several measures of diversity were evaluated for their usefulness at the state level. The ability to explain variation in the dependent variables was the primary consideration in evaluating the utility of diversity measures. The conceptual basis for the measure was also a consideration. For example, it was thought that using the national average as a base level for measuring the economic diversification of a state was unsound. Because national average measures are so widely used, they were tested in this study. The traditional ogive approach was considered and the threshold approach was introduced and evaluated. Residuals of regression between the size of the labor force and each of the dependent variables were considered. The residual showed that some

heteroscadasticity was present for the unemployment and poverty variables. Using the ogive measure, weighted regression was run to correct for heteroscadasticity.

The ogive measure was also used to evaluate the effects of aggregation of the economic sectors. Ogives using 12, 10, and 3 sectors were considered. It was acknowledged that a three sector ogive may not represent diversity, in the traditional sense, and may be more an indicator of the level of economic development or some other economic factor.

Results of regression between the dependent variables and the diversity measures were considered in terms of the literature. The primary hypothesis that economic well-being is positively associated with diversity was tested. The results of weighted regression between unemployment and diversity support the findings of a large body of literature, and a hypothesis of this study. Lower unemployment rates are associated with greater levels of economic diversity. The per capita income and poverty variables performed quite differently than expected. The discrepancies between the primary hypothesis, which was based on the literature, and the result of this study were discussed.

A secondary hypothesis, that a curvilinear relationship would exist between the dependent and independent variables, was also considered. To test this hypothesis non-linear regression was run. It was shown that linear regression explained more of the variation in each of the three dependent variables than quadratic or cubic functions.

Finally diversity was mapped in an attempt to determine any existing spatial patterns or sets. Some general regions could be identified. Although general trends could be seen, compact regions of contiguous states could not be closely defined because of the variation in the results of different measures.

Conclusions

Several conclusions were reached about the measurement of diversity, for the purpose of studying state level economic well-being. It was determined that national average measures are inappropriate for this use. Although relative levels of diversity could be produced, these values had no relationship with any of the economic well-being variables.

The threshold measure, which was introduced in this study, proved to be slightly inferior to the ogive measure. However the threshold approach provided useful information about the number of sectors required to represent diversity. Results of the threshold and ogive measures indicated that absolute measures of diversity are superior to the national average type of measure, at the state scale.

Each of the dependent variables was best explained by a different diversity measure. Weighted regression had to be used to establish any relationship between unemployment and diversity. Weighting also improved the correlation between poverty and diversity, although there was a significant relationship when weighting was not used. Weighting did not

improve the correlation between per capita income and diversity. This was expected as the income variable displayed homoscadasticity.

The three sector ogive explained far more of the variation in per capita income than any other diversity measure. It was concluded that this measure was more of an indicator of specialization in tertiary activities. Specialization in certain economic sectors may be a better indicator of per capita income than diversity. Several economic sectors were found to be very important to income levels. It was also concluded that the three sector ogive may be a good indicator of a state's stage of economic development.

The results of this study suggested that diversity is important to state level economic well-being. It has been concluded that there is a relationship between economic diversity and unemployment, in agreement with the academic and popular literature. However for the per capita income and poverty variables, the results of this study are contrary to conventional wisdom. It has been concluded that at the state level, diversification leads to lower levels of income and higher percentages of people living in poverty.

These results serve to emphasize the need for a clearer definition of economic diversity. Unclear definitions account for at least part of the discrepancy between the results of this study and findings of the scholarly and especially the popular literature. For example oil in Oklahoma appears to

have strong inter-sector links. The performance of this industry appears to affect most of the economic sectors. Therefore, even though Oklahoma is measured as a relatively diverse state, with the labor force well distributed among the economic sectors, it is still dominated by the oil industry. Perhaps Oklahoma's rather general goal of diversification should be replaced by well defined specialization in specific non-oil related activities.

It has been concluded that both state and federal government transfer payments could be more effective. If more consideration were given to the existing distribution of the labor force and the performance of various economic sectors, funds could be used to greater advantage. Governments should direct funds to diversifying states which suffer from unemployment. If the planning goal is higher income and lower poverty levels, specialization in the most advantageous sectors should be promoted.

Recommendations

State level diversity is not a thoroughly studied topic. For this reason there are many possibilities for future research. Further investigation is warranted into both the measurement of state level diversity and its relationship with economic well-being.

Measuring State Level Diversity

Various measures of diversity have been evaluated in the

literature, and are summarized in Chapter I. It has been shown that the entropy measure of diversity is not superior to the ogive measure, and produces almost identical results (Wasylenko and Erickson, 1978). However Kort (1981) showed that the entropy measure was superior to other traditional measures when heteroscadasticity was present in the data. The residuals for unemployment and percentage of people in poverty, shown in Appendix C, indicate that these variables display some heteroscadasticity. For this reason it would be worthwhile to conduct a study similar to this one, using the entropy measure of diversity.

Although the minimum requirements technique has received some sharp criticism (Pratt, 1968), it is still highly acclaimed as a measure of diversity (Bahl et al., 1971, Conory, 1975). The evaluations of this measure are based on city level studies. It is therefore recommended that this technique be applied at the state level. Such an application would permit evaluation of the method and may contribute to the understanding of state level diversification. Practical considerations precluded the minimum requirements approach from being evaluated in this study. However most of the other well accepted diversity measures were considered. The results, which are discussed in Chapters III and IV, indicate the utility of various measures. It was concluded that the ogive measure is superior for measuring state level diversity. With this evaluation of diversity measures in place, it would not be impractical for a study such as this to be conducted

using minimum requirements. This technique could be tested against the ogive measure, and the results of this study.

Conroy (1974) introduced the industrial portfolio approach to measuring diversity. This technique has been reviewed favorably for the analysis of economic instability and diversification of metropolitan areas (Brewer and Moomaw, 1984). If applied to income and poverty levels, rather than employment stability, the portfolio approach could have a broader application. With this type of application the industrial portfolio approach could indicate what type of diversification would produce greater wealth, rather than stable employment, for a region.

The nature of the portfolio approach, which considers risk and return for various industries, could make its application at the state scale difficult. However the quality and utility of the results, may justify the effort. The knowledge of which industries to promote, and how to diversify could be valuable for state economic planning.

With the introduction of the threshold measure this study has shown that analysis based on three or less sectors produces the same results as analysis based on eight to ten sectors. Twelve sectors were the maximum input in this analysis. It would be worthwhile to study the effects of increasing the number of sectors being input. Shear (1965) and Keinath (1985) suggest that valid analysis could be based on only the three or four largest sectors. This study confirmed these author's assertions. Future research could

apply the threshold approach in an attempt to determine if there is a maximum number of sectors which can reasonably be considered.

There could be a rather complex relationship between the number of sectors used and the utility of the diversity measure. Repeatedly breaking the sectors down into their components, and then evaluating diversity at various thresholds could be revealing. It may be possible to identify combinations of thresholds and number of input sectors, which are most informative. This would be a contribution to the understanding of labor force diversification. If thorough testing could confirm that diversity can be represented by only the three or four largest sectors, it would also be a worthwhile contribution.

Regardless of the diversity measure used, a worthwhile contribution would be to do a longitudinal study. Considering the relationship between economic diversity and economic well-being over a period of time may provide useful information. This type of analysis would not be as strongly influenced by the state of the economy during the sample year.

Finally, state level diversity could be evaluated in terms of value added in each sector, rather than the percent employed by each sector. Any or all of the diversity measures discussed could be applied to value added data. This approach may be more appropriate for some applications.

The Relationship between Diversity And Economic Well-Being

The results of this study indicate a need to evaluate links between economic sectors. Oklahoma is thought of as a specialized state largely because of the importance of oil to the state's economy. However all but one of the diversity measures used in this study indicate that Oklahoma is one of the most diversified states, because its labor force is well distributed among the various sectors. It is likely that oil related jobs exist in most sectors, dominating the whole economy rather than a few sectors. The impact of one activity on the various sectors could be identified by regional input-output analysis.

There appears to be a strong relationship between some economic sectors and per capita income. This study has shown the importance of most of the tertiary sectors, indicating that specialization in specific sectors is closely associated with income levels. For this variable, and to some extent for the poverty variable, it may be more informative to study specialization than diversity.

An appraisal of how states should diversify or specialize their economies, to produce greater personal income or lower levels of poverty would be valuable. Studying the residuals of regression between individual sectors and the unemployment, income, and poverty variables may be a useful task. By using the residuals a researcher could determine which sectors were under or over represented in a state. For example, a state planner could consider the residuals from each sector. The residuals would show if the state was

employing an exceptionally large or small percent of its labor force in each sector. The exceptionally small sectors could be considered for promotion and the sectors which are relatively large could be de-emphasized. The action taken would depend on the state's economic planning goals.

If the major problem is unemployment, diversification should be an economic planning goal. Residuals for the individual sectors would indicate which economic activities are under represented and could be promoted. If a state is seeking higher per capita income, attempts should be made to specialize in those sectors which would benefit the state, but are not already over represented by the labor force. Again residual should be a good indicator of what activity or activities could wisely be promoted in a state.

Additional Considerations

The results of this study indicate a strong, and perhaps special, relationship between the finance, insurance, and real estate sector and the income and poverty variables. This inspired a preliminary investigation into financial attributes which may help explain variations in income and poverty. Although capital is generally considered to be mobile, it may in fact have a fairly strong spatial component. Proximity to money centered banking appears to be associated with income and poverty levels.

Federal Reserve banks tend to be fairly well distributed among states with high or moderate levels on income. However,

of the 20 lowest income states, only Georgia has a Federal Reserve bank. While it is unlikely that regional and local banking would influence income levels, the Federal Reserve system and international money centered banking may be important factors. This relationship is worthy of consideration.

The availability of venture capital is closely associated with the more specialized, higher income states. Such capital is lacking or nonexistent in the diverse states with lower levels of income (Leinbach and Amrhein, 1987). Although venture capital is a relatively small source of money for business, its availability may reflect a region's inclination for economic growth and prosperity.

The location of insurance companies appears to be even more closely associated with per capita income. All of the 15 largest insurance companies are located in the 20 wealthiest states. It appears that this trend would continue if more insurance companies were considered (The Insurance Almanac, 1983). It is significant that major insurance companies are not located in any of the 30 lowest income states. To this point inquiry into the relationship between income and insurance company location is superficial. However, these observations indicate that further investigation may be appropriate.

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APPENDIX A

DATA FROM THE 1980 CENSUS OF POPULATION EXPRESSED IN RAW FORM AND AS PERCENTAGES

TABLE X

DEPENDENT VARIABLES

STATE	PERCENT UNEMPLOYMENT	PER CAPITA INCOME	PERCENT POVERTY
ALABAMA	7.5	5894	18.9
ALASKA	9.7	10193	10.7
ARIZONA	6.2	7041	13.2
ARKANSAS	6.9	5614	19.0
CALIFORNIA	6.5	8295	11.4
COLORADO	5.0	7998	10.1
CONNETICUTT	4.7	8511	8.0
DELEWARE	6.3	7449	11.9
FLORIDA	5.1	7270	13.5
GEORGIA	5.9	6402	16.6
HAWAII	4.7	7740	9.9
IDAHO	8.0	6248	12.6
ILLINOIS	7.2	8066	11.0
INDIANA	7.8	7142	9.7
IOWA	5.0	7136	10.1
KANSAS	4.0	7350	10.1
KENTUCKY	8.5	5978	17.6
LOUISIANA	6.0	6430	18.6
MAINE	7.6	5768	13.0
MARYLAND	5.8	8293	9.8
MASSACHUSETTS	5.0	7458	9.6
MICHIGAN	11.0	7688	10.4
MINNESOTA	5.4	7451	9.5
MISSISSIPPI	7.1	5183	23.9
MISSOURI	6.9	6917	12.2
MONTANA	8.3	6589	12.3
NEBRASKA	3.7	6936	10.7
NEVADA	5.9	8453	8.7
NEW HAMPSHIRE	4.8	6966	8.5
NEW JERSEY	6.7	8127	9.5
NEW MEXICO	7.1	6119	17.6
NEW YORK	7.1	7498	13.4
NORTH CAROLINA	5.5	6133	14.8
NORTH DAKOTA	5.3	6417	12.6
OHIO	8.0	7285	10.3
OKLAHOMA	4.1	6858	13.4
OREGON	8.3	7557	10.7
PENNSYLVANIA	7.4	7077	10.5
RHODE ISLAND	7.0	6897	10.3
SOUTH CAROLINA	6.1	5886	16.6
SOUTH DAKOTA	4.9	5697	16.9
TENNESSEE	7.4	6213	16.5
TEXAS	4.0	7205	14.7
UTAH	5.5	6305	10.3
VERMONT	6.3	6178	12.1
VIRGINIA	5.0	7478	11.8
WASHINGTON	7.4	8073	9.8
WEST VIRGINIA	8.4	6141	15.0
WISCONSIN	6.6	7243	8.7
WYOMING	4.1	7927	7.9

TABLE XI

NUMBER OF PEOPLE EMPLOYED IN PRIMARY AND SECONDARY SECTORS

STATE (1)	AG (1)	F&F (2)	MINE (3)	CONST (4)	N.D.M. (5)	D.M. (6)
ALABAMA	35806	3210	17722	103369	197204	197709
ALASKA	1031	4015	4771	13127	6361	3988
ARIZONA	30493	2298	26605	90381	36983	124319
ARKANSAS	50616	2336	6260	61276	96722	122998
CALIFORNIA	310954	17930	42404	601822	657689	1502149
COLORADO	39617	2568	36632	107063	64253	128052
CONNETICUTT	13683	611	2018	64425	111382	347434
DELEWARE	6385	235	189	17197	41191	20886
FLORIDA	131864	11117	14648	334121	207650	296910
GEORGIA	63741	4384	8588	150041	341941	220082
HAWAII	13742	818	233	29888	21234	11680
IDAHO	34812	3704	5443	26718	26016	27439
ILLINOIS	110774	1700	32997	230904	426756	881243
INDIANA	68566	570	11598	119249	171978	559822
IOWA	130520	225	2552	67697	97629	166490
KANSAS	69290	176	16526	64562	76459	131015
KENTUCKY	60012	954	56674	84707	134591	177431
LOUISIANA	35534	6883	81327	153122	123727	112347
MAINE	11093	4172	256	25926	73105	52253
MARYLAND	27303	2995	2968	127840	118708	161032
MASSACHUSETTS	17726	4604	1555	111541	245860	448332
MICHIGAN	61087	2460	13493	155332	217594	918677
MINNESOTA	108727	1920	15221	99380	131666	249097
MISSISSIPPI	38282	3293	15683	67680	100623	129485
MISSOURI	88563	1122	9686	118437	193125	268537
MONTANA	30546	3767	9047	23035	8872	15415
NEBRASKA	76696	390	1754	43296	45269	53777
NEVADA	6118	534	5381	31428	8008	15345
NEW HAMPSHIRE	5140	609	447	26137	46280	91672
NEW JERSEY	22772	1675	3990	154009	414416	405728
NEW MEXICO	16119	2698	28697	42769	15502	22235
NEW YORK	85297	2815	7997	274956	676814	880336
NORTH CAROLINA	83867	5563	5600	162467	515392	339157
NORTH DAKOTA	41308	179	6029	18999	7593	8284
OHIO	81556	969	30989	209497	397728	975444
OKLAHOMA	48621	860	64690	92856	77724	137055
OREGON	39891	12411	2699	73250	53593	168424
PENNSYLVANIA	78796	1676	55645	240162	540872	879965
RHODE ISLAND	2429	1128	315	17531	40913	97673
SOUTH CAROLINA	31398	3166	2435	95206	284826	145239
SOUTH DAKOTA	47762	465	2791	17464	13478	15077
TENNESSEE	48541	1976	11088	119059	270620	240509
TEXAS	182279	4899	209617	545450	458210	671057
UTAH	12684	1602	18128	41797	28363	64194
VERMONT	10711	595	793	13832	15234	38967
VIRGINIA	51614	5614	26077	168691	230150	215130
WASHINGTON	57790	11227	3706	122396	95166	254811
WEST VIRGINIA	10460	775	69248	52179	53430	73152
WISCONSIN	115909	2689	2473	94496	199645	402862
WYOMING	10874	659	32324	22282	6660	5161

(1) Agriculture
(2) Forestry and Fisheries
(3) Mining
(4) Construction
(5) Nondurable Manufacturing
(6) Durable Manufacturing

TABLE XII

NUMBER OF PEOPLE EMPLOYED IN TERTIARY SECTORS AND TOTAL LABOR FORCE

STATE	UTIL (1)	W.TR. (2)	R.TR. (3)	FIRE (4)	SERV (5)	P.A. (6)	TOTAL (7)
ALABAMA	106816	64120	226226	71988	394680	93078	1511928
ALASKA	18390	4100	24870	8384	49585	26252	164874
ARIZONA	73779	44413	201681	77266	332072	72980	1113270
ARKANSAS	62015	36399	137045	37305	227965	34796	875733
CALIFORNIA	757862	463561	1756070	759626	3226646	543692	10640405
COLORADO	108668	61712	236814	96725	402846	77067	1362017
CONNETICUTT	83750	53291	215873	118702	413623	57517	1482309
DELEWARE	17186	14651	42457	13437	74553	14442	262809
FLORIDA	321037	175690	769137	305828	1214752	219576	4002330
GEORGIA	188676	113927	358122	130329	620630	135374	2335835
HAWAII	36478	16089	82453	31648	129345	41573	415181
IDAHO	28789	17239	67556	20755	102445	22736	383652
ILLINOIS	404862	235680	811490	342392	1372401	217229	5068428
INDIANA	154577	93926	386804	119281	597004	82888	2366263
IOWA	83572	66840	215938	67788	356307	49080	1304638
KANSAS	82715	51727	172495	59504	306496	47776	1078741
KENTUCKY	102024	55259	224468	64231	356683	71012	1388046
LOUISIANA	142611	78448	268288	83662	468996	84449	1639394
MAINE	26844	16665	73645	20247	130441	24875	459522
MARYLAND	140966	66590	299592	115619	603079	279920	1946612
MASSACHUSETTS	164807	100400	409023	169855	860040	140532	2674275
MICHIGAN	214546	136785	618831	183830	1066636	161461	3750732
MINNESOTA	129111	92232	321167	107669	559780	69551	1885521
MISSISSIPPI	64492	38285	138008	40252	253762	47361	937206
MISSOURI	172514	103370	342981	114718	589845	101009	2103907
MONTANA	29417	13208	60654	16162	96218	21976	328317
NEBRASKA	66834	33961	120958	44014	200940	28744	716633
NEVADA	30265	10690	64689	23884	176533	25691	398566
NEW HAMPSHIRE	23246	14424	68551	23573	114887	17656	432622
NEW JERSEY	272917	164864	495343	231953	942801	177834	3288302
NEW MEXICO	37362	17024	88529	26445	167828	43030	508238
NEW YORK	616737	337447	1099083	614276	2453549	391461	7440768
NORTH CAROLINA	159177	106459	372982	110576	638743	107942	2607925
NORTH DAKOTA	20935	13731	50070	12493	79021	13978	272620
OHIO	302310	186605	742698	229779	1222366	178501	4558442
OKLAHOMA	96043	57921	211505	68873	352636	79073	1287857
OREGON	81621	53277	203220	71228	321809	57002	1138425
PENNSYLVANIA	347197	194512	778164	256725	1359848	227939	4961501
RHODE ISLAND	20453	15573	65769	23259	118915	22854	426812
SOUTH CAROLINA	76015	46451	191168	57429	330837	55800	1319970
SOUTH DAKOTA	18005	13872	51384	13856	85476	17049	296679
TENNESSEE	153903	84663	294731	93492	504926	91412	1914920
TEXAS	476436	331587	1046821	377862	1726223	281404	6311845
UTAH	43979	27280	97555	34316	166596	50427	586921
VERMONT	12344	7018	35555	10211	71790	10145	227195
VIRGINIA	158067	79377	351227	129723	689496	243235	2348401
WASHINGTON	139132	91171	303562	111485	515905	88003	1794354
WEST VIRGINIA	56033	24365	108700	24268	181517	35334	689461
WISCONSIN	121035	79267	348156	105040	566874	76027	2114473
WYOMING	19946	7058	34809	8794	56405	12402	217374

(1) Utilities, Transport & Communication
(2) Wholesale Trade
(3) Retail Trade
(4) Finance, Insurance & Real Estate
(5) Services
(6) Public Administration
(7) Total Labor Force

TABLE XIII

PERCENTAGE OF THE LABOR FORCE EMPLOYED IN EACH OF THE PRIMARY AND SECONDARY SECTORS

STATE	AG (1)	F&F (2)	MINE (3)	CONST (4)	N.D.M. (5)	D.M. (6)
ALABAMA	2.37	0.21	1.17	6.84	13.04	13.08
ALASKA	0.63	2.44	2.89	7.96	3.86	2.42
ARIZONA	2.74	0.21	2.39	8.12	3.32	11.17
ARKANSAS	5.78	0.27	0.71	7.00	11.04	14.05
CALIFORNIA	2.92	0.17	0.40	5.66	6.18	14.12
COLORADO	2.91	0.19	2.69	7.86	4.72	9.40
CONNETICUTT	0.92	0.04	0.14	4.35	7.51	23.44
DELEWARE	2.43	0.09	0.07	6.54	15.67	7.95
FLORIDA	3.29	0.28	0.37	8.35	5.19	7.42
GEORGIA	2.73	0.19	0.37	6.42	14.64	9.42
HAWAII	3.31	0.20	0.06	7.20	5.11	2.81
IDAHO	9.07	0.97	1.42	6.96	6.78	7.15
ILLINOIS	2.19	0.03	0.65	4.56	8.42	17.39
INDIANA	2.90	0.02	0.49	5.04	7.27	23.66
IOWA	10.00	0.02	0.20	5.19	7.48	12.76
KANSAS	6.42	0.02	1.53	5.98	7.09	12.15
KENTUCKY	4.32	0.07	4.08	6.10	9.70	12.78
LOUISIANA	2.17	0.42	4.96	9.34	7.55	6.85
MAINE	2.41	0.91	0.06	5.64	15.91	11.37
MARYLAND	1.40	0.15	0.15	6.57	6.10	8.27
MASSACHUSETTS	0.66	0.17	0.06	4.17	9.19	16.76
MICHIGAN	1.63	0.07	0.36	4.14	5.80	24.49
MINNESOTA	5.77	0.10	0.81	5.27	6.98	13.21
MISSISSIPPI	4.08	0.35	1.67	7.22	10.74	13.82
MISSOURI	4.21	0.05	0.46	5.63	9.18	12.76
MONTANA	9.30	1.15	2.76	7.02	2.70	4.70
NEBRASKA	10.70	0.05	0.24	6.04	6.32	7.50
NEVADA	1.54	0.13	1.35	7.89	2.01	3.85
NEW HAMPSHIRE	1.19	0.14	0.10	6.04	10.70	21.19
NEW JERSEY	0.69	0.05	0.12	4.68	12.60	12.34
NEW MEXICO	3.17	0.53	5.65	8.42	3.05	4.37
NEW YORK	1.15	0.04	0.11	3.70	9.10	11.83
NORTH CAROLINA	3.22	0.21	0.21	6.23	19.76	13.00
NORTH DAKOTA	15.15	0.07	2.21	6.97	2.79	3.04
OHIO	1.79	0.02	0.68	4.60	8.73	21.40
OKLAHOMA	3.78	0.07	5.02	7.21	6.04	10.64
OREGON	3.50	1.09	0.24	6.43	4.71	14.79
PENNSYLVANIA	1.59	0.03	1.12	4.84	10.90	17.74
RHODE ISLAND	0.57	0.26	0.07	4.11	9.59	22.88
SOUTH CAROLINA	2.38	0.24	0.18	7.21	21.58	11.00
SOUTH DAKOTA	16.10	0.16	0.94	5.89	4.54	5.08
TENNESSEE	2.53	0.10	0.58	6.22	14.13	12.56
TEXAS	2.89	0.08	3.32	8.64	7.26	10.63
UTAH	2.16	0.27	3.09	7.12	4.83	10.94
VERMONT	4.71	0.26	0.35	6.09	6.71	17.15
VIRGINIA	2.20	0.24	1.11	7.18	9.80	9.16
WASHINGTON	3.22	0.63	0.21	6.82	5.30	14.20
WEST VIRGINIA	1.52	0.11	10.04	7.57	7.75	10.61
WISCONSIN	5.48	0.13	0.12	4.47	9.44	19.05
WYOMING	5.00	0.30	14.87	10.25	3.06	2.37
NATIONAL AVERAGE	2.83	0.16	1.06	5.89	8.66	13.84

(1) Agriculture
(2) Forestries & Fisheries
(3) Mining
(4) Construction
(5) Nondurable Manufacturing
(6) Durable Manufacturing

TABLE XIV

PERCENTAGE OF THE LABOR FORCE EMPLOYED IN EACH OF THE TERTIARY SECTORS AND EACH STATE'S PERCENTAGE OF THE NATIONAL LABOR FORCE

STATE	UTIL (1)	W.TR. (2)	R.TR. (3)	FIRE (4)	SERV (5)	P.A. (6)	TOTAL (7)
ALABAMA	7.06	4.24	14.96	4.76	26.10	6.16	1.55
ALASKA	11.15	2.49	15.08	5.09	30.07	15.92	0.17
ARIZONA	6.63	3.99	18.12	6.94	29.83	6.56	1.14
ARKANSAS	7.08	4.16	15.65	4.26	26.03	3.97	0.90
CALIFORNIA	7.12	4.36	16.50	7.14	30.32	5.11	10.93
COLORADO	7.98	4.53	17.39	7.10	29.58	5.66	1.40
CONNETICUTT	5.65	3.60	14.56	8.01	27.90	3.88	1.52
DELEWARE	6.54	5.57	16.16	5.11	28.37	5.50	0.27
FLORIDA	8.02	4.39	19.22	7.64	30.35	5.49	4.11
GEORGIA	8.08	4.88	15.33	5.58	26.57	5.80	2.40
HAWAII	8.79	3.88	19.86	7.62	31.15	10.01	0.43
IDAHO	7.50	4.49	17.61	5.41	26.70	5.93	0.39
ILLINOIS	7.99	4.65	16.01	6.76	27.08	4.29	5.2
INDIANA	6.53	3.97	16.35	5.04	25.23	3.50	2.43
IOWA	6.41	5.12	16.55	5.20	27.31	3.76	1.34
KANSAS	7.67	4.80	15.99	5.52	28.41	4.43	1.11
KENTUCKY	7.35	3.98	16.17	4.63	25.70	5.12	1.43
LOUISIANA	8.70	4.79	16.37	5.10	28.61	5.15	1.68
MAINE	5.84	3.63	16.03	4.41	28.39	5.41	0.47
MARYLAND	7.24	3.42	15.39	5.94	30.98	14.38	2.00
MASSACHUSETTS	6.16	3.75	15.29	6.35	32.16	5.25	2.75
MICHIGAN	5.72	3.65	16.50	4.90	28.44	4.30	3.85
MINNESOTA	6.85	4.89	17.03	5.71	29.69	3.69	1.94
MISSISSIPPI	6.88	4.09	14.73	4.29	27.08	5.05	0.96
MISSOURI	8.20	4.91	16.30	5.45	28.04	4.80	2.16
MONTANA	8.96	4.02	18.47	4.92	29.31	6.69	0.34
NEBRASKA	9.33	4.74	16.88	6.14	28.04	4.01	0.74
NEVADA	7.59	2.68	16.23	5.99	44.29	6.45	0.41
NEW HAMPSHIRE	5.37	3.33	15.85	5.45	26.56	4.08	0.44
NEW JERSEY	8.30	5.01	15.06	7.05	28.67	5.41	3.38
NEW MEXICO	7.35	3.35	17.42	5.20	33.02	8.47	0.52
NEW YORK	8.29	4.54	14.77	8.26	32.97	5.26	7.64
NORTH CAROLINA	6.10	4.08	14.30	4.24	24.49	4.14	2.68
NORTH DAKOTA	7.68	5.04	18.37	4.58	28.99	5.13	0.28
OHIO	6.63	4.09	16.29	5.04	26.82	3.92	4.68
OKLAHOMA	7.46	4.50	16.42	5.35	27.38	6.14	1.32
OREGON	7.17	4.68	17.85	6.26	28.27	5.01	1.17
PENNSYLVANIA	7.00	3.92	15.68	5.17	27.41	4.59	5.10
RHODE ISLAND	4.79	3.65	15.41	5.45	27.86	5.35	0.44
SOUTH CAROLINA	5.76	3.52	14.48	4.35	25.06	4.23	1.36
SOUTH DAKOTA	6.07	4.68	17.32	4.67	28.81	5.75	0.30
TENNESSEE	8.04	4.42	15.39	4.88	26.37	4.77	1.97
TEXAS	7.55	5.25	16.59	5.99	27.35	4.46	6.48
UTAH	7.49	4.65	16.62	5.85	28.38	8.59	0.60
VERMONT	5.43	3.09	15.65	4.49	31.60	4.47	0.23
VIRGINIA	6.73	3.38	14.96	5.52	29.36	10.36	2.41
WASHINGTON	7.75	5.08	16.92	6.21	28.75	4.90	1.84
WEST VIRGINIA	8.13	3.53	15.77	3.52	26.33	5.12	0.71
WISCONSIN	5.72	3.75	16.47	4.97	26.81	3.60	2.17
WYOMING	9.18	3.25	16.01	4.05	25.95	5.71	0.22
NATIONAL AVERAGE	7.26	4.33	16.12	6.04	28.61	5.21	

(1) Utilities, Transport & Communication
(2) Wholesale Trade
(3) Retail Trade
(4) Finance, Insurance & Real Eastate
(5) Services
(6) Public Administration
(7) Percent of National Labor Force

APPENDIX B

SUMMARY OF DIVERSITY MEASURES

TABLE XV

SUMMARY OF RAW DIVERSITY MEASURES

STATE	OGIVE: NUMBER OF SECTORS			THRESHOLDS	
	12	10	3	50%	90%
ALABAMA	9.18	7.19	2.60	2.68	7.58
ALASKA	9.47	7.60	2.74	2.27	7.30
ARIZONA	9.30	7.36	2.67	2.18	7.66
ARKANSAS	9.16	7.20	2.54	2.59	7.79
CALIFORNIA	9.38	7.38	2.67	2.23	7.58
COLORADO	9.15	7.20	2.66	2.32	8.07
CONNETICUTT	9.73	7.73	2.63	1.94	6.67
DELEWARE	9.33	7.34	2.65	2.35	7.58
FLORIDA	9.32	7.33	2.71	2.05	7.68
GEORGIA	9.20	7.20	2.63	2.55	7.67
HAWAII	9.55	7.56	2.78	1.95	7.07
IDAHO	8.87	7.08	2.56	2.63	8.43
ILLINOIS	9.39	7.40	2.64	2.35	7.37
INDIANA	9.53	7.54	2.57	2.07	7.22
IOWA	9.21	7.23	2.54	2.48	7.83
KANSAS	9.08	7.17	2.59	2.46	8.16
KENTUCKY	8.94	7.13	2.54	2.64	8.57
LOUISIANA	8.99	7.10	2.61	2.54	8.47
MAINE	9.43	7.44	2.60	2.35	7.32
MARYLAND	9.48	7.48	2.76	2.25	7.18
MASSACHUSETTS	9.70	7.70	2.68	2.07	6.78
MICHIGAN	9.75	7.75	2.61	1.88	6.97
MINNESOTA	9.27	7.31	2.61	2.25	7.90
MISSISSIPPI	9.12	7.19	2.56	2.59	8.05
MISSOURI	9.21	7.22	2.63	2.44	7.90
MONTANA	9.15	7.48	2.59	2.24	8.16
NEBRASKA	9.16	7.18	2.58	2.47	7.84
NEVADA	10.03	8.06	2.80	1.35	6.41
NEW HAMPSHIRE	9.63	7.63	2.59	2.14	6.78
NEW JERSEY	9.41	7.41	2.69	2.50	7.11
NEW MEXICO	9.29	7.52	2.65	1.97	8.03
NEW YORK	9.55	7.55	2.73	2.19	6.91
NORTH CAROLINA	9.37	7.37	2.54	2.40	7.45
NORTH DAKOTA	9.40	7.59	2.57	2.17	7.58
OHIO	9.58	7.58	2.60	2.11	7.12
OKLAHOMA	8.88	7.07	2.58	2.58	8.67
OREGON	9.29	7.30	2.64	2.26	7.90
PENNSYLVANIA	9.46	7.47	2.61	2.31	7.27
RHODE ISLAND	9.74	7.74	2.62	1.97	6.72
SOUTH CAROLINA	9.49	7.50	2.55	2.23	7.13
SOUTH DAKOTA	9.27	7.36	2.52	2.24	8.06
TENNESSEE	9.28	7.28	2.61	2.58	7.51
TEXAS	9.02	7.08	2.61	2.57	8.17
UTAH	9.12	7.16	2.66	2.46	8.04
VERMONT	9.50	7.53	2.59	2.08	7.59
VIRGINIA	9.23	7.25	2.67	2.55	7.44
WASHINGTON	9.29	7.30	2.66	2.30	7.80
WEST VIRGINIA	9.04	7.17	2.51	2.74	7.74
WISCONSIN	9.43	7.45	2.56	2.25	7.46
WYOMING	9.19	7.59	2.48	2.54	7.75

TABLE XVI

COMPARISON OF NORMALIZED DIVERSITY MEASURES

STATE	OGIVE: NUMBER OF SECTORS			THRESHOLDS	
	12	10	3	50%	90%
ALABAMA	0.74	0.88	0.65	0.96	0.52
ALASKA	0.49	0.47	0.20	0.66	0.39
ARIZONA	0.63	0.71	0.42	0.60	0.55
ARKANSAS	0.75	0.87	0.81	0.89	0.61
CALIFORNIA	0.56	0.68	0.41	0.63	0.52
COLORADO	0.76	0.87	0.43	0.70	0.73
CONNETICUTT	0.26	0.33	0.56	0.42	0.12
DELEWARE	0.60	0.73	0.49	0.72	0.52
FLORIDA	0.62	0.74	0.28	0.50	0.56
GEORGIA	0.72	0.87	0.54	0.86	0.56
HAWAII	0.41	0.51	0.08	0.43	0.29
IDAHO	1.00	1.00	0.76	0.92	0.89
ILLINOIS	0.55	0.67	0.51	0.72	0.42
INDIANA	0.43	0.53	0.72	0.52	0.36
IOWA	0.71	0.84	0.82	0.81	0.63
KANSAS	0.82	0.90	0.67	0.80	0.77
KENTUCKY	0.94	0.94	0.81	0.93	0.96
LOUISIANA	0.90	0.98	0.60	0.86	0.91
MAINE	0.52	0.63	0.63	0.72	0.40
MARYLAND	0.48	0.58	0.14	0.65	0.34
MASSACHUSETTS	0.29	0.36	0.38	0.52	0.16
MICHIGAN	0.24	0.31	0.59	0.38	0.25
MINNESOTA	0.66	0.76	0.60	0.65	0.66
MISSISSIPPI	0.79	0.88	0.76	0.89	0.73
MISSOURI	0.71	0.86	0.54	0.78	0.66
MONTANA	0.76	0.59	0.66	0.64	0.77
NEBRASKA	0.75	0.89	0.69	0.81	0.63
NEVADA	0.00	0.00	0.00	0.00	0.00
NEW HAMPSHIRE	0.34	0.43	0.66	0.57	0.16
NEW JERSEY	0.53	0.66	0.36	0.83	0.31
NEW MEXICO	0.64	0.55	0.46	0.45	0.72
NEW YORK	0.41	0.51	0.23	0.60	0.22
NORTH CAROLINA	0.57	0.70	0.83	0.76	0.46
NORTH DAKOTA	0.54	0.48	0.73	0.59	0.52
OHIO	0.39	0.48	0.63	0.55	0.31
OKLAHOMA	1.00	1.00	0.69	0.88	1.00
OREGON	0.64	0.77	0.50	0.65	0.66
PENNSYLVANIA	0.49	0.60	0.60	0.69	0.38
RHODE ISLAND	0.25	0.32	0.58	0.45	0.14
SOUTH CAROLINA	0.47	0.57	0.81	0.63	0.32
SOUTH DAKOTA	0.65	0.71	0.89	0.64	0.73
TENNESSEE	0.65	0.79	0.61	0.88	0.49
TEXAS	0.88	0.99	0.61	0.88	0.78
UTAH	0.79	0.92	0.44	0.80	0.72
VERMONT	0.45	0.54	0.65	0.53	0.52
VIRGINIA	0.69	0.83	0.42	0.86	0.46
WASHINGTON	0.64	0.77	0.46	0.68	0.62
WEST VIRGINIA	0.86	0.91	0.93	1.00	0.59
WISCONSIN	0.51	0.62	0.77	0.65	0.46
WYOMING	0.72	0.48	1.00	0.86	0.59

TABLE XVII

COMPARISON OF STANDARD DEVIATIONS OF THE DIVERSITY MEASURES

STATE	OGIVE: NUMBER OF SECTORS			THRESHOLDS	
	12	10	3	50%	90%
ALABAMA	0.63	0.94	0.29	1.43	-0.02
ALASKA	-0.58	-0.98	-1.74	-0.15	-0.56
ARIZONA	0.13	0.14	-0.73	-0.50	0.14
ARKANSAS	0.71	0.89	1.16	1.08	0.39
CALIFORNIA	-0.21	0.05	-0.73	-0.31	-0.02
COLORADO	0.75	0.89	-0.58	0.04	0.93
CONNETICUTT	-1.67	-1.59	-0.15	-1.43	-1.79
DELEWARE	0.00	0.23	-0.44	0.15	-0.02
FLORIDA	0.04	0.28	-1.31	-1.00	0.17
GEORGIA	0.54	0.89	-0.15	0.93	0.16
HAWAII	-0.92	-0.80	-2.32	-1.39	-1.01
IDAHO	1.92	1.45	0.87	1.24	1.63
ILLINOIS	-0.25	-0.05	-0.29	0.15	-0.43
INDIANA	-0.83	-0.70	0.73	-0.93	-0.72
IOWA	0.50	0.75	1.16	0.66	0.47
KANSAS	1.04	1.03	0.44	0.58	1.11
KENTUCKY	1.63	1.22	1.16	1.27	1.90
LOUISIANA	1.42	1.36	0.15	0.89	1.71
MAINE	-0.42	-0.23	0.29	0.15	-0.52
MARYLAND	-0.63	-0.42	-2.03	-0.23	-0.80
MASSACHUSETTS	-1.54	-1.45	-0.87	-0.93	-1.57
MICHIGAN	-1.75	-1.69	0.15	-1.66	-1.20
MINNESOTA	0.25	0.37	0.15	-0.23	0.60
MISSISSIPPI	0.88	0.94	0.87	1.08	0.89
MISSOURI	0.50	0.80	-0.15	0.50	0.60
MONTANA	0.75	-0.42	0.44	-0.27	1.11
NEBRASKA	0.71	0.98	0.58	0.62	0.49
NEVADA	-2.92	-3.14	-2.61	-3.71	-2.29
NEW HAMPSHIRE	-1.25	-1.12	0.44	-0.66	-1.57
NEW JERSEY	-0.33	-0.09	-1.02	0.73	-0.93
NEW MEXICO	0.17	-0.61	-0.44	-1.31	0.85
NEW YORK	-0.92	-0.75	-1.60	-0.46	-1.32
NORTH CAROLINA	-0.17	0.09	1.16	0.35	-0.27
NORTH DAKOTA	-0.29	-0.94	0.73	-0.54	-0.02
OHIO	-1.04	-0.89	0.29	-0.77	-0.91
OKLAHOMA	1.88	1.50	0.58	1.04	2.10
OREGON	0.17	0.42	-0.29	-0.19	0.60
PENNSYLVANIA	-0.54	-0.37	0.15	0.00	-0.62
RHODE ISLAND	-1.71	-1.64	0.00	-1.31	-1.69
SOUTH CAROLINA	-0.67	-0.52	1.02	-0.31	-0.89
SOUTH DAKOTA	0.25	0.14	1.45	-0.27	0.91
TENNESSEE	0.21	0.52	0.15	1.04	-0.16
TEXAS	1.29	1.45	0.15	1.00	1.13
UTAH	0.88	1.08	-0.58	0.58	0.87
VERMONT	-0.71	-0.66	0.44	-0.89	0.00
VIRGINIA	0.42	0.66	-0.73	0.93	-0.29
WASHINGTON	0.17	0.42	-0.58	-0.04	0.41
WEST VIRGINIA	1.21	1.03	1.60	1.66	0.29
WISCONSIN	-0.42	-0.28	0.87	-0.23	-0.25
WYOMING	0.58	-0.94	2.03	0.89	0.31

APPENDIX C

RESIDUALS

Figure 18. Plot of Labor Force and Student Residuals from Regression between Percent Unemployment and 12 Sector Ogive

Figure 19. Plot of Labor Force and Student Residuals from Weighted Regression between Percent Unemployment and 12 Sector Ogive

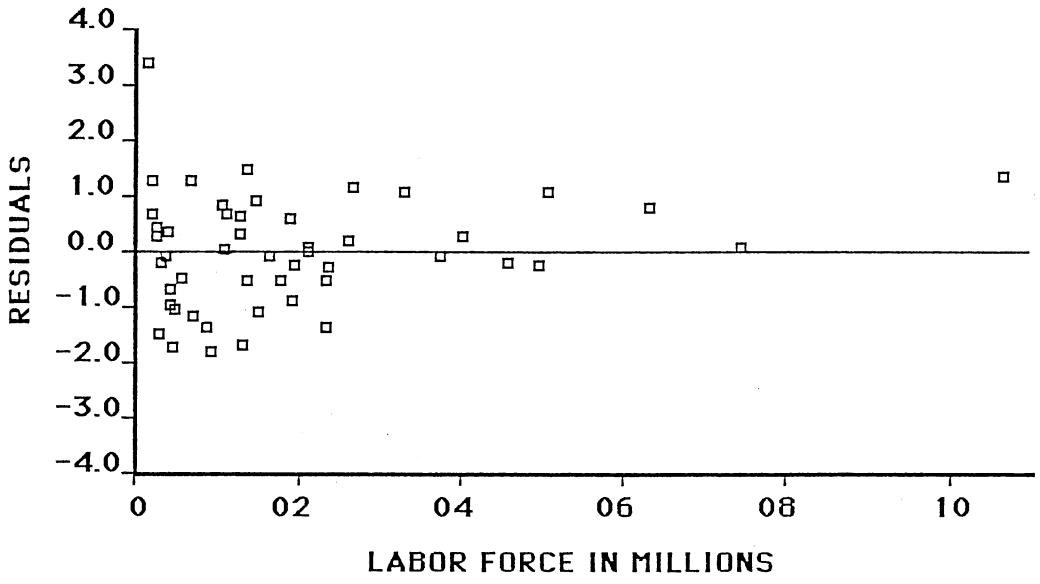

Figure 20. Plot of Labor Force and Student Residuals from Regression between Per Capita Income and 12 Sector Ogive

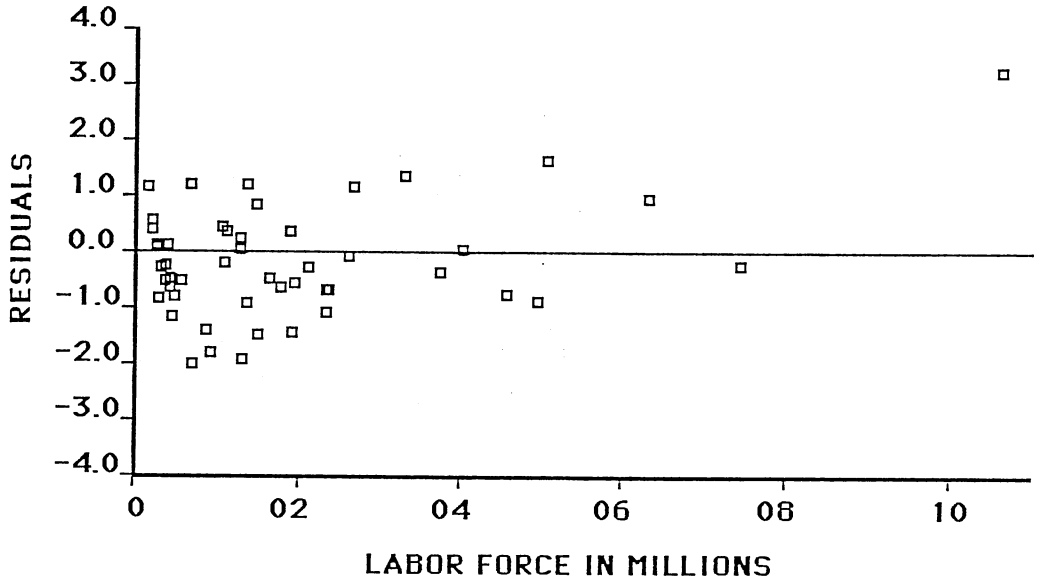

Figure 21. Plot of Labor Force and Student Residuals from Weighted Regression between Per Capita Income and 12 Sector Ogive

Figure 22. Plot of Labor Force and Student Residuals from Regression between Percent Poverty and 12 Sector Ogive

Figure 23. Plot of Labor Force and Student Residuals from Weighted Regression between Percent Poverty and 12 Sector Ogive

VITA 2

Rowena Diane Ahern

Candidate for the Degree of

Master of Science

Thesis: THE RELATIONSHIP BETWEEN ECONOMIC WELL-BEING AND STATE LEVEL ECONOMIC DIVERSITY

Major Field: Geography

Biographical:

Personal Data: Born in Nakusp, British Columbia, January 3, 1958, the daughter of Edwin and Heather Gates. Married to Timothy K. Ahern on June 25, 1977.

Education: Graduated from Magee High School, Vancouver, British Columbia, in June 1976; received Bachelor of Science Degree in Education From the University of Tulsa in July, 1981; completed requirements for the Master of Science degree at Oklahoma State University in July, 1987.

Professional Experience: Secondary School Teacher, Bishop Kelley High School in Tulsa Oklahoma, August 1981, to January, 1985. Cartographic Aid, United States Geological Survey, June, 1985 to June 1986. Teaching Assistant, Department of Geography, Oklahoma State University, August, 1986, to May, 1987. Professional membership in the Association of American Geographers; Phi Kappa Phi Honor Society; Pi Gamma Mu, the International Honor Society in Social Science.