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CHAPTER I

INTRODUCTION

County Estimates and Projections

The improvement in the use and understanding of national income accounts in the last few decades has exerted a significant influence on the development of tools for aiding policy-making in the public and private sectors. This widely accepted utility of the national income accounts has encouraged the preparation of regional income estimates.[1] The latter, emerging mainly in the past decade, remains to be more fully developed. However, the regional estimates have served as significant economic indicators which are useful for the formulation of policies and the solution of problems of the regions. For instance, state and local governments need county income data to help them estimate the tax-paying ability of the people in

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[1] See L. Delwart and S. Sonenblem, "Regional Account Projection in the Context of National Projections," W. Hochwald, ed., Design of Regional Accounts (Papers Presented in the Conference for the Regional Accounts, 1960), Baltimore, Maryland: the Johns Hopkins Press, 1961.

the county and to allocate public funds for health, education, roads, etc., and in the meantime, find the solution to the problem of encouraging the attraction and expansion of local industry in a manner consistent with the long-run aspirations and resource availabilities of an area. The policy-makers of the business sector also have a concern about this type of information which can be used as a guide to locate investment opportunities and to estimate volume of sales.[2] Regional estimates thus aid in the formulation of public and private policies. Projections of these regional estimates, on the other hand, are especially meaningful to regional planning since the planner cannot plan without having some sort of projection in mind. Increasingly, regional projections have become the key indicators of economic and social change or, in Biderman's felicitous phrase, "vindicators" of economic and social planning.[3]

Income is one of the most important economic indicators

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[2]For a discussion of the different purposes which county income studies serve, see W.M. Adamson, "Measurement of income in Small Geographic Areas," Southern Economic Journal, Vol. 8, April 1942, pp. 479-492, and J.W. Martin, Conference on the Measurement of County Income: a Report of Three Years of Work, Lexington, Kentucky: Bureau of Business Research, University of Kentucky, June 1952 (mimeographed).

[3]See S. Sonenblem, "The Use and Development of Regional Projections," H.S. Perloff and L. Wingo, Jr., eds., Issue in Urban Economics (Based on Papers Presented at a Conference Sponsored by the Committee on Urban Economics of Resource for the Future, Inc.), Baltimore, Maryland: the Johns Hopkins Press, 1968, p. 141.

which can be used as a measure of the general level of economic activity and well-being of an area. In the United States, as elsewhere, there has been since the 1930's significant progress in the development of techniques for defining and measuring the many dimensions of income, including its component parts. In this country the National Income Division of the U.S. Department of Commerce has the primary responsibility for compiling and publishing statistical data pertaining to various national income and product aggregates.[4] Projections of these national aggregates have been prepared by various agencies and have proved helpful to the planning and understanding of the future development of the national economy. In income analysis, the most urgent need at the present time is for timely estimates and projections of the income of people living in areas smaller than states, such as counties. Businessmen and public administrators particularly have felt the need for this kind of data. The need for information on county income has led to several attempts to develop a method for allocating to counties the estimated income of the state. In earlier years, postal receipts, newspaper circulation, the number of income tax returns, bank deposits, the assessed valuation of property, rental data, etc.,

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[4]A basic source for fundamental concepts, definitions, and methodology in national income and social accounting is the U.S. Department of Commerce, National Income, Supplement to the Survey of Current Bussiness, Washington, D.C.: U.S. Government Printing Office, 1954. See also U.S. Department of Commerce, National Income and Product Accounts of the U.S., a Supplement to the Survey of Current Business, 1966.

were used as indicators for estimating county income.[5] During the past three decades, a considerable volume of new data has become available for use in estimating county income. In this connection, as Copeland has pointed out,[6] the reports of employers to the social security programs, especially the federal old age and survivors insurance and the state unemployment compensation programs, provide important statistics on the amount and industrial sources of most wages and salaries, by counties. Meanwhile, the Census of Agriculture, published every five years by the U.S. Bureau of the Census, contains information on many aspects of farm income. Some payments to counties by government agencies are also recorded by counties. These data, among others, help us obtain more accurate county income estimates and projections.

In an increasing number of states, estimates of county personal income are being prepared on a regular basis. Recent county estimates of personal income by government and nonprofit agencies are now available for more than half of the United States.[7] The Regional Economic Division of the Office

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[5]See L.C. Copeland, Methods for Estimating Income Payments in County -- a Technical Supplement to County Income Estimates for Seven Southeastern States, Virginia: Bureau of Population and Economic Research, University of Virginia, 1952, App. A.

[6]ibid.

[7]See G.C. Ehemann, The Construction of Personal Income Estimates for Counties -- a Study in Economic Statistics, Iowa City, Iowa: the University of Iowa, 1969.

of Business Economics, U.S. Department of Commerce (OBE) has recently completed the first comprehensive estimates of personal income by type and industrial source covering all SMSA's and counties in the Nation for selected years, 1929-1967.[8] However, the estimates have not been published; they are available on a cost basis.[9]

In Oklahoma, considerable progress in county income estimation has been made, and county personal income data are available on a continuing basis for the period of 1950-1961.[10] These estimates are generally comparable to those prepared by the OBE. Recently, the author has worked with Dr. W. Nelson Peach, Research Professor of Economics, University of Oklahoma, updating these data to 1968. The estimates have been improved to some degree because some improved data sources have become available since 1962. It is reasonable to expect that, in later years, county income estimates will be

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[8]Regional Economics Division, Office of Business Economics, U.S. Department of Commerce, Sources and Methods Used in Estimating Local Area Income, undated, mimeographed. The estimates are available for the years 1929, 1940, 1950, 1959, 1962, 1965, 1966, and 1967.

[9]See R.E. Graham, Jr., and E.J. Coleman, "Metropolitan Area Income, 1929-1966," Survey of Current Business, August 1968, pp. 25-48. A sample of the tabulation about industrial source and type-of-income detail available is shown in an exhibit on ibid., p. 47.

[10]See W.N. Peach, R.W. Poole, and J.D. Tarver, County Building Block Data for Regional Analysis: Oklahoma, Stillwater, Oklahoma: Research Foundation, Oklahoma State University, 1965.

more accurate as better information becomes available. A brief description of the method by which the estimates are computed is provided in Appendix I.

County Projections with Limited Information

The prime concern of this study is to project one calendar year ahead the county personal income for Oklahoma. The available county income data will be utilized. But these data are one year old when they become available, and thus, the projection actually is for two years in advance. The projection of such a range is short term by nature. However, in making projections for a small unit like a county, one is confronted with considerable difficulty, the major one of which is the limitation of the data. The projected data derived under such circumstances may be conceived as raw materials for further data processing and analysis. Moreover, in the theoretical aspects of county income projections, much more work remains to be done. As Delwart and Sonenblem of the National Planning Association argue,[11] even for state projections, no comprehensive theory is available, and the methodology of projection is largely guided by some major premises and simplifying assumptions. It is even more so in county projections. The projection of regional economic activities is still a crude art.

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[11] L. Delwart and S. Sonenblem, op. cit., p. 204.

There are many approaches to making regional projections with varying degrees of sophistication. The sophisticated projection model, generating a number of projected indicators, provides a more comprehensive picture for a region's future. But it is also the type of approach that requires a large budget and detailed data. This kind of study is beyond the resources of the author. A less sophisticated method has been used.

In view of the present status of theoretical and empirical knowledge on county behavior, the trend line and regression analysis can be used to produce a set of first approximations for county income. Then, a few more rounds of successive approximations may be used to obtain a set of projections reasonably consistent in terms of specific county's past behavior and its relationship with expected changes in the State. Ideally, detailed impact analysis which identifies the endogenous variables, exogenous variables and behavioral relationships should be explored. But there is not enough data on a county basis at the present time, and to project income for counties through this impact-type approach is impossible. If better data are available some time in the future, the projection technique for county income will undoubtedly be improved. The present study aims at obtaining the most plausible county income projections on the basis of the limited information available.

Generally, income is one of the variables which can be derived from a comprehensive regional projection model, and its projection is usually not made independently. In other words, the projections of a region's income are often derived from the projections of other economic factors such as employment or output. However, projections of this nature have seldom been made for small areas, such as counties.

In this study, no attempt has been made to obtain a comprehensive regional projection model from which income projection is to be derived. The study focuses on the area of county personal income only, based on well established county income data. In a sense, this is a type of partial projection.[12] In light of the present data conditions and resources available to the author, this approach is the best possible choice in the sense that it is operational and arrives at a set of reasonably useful projections for counties.

What is Projection

A projection is not a prediction of actual conditions in the future, but an estimate of likely conditions under

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[12]This relates to time series analysis, and in this connection, least-squares method is often used by economists as a less-sophisticated approach to obtain projections. In Missouri, for example, Paterson and his associates use a CALCOMP Model 563 Digital Incremental Plotter to obtain a trend line for each county for personal income and extend the trend to 1982. See P.E. Junk, B. Hinchey, R.W. Paterson, and L. Nickles, Personal Income for Missouri Counties, 1950-1965, Columbia, Missouri: Research Center, University of Missouri, 1968.

specified and reasonable assumptions.[13] Generally speaking, economic projections are based upon factual knowledge of the past and judgments regarding expectations for the future. As has been argued,[14] although the most careful projection estimate is still only an estimate, whose reliability is subject to the influence of unpredictable events, it still may be of value as a guide. In a sense, it is similar to an air reconnaissance map which offers the navigator a high probability that he will find the county as shown, though many details will not become visible until he can get a closer view.

Perloff, in his study concerning relative regional economic growth,[15] points out that the application of trend lines to the future from the historical series may be done by regression analysis with a good dose of judgment. Through this analysis, future values of the measurement indices, such as personal income, can be obtained. This

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[13]Prediction refers to unequivocal statements about what will happen, and projection, conditional (if-then) statements about the future to the implications of various assumptions that need not be (or may not prove to be) correct. See I. Siegel, "Technological Change and Long-Run Forecasting," Journal of Business, July 1953, pp. 141-156.

[14]National Planning Association, Long-Range Projections for Economic Growth -- the American Economy in 1970, Washington, D.C., Oct. 1959.

[15]H.S. Perloff, "Relative Regional Economic Growth," H. Hochwald, ed., op. cit.

is a feasible and fruitful approach for county projections since the trend line for such a unit shows a relatively stable growth pattern. However, it should be noted that anyone preparing projections for an individual county should relate them to the across-the-board projections, namely, the state projection; otherwise, some counties may be over-projected relative to the expected growth of the entire state.

As indicated earlier, a projection based on past or present data is subject to error because of future qualitative changes in social, technological and economic conditions, the influences of many of which cannot be crudely, let alone precisely, estimated. For such a short term as two years and for such a small unit as a county, however, the problems related to these qualitative changes are not so serious as those for a longer term and a larger unit.

What Is to Be Done

In the following chapters, the analytical framework of a region's growth, as developed in regional economics, and some of the problems involved will be discussed first. The future development is generally affected by the way a region has been growing. The past growth pattern is usually a prologue for the near future.

Theoretically, there are various ways to project a county's income. Some of them require a complicated system

and detailed data; an income projection derived in this manner is only one of the outputs produced by the projection system or model. Because of data requirements, most of these income projection models do not work on a county basis. A brief discussion of some of the well known regional income projection models is provided in Chapter III.

The objective of this study is to obtain a set of reasonably reliable county personal income projections for Oklahoma. The projections are for a short run, namely, one calendar year. As such, the past behavioral patterns of county personal income play a dominant role in the projections. If the historical series of a given county has shown a continuously rising growth rate for a period of two decades, it is reasonable to expect that this county will grow at a similar rate in the immediate future. The county income patterns in Oklahoma and the significant factors affecting these patterns will be analyzed in Chapter IV. This Chapter also sketches out the important structural changes in county personal income in the State.

In Chapter V the method of approach used to derive the county income projections for the 77 counties of Oklahoma is set forth.

In the final chapter there is a summary and conclusion. It also includes a discussion of the limitation of the approach and recommendation for improvements.

Lengthy statistical tables may be found in Appendix II. Appendix I outlines the method used to derive the county income estimates for Oklahoma.

CHAPTER II

SOME IMPORTANT CHARACTERISTICS OF REGIONAL ECONOMIC ANALYSIS RELATED TO COUNTY INCOME PROJECTIONS

Regional problems and analyses have received increasing emphasis in the United States, especially since the end of World War II. In the academic world, regional economics has become a recognized specialty.[1] However, the theory and practice in regional economic analyses are considerably less developed than those of national income and employment analyses. For example, as Hamilton and his associates point out,[2] there is no well-constructed theory of regional income generation. On the national level, the theory of national income generation, in the post-Keynesian period, has received a great deal of

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[1]For an extensive review of this field, see J.R. Meyer, "Regional Economics: A Survey," American Economic Review, Vol. LIII, Part I, March 1965, pp. 19-54. W. Isard deserves a large part of the credit for the development of regional analysis as a recognized field of study; see his Methods of Regional Analysis: An Introduction to Regional Science, New York: the Technology Press of the MIT and John Wiley & Sons, Inc. 1960.

[2]See H.R. Hamilton, S.E. Goldston, J.W. Milliman, A.L. Pugy, III, E.B. Roberts, and A. Zellner, System Simulation for Regional Analysis, Mass.: the MIT Press, 1969, p. 39.

scrutiny and is now relatively sophisticated and well developed. Nevertheless, regional analysis has helped develop tools applicable to economic planning problems at a time when economic planning has been increasingly in favor in many circles and governments. As Meyer argues,[3] the great strength or appeal of regional analysis would appear to be its essentially pragmatic character and, in particular, its willingness to integrate theory and data and to undertake empirically difficult analyses.

The discussion of the theoretical foundations of regional economic analysis is beyond the scope of this study. However, some important aspects of regional economic analysis which are relevant to county projections may be noted; these aspects in a sense are closely related to general economics. As the objective of this study is to prepare a set of county personal income projections for all of the counties of Oklahoma, we are particularly concerned with the sources of growth for various counties. What are the crucial growth factors which play an important role in affecting a county's future development? In what manner do they operate in the regional economic framework? How can we analyze them? And, what problems might we face? This chapter provides a partial answer to these general questions. The growth patterns of Oklahoma's county personal income will be discussed in Chapter IV.

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[3]J.R. Meyer, op. cit., p. 29.

The Mechanism of Regional Growth

Regional economic growth is a highly complex phenomenon. However, certain significant features can be identified. One way of looking at the mechanics of regional growth is in terms of interregional multiplier analysis which is closely bound up in regional economics with the concept of an economic base. Meyer has pointed out that the essential notions of the economic base-multiplier concept as applied in regional studies are the same as similar concepts used elsewhere in economics, and are clear and simple, though subject to a number of modifications, qualifications or adjustments in actual application.[4] Generally speaking, there are two basic factors affecting the base-multiplier, namely, resource specialization and mobility. Changes in these factors result in changes in the growth rates of the regions concerned.

Economic development history shows that one of the most familiar factors producing differences among counties in a state is the specialization of economic activity. This kind of division of labor between counties is largely explainable by the theory of resource allocation. A county's specialization of transportable commodities indicates that a particular commodity or service may be produced more cheaply in one county than in others. This gives rise to the export of this commodity

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[4] ibid., p. 30.

to other counties in return for commodities which other counties can produce with comparative advantage. In other words as Borts and Stoltz point out,[5] specialization will occur when natural resources will allow a high rate of utilization and still repay the alternative costs of the mobile resources employed. Based on this analytical framework, growth in a given area's volume of economic activities is related to two factors: its access at competitive costs to the inputs of production and its access at competitive costs to markets for the outputs of this production. This, in fact, is a modified version of the conventional international trade theory.

In an economy where many types of resources possess regional mobility, specialization generally means that the non-mobile resources of a county or region are especially adapted to the production of a certain commodity. This seems obvious in the case of natural resources such as fertile land, forests, and oil fields which are found in some counties and not in others. With respect to manufacturing activities, however, a large number of cases occur independently of the location of natural resources. This is so because of the nature of manufacturing industries. The rule of external economies also works in this connection. As the development of certain

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[5] G Borts and M.P. Stoltz, "A Theoretical Framework for the Analysis of Regional Economic Problems with Application to Rhode Island as an Example of a Mature Regional Economy," undated, mimeographed, p. 7.

manufacturing industries gets under way, external economies are generated by the growth of an industrial complex which makes further specialization economical. The location of the aircraft material industry and related activities in the Oklahoma City area is a good example. As a matter of fact, there are two significant factors which attract new firms into an industrial complex, namely, the supply of skilled labor which comes into being as a result of the expansion of a large number of firms, and the existence of a number of firms specializing in functions which a new or small firm may be unwilling or unable to carry on for itself, such as designing, repair, marketing, factoring, pre-assembly of components, etc.[6] As such, the external economies resulting from this situation affect specialization which in turn exerts influence on the economic growth of the county or area.

In such a manner, regional specialization can be treated as a key factor in regional economic growth. These specialized regional activities are included in the export-oriented industries. The development of the local economic activities is considered to be a function of the development of these export industries. In other words, the export industries are considered to be the primary source for the growth of a region. The growth of non-export or residentiary industries is taken to be conditional upon the growth of the export industries. An empirical

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[6] See ibid., p. 8.

multiplier can be determined by observing the historical relationship between the export activity and the total economic activity in a region.[7] This empirical multiplier is then applied to an estimate of the economic base to project total economic activity.

It has been argued that in addition to the external development which brings forth the growth of export industries of an area, the internal shifts between sectors within the area's economic structure are also essential for its growth.[8] Generally, regional economic growth is accompanied by a decline in the relative importance of the agricultural sector and a rise in the relative importance in other sectors, such as manufacturing and services. Consciously encouraging the expanding sectors -- e.g., manufacturing and tertiary activities -- is thus con-

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[7]As North, one of the strong exponents of the export industry thesis, puts it, "the pull of economic opportunity as a result of comparative advantage in producing goods and services in demand in existing markets was the principal factor in the differential rates of growth of regions. Since residentiary industry (i.e., local-market-oriented) depends on income within the region, the expansion of such activities must have been induced by the increased income of the region's inhabitants. Therefore, increased investment in residentiary activity is primarily induced investment as a result of expanded income received from outside the region, and correspondingly, expanded employment in locally oriented industry, trade and services primarily reflects long-run changes in income received from the export base." See D.C. North, "Reply to Comments on Exports in Regional Economic Growth," Journal of Political Economy, April 1956, p. 166.

[8]See C. Clark, The Conditions of Economic Progress, London: MaCmillan, 1940; A.G.B. Fisher, "Capital and Growth of Knowledge," Economic Journal, Vol. 43, Sept. 1933, pp. 379-89; and A.G.B. Fisher, "Production, Primary, Secondary and Tertiary," Economic Record, Vol. 15, June 1939, pp. 24-38.

sidered to be a way of achieving rapid economic growth.[9] It must be noted, however, that this type of analysis, like the export-base concept, is partial in scope and overlooks other equally significant aspects of regional economic growth, and at the same time, it deals with classifications which, while highly suggestive for general description, are too aggregative for analysis in depth.[10] Even so, these two types of concepts, export-base and sector analysis, though partial, are highly useful for the insight they provide into the process of economic growth of an area.

To obtain a more comprehensive picture showing the performance of an area's economy, one may resort to studies of regional input-output models. The objective of these more sophisticated models is to derive a matrix of input-output coefficients identified not only by industry but also by geographic areas or regions.[11] A great deal of data and a complicated computational procedure are required to obtain

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[9]See H.S. Perloff, "Interrelations of State Income and Industrial Structure," Review of Economics and Statistics, Vol. 39, May 1957, pp. 1962-1963.

[10]For a discussion of this point, see H.S. Perloff, E.S. Dunn, Jr., E.E. Lampard, and R.E. Muth, Regions, Resources and Economic Growth, Lincoln, Nebraska: the University of Nebraska Press, 1960, Ch. 4.

[11]See W. Isard, "Interregional and Regional Input-Output Analysis: A Model of a Space-Economy," Review of Economics and Statistics, Nov. 1951, pp. 318-28, and L.M. Moses, "Interregional Analysis," Report on Research for 1954 Harvard Economic Research Project, Cambridge, Mass.: Harvard University Press, 1955.

this matrix. In practice, a few simplified methods are used.[12]

Input-output techniques are subject to a number of criticisms. So far as regional growth is concerned, the usefulness of the input-output matrix is severely limited because it does not aid economists in projecting which industries will spark regional growth. Furthermore, even if we know which industries will expand, the usefulness of the matrix requires that the coefficients be stable, and this in turn requires that cost relations and relative expenditure patterns remain stable as development proceeds. This condition, as Borts and Staltz argue,[13] is least likely to be met as a result of external economies and per capita income growth.

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[12]Five different simplified methods are used by economists in this respect. The approaches are: 1) to retain the interindustry relationships within the region under study and to treat each region as if it were an almost autonomous economic unit and proceed as with the estimation of an input-output table for a national economy by consolidating all inflows and outflows to other regions into an import-export sector; 2) to completely forget about the interindustry relationships and concentrate on interregional trade patterns; 3) to define interregional trade coefficients for each commodity as an input, forgetting about interindustry differences in import patterns with each region; 4) to design a balanced regional growth model which is based on the notion that a hierarchical arrangement or definition of industries is possible in which certain industries can be described as basically catering to national markets, and others to regional or local markets; and 5) to use gravity-type structural equations to explain or estimate the magnitude or interregional flow -- e.g., the flow of a commodity from one region to another is assumed to be directly proportional to the product of its total output in a shipping region by its total input in a receiving region divided by the aggregate amount of commodity produced and consumed in the entire economy, all multiplied by an empirical constant. See J.R. Meyer, op. cit., pp. 33-34.

[13]G.Borts and M.P. Stoltz, op. cit., p. 14.

Limitations and Problems

Hamilton and his associates have pointed out that most regional analyses deal with regions that are "open", as compared to the national income theory which deals with relatively "closed" economies.[14] As a result of this "openness", the flow of goods, services, and capital between regions are considerable. This is especially true with small units, such as counties. This type of inter-county or interregional flow is necessary since counties or regions are usually less able to rely on internal production to meet their needs than are national economies. Consequently, for a regional economy, exports and imports will constitute a large part of total economic activity. As pointed out earlier, regional income and employment theory is like international trade theory with its emphasis on imports and exports. However, in view of the higher degree of mobility of resources across boundaries and the use of a common monetary system, regional analysis is somewhat different from international trade theory. The openness of a region and its smallness sometime make it difficult, or perhaps impossible, to identify transactions by region. For example, business firms and households cannot be expected to distinguish between purchases and sales to and from specific geographic regions within an overall economy. The allocation of corporate profits and depreciation allowances among regions constitutes another major problem. Regional projections based on this type of relatively incomplete

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[14] H.R. Hamilton, et. al., op. cit., pp. 38-39.

regional income and employment theory need further development. This is especially so with county personal income projections since the county income accounts are far from being a complete system. This study is an experimental undertaking with a view to deriving a set of reasonable personal income projections for Oklahoma's counties. As noted earlier, these projections are not generated by a complete economic model backed up by a set of equations or relationships. The comprehensive economic models of high sensitivity, though desirable, are not operational on a county basis at the present time. The method of approach used in this study will be presented in Chapter V after the alternatives and the growth patterns of Oklahoma's county personal income have been reviewed.

The availability of data on a county-by-county basis is a major consideration when we prepare for county projections. County data collection usually lags behind the data collection for the nation as a whole. And in most cases, county data are relatively limited in coverage for various reasons. They do not contain enough information which is crucial for model-type analyses. For instance, data on detailed industrial employment breakdown and capital flow are not available. Although there are quite a few possible approaches to project county income, as will be seen in the next chapter, insufficiency of data makes most of them unworkable. The increased availability

in the future of data on a county basis will make it easier for analysts to build various types of models for regional analyses.

CHAPTER III

ALTERNATIVE APPROACHES TO COUNTY INCOME PROJECTIONS

To prepare regional projections, one may use sophisticated or less sophisticated regional projection techniques. The sophisticated ones include various kinds of mathematical models that make use of such tools as linear programming, input-output analysis, and complex regional accounting systems. They generally involve the construction of complex economic models and the use of computers. They are costly in terms of time, talent, and data. On the other hand, less-sophisticated techniques, which consists of such methods as trend extrapolation, share analysis, and simple economic base studies, are easier to handle. The most satisfactory technique to use depends to a large extent upon the need for completeness in the projection (i.e., the number of variables to be projected) and the budget and technical personnel available. Hamilton and his associates point out that less-sophisticated techniques are quite adequate for many purposes.[1] As indicated in Chapter I, the purpose of this study is to prepare for a set of county personal income

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[1]Hamilton, et. al., op. cit., p.56.

projections for Oklahoma's 77 counties. The nature of our projections suggests that less-sophisticated technique must be used.

During the past decade, a number of large-scale regional projection models have been developed. Each of these efforts has involved large budgets and sophisticated analysis. The general features of some of these comprehensive regional projection models have been reviewed elsewhere.[2] In this chapter, we will discuss five alternative approaches to county income projections. Some of the approaches are only portions of a larger regional model. The discussion is not comprehensive either in terms of coverage or depth. What is attempted is to point out the possibilities and to sketch out a methodological basis for later discussion. The method which will be used for our county personal income projections will be explained in detail in a later chapter.[3]

Projection through County Income Framework

The basic idea underlying this approach is that counties

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[2]Hamilton, et. al., reviewed six regional projection models: 1) the New York Metropolitan Regional Study by the Graduate School of Public Administration, Harvard University, for the Regional Plan Association; 2) the Upper Midwest Economic Study jointly undertaken by the Upper Midwest Research and Development Council and the University of Minnesota; 3) the Ohio River Basin Study by Arthur D. Little for the Corps of Engineers; 4) the California Development Model for the State of California; 5) the Oahu, Hawaii, Model for the State of Hawaii; and 6) the Lehigh Basin Simulation Model. See ibid., Ch. 4, pp. 54-87.

[3]See Chapter V.

are not isolated entities and that income generated from the county's basic (i.e., export-oriented) industry has a multiplier effect.[4] The export industries are seen to have a special "lead" role in county growth and to be "autonomous" from the standpoint of a given county. The employment and income created by these export industries provide the main base on which the so-called derived or residentiary industries will be built. The extent to which the derived industries will be built up will depend on various factors, including the types of forward and backward linkages provided by the export industries, the wage and salary levels set by the export industries, and the like.[5] These are major elements constituting the so-called "interregional trade multiplier". This multiplier is analytically important and can be used for making regional projections.[6]

The interregional trade multiplier is derived from the regional income system. Vining and others have developed a regional income framework which is similar to the Keynesian type national income system.[7] If the unit to be considered

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[4] In defining exports, allowance is made for such items as the earning of commuters, capital flows, government transfer payments, and linked industries. See C. Tiebout, "Export and Regional Economic Growth," Journal of Political Economy, April 1956, p. 160.

[5] See Perloff, op. cit., p. 45.

[6] For a detailed discussion of this type of multiplier, see W. Isard, op. cit., Ch. 6.

[7] R. Vining, "The Region as a Concept in Business Cycle Analysis," Econometrica, Vol. 14, July 1946, pp. 212-218.

is a county, county income can be explained by the following equation:

$$Y = C + A + E - M \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where Y = income in the county.

C = consumption in the county.

A = autonomous expenditure including investment and government spending in the county

E = export made by the county.

M = import into the county.

Import (M) consists of two major elements, namely, imports of consumption goods (M_c) and imports of investment goods (M_i). Then, we may derive the average propensity to consume for local goods by taking the ratio of consumption expenditure on local goods to local income, i.e.,

$$\frac{C - M_c}{Y} = \frac{C}{Y} - \frac{M_c}{Y} = \frac{C}{Y}\left(1 - \frac{M_c}{C}\right)$$

$$= p(1 - q) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where $p = C/Y$ is the average propensity to consume and $q = M_c/C$ is the proportion of local consumption expenditures accounted for by imports of consumer goods.

Dividing Eq. (1) through by Y, we have

$$1 = \frac{C}{Y} + \frac{A}{Y} + \frac{E}{Y} - \frac{M_c + M_i}{Y}$$

or,
$$1 = \frac{A + E}{Y} + \frac{C - M_c - M_i}{Y} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

In a simple case, let us assume only consumer goods are imported so that $M_i = 0$.[8] Then, Eq. (3) becomes

$$1 = \frac{A + E}{Y} + \frac{C - M_c}{Y} = \frac{A + E}{Y} + p(1 - q) \quad \ldots\ldots(4)$$

Adding $-p(1 - q)$ to both sides of Eq. (4), we have

$$1 - p(1 - q) = \frac{A + E}{Y} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Multiply Eq. (5) through by Y and then divide it through by $1 - p(1 - q)$:

$$Y = \frac{1}{1 - p(1 - q)} \cdot (A + E) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(6)$$

or, $Y = k \cdot (A + E)$

where k is the well-known interregional trade multiplier. From this simplified formula, it is easy to see that changes in any one of the variables in the right hand side of Eq. (6), i.e., p, q, A or E, will affect the county income level. If p and q are relatively stable, as is usually argued, changes in the autonomous portion of the system, namely, A and E, will have a multiplier effect on the whole system. Thus, theoretically speaking, the basic or export-oriented activities in a county serve as a basis for projecting the county's income.

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[8] If import of capital goods is allowed, the value of A should be reduced by M_i and be substituted by $(A - M_i)$.

Following this approach, the starting point in making a county projection is a determination of the probable location and production of the basic economic activities, including the export industries. To examine the potential of the export industry, a variety of data is needed, which include data on human resources (i.e., manpower or labor characteristics), input-output relationships, and capital (the nonhuman resources). Historical series of county income may be used to obtain some first approximations, from which departures can be made by way of analysis of changing conditions and their impact on the key relationships with respect to the basic economic activities in counties. In this connection, government expenditures in counties (as compared with tax withdrawals) can serve as a cause of expansion for these areas. On the other hand, migration for non-economic reasons -- such as the amenities of living -- may lead to expansion of residentiary activity without expansion of the export base. These factors, as well as others, should be considered.

Although this approach is theoretically desirable, it is not workable for such small units as counties. The major difficulty is that data are not available. Furthermore, gross state product or total state income have not been officially calculated, let alone the estimates for counties. In any case, the regional data on capacity are not generally available. "Personal Income" is the most comprehensive measurement we have

at the present time. Let us turn now to another approach, which is based on the components of personal income.

Projection of County Income through Components of Personal Income

Bolton, in his study of the impact of defense purchases on regional growth, designed a regional personal income model which divides total personal income into two categories, exogenous and endogenous.[9] The model was originally applied to states, but it can be fitted into counties without significant modifications. This is another version of the simple national income model.

In a single county, the following relationships can be used to represent the county personal income picture:

$$Y_w = f(Y_p)^{10} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

$$Y_p = Y_w + P + E \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

where Y_p = county personal income.

Y_w = county wages and salaries and proprietor's income in "local industries, dependent only on total personal income -- see (7).

P = the sum of county property income and transfer payments, both considered exogenous.

E = county wages and salaries and proprietor's income in "export" industries, for which demand is exogenous.

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[9] R.E. Bolton, Defense Purchases and Regional Growth, Washington, D.C.: the Brookings Institution, 1966, Ch. III.

[10] $f(Y_p)$ is the difference between $u(Y_p)$ and $m(Y_p)$, where u is a total spending function and m an import function, both in terms of generated wages and proprietor's income.

Let us assume Eq. (7) to be linear:

$$Y_w = a + bY_p \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

where a and b are constants.

Substitute Eq. (9) into Eq. (8):

$$Y_p = (a + bY_p) + P + E$$

or,
$$Y_p = \frac{a}{1 - b} + \frac{1}{1 - b} \cdot (P + E) \quad \ldots\ldots\ldots \quad (10)$$

Substitute Eq. (10) into Eq. (9):

$$Y_w = \frac{a}{1 - b} + \frac{b}{1 - b} \cdot (P + E) \quad \ldots\ldots\ldots \quad (11)$$

The rate of growth of both Y_p and Y_w can be computed from Eqs. (10) and (11). Take the derivative of Y_p with respect to time:

$$\frac{dY_p}{dt} = \frac{1}{1 - b} \cdot \frac{d(P+E)}{dt} \quad \ldots\ldots\ldots\ldots\ldots \quad (12)$$

Similarly, we have

$$\frac{dY_w}{dt} = \frac{b}{1 - b} \cdot \frac{d(P+E)}{dt} \quad \ldots\ldots\ldots\ldots\ldots \quad (13)$$

To obtain the rate of growth for Y_p, namely r_p, we may divide Eq. (12) through by Y_p and then multiply the right hand side by A/A where $A = P + E$:[11]

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[11]For definition of rate of growth in mathematical terms and manipulation of the differential equations, see H. Brems, Quantitative Economic Theory -- A Synthetic Approach, New York: John Wiley & Sons, Inc., 1968, esp. Ch. 46.

$$r_p = \frac{\frac{dY_p}{dt}}{Y_p} = \frac{1}{1-b} \cdot \frac{\frac{dA}{dt}}{Y_p} \cdot \frac{A}{A}$$

$$= \frac{1}{1-b} \cdot \frac{\frac{dA}{dt}}{A} \cdot \frac{A}{Y_p}$$

$$= \frac{1}{1-b} \cdot \frac{\frac{dA}{dt}}{A} \cdot \frac{A}{\frac{a+A}{1-b}} \qquad \text{[From (10) above]}$$

$$= \frac{\frac{dA}{dt}}{A} \cdot \frac{A}{a+A} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

$$\left[\frac{\frac{dA}{dt}}{A} = r_a = \text{the growth rate for } A = P + E.\right]$$

Similarly, for the rate of growth for Y_w:

$$r_w = \frac{\frac{dY_w}{dt}}{Y_w} = \frac{\frac{dA}{dt}}{A} \cdot \frac{bA}{a + bA} \qquad \ldots\ldots\ldots\ldots \quad (15)$$

These growth rates can be used for projection purposes. We may work out the Y_p^t in year t assuming Y_p° to be the personal income in the initial year:

$$Y_p^t = Y_p^\circ \cdot e^{r_p \cdot t}$$

$$= \left[\frac{a}{1-b} + \frac{A^\circ}{1-b}\right] \cdot [\,e\,] \exp \frac{dA}{dt} \cdot \frac{1}{A} \cdot \frac{A}{a+A} \cdot t$$

$$= \left[\frac{a + A^\circ}{1-b}\right] \cdot [\,e\,] \exp \frac{A}{a + A} \cdot r_a \cdot t$$

$$= \alpha \cdot e^{\beta \cdot r_a \cdot t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (16)$$

where e = Euler's number, the base of natural logarithms.

$$\alpha = \frac{a + A^{\circ}}{1 - b}$$

$$\beta = \frac{A}{a + A}$$

Similarly, for Y_w^t:

$$Y_w^t = \lambda \cdot e^{\mu \cdot r_a \cdot t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (17)$$

where $\lambda = \frac{a + bA^{\circ}}{1 - b}$

$$\mu = \frac{bA}{a + bA}$$

From (16) and (17), it is clear that Y_p^t and Y_w^t depend on the magnitudes of a, b, A°, A, and r_a. A° is a known quantity, and a and b can be computed from the time series through regression method. Projections of A and r_a will give enough information to obtain a projection for Y_p^t or Y_w^t. However, in implementing the model on a county basis, the data requirement is not easy to fulfill at the present time. Moreover, the process of identifying exogenous and endogenous income is not clear-cut; conceptually, Bolton's classification of income would cause confusion since he cuts across the usual distinction between consumption and investment by specifying that

not all investment goods are considered exogenous, and that consumer goods industries producing for export are exogenous.

To Project through Employment -- the NPA Approach

The National Planning Association (NPA) has made considerable contributions to regional projections. It has published projections for states and some metropolitan areas.[12] The methodology used in the NPA projections may be adjusted for smaller units, such as counties.

The methodology of the NPA regional projections is guided by two major premises. First, regional development is considered to be primarily determined by the growth and changes in the national environment -- in the case of county projection, state environment should be more important. Past experience shows that the range of potential reactions to given national impulses by specific regions is sufficiently limited so as to permit reasonable quantitative estimates for the future. This is also true with "county-state" situations, as we will see in a later chapter. National projections serve as the starting point for regional projections in the NPA projection framework. Secondly, employment is considered as a point of departure. Generally speaking, employment data are more readily

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[12] See National Planning Association, State Projections to 1975: A Quantitative Analysis of Economic Demographic Changes, Report No. 65-II, Oct. 1965; Economic and Demographic Projections for Eight-Two Metropolitan Areas, Report No. 66-R-1, May 1966; and Economic and Demographic Projections for Two Hundred and Twenty-Four Metropolitan Areas, Report No. 67-R-1, May 1967.

available than any other regional economic data at the present time. The NPA argues that the changing migration decisions of business and people are adequately reflected in the data on state industry employment trends. Past trends are thus considered to be crucial to an understanding of future possibilities.

In addition to these two premises, the NPA regional projections are based on two simplified assumptions: (1) The region's reaction to changing demand and output of key industries is supposed to come through the allocation of new capacity, unless there are strong reasons to indicate the contrary, will tend to locate where similar capacity is already located. (2) In analyzing the demand and supply characteristics of specific industry developments in a region, the NPA relies on some aspects of economic base theory to distinguish between basic and derived industry outputs, and final and intermediate markets. Its approach places emphasis on the projection of basic industries. From this projection, the projection of the derived industries is obtained. According to the NPA, the relationship between basic and derived industries is likely to vary within a sufficiently narrow range for projection purposes.

Based on the above-mentioned premises and assumptions, the NPA develops a three-stage approach for regional projections. This involves three successive stages of approximation. The first approximation considers the trends in the region's industry employment and income. A region's basic industry employment is projected on the basis of the distinction between proportion-

al and differential shifts in employment. Meanwhile, in this stage, the derived industry employment is projected through analysis of the trend in each region's share of the national industry employment. The second approximation adjusts the projected trends of differential growth for the basic industries by analyzing the potential effects of specific supply factors and determining how they may be expected to behave regionally in a manner different from that evidenced by past trends. The third approximation seeks to adjust the second approximation's regional industry employment estimates by consideration of regional demand factors. Through these three stages, the NPA derives projected matrices of regional industry employment, and then works out projections of personal income and other economic indicators by relating them to employment estimates.

The NPA has not prepared projections for counties. The smallest units it works on are metropolitan areas. Although its approach can be applied to county projections in principle, one will be confronted with a great deal of operational difficulties in implementing it because of limitations of information on a county basis. The NPA has a detailed description of some of the technical points for regional projections.

The Berman Approach -- Operational Technique for Projections of the New York Metropolitan Area

In 1956, the Graduate School of Public Administration of Harvard University undertook a three-year study of the New York Metropolitan Region, with support from the Regional Plan Association. This challenging task was to analyze the key economic and demographic features of the Region and to project them for 1965, 1975, and 1985. The system developed by Berman is called the Unified Regional Model (U.R.M.).[13] The model is designed to project employment, output, and value added by industry, as well as breakdowns of these magnitudes by type of demand. It also generates projections of disposable income and population.

Berman divides firms into two groups, namely, those which cater to the national market -- i.e., "national-market" firms -- and "local-market" firms. The source of demand for the local-market product of an industry is considered to consist of the following buyers: business purchasers, consumers, and government agencies. For each group of buyers, a set of equations is developed, which describes how their

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[13] B.R. Berman, "Economic Projections for the Region as a Whole," B.R. Berman, B. Chinitz, and E.M. Hoover, Projection of a Metropolis, Cambridge, Mass.: Harvard University Press, 1961, Ch. 2, pp. 3-10. Studies of methodology similar to Berman's approach can be found in I. Hoch, Economic Activity Forecast, Final Report, Chicago, 1959, which has references to publications useful in the construction of regional projections.

demand for output from each industry depends on variables affecting their economic activities. Berman approaches the regional projections through the input-output table. Essentially, what was done was to project total employment in the United States by industry groups for 1965, 1975, and 1985. Employment in national industries in the region was assumed then to be some constant "share" of the total national employment in that industry. These exogenously derived employment demands for the national industries were then used to derive an input-output matrix for the region. The matrix multiplied by exogenously determined employment into total employment through the implied multipliers in the matrix based upon assumed local input demands, local consumption patterns, and local labor force participation rates. Once total employment was found, the output and employment for each industry was derived as well as estimates of disposable personal income and total population. As county income projection is the major concern in this study, we may examine the income projection portion of the Berman's U.R.M.

Though an input-output table is the foundation of Berman's model, employment projection is the basic point for income projection. Income, employment, population, and output are correlated in the whole system. First, population is related to total employment by the so-called "malthusian" equation:

$$P^t = m^t E^t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1a)$$

where P^t = region's population in year t.

m^t = constant depending on the population's propensity to participate in the labor force, and the percentage of the labor force which is expected to be employed.

E^t = region's employment in year t.

Government employment is assumed to be a linear function of population, i.e.,

$$e_g^t = a^t + b^t P^t$$

$$\text{or,} \quad e_g^t = a^t + b^t m^t p^t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2a)$$

[From (1a) above]

where a^t and b^t are constants.

Total employment (E^t) is the sum of employment in all the industry sectors, plus government employment, plus employment of domestic servants in households (e_h^t), i.e.,

$$E^t = \sum_{i=1}^{s} e_i^t + e_g^t + e_h^t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3a)$$

where s is the number of industries in the region.

e_i^t can be related to the industrial output in the following way:

$$e_i^t = r_i^r \cdot X_i^t$$

where r_i^t = the projected number of employees per million dollars of annual output by the ith industry in year t.

X_i^t = value of annual output of the ith industry.

Then, Eq. (3a) can be rewritten as

$$E^t = \sum_{i=1}^{s} r_i^t \cdot X_i^t + e_g^t + e_h^t \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4a)$$

Through the input-output equations in the commodity market, output (X_i^t) may be related to total employment (E^t) in terms of a linear function, i.e.,

$$X_i^t = c_i^t + d_i^t E^t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5a)$$

where c_i^t and d_i^t are constants.

Substitute Eqs. (2a), (3a), and (5a) into Eq. (4a):

$$E^t = \sum_{i=1}^{s} r_i^t (c_i^t + d_i^t E^t) + (b^t m^t E^t + a^t) + e_h^t$$

or,
$$E^t = \frac{\sum_{i=1}^{s} r_i^t c_i^t + a^t + e_h^t}{1 - \sum_{i=1}^{s} r_i^t d_i^t - b^t m^t} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6a)$$

The right hand side of Eq. (6a) contains constants only, so we can obtain a solution for E^t. Based on this computed value of E^t, Berman uses a very simple relation of disposable personal income to total employment to project a region's income:

$$Y^t = k^t E^t$$

where Y^t = disposable personal income in year t.

k^t = constant including projections of value added per employee, average tax rates and so forth.

Berman's approach to income projection is part of the projections for a region as a whole. This approach requires an input-output table for the region, and thus requires the processing of a considerable amount of statistical data but poses no difficulties in principle. However, application of this approach to a county would be extremely costly. Unless we can have more complete data on a county basis, this approach does not seem feasible.

The Trend Line and the Ratio Method

We have obtained a set of county personal income series in Oklahoma for the period of 1950-1968. The trend lines of these historical series, produced by plotter, show stable patterns. Under such circumstances, a trend line together with regression analysis of the time series of county income and other important economic indicators can be used for county projection purposes. The concept of trend is related to long-run growth or decline. It is characterized by regularity and persistency. To measure trend, it is necessary to separate the underlying long-term movement in a time series not only from the random, irregular factors but also from the effects of changes in the business cycle.

The regression method has been widely used for economic analyses. Hanna, for example, has used this method extensively in his well-known study of state income differentials.[14] In

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[14] F.A. Hanna, State Income Differentials, 1919-1954, Durham, N.C.: Duke University Press, 1959.

the NPA regional projections, as mentioned earlier, regression analyses and trend line extrapolation also play a significant role. In county income projections, this approach is especially useful and operational.

Using the historical series, we may compute a county's share of the state's total personal income, and compute least-squares for these ratios. A projection for state total personal income provides a control number to get an approximation for each county in the state. The trend lines of the county's major income components -- such as wages and salaries and other labor income, proprietors' income, etc. -- shed some light on the relative importance of these components in the county income picture. The projected figures through extrapolation of the trend lines of these components and total county personal income also help check the projected total county personal income obtained from the state projection.

If we want to compare the projected county income with those obtained by using other sources, such as employment, we may regress income against employment, since employment is one of the significant factors affecting income. Employment data are readily available on a county basis in Oklahoma for some years, though they are not so complete as those for the State. The Oklahoma Employment Security Commission (OESC) publishes County Employment and Wage Data annually, which provides average yearly covered wage and salary employment by county from 1949 to date. Other publications by the OESC, such as Handbook of Oklahoma Employment Statistics and Handbook of

Labor Force Data for Selected Areas of Oklahoma contain information on state total employment from 1958 to the present and total employment for some selected areas for recent years.

Generally speaking, there is a high correlation between the two historical series of income and employment. From the regression equation, which takes the form of $Y = a + bE$, if the relationship is linear, an employment projection will give enough information to obtain a projected county income. OESC has made some employment projections for the State. Extending the trend line of the ratios of county employment to state total provides projected employment shares for counties. A projection of county employment can then be obtained by applying these projected ratios to the state employment projections.

County personal income projections derived from the above sources should be evaluated for reasonableness. If additional information about specific counties -- such as information about new large construction projects, new manufacturing firms, completion of the Arkansas River Navigation System in the eastern part of the State -- are available, adjustment must be made so as to take the major sources of potential growth into account. Otherwise underestimation might occur in these counties, at the same time some other counties might be over-projected. Population is another important factor which should not be neglected in county income projections since changes in county income are closely related to the changes in population. In the next

chapter some of these crucial factors will be discussed. These may serve as the background for our county income projections. It is more desirable to have some kind of theoretical basis for our projections. However, the county projections derived from the extrapolation of the trend lines in the above manner are not likely to have a significant error of projection since there are no significant ups and downs in the county growth patterns and the state projections have been taken into consideration. If the trend is stable in the past, a similar growth pattern is generally likely to continue for the next one or two years.

If we want to project county personal income one or two years ahead, another allocation procedure is available. That is to use the shares of county income of the state total in year t to project for year t+1 or t+2 by applying these ratios to a projected state total. The historical data show that the stability of growth patterns in county income provides a reasonable basis for this approach to generate generally reliable short-term projections. In the meantime, the state's trends serve as constraints on a county's projection so as to make certain that the expected changes do not deviate too much from the benchmark trend of the state.

Problems Related to Projection Techniques

The impact-multiplier type of projection, as Sonenblem points out,[15] is most useful in short-term projections,

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[15] S. Sonenblem, op. cit., p. 167.

although there is nothing implicit in the perspective which facilitates the identification of long-run structural changes that might occur as a result of the impact. But the difficulty here is to obtain data for establishing the impact relationship or the multiplier. Furthermore, because there are some other factors in addition to the impact, which are usually affecting the economic condition of the area at the same time, the reliability of impact projection is reduced.

Although autonomous elements of a county's personal income can be theoretically utilized for projection purposes, the difficulty involved in identifying export industrial activities is considerable. Location coefficient techniques may be used in this connection, but paucity of data on a county basis makes them unworkable. Similarly, the projection approach requiring an input-output table is also impractical for an area such as a county. Substantial amounts of data are needed to obtain the interindustry relationship, flow system, or intercounty trade relationship for the input-output table. Present county data conditions cannot satisfy this luxurious demand.

On the basis of the resources and data available for this study, a trend line approach would be relatively easier for implementation, and probably will result in more reliable projections. However, it should be noted that source data conditions for various types of counties are somewhat different. Not all of the counties have equally-good figures. As has been pointed

out,[16] data for heavily populated counties have a high degree of reliability, but those for some of the sparsely settled counties are subject to a wider margin of error. On the other hand, data for individual components and individual sources of personal income frequently lack precision, but greater reliability attaches to total personal income.

For Oklahoma's three SMSA's and larger counties which are more developed and have higher income and population, government agencies, such as OESC, keep better employment and wage records, while for the smaller counties in the State, source data are generally limited. For instance, the industrial detail of county employment and wages covered by the State Employment Security Act is not available for some small counties in order to avoid publishing information that would identify individual firms. This kind of problem would naturally affect the reliability of the projection.

Projections based on model-type impact analyses require projections of the exogenous variables. Questions have been raised whether this type of indirect projection is better than the direct projections of the dependent variables. Leven has pointed out that: [17]

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[16] See N.W. Peach, et. al., op. cit., p. 3.

[17] C.L. Leven, "Establishing Goals for Regional Economic Development," Journal of the American Institute of Planners, Vol. XXX, No. 2, May 1964, p. 101.

> Even so it seems fair to ask whether it is easier to predict the independent (exogenous) variables in a system than to predict directly these dependent variables in which one is specifically interested. It is not clear that independent variables can be predicted more easily. And if not, the moral should be clear: there is a legitimate basis for skepticism about the use of sophisticated analytical system simply for the purpose of obtaining more accurate predictions of such major regional economic aggregates as employment, population, or income.

This is the case with county income projections. It is clear in this respect that the independent variables cannot be predicted more easily, due to data insufficiency. The approach which projects the relevant variables directly seems to be the best possible way to achieve our objective.

CHAPTER IV

GROWTH PATTERNS OF COUNTY PERSONAL INCOME IN OKLAHOMA[1]

In Chapter II we discussed a simple conceptual framework within which the main elements of the growth phenomenon can be analyzed. We now attempt to examine the various growth patterns of county income in Oklahoma. The available county income data will be utilized in this connection.

As has been pointed out,[2] around 1940 Oklahoma entered the beginning stage of a period of transition from an economy based primarily on natural resources to an economy moving toward an enlarging industrial and commercial base. The performance of Oklahoma's economy in the past two decades clearly marked this trend of economic transition. However, growth did

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[1]This chapter was written when 1968 data were not available. The 1968 data were computed as soon as the National Income Division, U.S. Department of Commerce released 1968 state personal income figures in September 1969. The preliminary county estimates for 1968 show no significant changes from 1967 for all the counties in the State. It was thus decided to retain 1967 data for the analytical discussion in this chapter.

[2]See the Governor's Economic Development Commission, Report on Oklahoma Economy, Oklahoma City, Okla., Dec. 1958. Also see S. Liang and A.G. Homan, "Progress Report on Oklahoma Economy, 1959-1968," Oklahoma Business Bulletin, Vol. 37, No. 2, Feb. 1969, pp. 1-7.

not occur uniformly throughout the State. In this chapter we shall review the significant characteristics of those counties that grew more rapidly than the state average, as well as those that developed more slowly between 1950 and 1967. This historical background will facilitate our later discussion concerning the possible growth of county personal income in the immediate future in Oklahoma.

Before getting into the county income picture, however, let us review briefly some of the significant changes in the state's personal income during past couple of decades and compare Oklahoma's performance with that of the United State and neighboring Kansas. Oklahoma's personal income experienced a 162.3 per cent increase between 1950 and 1967; this is lower than either the United States or the Kansas increase. As for the major components of personal income, wage and salary disbursements are the most significant.[3] Between 1950 and 1967, the wage and salary disbursements in Oklahoma increased from $1,412 million to $4,059 million. This represents a 187.5 per cent increase. Compared to the corresponding increases for the United States and Kansas, Oklahoma experienced a lower growth rate in this respect. Those sectors that gained most in wages and salaries in Oklahoma were government, manufactur-

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[3]Wage and salary disbursements usually account for about two-thrids of the personal income in Oklahoma. Other categories of personal income are other labor income, proprietor income (including farm and nonfarm), property income, transfer payments, and personal contribution for social insurance (negative).

ing, finance, and services. From 1950 to 1967, government wages and salaries increased 323.9 per cent, which is higher than the United States rate and Kansas rate. As a percentage of total wage and salary disbursements, government wages and salaries increased from 19.8 per cent in 1950 to 29.2 per cent in 1967 in Oklahoma. These shares were higher than those of the United States and Kansas. In fact, wages and salaries originating in the government sector have become the biggest income source in Oklahoma. Wages and salaries from Oklahoma's manufacturing sector, as a percentage of state total wage and salary disbursements, increased from 14.5 per cent in 1950 to 18.1 per cent in 1967. Manufacturing wages and salaries in the United States personal income structure is about one-third of total wage and salary disbursements. Kansas also had a relatively high ratio of 27.8 per cent in 1967. This suggests that the manufacturing sector has not advanced as far in Oklahoma as in the United States as a whole or in Kansas. Wages and salaries from the Oklahoma agricultural sector decreased in importance in relation to other industrial groups. The decrease follows the national trend but is greater than in the United States or in Kansas. Wages and salaries from mining, construction, and public utilities also declined as a percentage of state total wage and salary disbursements. This development paralled the national trend. With respect to other major components of personal income, Oklahoma's proprietor income in-

creased faster than Kansas' but more slowly than the national level between 1950 and 1967. The increase of Oklahoma property income for the same period, though higher than the national average, lagged behind Kansas. Transfer payments, on the other hand, grew faster in Oklahoma than in either the United States or Kansas, between 1950 and 1967. This component is more important in Oklahoma. Specifically, Oklahoma transfer payments, as a percentage of state personal income were 10.7 per cent in 1967, while corresponding ratio for both Kansas and the United States were 8.3 per cent. In 1968 per capita expenditure for public welfare in Oklahoma ranked first in the Nation;[4] Oklahoma spent $82.70 for public welfare, compared to $25.67 in Kansas and $36.47 in the United States as a whole. This reflects the relative importance of transfer payments in the Oklahoma personal income structure.

As mentioned above, personal income in Oklahoma increased 162.3 per cent between 1950 and 1967. There were 20 counties in the State which experienced a greater percentage increase in their personal income than did the State as a whole. Among this group of counties are Oklahoma, Tulsa, and Comanche which contain three of the largest cities in the State, namely, Oklahoma City, Tulsa, and Lawton. This reflects the urbanization trend of the state population. As a matter of fact, most of the growth in income and population has occurred in the State's

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[4]U.S. Bureau of the Census, State Government Finances in 1967, Washington, D.C.: U.S. Government Printing Office, 1968, p. 15.

three Standard Metropolitan Statistical Areas (SMSA). These Areas generated 47.6 per cent of Oklahoma's personal income in 1950, and their share increased to 52.9 per cent in 1967. Most of the other counties each account for less than 1 per cent of the state total. In 1967 the smallest county personal income share was 0.11 per cent (Love County) as compared to the largest share of 28.8 per cent (Oklahoma County). The income distribution among counties is highly unequal. However, for most of the counties in the State, the trend line of personal income produced by a CALCOMP Model 563 Digital Incremental Plotter shows a very stable growth pattern for the period 1950-1967. Furthermore, the county income share remains rather constant from year to year. This type of growth pattern is favorable to our projections, as will be seen in Chapter V.

Income Change Relative to Population Change

Generally speaking, income is closely related to population. The most important way in which population growth influences income level is through the labor force. Growth in the latter depends mainly upon growth in the size of population of 14 years of age and over, the change in age composition of the population, and changes in the level of age-sex specific labor participation rates. In some counties which experienced a higher growth rate than the state average and, at the same time, suffered a loss of population, factors such as welfare payments and defense expenditures played a more important role.

One way to provide an income growth picture showing the relative position of counties is to relate income changes to population changes and to compare these changes with the state average. In the following section, we shall analyze Oklahoma's 77 counties in this manner.

The Relative Growth Chart

Based on a technique developed by Hoover and Fisher,[5] a relative growth chart has been prepared for Oklahoma's counties. In Chart 1 the horizontal axis measures 1967 population as a percentage of 1950 population and the vertical axis measures 1967 total personal income as a percentage of 1950 total personal income. There are two origins shown in Chart 1. The origin O is at 100 for population which represents population unchanged between 1950 and 1967, and at 138.8 for total personal income at current prices. Since prices increased 38.8 per cent between 1950 and 1967 as measured by the consumer price index of the U.S. Bureau of Labor Statistics, and increase in total money income of 38.8 per cent between 1950 and 1967 is the same as an unchanged total real income. Thus, any dot below this solid horizontal axis represents a decline in real income.

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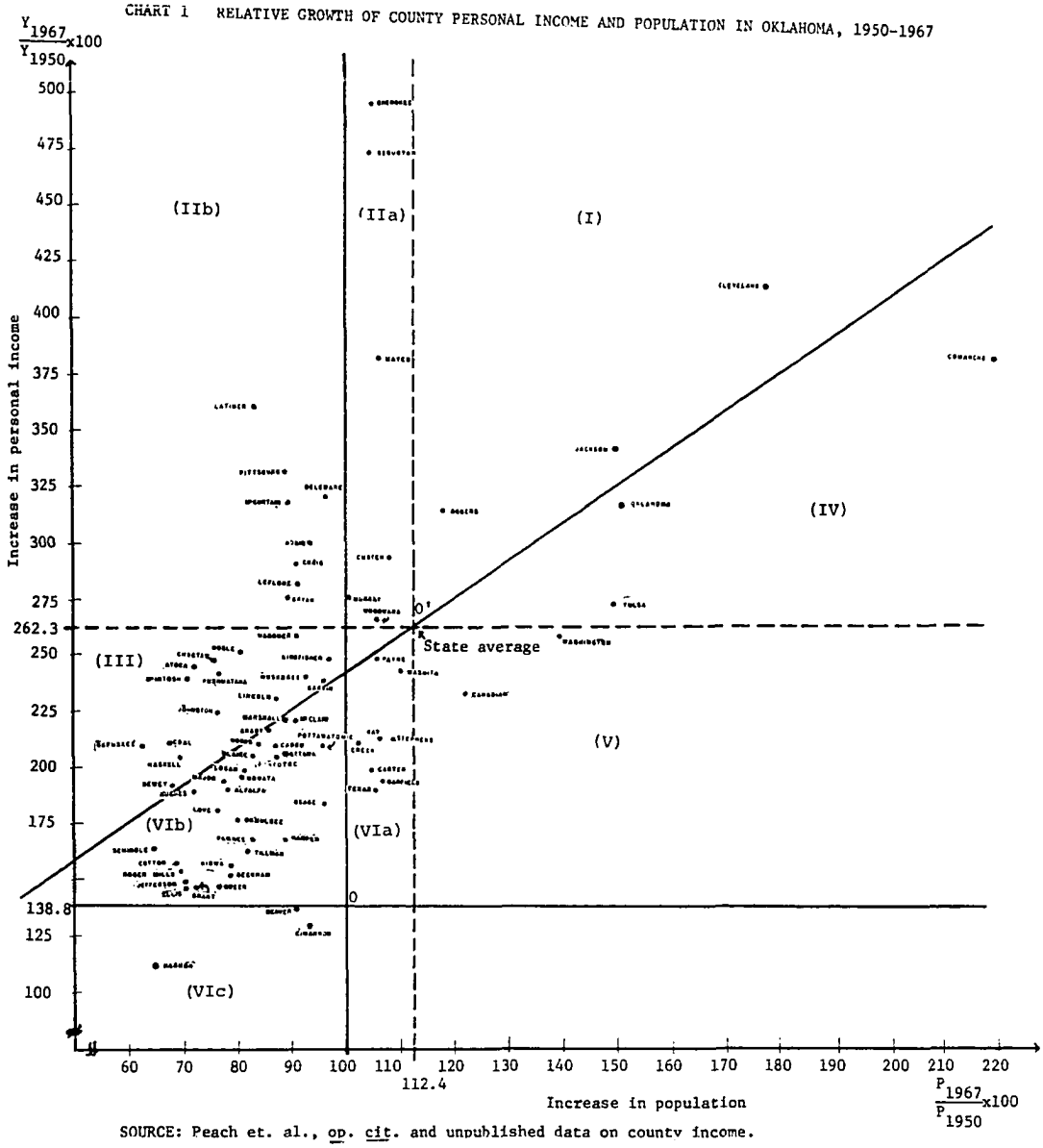
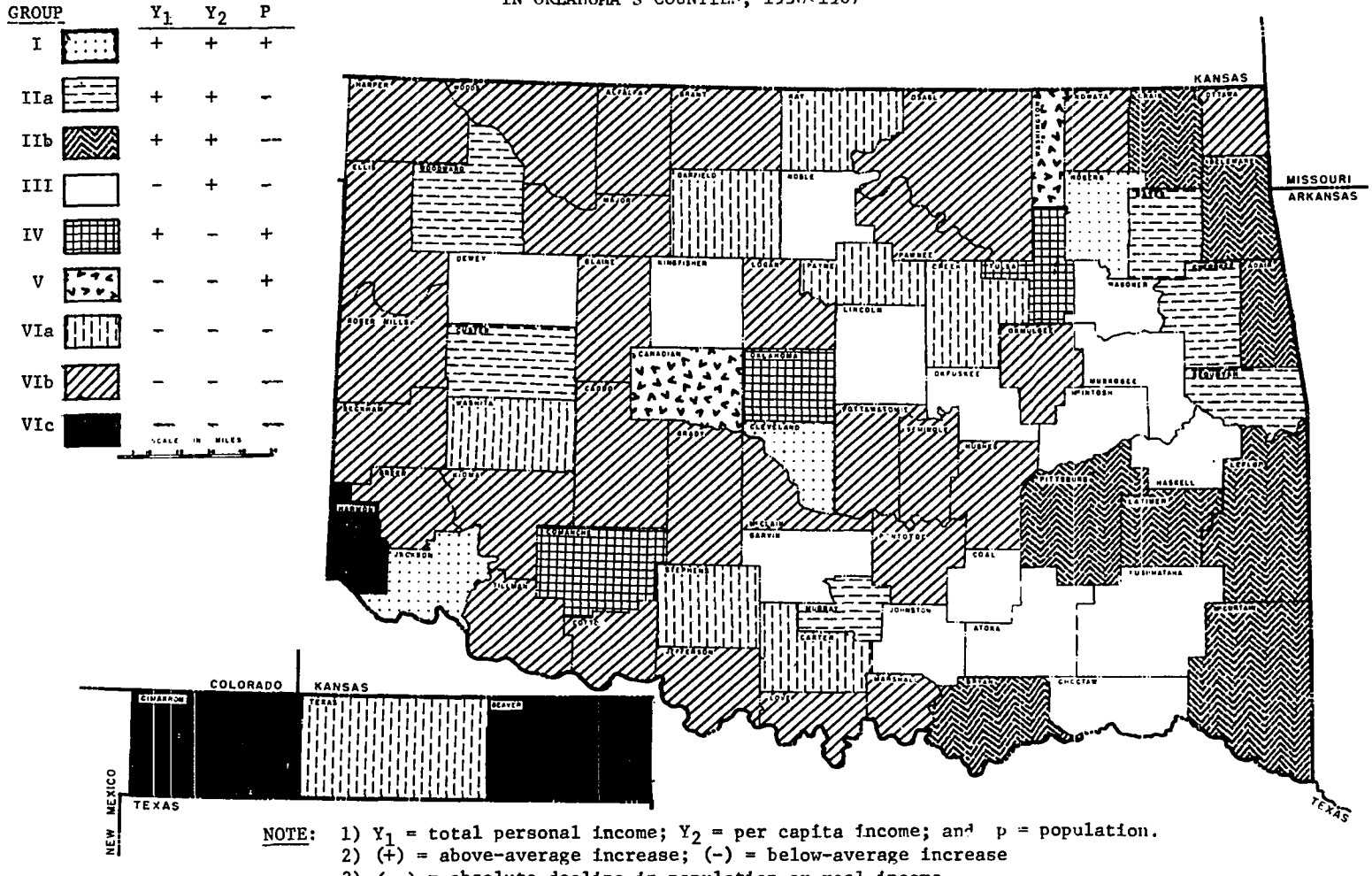
[5]E.M. Hoover, Jr. and J.L. Fisher, "Research in Regional Economic Growth," Problems in the Study of Economic Growth by Universities-NBER's Committee on Economic Research, New York: National Bureau of Economic Research, 1949, pp. 195-203. Perloff and his associates applied this technique to the state-nation level for the United States. See H.S. Perloff, et. al., op. cit., Ch. 3.

CHART 1 RELATIVE GROWTH OF COUNTY PERSONAL INCOME AND POPULATION IN OKLAHOMA, 1950-1967



SOURCE: Peach et. al., op. cit. and unpublished data on county income.

CHART 2 RELATIVE GROWTH PATTERNS IN PERSONAL INCOME AND POPULATION IN OKLAHOMA'S COUNTIES, 1950-1967



NOTE: 1) Y_1 = total personal income; Y_2 = per capita income; and p = population.
2) (+) = above-average increase; (-) = below-average increase
3) (--) = absolute decline in population or real income

SOURCE: Same as Chart 1.

Each county is represented by a dot on the chart with coordinates determined by its percentage changes in population and in total personal income between 1950 and 1967. Any dot to the right of the solid vertical axis represents an increase in population and any dot above the solid horizontal axis, an increase in real total personal income.

The solid diagonal line drawn from the origin (which is not shown in the chart) through the State point has a slope equal to the ratio of the two relevant percentages for the State average as measured on the two axes. This slope is also equivalent to the percentage change in the State's per capita income. This can be seen very clearly by a simple mathematical manipulation. Let Y = income, P = population, and the period for review = 1950-1967, then the slope of the diagonal going through the State average point should be equal to

$$\frac{\frac{Y_{1967}}{Y_{1950}}}{\frac{P_{1967}}{P_{1950}}} = \frac{\frac{Y_{1967}}{P_{1967}}}{\frac{Y_{1950}}{P_{1950}}} = \frac{\text{Per capita income in 1967}}{\text{Per capita income in 1950}} .$$

The diagonal permits easy visual comparison of the county per capita income changes with the State's per capita income change. If a county is represented by a point lying above and to the left of the diagonal, its per capita income change is greater than that for the State as a whole.

In Chart 1, there are dashed axes in addition to the solid axes. The origin of these dashed axes, O' , is the State average increase, namely, a 12.4 per cent increase for State population and a 162.3 per cent increase for total State personal income in current prices. Any dot to the right of the dashed vertical axis represents a population increase greater than the State average, and any dot above the dashed horizontal axis a total personal icome increase greater than the State average. These permit visual comparison of county rates of both income change and population change in a given county with the corresponding State rates.

This chart highlights the wide variety of growth patterns among the counties in the State. The 77 counties of Oklahoma are classified into the following categories with respect to their relative changes to the State average between 1950 and 1967. In the meantime, the available data on county personal income will be utilized to point out some of the important changes taking place in the structure of Oklahoma's county income.

Source of Change in Oklahoma's County Personal Income

(1) In counties with above-average increases in total personal income, per capita income and population (see Table 1):

Only three counties fall into this category. They roughly locate on the diagonal drawn from Ottawa County to

TABLE 1

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN TOTAL PERSONAL INCOME, PER CAPITA INCOME AND POPULATION, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Cleveland	318.1	334.7	130.7	540.2	364.2	9.7	351.5	339.1
Jackson	242.0	428.7	58.6	193.8	274.9	6.8	830.9	230.2
Rogers	215.1	283.9	94.1	317.6	208.7	32.6	243.3	296.1
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Computed from Peach, et. al., op. cit. and unpublished data on county income.

*Including counties in Group I in Chart 1.
**Including other labor income.

Jackson County, with Rogers County on the northeast, Cleveland County on the central, and Jackson County on the southwest. Cleveland County is the only constituent county of the State's SMSA's which has this kind of growth pattern.

Wage and salary components of personal income were an important source of growth for this group of counties. Property income and income from proprietorships in Cleveland and Rogers counties also gave a considerable push to their personal income totals.

In terms of broad industrial sources of personal income, Jackson County with defense programs in the area registered the highest percentage increase in income from the government sector. Cleveland County also had an above-average increase in this respect. All three counties experienced higher percentage increases for the income originating from the private nonfarm sector than the State average. Rogers County's income from farming showed a percentage increase almost double that of the corresponding State average, while the rate of increase for farm income in Cleveland and Jackson counties lagged far behind the State rate.

(2) In counties with above-average increases in total and per capita income and below-average increase in population (see Tables 2 and 3):

This category may be divided into two subcategories:

(2a) Those with absolute increase in population (see Table 2). Most counties of this group are in the State's agricultural area. In Cherokee and Sequoyah counties farm income

TABLE 2

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN TOTAL AND PER CAPITA INCOME AND BELOW-AVERAGE INCREASE IN POPULATION BUT WITH ABSOLUTE INCREASE IN POPULATION, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Cherokee	395.4	525.8	255.5	543.3	256.2	178.9	401.4	487.0
Sequoyah	374.4	613.9	276.6	601.8	194.3	129.9	236.3	791.8
Mayes	283.3	417.2	127.2	413.1	192.2	35.3	172.8	559.6
Custer	194.0	240.4	106.1	251.2	233.6	40.4	330.3	237.0
Murray	175.0	241.1	38.9	258.7	205.7	34.2	253.4	184.1
Woodward	165.3	258.7	52.9	178.7	202.7	8.3	271.4	220.2
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group IIa in Chart 1.
**Including other labor income.

TABLE 3

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN TOTAL AND PER CAPITA INCOME AND BELOW-AVERAGE INCREASE IN POPULATION BUT WITH ABSOLUTE LOSS IN POPULATION, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Latimer	260.1	401.6	110.8	494.5	146.0	23.6	367.8	246.4
Pittsburg	232.0	292.2	88.9	295.2	132.7	28.5	357.2	169.2
Delaware	226.3	239.6	160.3	480.6	249.5	100.9	244.7	428.0
McCurtain	218.3	233.6	169.7	507.6	152.4	48.5	158.7	328.8
Adair	200.1	160.9	154.4	335.8	241.1	95.4	246.3	236.1
Craig	190.7	225.0	104.2	328.1	180.4	73.1	232.5	238.7
LeFlore	181.7	175.7	200.1	268.3	169.0	125.2	147.5	233.9
Bryan	176.0	201.7	62.2	336.6	182.5	5.8	200.9	240.0
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group IIb in Chart 1.
**Including other labor income.

recorded a much higher percentage increase than the State average; for the rest of the counties (except woodward) the percentage increases also were more than double the State average. In terms of major components, wages and salaries were important sources of personal income increases in all the counties in this group. Mayes County's income from the government sector increased at a lower rate than the State average, but a significant increase in its private nonfarm sector gave a big push to its personal income total. Four (Mayes, Cherokee, Sequoyah, and Murray) of these six counties are in the Ozarks Region.

(2b) Those with an absolute loss in population (see Table 3). The counties falling into this category are mainly in the eastern border of the State, with only Bryan County in the Red River Valley; all the counties are in the Ozarks Region. The major economic activity in these counties is agriculture. Most of these counties experienced significant increases in income from farming. For all of them income originating in proprietorship and property income were important sources of growth; meanwhile they all experienced an above-average increase in income from the private nonfarm sector. The situation concerning their above-average increase in income together with an absolute loss in population might be explained by the rising productivity in agriculture and private nonfarm sectors, and by changes in population components. This matter needs additional research into the pro-

ductivity trend, the structure of population, and labor participation rate.

(3) In counties with above-average increase in per capita income and below-average increases in total personal income and population (see Table 4):

Fifteen counties fall into this category. The overwhelming majority of them are located in the southeastern portion of the diagonal drawn from Ottawa County to Jackson County. Most of these are agricultural counties. All the counties experienced lower percentage increases than the State average in income from the government sector. Five recorded a below-average increase in farm income with McIntosh having an absolute decline of 24.3 per cent. Out of the 15 counties, only two (Kingfisher and Noble) had wage and salary component increases higher than the State average, while the remaining counties lagged behind in this regard. All of the counties except three (Noble, Kingfisher, and Dewey) are included in the Ozarks Region.

(4) In counties with above-average increase in total personal income and population, and with below-average increase in per capita income (see Table 5):

This category contains three big urban and developed counties in the State. These counties experienced above-average increases in income from the private nonfarm sector and government sector, and their wage and salary components were important sources of growth for total personal income.

TABLE 4

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN PER CAPITA INCOME AND BELOW-AVERAGE INCREASE IN POPULATION AND TOTAL PERSONAL INCOME, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Wagoner	158.5	117.5	135.3	257.7	200.4	74.0	188.7	223.1
Noble	150.9	195.5	50.7	310.3	214.8	37.6	185.5	221.6
Kingfisher	148.8	304.8	49.3	253.7	296.0	22.8	262.8	308.6
Choctaw	148.4	142.6	107.3	269.2	146.8	32.9	154.6	181.0
Atoka	144.8	125.7	69.9	586.7	149.6	15.0	178.6	230.3
Pushmataha	142.8	139.1	83.4	235.0	157.6	1.9	174.6	190.7
Muskogee	141.2	153.8	59.4	186.5	174.2	42.1	200.5	133.1
McIntosh	140.0	190.1	46.3	257.6	146.1	-24.3	130.0	336.6
Garvin	138.0	132.4	93.3	181.1	221.9	25.6	197.0	150.0
Lincoln	130.7	96.2	69.9	276.4	158.6	42.3	144.6	149.6
Johnston	123.9	153.5	47.5	191.7	172.1	16.8	212.1	127.3
Coal	110.4	133.9	34.5	499.5	133.7	27.8	124.5	226.9
Okfuskee	109.1	148.7	19.5	104.3	180.7	11.6	163.5	117.3
Haskell	104.8	60.3	85.7	180.?	166.6	25.7	156.3	119.0
Dewey	92.0	98.3	35.0	236.0	194.0	9.8	194.0	223.4
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group III in Chart 1.
**Including other labor income.

TABLE 5

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN TOTAL PERSONAL INCOME AND POPULATION AND BELOW-AVERAGE INCREASE IN PER CAPITA INCOME, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Comanche	283.9	302.4	102.5	389.5	284.6	- 6.3	320.0	262.0
Oklahoma	216.4	231.1	60.3	388.9	249.9	10.5	385.1	181.9
Tulsa	173.0	226.8	21.1	180.2	240.0	-21.5	276.5	174.3
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group IV in Chart 1.
**Including other labor income.

As the State's major manufacturing, government, and commercial activities are concentrated in these areas, they offer better employment opportunities and higher wage rates, and thus attract more people from other parts of the State, reflecting the urbanization trend of the State population.

(5) In counties with above-average increase in population and below-average increase in total and per capita income (see Table 6):

There are only two counties, Canadian and Washington, in this category. Washington County's percentage increase of total personal income was close to the State average. In terms of per capita income, Washington County ranked first in 1950 and remained in the same place in 1967. Washington County was among the eight counties in the State which experienced an absolute decline in proprietor's income. Canadian County is in the Oklahoma City SMSA and was the only constituent county in this SMSA which suffered a below-average increase in total personal income. In Canadian County, lower rates of increase in wages and salaries and transfer payments are reflected in its lower increase in income from government and private nonfarm sectors.

(6) In counties with below-average increase in total personal income, per capita income and population:

This category may be classified into the following three groups:

(6a) Those with absolute increase in population (see

TABLE 6

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH ABOVE-AVERAGE INCREASE IN POPULATION AND BELOW-AVERAGE INCREASE IN TOTAL AND PER CAPITA INCOME, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
		Per cent						
Washington	159.2	182.6	- 3.4	289.3	247.0	38.9	274.8	161.8
Canadian	133.6	143.3	79.5	244.4	151.5	70.4	174.8	151.9
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group V in Chart 1.
**Including other labor income.

Table 7). The percentage increases of the wage and salary component were below the State average for all the counties in this group except one (Washita County). Defense programs exerted significant influences on the growth of Washita County. Of the eight counties of this group, five had above-average increases in transfer payments. In terms of broad industrial sources, in seven of the eight, the government sector accounted for the largest percentage increase of any of the three major industrial sources of income. Washita County had the highest percentage increase in income from the government sector (943.2 per cent), but its agricultural sector declined 7.6 per cent, the only negative rate recorded for farm income in this category. Payne (where Oklahoma State University is located) and Creek, one of the constituent counties of the Tulsa SMSA, witnessed a significant increase in property income. There are two counties (Carter and Creek) in this group which are included in the Ozarks Region. As a whole, all the counties in this category did not perform so well as the corresponding State average in the private non-farm sector. This may have led to the lower percentage increase in income and population.

(6b) Those with absolute decline in population but with increase in real income (see Table 8). Fourteen of the 29 counties in this group are on the border of the State. They are essentially agricultural counties. Percentage increases of the wage and salary component for the overwhelming majority

TABLE 7

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH BELOW-AVERAGE INCREASE IN TOTAL PERSONAL INCOME, PER CAPITA INCOME, AND POPULATION BUT WITH ABSOLUTE INCREASE IN POPULATION, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Payne	148.8	152.2	43.3	323.3	171.2	30.2	251.2	114.5
Washita	143.4	381.3	12.6	143.5	232.2	- 7.6	943.2	114.1
Stephens	113.2	140.1	8.9	138.8	255.6	34.5	228.2	109.5
Kay	112.6	132.8	31.5	149.7	182.1	32.6	189.1	115.9
Creek	110.2	82.1	82.6	318.4	153.4	10.9	159.9	107.1
Carter	98.2	122.5	-10.1	174.1	201.9	13.5	236.9	83.6
Garfield	94.2	102.9	41.2	117.2	211.4	17.6	69.8	121.5
Texas	90.0	133.0	34.9	115.0	278.0	17.3	288.7	123.7
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group VIa in Chart 1.
**Including other labor income.

TABLE 8

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH BELOW-AVERAGE INCREASE IN TOTAL PERSONAL INCOME, PER CAPITA INCOME, AND POPULATION BUT WITH ABSOLUTE DECREASE IN POPULATION, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Marshall	121.1	80.7	15.4	333.6	302.9	-16.1	269.9	130.7
McClain	120.4	64.2	64.9	397.2	177.6	23.2	257.1	216.9
Grady	118.5	137.5	46.8	188.5	168.3	15.7	220.3	134.2
Woods	110.6	132.6	59.2	187.8	149.0	39.9	213.5	131.2
Caddo	110.5	126.6	59.9	134.9	185.6	28.7	134.9	164.4
Pottawatomie	110.2	98.1	57.8	200.2	174.2	43.4	178.9	101.2
Blaine	106.3	150.6	33.6	207.9	179.0	11.7	157.5	188.0
Ottawa	106.0	100.5	47.0	264.7	137.9	20.6	180.8	102.3
Pontotoc	105.3	101.1	38.1	194.6	184.6	44.9	217.3	88.6
Logan	97.7	83.0	61.5	144.2	170.3	49.4	166.3	86.1
Nowata	95.5	115.3	12.0	204.0	150.8	46.5	154.8	91.4
Alfalfa	91.1	56.9	75.9	151.4	219.1	62.0	198.6	96.8
Hughes	87.8	89.4	30.6	162.0	125.4	40.1	115.8	88.2
Major	87.5	54.4	52.2	282.5	198.1	31.8	159.3	148.3
Osage	84.7	108.0	12.4	215.2	137.4	- 1.2	166.1	106.6

(continued)

TABLE 8 (continued)

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER INCOME	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Love	81.3	71.2	34.8	144.0	166.7	4.7	187.3	92.2
Okmulgee	76.1	60.2	30.3	219.8	141.5	0.8	154.6	64.7
Harper	68.1	207.0	- 5.1	165.8	258.9	-19.9	323.7	198.0
Pawnee	67.6	21.8	40.5	137.0	154.6	14.1	120.8	64.9
Seminole	63.5	40.8	42.4	158.6	152.1	35.1	160.5	43.6
Tillman	61.6	94.0	18.9	52.6	209.4	5.3	205.4	89.5
Cotton	55.7	17.4	25.6	183.8	178.8	3.4	164.0	71.1
Kiowa	55.6	55.2	9.8	86.8	214.1	-10.9	144.7	80.5
Roger Mills	53.6	41.2	18.5	203.3	137.6	2.5	136.4	141.0
Beckham	52.4	34.3	1.8	140.2	206.0	-26.3	207.7	52.1
Jefferson	48.1	38.3	-11.4	107.8	162.3	-30.2	145.0	78.4
Ellis	46.2	91.2	4.8	99.9	181.9	- 2.5	181.1	81.2
Grant	45.9	46.4	12.0	139.5	188.1	1.1	127.3	112.6
Greer	45.2	37.9	- 7.9	82.8	223.2	38.5	242.9	55.9
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group VIb in Chart 1.
**Including other labor income.

of the counties in this group were significantly below the State average. Eight of the 29 counties experienced absolute declines in income from the agricultural sector. Another 10 counties recorded percentage increases for farm income lower than the State average, with the percentage increase for five of them less than 5 per cent. All the counties except one (Harper County) registered below-average percentage increases for income from government; however, for all the counties except three (Caddo, Blaine, and Roger Mills), the percentage increases in income from the government sector were the highest in the three broad industrial sources. Also, in all the counties except three (McClain, Caddo, and Blaine), percentage increases of income originating from the private nonfarm sector lagged behind the State average. Declining agricultural and mining sectors in these areas caused outward migration, which might have brought about a shift in the age structure of the population in the direction of a higher proportion of older persons in the population total.[6] The local productivity trend

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[6]Population losses in these counties mainly occurred in the 1950's. According to Beale, in rural areas, net migration is commonly the major component of population change. It is also a major determinant of age structure. Out-migration of youth, in particular, has been very high since the Depression. From 1950 to 1960, the rural and predominantly rural counties of the United States that had net outmigration lost 40 per cent of their youth who reached 20 years of age during that decade. But since 1960, there has been a marked reduction of population loss in many rural counties; some even experienced gain. For example, there are a number of inmigrant counties in eastern Oklahoma where very heavy loss of population was the norm in the 1950's. But between 1950 and 1967, net loss existed because these counties lost more people in the 1950's than what they gained in the period 1960-1967. See C.L. Beale, "Demographic and Social Considerations for U.S. Rural Economic Policy," Background Paper No. 7, National Rural Housing Conference, June 1969, mimeographed.

might have been affected. Generally, all of these counties are relatively poor with 10 of them falling into the Ozarks Region.

(6c) Those with declines in real income (see Table 9). Three counties fall into this category; two of them are in the Panhandle. The economic activity of these three counties is basically agricultural. It is significant to note that all these counties show a considerable drop in income derived from the agricultural sector; meanwhile, they all experienced an absolute decrease in income from proprietorships. Their percentage increases for the wage and salary component are substantially below the State average. Among the three, Harmon county, which increased least in the State with respect to total personal income, is the only county in Oklahoma that suffered an absolute decline in the wage and salary component of personal income. For all three counties, income originating in the government sector recorded the highest percentage increase of any of the broad industrial sources. These are the counties in which the lower percentage increase in income cannot catch up with price inflation, and thus cause real income to decline.

Changes in County personal Income Structure

We have indicated that our projection of county personal income will be based on the historical income data available. As the past development is a prologue for the unwritten chapters for the future, the way each county has been growing with re-

TABLE 9

PERCENTAGE CHANGES IN PERSONAL INCOME, BY MAJOR COMPONENT AND BY BROAD INDUSTRIAL SOURCE, FOR COUNTIES IN OKLAHOMA WITH BELOW-AVERAGE INCREASE IN TOTAL PERSONAL INCOME, PER CAPITA INCOME, POPULATION, AND WITH ABSOLUTE DECLINE IN REAL INCOME, 1950-1967*

COUNTY	TOTAL PERSONAL INCOME	BY MAJOR COMPONENT				BY BROAD INDUSTRIAL SOURCE		
		WAGES AND SALARIES**	PROPRIETOR INCOME	PROPERTY INCOME	TRANSFER PAYMENTS	FARM	GOVERN-MENT	PRIVATE NONFARM
	Per cent							
Beaver	36.1	84.1	-11.1	232.5	200.9	-16.1	301.9	108.8
Cimarron	27.4	108.6	-18.4	66.7	336.0	-26.5	503.1	66.3
Harmon	12.3	- 24.0	- 4.6	58.3	255.2	-27.5	173.4	28.4
State Average	162.3	194.2	43.4	239.6	200.9	16.8	271.2	160.9

SOURCE: Same as Table 1.

*Including counties in Group VIc in Chart 1.
**Including other labor income.

spect to county personal income will throw light on its income level for one or two years in the future. In the previous section of this chapter, we examined the relative growth patterns of the 77 counties of Oklahoma. A further review of the changes in county personal income structure would show the other side of the coin which exposes how the relevant factors affecting the growth pattern of Oklahoma's county personal income behaved. This will be done by analyzing the sources of personal income in Oklahoma's 77 counties with respect to both the relative importance of the components of personal income and its industrial origins.

Relative Weights of Major Components

In Table 10 the percentage distribution of personal income by major component for 1950 and 1967 in each of the Oklahoma's 77 counties and the State average are shown. The group of counties which have an above-average increase in income and population, have relatively higher weights for the wage and salary component as a proportion of personal income. For those counties which have below-average increases in income and have lost population, the wage and salary component accounted for a lower percentage of total county personal income. In Alfalfa County, for example, the wage and salary share was 20.8 per cent in 1967 as compared to the corresponding 82.7 per cent in Comanche and 72.0 per cent in Tulsa. Wages and salaries and other labor income have become more important as a source of

TABLE 10

PERCENTAGE DISTRIBUTION OF COUNTY PERSONAL INCOME IN OKLAHOMA, BY MAJOR COMPONENT, BY COUNTY, 1950 AND 1967

COUNTY	WAGES AND SALARIES*		PROPRIETOR INCOME		PROPERTY INCOME		TRANSFER PAYMENTS		LESS: SOCIAL INSURANCE	
	1950	1967	1950	1967	1950	1967	1950	1967	1950	1967
	Per cent									
Adair	27.6	24.0	28.9	24.5	9.4	13.7	34.7	39.4	0.6	1.5
Alfalfa	25.3	20.8	54.3	49.9	13.1	17.2	7.7	13.0	0.5	1.0
Atoka	31.4	28.9	31.7	22.0	7.0	19.5	30.5	31.1	0.6	1.7
Beaver	21.2	28.6	66.4	43.4	8.4	20.5	4.5	9.9	0.4	2.4
Beckham	48.3	42.5	30.6	20.4	13.3	20.9	8.8	17.8	1.0	1.7
Blaine	30.8	37.4	45.5	29.5	13.4	20.0	11.0	14.8	0.6	1.6
Bryan	43.0	46.9	25.8	15.2	12.3	19.4	19.8	20.2	0.9	1.9
Caddo	42.6	45.9	33.6	25.5	12.9	14.4	11.7	15.9	0.9	1.7
Canadian	43.2	45.0	34.2	26.3	12.2	17.9	11.3	12.2	0.9	1.4
Carter	56.9	63.8	24.7	11.2	9.5	13.2	10.1	15.4	1.2	3.5
Cherokee	41.5	52.6	19.2	13.8	10.0	13.0	29.9	21.5	0.9	1.0
Choctaw	44.0	43.0	17.5	14.6	9.8	14.6	29.6	29.4	0.9	1.6
Cimarron	22.6	37.0	64.0	41.0	11.1	14.5	2.9	9.8	0.4	2.2
Cleveland	60.9	63.3	19.2	10.6	10.8	16.6	10.4	11.5	1.3	2.0
Coal	26.6	29.6	41.3	26.4	5.5	15.7	27.1	30.1	0.5	1.8
Comanche	78.5	82.7	12.0	6.3	5.1	6.5	5.6	5.6	1.6	1.8
Cotton	33.6	25.4	43.8	35.4	10.8	19.7	12.5	22.4	0.7	2.7
Craig	40.6	45.4	31.5	22.1	12.2	17.9	16.6	16.0	0.8	1.4
Creek	62.9	54.5	13.3	11.6	8.6	17.2	16.5	19.9	1.3	3.1
Custer	45.2	52.3	33.4	23.4	12.7	15.1	9.7	11.0	0.9	1.8
Delaware	26.1	27.2	35.8	28.6	6.5	11.6	32.1	34.4	0.5	1.7
Dewey	19.6	20.3	55.6	39.1	14.2	24.9	10.9	16.7	0.4	1.0
Ellis	23.2	30.4	57.3	41.1	11.7	15.9	8.3	15.9	0.5	3.4
Garfield	61.1	63.8	21.4	15.5	12.5	14.0	6.3	10.1	1.3	3.5
Garvin	58.0	56.7	18.8	15.3	12.8	15.2	11.7	15.6	1.2	2.8
Grady	45.1	49.0	29.8	20.0	12.8	16.9	13.2	16.2	0.9	2.2
Grant	20.7	20.8	60.1	46.1	12.9	21.1	6.7	13.2	0.4	1.3

(continued)

TABLE 10 (continued)

COUNTY	WAGES AND SALARIES*		PROPRIETOR INCOME		PROPERTY INCOME		TRANSFER PAYMENTS		LESS: SOCIAL INSURANCE	
	1950	1967	1950	1967	1950	1967	1950	1967	1950	1967
	Per cent									
Greer	31.7	30.1	41.9	26.6	16.1	20.3	10.9	24.3	0.7	1.3
Harmon	34.2	23.2	48.9	41.6	10.9	15.4	6.6	20.9	0.7	1.1
Harper	17.6	32.1	63.0	35.6	13.9	22.0	5.8	12.4	0.4	2.1
Haskell	34.9	27.3	28.2	25.6	8.5	11.7	29.1	37.9	0.7	2.4
Hughes	41.4	41.7	26.9	18.7	10.4	14.6	22.1	26.6	0.9	1.6
Jackson	39.6	41.4	37.9	17.6	13.5	11.6	9.8	10.8	0.8	1.1
Jefferson	30.1	28.1	39.6	23.7	15.5	21.8	15.5	27.4	0.6	0.9
Johnston	31.8	36.0	35.1	23.1	7.2	9.3	26.5	32.3	0.7	0.8
Kay	62.1	68.0	20.8	12.9	10.3	12.1	8.0	10.7	1.3	3.7
Kingfisher	24.4	39.7	57.1	34.3	12.1	17.1	6.9	11.0	0.5	2.1
Kiowa	36.1	36.0	39.8	28.1	15.8	19.0	9.0	18.2	0.7	1.3
Latimer	35.5	49.5	21.3	12.5	9.9	16.4	33.9	23.2	0.7	1.5
LeFlore	51.0	50.0	14.7	15.7	8.3	10.8	27.1	25.9	1.1	2.3
Lincoln	46.0	39.5	20.7	15.3	16.9	27.5	17.4	19.5	0.9	1.8
Logan	47.2	43.7	24.6	20.1	14.5	17.9	14.6	20.0	1.0	2.9
Love	30.7	29.0	37.5	27.9	13.4	18.0	19.1	28.2	0.6	2.9
McClain	33.6	25.0	37.7	28.2	12.1	27.3	17.4	21.9	1.0	2.3
McCurtain	48.3	50.6	15.3	13.0	8.1	15.4	29.3	23.3	1.0	2.3
McIntosh	28.2	34.1	30.0	18.3	11.5	17.2	30.8	31.6	0.6	1.2
Major	27.6	22.7	52.8	42.9	10.5	21.5	9.7	15.4	0.6	2.5
Marshall	35.6	29.1	36.7	19.1	12.4	24.3	16.0	29.2	0.7	1.8
Mayes	42.0	56.7	25.8	15.3	9.4	12.6	23.7	18.1	0.9	2.6
Murray	41.4	51.3	29.4	14.8	11.4	14.9	18.7	20.8	0.9	1.8
Muskogee	60.2	63.4	16.1	10.7	11.4	13.5	13.5	15.3	1.2	2.9
Noble	40.6	47.8	39.0	23.4	11.1	18.2	10.2	12.8	0.8	2.1
Nowata	37.8	41.6	34.0	19.5	12.3	19.2	16.7	21.4	0.8	1.6
Okfuskee	35.1	41.7	28.0	16.0	17.6	17.2	20.1	26.9	0.7	1.8
Oklahoma	70.3	73.6	15.4	7.8	9.9	15.4	5.8	6.4	1.5	3.2

(continued)

TABLE 10 (continued)

COUNTY	WAGES AND SALARIES*		PROPRIETOR INCOME		PROPERTY INCOME		TRANSFER PAYMENTS		LESS: SOCIAL INSURANCE	
	1950	1967	1950	1967	1950	1967	1950	1967	1950	1967
	Per cent									
Okmulgee	66.4	60.4	13.3	9.8	7.8	14.3	13.8	19.0	1.4	3.5
Osage	45.6	51.4	34.7	21.1	6.9	11.7	13.8	17.8	0.9	2.0
Ottawa	66.4	64.6	14.8	10.6	8.4	14.9	11.8	13.6	1.4	3.6
Pawnee	35.7	25.9	31.9	26.8	15.0	21.2	18.1	27.5	0.7	1.4
Payne	63.5	64.4	18.2	10.5	9.2	15.6	10.4	11.4	1.3	1.8
Pittsburg	59.6	70.4	14.3	8.1	10.2	11.1	17.1	12.0	1.2	1.6
Pontotoc	57.6	56.5	20.6	13.8	11.1	16.0	11.8	16.4	1.2	2.7
Pottawatomie	55.1	52.0	19.6	14.7	12.1	17.2	14.4	18.8	1.4	2.6
Pushmataha	31.4	30.9	23.0	17.4	11.9	16.4	34.5	36.6	0.6	1.2
Roger Mills	25.3	23.3	55.4	42.7	8.9	17.6	10.9	16.8	0.5	0.5
Rogers	40.4	49.3	28.8	17.7	10.7	14.1	21.0	20.5	0.8	1.7
Seminole	65.5	56.4	13.8	12.1	8.3	13.1	13.8	21.3	1.4	2.8
Sequoyah	32.3	48.6	18.5	14.7	7.9	11.7	42.0	26.0	0.7	1.0
Stephens	57.0	64.2	22.5	11.5	14.4	16.1	7.3	12.2	1.2	4.0
Texas	38.9	47.7	45.6	32.4	12.4	14.0	3.9	7.8	0.8	1.9
Tillman	33.2	39.9	46.4	34.2	12.9	12.2	8.2	15.6	0.7	1.8
Tulsa	60.2	72.0	18.7	8.3	16.9	17.3	5.4	6.8	1.2	4.5
Wagoner	30.7	25.8	32.2	29.3	10.4	14.4	27.4	31.8	0.6	1.3
Washington	64.0	69.8	18.1	6.7	14.6	21.9	4.7	6.2	1.3	4.7
Washita	26.5	52.5	53.0	24.5	13.8	13.8	7.2	9.9	0.6	0.7
Woods	36.6	40.4	40.7	30.8	14.1	19.2	9.3	11.0	0.8	1.5
Woodward	42.6	57.6	35.9	20.7	13.5	14.2	8.9	10.1	0.9	2.6
State Average	57.6	64.6	22.2	12.1	12.1	15.6	9.3	10.7	1.2	3.0

SOURCE: Same as Table 1.

*Including other labor income.

personal income in Oklahoma's counties. In 1967 there were 28 counties in which the wage and salary component accounted for 50 per cent or more of the personal income total, while in 1950, only 19 counties fell into this group. For the State as a whole, the wage and salary component of personal income has increased from 57.6 per cent in 1950 to 64.6 per cent in 1967. This trend has been followed by the majority of the counties in the State; i.e., 48 counties experienced an increase in the relative share of wages and salaries in the county personal income. Most of the remaining 29 counties are those with below-average increases in income and losses in population; generally, they are in the rural areas of the State.

The relative importance of proprietor's income component in the State personal income declined from 22.2 per cent in 1950 to 12.1 per cent in 1967. This pattern of change was shared by all the counties except one (LeFlore). In 1967 income from proprietorships varied from a high of 49.9 per cent of total personal income in Alfalfa County to a low of 6.3 per cent in Comanche County, while in 1950 the range was from 66.4 per cent in Beaver County to 12.0 per cent in Comanche County.

As for the property income component, the State average showed an increase from 12.1 per cent in 1950 to 15.6 per cent in 1967. The overwhelming majority of the counties followed this trend; only three of the 77 counties (Jackson, Okfuskee, and Tillman) experienced a slight decline and another (Washita)

held its share constant. Property income as a percentage of total county personal income ranged in 1967 from a high of 27.5 per cent in Lincoln County to a low of 6.5 per cent in Comanche County; in 1950 the range was from 17.6 per cent in Okfuskee County to 5.1 per cent in Comanche County.

The data show that the transfer payments component of personal income plays an important role in Oklahoma's county income picture. The State average of this component as a percentage of total personal income was 9.3 per cent in 1950 and increased to 10.7 per cent in 1967. But, on the county level, the majority of the counties have higher ratios than the State average. In 1950 the share of transfer payments in total personal income ranged from a high of 42.0 per cent in Sequoyah County to a low of 2.9 per cent in Cimarron County; 53 counties had a percentage higher than the State average and there were 20 counties which derived 20 per cent or more of their personal income from this component. In 1967 the range narrowed slightly, i.e., from 39.4 per cent in Adair County to 5.6 per cent in Comanche County, but 67 counties had a percentage higher than the State average of 10.7 per cent and 33 counties had 20 per cent or more of their total personal income contributed by this component. Most of the counties with below-average increases in income and losses of population have a higher share of their total personal income from transfer payments, and these shares increased substantially. The rural counties are usually relatively poor and need the support

of the public sector. The picture just sketched suggests that the continuous urbanization of the State economy has the effect of forcing some rural counties to rely more heavily on the public sector as a source of income.

Changes by Broad Industrial Source

There are some significant changes which occurred in the industrial origins of Oklahoma's county personal income. The State's basic economic structure, as indicated earlier, has witnessed a transition from a rural economy toward an economy with an enlarging industrial and commercial base. On the county level, some counties experienced striking declines in the agricultural sector, and the relative importance of two other sectors, namely, government and private nonfarm, have increased. But for the State as a whole, the slack resulting from the declining agricultural sector bewteen 1950 and 1967 was made up by the rising government sector, while the private nonfarm sector remained somewhat stable with a very slight drop -- i.e., from 70.4 per cent in 1950 to 70.0 per cent in 1967 (see Table 11).

The changes in the basic economic structure in various counties provide us with important information for understanding growth patterns of the counties. These patterns signal possible development in the near future. Let us now turn to data showing changes taking place between 1950 and 1967 in personal income in terms of the industrial source of income (see Table 11).

TABLE 11

PERCENTAGE DISTRIBUTION OF PERSONAL INCOME IN OKLAHOMA, BY BROAD INDUSTRIAL SOURCE, BY COUNTY, 1950 AND 1967*

COUNTY	AGRICULTURAL SECTOR		GOVERNMENT SECTOR		PRIVATE-NONFARM SECTOR	
	1950	1967	1950	1967	1950	1967
	Per cent					
Adair	27.1	17.6	47.8	55.1	25.7	28.8
Alfalfa	55.3	46.8	14.2	22.1	31.1	32.0
Atoka	28.9	13.6	41.1	46.8	36.8	41.3
Beaver	68.2	42.1	7.7	22.7	24.5	37.6
Beckham	24.8	12.0	11.9	25.5	64.3	64.2
Blaine	42.3	22.9	18.0	22.4	40.3	56.3
Bryan	21.1	8.1	31.9	34.8	47.9	59.0
Caddo	33.5	20.5	24.0	26.8	43.4	54.5
Canadian	27.5	20.1	22.6	26.5	50.8	54.8
Carter	3.4	1.9	14.3	24.3	83.5	77.3
Cherokee	15.4	8.6	52.0	52.6	33.5	39.7
Choctaw	13.8	7.4	40.9	41.9	46.2	52.3
Cimarron	66.3	38.2	7.3	29.0	26.8	35.0
Cleveland	7.0	1.8	38.0	41.1	56.3	59.1
Coal	35.9	21.8	42.3	45.2	22.4	34.8
Comanche	4.9	1.2	60.4	65.8	36.3	34.2
Cotton	45.3	30.1	19.8	33.5	35.6	39.1
Craig	27.1	16.1	29.9	34.2	43.9	51.1
Creek	4.8	2.5	21.9	27.0	74.6	73.5
Custer	30.1	14.4	19.7	28.9	51.1	58.6
Delaware	35.5	21.9	45.2	47.7	19.9	32.2
Dewey	58.5	33.4	18.0	27.3	23.9	40.3
Ellis	54.2	36.2	14.5	27.8	31.8	39.4
Garfield	10.1	6.1	24.9	21.8	66.3	75.6
Garvin	14.1	7.4	18.7	23.3	68.4	72.1
Grady	24.5	13.0	18.6	27.2	57.8	62.0
Grant	60.8	42.1	14.0	21.8	25.6	37.3
Greer	45.5	19.3	17.7	41.8	37.4	40.2
Harmon	60.2	38.9	12.3	30.0	28.2	32.3
Harper	64.8	30.9	11.0	27.7	24.6	43.5
Haskell	28.5	17.5	42.4	53.0	29.9	31.9
Hughes	16.1	12.0	31.4	36.0	53.4	53.6
Jackson	36.8	12.1	16.5	45.0	45.6	44.1
Jefferson	42.3	19.9	23.8	39.4	34.5	41.6
Johnston	35.9	18.7	43.1	60.0	21.7	22.1
Kay	9.6	6.0	13.2	18.0	78.5	79.7
Kingfisher	52.8	26.0	12.2	17.8	35.5	58.2
Kiowa	38.6	22.1	17.2	27.0	44.9	52.1
Latimer	18.7	6.4	48.1	62.5	34.0	32.7
LeFlore	11.9	9.5	42.1	37.0	47.1	55.8

(continued)

TABLE 11 (continued)

COUNTY	AGRICULTURAL SECTOR		GOVERNMENT SECTOR		PRIVATE NONFARM SECTOR	
	1950	1967	1950	1967	1950	1967
	Per cent					
Lincoln	14.7	9.1	26.1	27.6	60.2	65.1
Logan	17.9	13.5	24.6	33.1	58.5	55.1
Love	39.4	22.8	29.2	46.3	32.0	33.9
McClain	38.9	21.8	30.3	35.3	31.5	45.2
McCurtain	13.7	6.4	40.7	33.1	46.6	62.8
McIntosh	29.7	9.4	43.1	43.1	27.8	50.5
Major	51.2	36.0	17.9	24.7	31.5	41.7
Marshall	30.5	11.6	26.9	45.0	43.3	45.2
Mayes	22.2	7.8	40.2	28.6	38.4	66.1
Murray	19.3	9.4	32.3	41.5	49.3	50.9
Muskogee	5.5	3.3	25.6	31.9	70.1	67.8
Noble	33.2	18.2	19.4	22.1	48.2	61.9
Nowata	19.7	14.8	23.1	30.3	58.0	56.8
Okfuskee	19.2	10.3	31.2	39.4	50.3	52.2
Oklahoma	0.7	0.2	20.5	31.4	80.3	71.6
Okmulgee	4.5	2.5	20.1	29.1	76.8	71.9
Osage	29.5	15.8	19.4	28.0	52.0	58.1
Ottawa	6.0	3.5	17.0	23.1	78.4	77.0
Pawnee	27.0	18.4	31.5	41.5	42.2	41.5
Payne	6.1	3.2	30.2	42.6	65.0	56.1
Pittsburg	6.9	2.7	39.7	54.6	54.7	44.3
Pontotoc	6.5	4.6	17.7	27.4	77.0	70.8
Pottawatomie	7.1	4.8	21.1	28.0	72.9	69.8
Pushmataha	20.6	8.6	50.4	57.0	29.7	35.6
Roger Mills	62.9	41.9	19.2	29.5	18.5	29.0
Rogers	23.9	10.1	30.4	33.1	46.5	58.5
Seminole	4.4	3.7	19.5	31.1	77.4	68.0
Sequoyah	17.1	8.3	54.9	38.9	28.6	53.8
Stephens	5.5	3.5	11.7	17.9	84.0	82.6
Texas	43.8	27.1	9.0	18.3	48.0	56.5
Tillman	48.3	31.5	12.4	23.5	40.0	46.9
Tulsa	0.8	0.2	8.8	12.1	91.7	92.2
Wagoner	33.6	22.6	38.2	42.6	28.8	36.0
Washington	2.0	1.1	7.6	10.9	91.8	92.7
Washita	58.8	22.3	12.2	52.4	29.5	26.0
Woods	36.2	23.9	17.1	25.4	47.5	52.2
Woodward	27.9	11.4	16.3	22.9	56.6	68.3
State Average	10.9	4.8	19.9	28.2	70.4	70.0

SOURCE: Same as Table 1.

*Social insurance is a negative item in the income system and is not shown here.

For the entire State, farm income as a percentage of total personal income declined significantly from 10.9 per cent in 1950 to 4.8 per cent in 1967. In 1950 income from the agricultural sector as a percentage of total personal income varied from a high of 66.3 per cent in Cimarron County to a low of 0.7 per cent in Oklahoma County. By 1967 the range was considerably narrowed, with a high of 46.8 per cent in Alfalfa County and a low of 0.2 per cent in Oklahoma and Tulsa counties. Compared with the State average, there were 59 counties in 1950 which had a higher share of personal income originating in agriculture; meanwhile, there were 18 counties in which the agricultural sector accounted for the highest share of total personal income in the three broad industrial sources. Between 1950 and 1967, though the number of counties with a higher share of personal income from farming than the State average increased slightly to 62, the number of counties with the agricultural sector as the most important source of personal income declined to 6 (Alfalfa, Beaver, Cimarron, Grant, Harmon, and Roger Mills). Under such circumstances, structural changes at the county level with respect to the relative importance of the agricultural sector as an income source are not taking place more rapidly than is true for the State as a whole. A majority of the counties which formerly relied most heavily on agriculture as a source of income have shifted to government and nonfarm sectors. There was no county in the State in which farming accounted for 50 per cent or more of personal income in

1967, while in 1950, there were 12 counties falling into this category. Furthermore, between 1950 and 1967 the share of agriculture in county personal income declined in all the counties in the State. All these changes reflect the downward trend in the agricultural sector as an income source in the majority of Oklahoma's 77 counties.

Income from the government sector experienced a significant increase in Oklahoma. As a percentage of total personal income, the government sector increased from 19.9 per cent in 1950 to 28.2 per cent in 1967 for the entire State. On the county level, in 1950 government as a source of personal income varied from a high of 60.4 per cent in Comanche County to a low of 7.3 per cent in Cimarron County. In 1967 the range was from 65.8 per cent in Comanche to 10.9 per cent in Washington County. Comanche County remained the highest in this respect. The Artillery Missile Center at Fort Sill accounts for the importance of government as an income source in this county. For all counties except four (Garfield, LeFlore, Mayes, and Sequoyah) the share of income generated by the government sector witnessed increases following the trend for the entire State. This suggests that considerable increases in the relative importance of government as a source of personal income have occurred not only for the State as a whole, but at the county level as well. It is significant to note that in 1950 there were 45 counties -- representing 58 per cent of the total counties in the State -- in which the government sector

accounts for 20 per cent or more of the personal income total. By 1967 the number of counties increased to 71, accounting for 92 per cent of the total counties in the State.

With respect to the private nonfarm sector, its share of total personal income for the entire State, as pointed out earlier, declined very slightly from 70.4 per cent in 1950 to 70.0 per cent in 1967. However, a majority of the counties did not follow this trend. There were 58 counties in which the relative importance of the private nonfarm sector as an income source increased. If we examine the number of counties in which the private nonfarm sector represents 50 per cent or more of the total county personal income, there were 28 counties falling into this category in 1950, but by 1967 the number increased to 45. This also reflects the trend of transition toward a more industrialized economy on the county level in Oklahoma.

Per Capita Income and County Shares of State Personal Income

All the counties in the State have made a uniform forward movement in absolute per capita income gains between 1950 and 1967; there is no county which recorded an absolute decline in per capita personal income.

Per capita income is a balance between population numbers and total income received, and is considered to be highly suggestive of the type of economic adjustment being made within a given county. Changes in a county's population will likely

result in changes in per capita income of the county. In addition to the rate of population change, factor affecting per capita income include wage rate and employment-population ratio in various counties. On the county level, however, migration of population is generally the most important variable affecting the rate of county per capita income in Oklahoma. The rapid economic growth of urban industrial counties apparently has had the short-run effect of keeping per capita income lower than they would have been. On the other hand, relatively slow growth or no growth in some of the sparsely settled counties can lead to per capita income increases, at least in the short-run.

In the State there were 45 counties in which the percentage increases of per capita personal income between 1950 and 1967 were above the State average of 133.7 per cent. Thirty-five of these counties experienced an absolute loss in population. But only 14 of these 45 counties registered an above-average increase in total personal income. As such, the loss of population was a significant factor affecting the percentage increases of per capita income greater than the State average in this group of counties. In terms of economic well-being, this is not a healthy condition.

The personal income of a county can be characterized in terms of the share of the State's total personal income which it accounts for, and important insights into income growth can be obtained by tracing the changes in these shares. This type

of analysis also related counties to each other. Under such a framework, given certain assumptions about State growth, unusually rapid gains in certain counties of the State will be offset by stagnation or declines in other counties of the State; each county's growth is related to the State's total. During the period of 1950-1967, Oklahoma's county income shares showed no significant variation. From year to year, the share varied in a considerably limited range; most of them moved on very smoothly. For recent years, the range of variation and mean of the county shares are shown in Table 12.

In Oklahoma, as pointed out earlier in this chapter, about half of the State personal income is generated by Oklahoma City, Tulsa, and Lawton SMSA's. If we combine the shares of these three SMSA's with all other urban counties which have a city of 10,000 or more population, the share of the State personal income contributed by this group of counties was 77.7 per cent in 1950, and increased to 81.6 per cent in 1967. There were 19 counties in which the share registered an increase between 1950 and 1967. As the trend toward urbanization continues, the heavily populated counties will account for an increasing percentage of the total population and total income of the State.

The income shares of Oklahoma County and Tulsa County are much larger than any other county in the State. Changes in their shares have significant effects on those of all other

TABLE 12

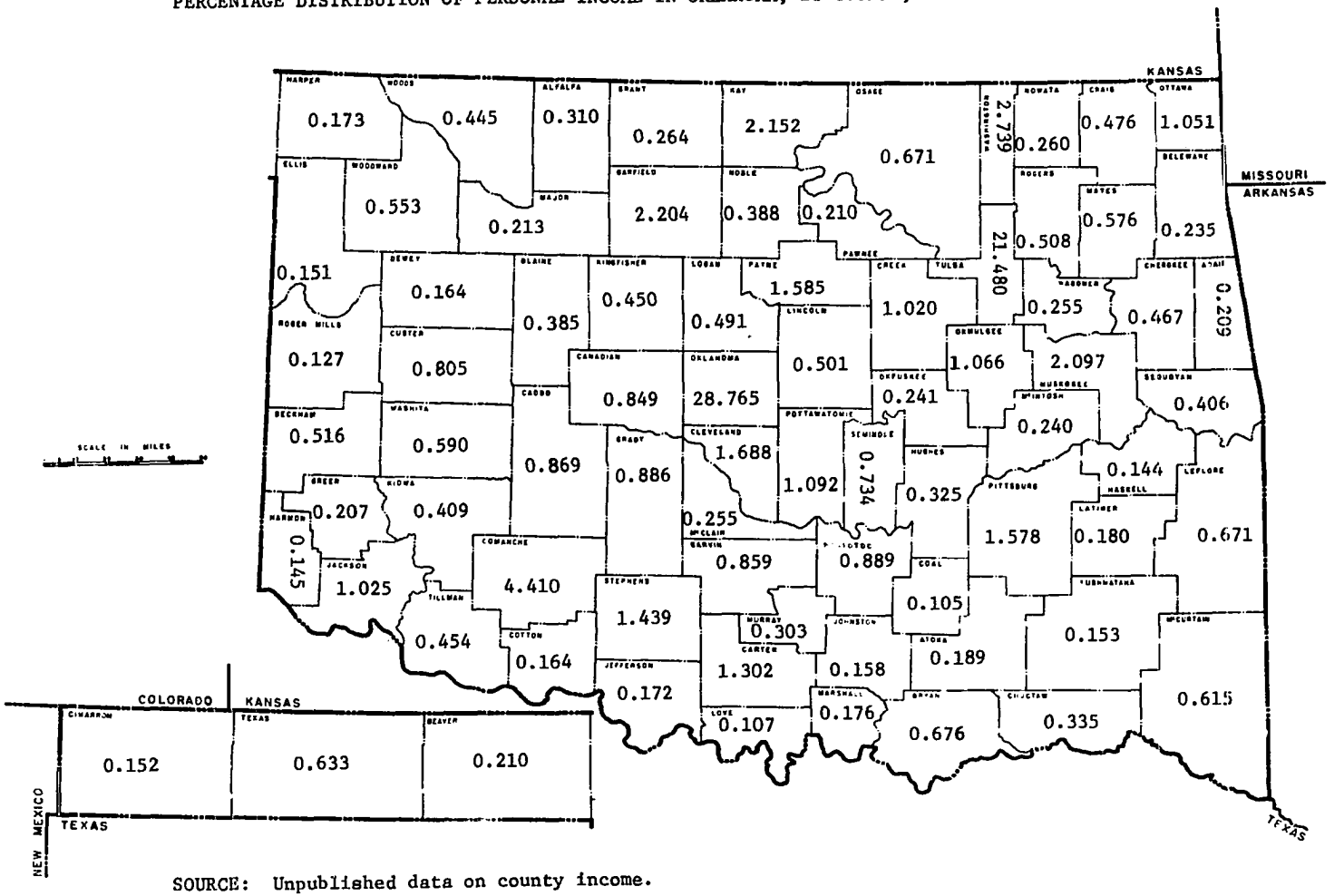
VARIATION OF COUNTY INCOME SHARES IN OKLAHOMA, 1962-1967
(IN PER CENT)

COUNTY	RANGE	MEAN	COUNTY	RANGE	MEAN
Adair	0.199 - 0.209	0.205	Lincoln	0.497 - 0.547	0.522
Alfalfa	0.306 - 0.363	0.331	Logan	0.491 - 0.526	0.509
Atoka	0.169 - 0.189	0.179	Love	0.107 - 0.118	0.111
Beaver	0.206 - 0.236	0.221	McClain	0.251 - 0.263	0.258
Beckham	0.516 - 0.603	0.546	McCurtain	0.542 - 0.620	0.581
Blaine	0.385 - 0.427	0.407	McIntosh	0.240 - 0.341	0.275
Bryan	0.629 - 0.676	0.647	Major	0.209 - 0.228	0.218
Caddo	0.828 - 0.889	0.860	Marshall	0.167 - 0.176	0.171
Canadian	0.832 - 0.897	0.860	Mayes	0.555 - 0.640	0.586
Carter	1.273 - 1.417	1.344	Murray	0.302 - 0.336	0.316
Cherokee	0.382 - 0.467	0.415	Muskogee	2.097 - 2.216	2.149
Choctaw	0.326 - 0.337	0.332	Noble	0.388 - 0.434	0.406
Cimarron	0.152 - 0.189	0.168	Nowata	0.260 - 0.325	0.286
Cleveland	1.438 - 1.688	1.606	Okfuskee	0.241 - 0.256	0.249
Coal	0.100 - 0.107	0.104	Oklahoma	27.777 -29.083	28.648
Comanche	3.685 - 4.410	3.896	Okmulgee	1.066 - 1.299	1.168
Cotton	0.164 - 0.183	0.174	Osage	0.671 - 0.793	0.740
Craig	0.476 - 0.516	0.499	Ottawa	1.051 - 1.122	1.109
Creek	1.020 - 1.101	1.063	Pawnee	0.210 - 0.238	0.223
Custer	0.751 - 0.805	0.777	Payne	1.530 - 1.578	1.273
Delaware	0.214 - 0.236	0.229	Pittsburg	1.156 - 1.578	1.273
Dewey	0.164 - 0.182	0.173	Pontotoc	0.878 - 1.006	0.931
Ellis	0.151 - 0.169	0.160	Pottawatomie	1.076 - 1.257	1.154
Garfield	2.167 - 2.292	2.221	Pushmataha	0.148 - 0.153	0.150
Garvin	0.859 - 1.000	0.943	Roger Mills	0.127 - 0.141	0.134
Grady	0.886 - 0.993	0.935	Rogers	0.487 - 0.529	0.503
Grant	0.264 - 0.303	0.284	Seminole	0.734 - 0.865	0.788
Greer	0.204 - 0.241	0.216	Sequoyah	0.295 - 0.406	0.335
Harmon	0.145 - 0.179	0.158	Stephens	1.439 - 1.577	1.502
Harper	0.168 - 0.205	0.182	Texas	0.633 - 0.696	0.654
Haskell	0.144 - 0.159	0.151	Tillman	0.454 - 0.566	0.506
Hughes	0.325 - 0.356	0.338	Tulsa	20.689 -21.480	21.131
Jackson	0.971 - 1.466	1.143	Wagoner	0.250 - 0.268	0.258
Jefferson	0.172 - 0.194	0.180	Washington	2.739 - 3.003	2.901
Johnston	0.148 - 0.164	0.157	Washita	0.590 - 0.641	0.624
Kay	2.152 - 2.376	2.254	Woods	0.434 - 0.468	0.458
Kingfisher	0.449 - 0.491	0.466	Woodward	0.532 - 0.557	0.546
Kiowa	0.409 - 0.507	0.442			
Latimer	0.133 - 0.185	0.171	OKC SMSA	30.047 -31.584	31.114
LeFlore	0.571 - 0.677	0.614	Tulsa SMSA	22.582 -23.237	22.933

SOURCE: Computed from unpublished data on county income.

CHART 3

PERCENTAGE DISTRIBUTION OF PERSONAL INCOME IN OKLAHOMA, BY COUNTY, 1967



SOURCE: Unpublished data on county income.

counties. Fortunately, the patterns of growth for these two giant counties in the State are rather stable; otherwise, the task of projecting income for all counties would be a difficult, perhaps impossible, mission. For the rest of the counties, their shares also have a similar stable growth pattern.

Significant Factors Affecting County Income Growth

For most of Oklahoma's counties, technological changes have exerted profound effect on their economic structures. Technological advance in agriculture through the years have afforded such large increases in output per acre and output per worker that these two input resources have been substantially freed for other lines of economic endeavor and utilization. As a result, large numbers of workers have sought employment away from the farm, and considerable amounts of land have been utilized by expanding urban centers, for dams and reservoirs, and for other nonfarm purposes. Meanwhile, with the change in production possibilities made available by the changes in technology, the pattern of regional advantage in production offered by a county may change so that new capacity in an industry may be located in places other than those in which previously existing capacity was located.

In the State, as shown in previous sections, most of the agricultural counties experienced below-average increases in income, and losses in population. This reflects the outmigration due to lack of local employment opportunities. In these counties the comparative regional advantage in produc-

tion in the nonfarm sector has been less favorable than those offered by the industrialized counties in the State. The latter are larger urban counties with cities of 10,000 or more population; in a better competitive position, they generally have a more developed manufacturing sector which produces high value-added products and pays higher wage rates to workers.

Some of the significant factors influencing the location of an enterprise are the spatial character of production inputs and outputs, and external economies as discussed in Chapter II. The transfer relations are important if the production inputs and outputs are mobile and substitutable. On the other hand, external economies resulting from an increase in efficiency with an industry as a whole will make cost savings possible for a firm. Joint research, organized markets for finished products, specialized brokers, and specialized machinery producers are examples of the kinds of economies that may be involved. These factors have exerted important effects on the larger counties, such as Oklahoma and Tulsa. In Oklahoma, employment in the industrial sector has increased at twice the rate in metropolitan counties as in the rest of the State.[7]

Military installations in Comanche, Pittsburg, Jackson, Washita, Oklahoma, and Garfield counties have contributed considerably to the income growth of these areas. Changes in the situation in Vietnam will have an important effect on some

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[7]See D.L. Keele, "Economic Growth Outside Metropolitan Areas: the Tenth District Experience," Monthly Review, the Federal Reserve Bank of Kansas City, June 1969, p. 7.

of these counties which rely heavily on defense programs as a source of employment and income.

Educational institutions of higher education affect the growth of some counties. Enrollment growth results in economic growth. The increases in the number of faculty and classrooms will induce higher employment and income in the counties concerned. In the meantime, money spent by students for a wide range of goods and services also has a multiplier effect on community income and employment.[8] Some of the eastern counties will have a new source of growth. The forthcoming Arkansas River Navigation System will establish a new basis for regional growth in eastern Oklahoma. As Dr. Robinson pointed out in his economic base study of this area,[9] some growth is likely to take place along the river even if no effort is made to facilitate it. The counties directly related to this navigation system are Haskell, LeFlore, Muskogee, Rogers, Sequoyah, Wagoner, and Tulsa. A few well-known industrial corporations have acquired plant sites in some of these counties, and a considerable amount of investment has been made at Catoosa (Rogers County) for the barge terminal and industrial district facilities and at Muskogee (Muskogee County) for port facilities.[10] Furthermore, the navigation channel will provide ample opportunities

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[8]See "The Economic Impact of a Small College," New England Business Review, Federal Reserve Bank of Boston, Sept. 1967.

[9]J.L. Robinson, The Arkansas River Basin in Oklahoma -- An Economic Base Study, Norman, Oklahoma: University of Oklahoma Research Institute, Sept. 1967.

[10]For detail, see ibid., p. 196.

for outdoor recreation. This will exert an influence on the growth of tourist industries and related service industries in the area.

Government expenditures on public school system, welfare programs, and construction projects have significant effects on Oklahoma's county income growth. For the low income counties on the State border, government sector has been an important source of growth for their personal income.

Summary

The main points of the above discussion can be summarized as follows:

(1) Oklahoma's county personal income grew in a stable manner. A majority of counties witnessed declines in their shares of State personal income. Between 1950 and 1967, there were 19 counties which experienced gains in shares of State personal income; all of these counties had above-average increases in total personal income.

(2) There are two major characteristics of county personal income trends. First is the continuity in trend which has prevailed over the entire period of 1950-1967. This is significant to our study because of its implication for the evaluation of future probable changes in county personal income. If relatively continuous trends have been experienced for about two decades, their continuation for a short term in the future seems to be likely. This is not to say that a mechanical extrapolation of past trends can be assumed to hold

for the future. It does give assurance, however, that there is sufficient stability in county personal income trends to permit their projection if the extensions are modified, relative to the past, as may be indicated by careful analysis. The second feature of the county personal income trends in Oklahoma is the dominant influence of particular counties with relatively big shares of the State's total personal income. Most of the growth in income and population has been in the State's three SMSA's.

(3) Wage and salary components of personal income were an important source of growth for the counties with above-average increases in income.

(4) All the counties in the State experienced decreases in the importance of the agricultural sector. A majority of the counties which formerly relied most heavily on agriculture as a source of income have shifted to the government and private nonfarm sectors.

(5) Income created by the government sector has become increasingly important for most counties in the State. Public spending such as expenditures on the public school system, defense programs, government-financed construction projects, and welfare programs have significant effects on a county's growth. Most of the counties with below-average increases in income and with losses of population receive a higher share of personal income from transfer payments. Some transfer payments, such as unemployment insurance or worker's compensation, are distributed under rules which require a close proximity of the re-

cipient's residence and his industrial activity. Other transfer payments, such as old-age pensions and veterans benefits, may be distributed under rules which do not include residence requirements. The choice of county residency by the recipients will affect the total personal income level of the counties concerned.

(6) The share of personal income derived from proprietorship declined in almost all of the counties in the State. In the majority of counties, the shares of wage and salary components of personal income have increased, reflecting the shifting of formerly self-employed workers. Generally, the relative importance of wage and salary disbursements and other labor income is higher in the more industrialized counties than in the sparsely populated and farm-oriented counties. The share of proprietor's income is relatively larger in the areas where the major activities are agricultural in character. On the other hand, with respect to the property income in the counties, the recipients of property income may choose their place of residence, at least to some extent, without regard to the location of the property or business activity producing the income. Amenities of life might attract some of the property income earners into the urban counties.

(7) Geographically, the more developed counties are located on the diagonal drawn from Ottawa County to Jackson County. The State's three SMSA's generated more than half of the State's personal income in 1967. Most of the slow growth

counties are located on the State's borders. In the eastern portion, the forthcoming Arkansas River Navigation System may bring forth a new source of growth.

CHAPTER V

PROJECTIONS OF OKLAHOMA'S COUNTY INCOME

It was pointed out in the introductory chapter that our county income projection will be made directly on available county income data. Some of the salient features of these county income data which mirror the income structure and growth of the county have been analyzed in the previous chapter. We are now ready to approach the projections of county income for Oklahoma's seventy-seven counties.

Since our projection is necessarily concerned with the movements of county income through time, the projection method used relates to time series analysis. The problem is to estimate the probable value of county income two years in the fufure in a sequence describing the past behavior of county income. As Bassie argues,[1] this is a kind of problem in probability; but it differs from the usual probability problem in that causes affecting county income are uncontrolled and underlying conditions are variable, so that the factors determining the outcome cannot be considered to remain the same from one period to the next. However, past data gave

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[1] V.L. Bassie, Economic Forecasting, New York: McGraw-Hill Book Company, Inc., 1958, p. 56.

some indications of what is likely to happen either in the continuation of movements currently in progress or in the recurrence of the movements observed in the past. A statistical test may be utilized to check the degree of confidence to be placed in the projection. But this kind of statistical test must be considered as a rough approximation only, and use of judgment in appraising the probability of the projection is necessary.

In the following sections, the method used for projecting county income will be discussed. This may be called a stepwise approach. Its objective is to derive a set of county shares which can be used to calculate county projections for all the counties of Oklahoma.

Methodology of Projecting County Income - A Stepwise Approach

The county is the basic building block for our projection, and, as indicated before, our county income projections will be made in the context of state income projections which will be, in turn, based on the well prepared national projections. The method utilized to derive our state projection will be described later. In this section, we will concentrate on the county income projection for Oklahoma's counties.

Our approach to the problem is to consider a county, as contrasted with the State. The relative importance of a county is characterized in terms of its share of state personal income. In other words, we consider the county as part of the State and

deal with it indirectly by projecting the state personal income and then breaking the projection into subsidiary parts.

Like the NPA's three-stage approach for regional projections, the stepwise projection approach used in this study will involve three approximations. However, because of the limitation of data, only the time series of county personal income is considered. Thus, the procedure comes out to be almost wholly internal to the income data themselves, and involves a high degree of abstraction from the real situation in which those data were produced. The first approximation of our stepwise approach analyzes the individual income trends and the trends of income shares for each county, and extrapolates them independently. The second approximation focuses on the county shares of state total personal income, applying the most recent ratio to given state income projections for the next two years. The third approximation is to reconcile the first and second approximations; for a small number of counties which show a wide variation, their ratio will be modified, utilizing the trend lines and the information available concerning the potential growth of the relevant counties.

First Approximation

Extrapolation of county personal income trends. The past trends of county personal income series will be extrapolated first. Graphically, for most of the counties in Oklahoma, the shape of the least-squares trend line drawn on the semi-logarithmic scales by a CALCOMP Model 563 Digital Incremental Plotter

shows that the regressions are linear. When plain coordinate paper is used, a straight line indicates constant absolute increments of growth over time. A nonlinear curve on plain coordiante paper indicates other than constant incremental growth; however, an upward-left-bent nonlinear curve may indicate a constant rate of income increase which yields a straight line relationship when plotted on semi-logarithmic paper.[2] The nature of Oklahoma's county income data shows that trend lines drawn on the semi-logarithmic paper by the least-squares method have a better fit. In terms of an equation, a linear regression fitted to the transformed income data takes the form as follows:

$$y = a + bt$$

where $y = \log Y$, county income.

$a = \log A$, a constant representing the intercept of the regression line.

$b = \log B$, a constant representing the slope of the regression line.

t = time, one year.

The result of simple regression for county personal income, as represented by mean percentage deviation between projections and actual estimates, the slope of the regression line (b value), and correlation coefficient, will give us some idea about how good the regression line fits the data and the rough growth rate suggested.

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[2]For a graphic comparison of this point, see F.E. Croxton, D.J. Cowden, and S. Klein, Applied General Statistics, 3rd ed., Englewood Cliff, N.J.: Prentice-Hall, Inc., 1967, Ch. 5.

The essence of this first approximation is to project roughly what the approximate level of a county's income will be in the next two years if the trend continues in the future. In this way, the trend of the income series of each county is extrapolated independently. It should be noted, however, that if a county's income has a wide range of variation, a linear regression line will fit the data poorly. For most of Oklahoma's seventy-seven counties, we have obtained rather good fits, as will be shown in a later section. The roughly projected numbers generated in this step are needed not so much for their own sake, but for obtaining improved projections of county income in later steps.

Extrapolation of the trends of county shares in the state's personal income. The trends of county shares in the state's personal income will be extrapolated individually using a simple regression method. The estimated ratios will not add up to 100 per cent since the trend of each county is extrapolated independently. For the counties which have a high correlation coefficient, the projected ratios give some clues to the likely level of the county share in the next two years. The estimated ratios obtained here are needed for improving our projection in the third approximation.

Second Approximation

Our second approximation yields another set of projections by using the county shares in the state's personal income in the most recent year to get projections of county income in

the next two years for the seventy-seven counties of Oklahoma. The approach is to apply a set of constant ratio which is calculated from the most recently available data to the state income projections in the next two years. It is assumed here that the factors governing the growth of a county are reflections of the factors governing the growth of the State, of which a county forms a part. The ratios are computed from the actual data, and they should sum up to 100 per cent. A projection of state personal income will provide enough information to obtain a preliminary set of projections for the seventy-seven counties. The second approximation is an important step in this projection procedure. The county projection obtained in this step will be examined in the third approximation. In the meantime, they will be adjusted, wherever necessary, based on the information revealed in the first approximation and those from other sources concerning the potential source of growth for the relevant counties. A projection-realization chart may be prepared to facilitate visual identification of the counties which have a high percentage deviation between the projections and actual estimates.[3]

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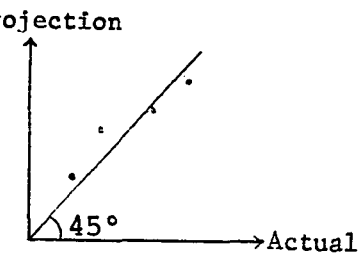
[3]The idea of the projection-realization chart is Theil's. As illustrated in the figure on the right-hand side, the horizontal axis measures realized value, and the vertical axis, the projected value. The 45° line is the line of perfect projection. This diagram is only part of Theil's "prediction-realization diagram" which identifies underestimation, overestimation, and turning point errors. See H. Theil, Applied Economic Forecasting, Chicago: Rand McNally & Co., 1966, Ch. 2. In this study, we have applied this technique to the county income data of Oklahoma for the period, 1962-1967.



Third Approximation

The third approximation is to synthesize the results from the first and second approximations. This approximation involves judgment and knowledge about the income picture of the various types of counties in the State. The historical background concerning county income growth and income structure as presented in Chapter IV may give us some hints in this connection.

As pointed out before, the major task of our county projection procedure is to develop a set of ratios which can be used to allocate a projected total of state personal income. The second approximation yields preliminary county projections, using the constant ratios of the most recent year for the next two years. For some counties, the projection error as represented by a percentage deviation is too large. Thus, the set of ratios obtained from such a crude method cannot be accepted without modification. The approach to adjust them is to:

1) examine the percentage deviation between the projections computed on a constant ratio basis and the actual estimates; this will be done for each county and for all the years covered by the time series of county income;

2) identify the counties with relatively small percentage deviations and those with larger percentage deviations; for the latter group, the range of deviation and behavorial patterns -- e.g., whether the fluctuation is transitory or continuous --

will be carefully reviewed;

3) check the counties with larger percentage deviations as identified in the above manner with the result of extrapolations worked out in the first approximation and make preliminary adjustments; and

4) bring in information about sources of potential growth and finalize the adjustments of the ratios for the counties in the State.

Thus, in this third approximation, we make a reconciliation of the available information revealed from the time series per se and the information from other sources. Meanwhile, state income projection serves as a control total, with which the sum of the county's projections must agree. This accounting constraint limits the possibility that inconsistency among different developments of the counties will be projected.

State Personal Income Projection

The Office of Business Economics of the U.S. Department of Commerce (OBE) releases state personal income estimates in the August issues of the Survey of Current Business with a one-year lag. For our county income projection, state income projection is needed for two years. For example, when we are in early 1969 and our county series is only up to 1967, state projections for 1968 and 1969 must be prepared if the county projection is to be made in the beginning of 1969.

For the first projected year, i.e., 1968 in our case, we may obtain a preliminary state estimate from the Business

Week.[4] The state projection of the second year is not readily available. A short-cut method is used, that is, to derive state projection from the national projection, which is available.

Oklahoma's share of the U.S. total personal income has been rather stable since 1948, showing a very steadily declining trend (see Table 13). For example, for the 19 years in the last two decades, Oklahoma accounted for about 1.1 per cent of the national total, and during the period 1963-1967, the share roughly remained at 1.05 per cent annually. Under such circumstances, there is a solid basis for using the ratio method for our state projection.

Various types of short-term national income projections are available. Some of these projections are carefully prepared; they are well known and widely used in the private and public sectors. Business Week, in an early issue in January, contains a forecast for the year of Gross National Product and of its major components. The forecast made from the econometric model developed by the research Seminar on Quantitative Economics at the University of Michigan is published annually in Business Week. Fortune magazine also offers national income forecasts in the January issue. Other well-known national income forecasts include the Prudential's Economic Forecast by the Prudential Insurance Company of America, and the Economic Reports by the

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[4]In Business Week, in addition to monthly state total personal income estimates, state annual personal income of last year is published in an early January issue. These figures are comparable to those of the OBE.

TABLE 13

TOTAL PERSONAL INCOME IN THE UNITED STATES AND OKLAHOMA, 1948-1968

YEAR	UNITED STATES		OKLAHOMA		OKLAHOMA AS PER CENT OF THE UNITED STATES
	AMOUNT ($000,000)	ANNUAL PER CENT CHANGE	AMOUNT ($000,000)	ANNUAL PER CENT CHANGE	
1948	208,878	...	2,390	...	1.144
1949	205,791	-1.48	2,460	2.93	1.195
1950	226,214	9.92	2,547	3.54	1.126
1951	253,233	11.94	2,837	11.39	1.120
1952	269,767	6.52	3,087	8.81	1.144
1953	285,458	5.82	3,201	3.69	1.121
1954	287,613	0.75	3,193	-0.25	1.110
1955	308,265	7.18	3,390	6.17	1.100
1956	330,481	7.21	3,591	5.93	1.087
1957	348,462	5.44	3,744	4.26	1.074
1958	358,474	2.87	3,994	6.68	1.114
1959	380,963	6.27	4,131	3.43	1.084
1960	398,725	4.66	4,350	5.30	1.091
1961	414,411	3.93	4,551	4.62	1.098
1962	440,192	6.22	4,688	3.01	1.065
1963	463,053	5.19	4,880	4.10	1.054
1964	494,914	6.88	5,220	6.97	1.055
1965	535,949	8.29	5,657	8.37	1.056
1966	583,461	8.87	6,098	7.80	1.045
1967	625,068	7.13	6,594	8.13	1.055
1968	683,702	9.38	7,259	10.08	1.062

SOURCE: U.S. Department of Commerce, Survey of Current Business, August 1969.

Securities Research Division of the Merrill Lynch, Pierce, Fenner, & Smith Inc. The Council of Economic Advisers also makes specific forecasts for the year for Gross National Product and its major components.[5] These sources and others can be referred to for obtaining the national projection.

Projections for Oklahoma's Seventy-Seven Counties

Result of Simple Regression

The county personal income series for the period 1950-1967 were regressed against time for the seventy-seven counties of Oklahoma. There are fifty-six counties which have a correlation coefficient higher than 0.90 and nine counties, lower than 0.80. Thus, generally, the regression line has a good fit for a majority of the counties. The regression line with a high correlation coefficient provides some indications of the likely level of county income in the future years.

The slope of the regression line represents roughly the growth rate for the county income. This rate is different from the annual average rate.[6] However, both rates move in the same direction, and normally, a county which has a steeper slope for its regression line of personal income has a higher annual average rate. Thus, the b value together with the R value would help us identify various types of counties.

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[5]For information about other source of short-term national projections, see C.A. Danten and L.M. Valentine, Business Cycles and Forecasting, Cincinnati, Ohio: South-Western Publishing Company, 1968, Ch. 20, pp. 498-510.

[6]For annual average rate of county income growth, see App. II, Table A-3.

Closely related to correlation coefficient is the mean percentage deviation which shows how close the estimated value obtained from the regression line is as compared to the actual estimate. These percentage deviations are computed to help evaluate the predictive power of the ratio method.

Simple regressions were also performed for the series of county share of state personal income in the period 1950-1967. As a whole, the regression line does not show a fit as good as that for the total personal income series; the R values are lower for most counties.

The important results of simple regression for Oklahoma county income series and county income shares are contained in App. Tables A-5 and A-6.

The Ratio Method

Constant ratios of the most recent year were applied to the state total one year and two years ahead in the period of 1950-1967. The outcome shows that the percentage deviations for some counties for earlier years are considerably large. Deficiency of data source may be the important reason for this situation. Oklahoma's county income series starts from 1950. In the early 1950's, wage data were much more limited. Later in 1956, OESC extended the coverage from firms with eight or more employees to firms with four or more employees. This also has some effect on the series, since wage and salary disbursements is a significant item in personal income. In

later years, the percentage deviations become much lower than the earlier ones. Especially, in the last three years, i.e., 1965, 1966, and 1967, majority of counties have a percentage deviation less than 5 per cent. The updated data for 1962-1967 period are computed from better source materials.[7] For example, the U.S. Department of Commerce has published the County Business Patterns annually beginning 1963. Before that, this publication was available biennially and even every three years in early 1950's. Generally, in terms of percentage deviation, the performance of ratio method appears to be better than that of the simple regression approach for recent years.

Grouping of County Shares

With respect to projecting county income two years ahead, the constant ratio method yields a higher degree of reliability in projecting income for the counties which have relatively larger shares of state total personal income than counties with smaller shares. As shown in Table 14, the counties whose income as a percentage of the state total is 0.8 per cent or more generally have a lower percentage deviation. Some of the counties in this high income group, such as Pittsburg and Comanche, witnessed rather larger percentage deviations in projections. This can be explained by the fluctuation in military employment. Needless to say, the military base is not the only source of employment, but it

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[7]For a brief description of the methodology used to compute Oklahoma county income, see App. I.

TABLE 14

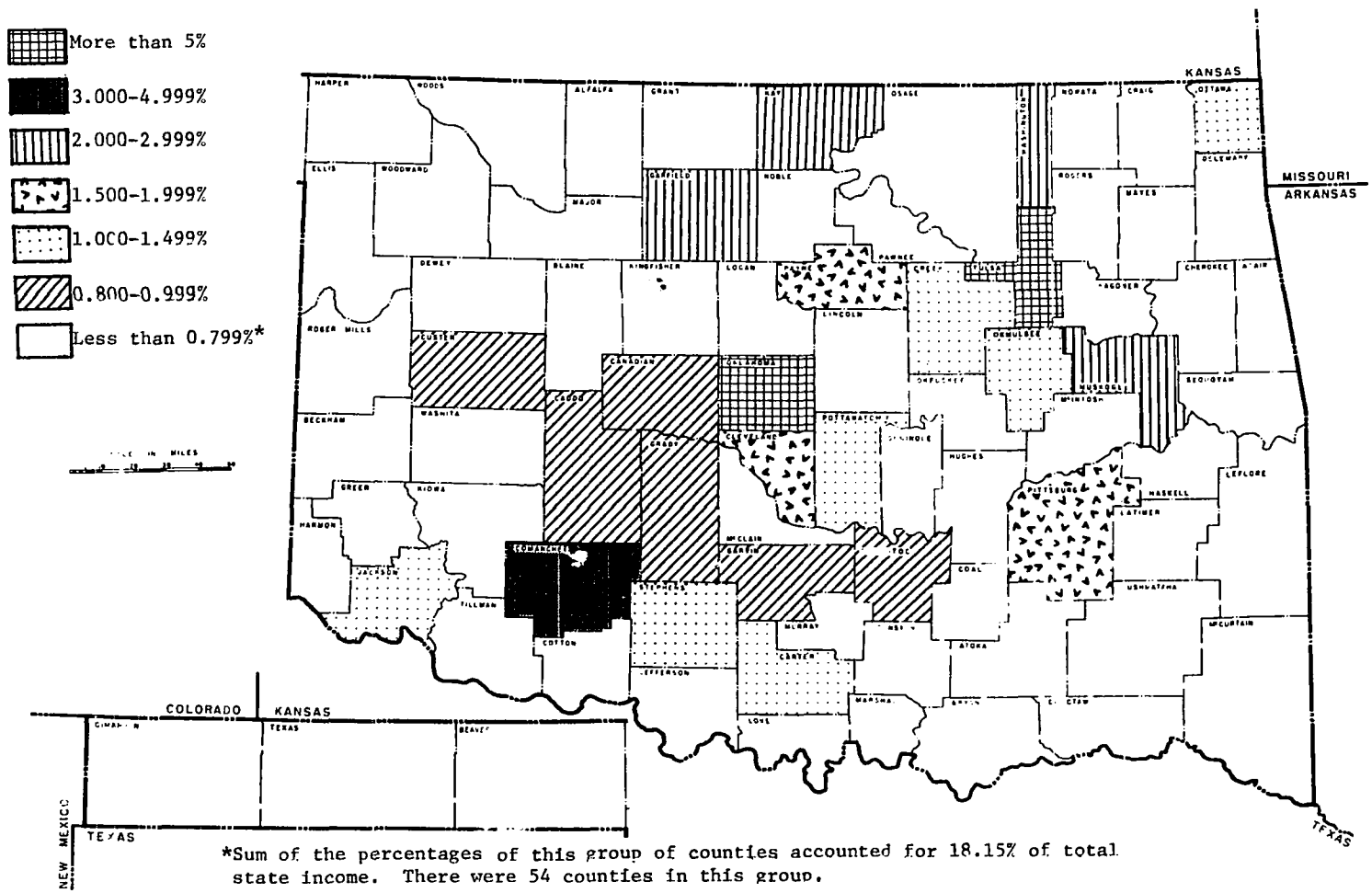
COUNTY INCOME SHARES AND PERCENTAGE DEVIATIONS OF PROJECTION IN OKLAHOMA, 1965, 1966, AND 1967

COUNTY SHARE (PER CENT)	PER CENT OF STATE TOTAL			PERCENTAGE DEVIATION BETWEEN OBSERVATION AND PROJECTION* NO. OF COUNTIES			1965		1966		1967	
	1965	1966	1967	1965	1966	1967	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
0.000-0.199	2.581	2.538	2.460	16	16	16	0.1- 8.9	3.2	0.5- 9.3	4.3	0.4-13.1	5.8
0.200-0.299	2.658	2.882	2.799	11	12	12	2.1-20.0	6.6	0.4-11.6	5.6	0.6-13.6	5.7
0.300-0.399	1.986	1.675	2.046	6	5	6	0.1- 9.0	5.0	0.7-10.6	6.0	0.5-10.1	6.7
0.400-0.499	3.142	4.589	3.589	7	10	8	1.0- 7.1	4.0	0.4- 8.7	4.0	4.3-17.4	9.4
0.500-0.599	4.888	2.129	3.244	9	4	6	0.2-13.2	3.8	3.2- 4.3	3.7	1.8- 8.7	3.8
0.600-0.699	1.951	3.238	3.266	3	5	5	1.6- 3.1	2.4	1.1-15.9	6.9	3.1-12.1	7.0
0.700-0.799	2.314	1.458	0.734	3	2	1	3.0- 3.5	3.3	2.4- 6.4	4.7	-	6.8
0.800-0.899	1.751	3.431	5.157	2	4	6	6.0- 7.1	6.6	3.5- 7.3	5.2	3.4- 9.1	4.7
0.900-0.999	2.793	2.810	-	3	3	-	1.7- 4.7	3.5	1.9-21.4	9.1	-	-
1.000-1.499	9.538	8.453	7.995	8	7	7	0.0- 9.9	4.2	1.6-14.1	6.2	1.5- 8.4	4.3
1.500-1.999	3.232	3.269	4.851	2	2	3	2.4- 5.7	4.1	0.8- 2.2	1.5	0.6-24.4[c]	9.3
2.000-2.999	9.507	9.363	9.192	4	4	4	2.6- 7.7	4.9	1.2- 6.2	2.7	0.9- 4.6	3.3
3.000-3.999	3.658	3.916	-	1	1	-	-	4.7	-	0.8	-	-
4.000-4.999	-	-	4.410	-	-	1	-	-	-	-	-	17.1[@]
5.000 & over	50.001	50.249	50.245	2	2	2	0.6- 1.4	1.0	1.1- 1.8	1.5	0.2- 1.4	1.6
Total	100.000	100.000	99.997	77	77	77						

SOURCE: Computed from unpublished data on county income.

*Using constant ratio method to project two years ahead.
[c]Including Pittsburg County.
[@]Comanche County.

CHART 4 GROUPING OF COUNTY INCOME SHARES IN OKLAHOMA, 1967



*Sum of the percentages of this group of counties accounted for 18.15% of total state income. There were 54 counties in this group.

SOURCE: Unpublished data on county income.

is by far the most important. But the problem arises because employment at the military base is subject to rather large swings within a short period of time. If employment in a given year is high, and if that figure is used to project the county's income two years hence, and if, in the meantime, employment has been substantially reduced the projected income for Pittsburg County or Comanche County will be too high. The volume of military employment may depend as much on the international situations as on decisions in Washington. Thus, we must face the fact that projections of income for this kind of county may be off the target. As illustrated in Table 15, in the counties where military employment is very large, and accounts for a significant per cent of total employment, expenditure and income are subject to wide fluctuations, and, as a result, the trend and mean deviation lose some of their meaning. For the rest of the counties in the high income group, the degree of reliability in projection appears better than most of the counties in the low income group whose shares are less than 0.8 per cent.

In terms of number of the counties in these two major groups, the majority of the counties in Oklahoma fall into the low income group as defined above. For example, there were 54 counties in 1967 which had an income share less than 0.8 per cent, and together they produced only 18.2 per cent of Oklahoma's total personal income. The high income group, on the other hand, consisted of 23 counties in 1967 and accounted for 81.8 per cent of the state personal income; the two top income counties, Okla-

TABLE 15

MILITARY WAGES IN OKLAHOMA, ANNUALLY, 1962-1967

	1962	1963	1964	1965	1966	1967
Comanche						
Amount ($000)	63,663	71,575	80,192	76,644	95,252	128,655
As per cent of total wages	46.6	47.4	49.0	47.0	49.3	53.5
Total wages as % of total income	79.6	80.7	80.7	78.9	80.9	82.7
Garfield						
Amount ($000)	2,337	2,788	3,388	3,688	4,179	4,922
As per cent of total wages	3.7	4.2	4.6	4.6	4.8	5.3
Total wages as % of total income	61.5	62.4	63.4	62.4	63.0	63.8
Jackson						
Amount ($000)	12,833	12,979	15,257	13,017	11,281	14,965
As per cent of total wages	26.5	36.2	38.4	37.1	33.2	36.2
Total wages as % of total income	70.7	63.3	64.5	58.7	57.4	61.2
Muskogee						
Amount ($000)	470	497	-	-	-	--
As per cent of total wages	0.7	0.7	-	-	-	--
Total wages as % of total income	64.6	63.7	-	-	-	--
Oklahoma						
Amount ($000)	58,686	62,951	70,269	75,420	89,049	104,941
As per cent of total wages	6.2	6.2	6.4	6.4	6.9	7.5
Total wages as % of total income	73.4	72.8	72.2	72.1	73.4	73.6
Pittsburg						
Amount ($000)	2,679	3,194	3,706	3,902	7,471	14,234
As per cent of total wages	8.3	9.2	10.3	9.3	13.8	19.4
Total wages as % of total income	59.5	59.9	59.6	61.1	65.9	70.4

(continued)

TABLE 15 (continued)

	1962	1963	1964	1965	1966	1967
Tulsa						
Amount ($000)	1,914	-	2,744	-	-	-
As per cent of total wages	0.2	-	0.4	-	-	-
Total wages as % of total income	66.0	-	70.4	-	-	-
Washita						
Amount ($000)	8,416	9,016	10,444	10,329	10,768	11,283
As per cent of total wages	52.4	54.9	57.7	55.5	53.8	55.3
Total wages as % of total income	53.6	54.2	55.7	51.3	52.2	52.5

SOURCE: Computed from unpublished data provided by the U.S. Department of Defense.

homa and Tulsa, alone contributed 52.2 per cent. The mean percentage deviation for these two counties was 1.6 per cent in 1967 which was the lowest in all the categories in Table 14. Projections through the constant ratio method for these two top income counties and some other counties in the high income group add up to more than three quarters of the state personal income projection with a relatively high degree of reliability.

As pointed out in Chapter III, source data available for county income estimation are more limited in the sparsely populated counties. Projections of income for these counties generally have a lower degree of reliability. For a county which is rapidly growing, such as Cleveland County, the time lag in data may lead to underestimation of income through the constant ratio method as the data may not adequately reflect recent increases in income.

In Chapter IV, we have pointed out that most of the sparsely populated counties on the State's border line experienced a low growth rate. Generally, agriculture is the major economic activity in these counties, and fluctuation in farm proprietor's income is a significant factor accounting for their less stable income trends. To illustrate, let us consider Alfalfa County which derives almost half of its income from the agricultural sector. In recent years, the share of farm income in this county fluctuated considerably; for example, it changed from 45.4 per cent in 1964 to 52.0 per cent in 1965, 51.1 per cent in 1966, and 46.8 per cent in 1967. This type of variation greatly affects the growth trend of the total county

personal income. The portion of income from the agricultural sector is frequently subject to wide fluctuation. Agricultural prices, the source of much of the county income at the lower end of the income scale, fluctuate more than do the prices of manufactured products.[8] Projections for those counties with a large income share from farming thus tend to have a lower degree of reliability. On the other hand, fluctuation of construction activities in several counties also has the similar effect on our projections. The counties which have an average percentage deviation greater than 10 per cent as shown in Table 16 (Sequoyah, McIntosh, LeFlore, and Jackson) witnessed considerable fluctuations in construction activities.

Mathematically, the smaller the share, the larger the percentage deviation will tend to be. This is so because a slight absolute increase or decrease for a small number will result in a rather large percentage change. For example, if the share increases from 0.001 per cent to 0.002 per cent, there would be a 100 per cent increase in the share of this county. In this case, the constant ratio method generates a high percentage deviation.

As Oklahoma moves further toward an urban and industrialized economy, there is increased migration from the farms to urbanized places, and often this also means migration from lower-income to higher-income counties. As a result, the shares of a few high income counties have shown a rising trend. And,

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[8] See C. Winston and M.A. Smith, "Income Sensitivity of Consumption Expenditures," Survey of Current Business, Jan. 1950, p. 17.

TABLE 16

AVERAGE PERCENTAGE DEVIATION BETWEEN PROJECTION AND ACTUAL ESTIMATE OF PERSONAL INCOME IN OKLAHOMA, BY COUNTY, 1965-1967

COUNTY	FIRST YEAR AVERAGE*	SECOND YEAR AVERAGE**	COUNTY	FIRST YEAR AVERAGE*	SECOND YEAR AVERAGE**
Adair	2.3	2.6	Lincoln	2.4	4.2
Alfalfa	7.6	8.3	Logan	1.5	2.8
Atoka	2.4	5.4	Love	3.5	3.6
Beaver	7.1	8.6	McClain	2.6	4.1
Beckham	1.6	4.4	McCurtain	3.6	6.7
Blaine	5.2	5.6	McIntosh	3.9	12.5
Bryan	2.4	3.5	Major	5.0	6.6
Caddo	1.6	2.1	Marshall	3.3	1.3
Canadian	3.4	5.1	Mayes	2.4	6.2
Carter	2.5	4.6	Murray	6.0	8.3
Cherokee	4.3	7.2	Muskogee	1.4	1.8
Choctaw	2.3	0.4	Noble	4.0	4.2
Cimarron	6.8	6.4	Nowata	3.2	7.3
Cleveland	1.2	3.6	Okfuskee	1.8	3.8
Coal	1.8	2.4	Oklahoma	0.4	0.6
Comanche	8.0	7.5	Okmulgee	3.9	6.4
Cotton	4.8	4.5	Osage	4.8	6.1
Craig	2.7	3.8	Ottawa	2.5	2.8
Creek	1.6	2.7	Pawnee	2.6	2.9
Custer	2.5	4.7	Payne	0.6	1.3
Delaware	5.0	7.5	Pittsburg	9.8	13.1
Dewey	5.4	6.5	Pontotoc	2.5	4.8
Ellis	7.1	9.0	Pottawatomie	4.0	6.7
Garfield	2.2	3.5	Pushmataha	2.2	2.5
Garvin	3.9	5.7	Roger Mills	6.8	8.1
Grady	2.2	3.1	Rogers	1.4	2.3
Grant	7.9	8.7	Seminole	2.6	5.4
Greer	2.4	3.4	Sequoyah	7.9	12.2
Harmon	5.3	4.4	Stephens	1.9	3.0
Harper	4.2	3.6	Texas	2.6	3.0
Haskell	2.7	2.1	Tillman	5.7	5.1
Hughes	1.3	3.1	Tulsa	0.6	1.6
Jackson	8.6	11.4	Wagoner	3.8	4.2
Jefferson	1.7	2.7	Washington	2.4	6.1
Johnston	4.2	4.0	Washita	3.8	4.3
Kay	1.4	3.1	Woods	5.7	7.7
Kingfisher	3.8	5.1	Woodward	1.3	2.0
Kiowa	3.0	3.8			
Latimer	2.1	4.3	OKC SMSA	0.3	0.7
LeFlore	5.8	10.4	Tulsa SMSA	0.6	1.1

SOURCE: Computed from unpublished data on county income.

*Using constant ratio method to project one year ahead.
**Using constant ratio method to project two years ahead.

as the historical data show, the larger the county share, the more stable the income trend becomes. From these considerations it may be expected that county projections through the constant ratio method will in the future have a higher degree of reliability for a larger portion of Oklahoma's personal income generated by the high income counties possessing a rising income share.

A Synthesis

For some counties, certain type of activity is relatively important in determining the county personal income level. Changes in supply and demand factors in this connection will significantly affect the shares of these counties. For instance, the construction of port facilities in Rogers and Muskogee counties has made a big push to their income levels. But after the construction projects were finished, the employment might drop considerably due to the multiplier effect. However, the induced investment and employment would later pick up the slack if the original investment is proved to be a profitable one; the time required to make this felt is different among counties depending on the nature of activities. For Sequoyah County, the constant ratio method underestimates income for 1964-1967; specifically, in 1967, projection is 17.4 per cent lower compared to the actual figure. The projection through ratio approach for this type of county is evidently in need of adjustment. Least-squares trend line for total personal income of this county yields a good fit ($R = 0.97$), and the projected income level by the extrapolation

of the trend line together with other relevant information may be used to adjust the ratio.

This is an example illustrating the case to which our attention should be directed. As for the information about the potential source of growth in a specific county, the State Economic Development and Industrial Park Department published news concerning establishment of new large manufacturing firms and big public construction projects such as the Arkansas River Navigation System.[9] The State Highway Commission, on the other hand, also releases information about highway construction projects.[10] These sources and others help us exercise our adjustment for some of the counties.

As shown earlier in Table 15, military wages play a significant role in several counties. In this area, some of the changes are not able to be projected. Thus, as argued before, for the counties which derive a relatively high percentage of wages and salaries from military sources and have some sort of fluctuation in military employment, their income projections tend to have a lower degree of reliability.

When we make the adjustment, closer attention should be paid to the development of the county shares in recent three years. This short-term development sometimes has a strong indication about what future course might be taken by the counties concerned.

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[9] See PEP put out monthly by the State Economic Development and Industrial Park Department.

[10] See, for example, the Progress Report published monthly by the State Highway Commission.

To project one year ahead, the constant ratio method yield a lower percentage deviation between projection and actual estimate of personal income in Oklahoma's counties (see Table 16); the outcome is better than the second-year projections. This indicates that on the same projection basis, the shorter the projected period, the higher the degree of reliability becomes. As such, the second-year projections should be revised using the most recent county shares which are available when projections for a new year are made.

The operational result of our county projections for 1969 for Oklahoma's seventy-seven counties can be found in App. II, Table A-1.

Oklahoma City and Tulsa SMSA's and the Constituent Counties

Oklahoma City and Tulsa SMSA's account for 54.5 per cent of Oklahoma's total personal income. Their shares show a steadily rising trend. Projections obtained from constant ratio method have a very low percentage deviation in the recent three years; for example, it was 0.2 per cent for Oklahoma City SMSA, and 0.8 per cent for Tulsa SMSA in 1967. Individual projections of the constituent counties of these two SMSA's can be cross-checked by using the direct projections of SMSA's.

Per Capita Personal Income Projections

The method used to obtain per capita income projection is to divide county income projection by county population projection. Per capita personal income projections for the constituent

counties of the SMSA's will not be shown because there are a great number of commuting workers in these areas. State population projection can be obtained from the U.S. Bureau of the Census.[11] OESC's county population series which are consistent with the decennial census data will be used as a base to allocate the state population to the seventy-seven counties.[12] Our projections of per capita income can be found in App. II. Table A-2.

Limitations and Reality

The method used here to obtain county income projection assumes for most of the counties that the most recent county shares of state total personal income will not change in the next two years. Theoretically, this is not a plausible assumption. However, as we have pointed out earlier, changes in the county shares are likely to take place but the range of variation is so limited as to permit the ratio approach to project the magnitude of future county income in such a short period of time. Available information is utilized to adjust the ratios of a small number of counties whose shares fluctuate considerably. We do wish to obtain a perfect set of shares for all the counties for projection purposes. But this is too beautiful to be realized. The room for exercising our adjustment is some-

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[11] U.S. Bureau of the Census, "Revised Projections of the Population of State, 1970 to 1985," Current Populaton Reports, Population Estimates, Series P-25, No. 375, Oct. 3, 1967. The state population for the intervening years can be made by using the trend line.

[12] OESC county population estimates are published annually, see its publication entitled Oklahoma Population Estimate.

what limited due to serious inadequacy of information. Too much adjustment might make the overall projections worse.

Nobody knows the future for sure. At the present time, the most that we can hope for county income projection is to obtain a higher degree of reliability for a greater number of counties. Under the condition of the present data availability, it is impractical to hope for a higher degree of reliability for all the counties in the State.

CHAPTER VI

SUMMARY AND CONCLUSION

County income is one of the most useful economic indicators of a local economy because it measures the economic performance of a county. Overall, it indicates whether a county is advancing, stagnating, or just holding its own. In Oklahoma, county income data are available on a continuing basis for the period of 1950-1961, and have been recently updated to 1968. But the data are one year old when they become available. There exists a need for short term projections of these data. The projections of this kind are valuable to business in planning inventories, markets, and personnel acquisitions, and to government in estimating tax revenues, unemployment, and welfare payments. At the present time, no such projections are available. This study is an attempt to fill this need.

This is done by obtaining one calendar year income projections for Oklahoma's seventy-seven counties. The projections actually are for two years in advance of the availability of actual estimates. Well established county income data, covering almost two decades, were used as the basic data. In view of present county data conditions, this approach is the only feasible

way to achieve our purpose, incurring reasonable costs and producing a set of generally useful projections. Much of the effort is devoted to interpretation and diagnosis of current data, blending the information on how county income has been moving in the past with the projection of how it is likely to move in the near future.

Regional studies have attracted a great deal of attention since the end of World War II. However, the development of regional analytical techniques lags behind those of general economics. This is mainly due to the inadequacy of data and the nature of a region. In recent years efforts have been made to collect data for various types of regional units smaller than states. As for county income, the estimates are now available in more than half of the states in this country. The computation of these estimates is no simple task. A wide variety of source data have to be used. As shown in Appendix II, the basic technique used in estimating Oklahoma's county income is to construct a series of allocators so that the state income estimate prepared by the National Income Division, U.S. Department of Commerce can be allocated to counties in the State. Every effort has been made to obtain the most appropriate allocators, based on source data which have a direct and reliable relationship to the individual income components. For example, county wage and employment data from the Oklahoma Employment Security Commission and a publication entitled County Business Patterns by the U.S. Bureau of the Census are utilized to compute county wage and

salary disbursements in the private nonfarm sector. Other sources include published and unpublished data from the Regional Economics Division of the Office of Business Economics, U.S. Department of Commerce, U.S. Bureau of the Census, U.S. Department of Defense, U.S. Department of Health, Education, and Welfare, State Social Security Administration, State Welfare Department, Federal Deposit Insurance Corporation, etc. Derived from these sources, the county income estimates are considered to be basic building blocks for regional analysis and have proved to be useful to public and private decision-makers. The provision of short-term projections of these county income data will further facilitate short-term planning in the public and private sectors.

Since income data are the only useful data available on a county basis for our projections, careful analyses of these data will provide insight into the county income structure and possible growth in the near future. In Chapter IV, county economic changes have been related to the state average for comparison purposes. Various county growth patterns have been identified in this manner. During the past two decades, Oklahoma's economy shifted from an economy based primarily on natural resources to an economy moving toward an enlarging industrial and commercial base. All the counties experience, in varying degrees, this change in economic structure. So far as total personal income is concerned, the relative position of Oklahoma declined gradually as a per cent of the national total.

Oklahoma lagged behind the Nation and neighboring Kansas in personal income growth. Among the major industrial sources, the manufacturing sector did not advance in Oklahoma as fast as in the Nation and Kansas. On the other hand, the government sector has become the biggest income source in Oklahoma. A big welfare sector exists in the State. On the county level, the effect of the public sector is dominant in most of the counties. Government spending on education, welfare programs, construction projects, and military installations have significant effects on the growth of the counties in Oklahoma. In the meantime, the share of personal income derived from proprietorship declined in almost all the counties in the State, reflecting the shifting of formerly self-employed workers. In general, the county personal income trends show that the trend continuity has prevailed over the entire period, 1950-1968. The counties with relatively big shares of the state total personal income have dominant influences in the income picture. Oklahoma's two giant counties, Oklahoma and Tulsa, account for about half of the state total income and about 35 per cent of state total population. These two counties, together with other urban counties which have a city of 10,000 or more population, generated about 82 per cent of state total income in 1967. The trend shows that the heavily populated counties tend to have an increasing share in income and population as urbanization continues.

It is significant to note that Oklahoma's county income shares showed no wide variation in the period 1950-1968. This

is not to say that the share did not change, but that the range of variation of the shares is relatively limited so that they can be utilized as a base to obtain county projections.

It should be pointed out, however, that the estimates for the first few years of our county income series are less accurate than those of the later years due to a deficiency of data. Between 1961 and 1962 some of the changes in the series resulted from a slight change in methodology and availability of a better data source. The estimates computed from more complete data sources also seem to show that county shares in later years appear more stable than those for earlier periods. This development has a favorable effect on our projections.

As for projection methodology, five well-known approaches were reviewed briefly in Chapter III. The approach to projection through county income framework needs data on autonomous expenditure including investment and government spending, export, propensity to consume and propensity to consume imported goods. The one which projects through income components requires identification of exogenous and endogenous income. The NPA approach depends on detailed data on employment and basic industries. The Berman approach is based on a regional input-output table. Because of lack of data on a county basis, these four methods are not workable and had to be rejected. Simple trend line extrapolation yields, for most of the counties, projections not as good as the ratio method. It was decided to

use the latter for making our county projections. The trend line is used only for adjustments to a few counties in which the percentage deviation between projections and actual estimates are high. In demographic studies, the ratio method has been used extensively to obtain county population projections. In this study, the ratio method together with the simple regression approach is used to obtain a set of county income shares. The method is essentially as follows. Personal income of each county is computed as a percentage of personal income for the state in the year, say, 1964. These ratios are then applied to 1965 and 1966 in order to obtain the projections. The projections for 1965 and 1966 are then compared with the actual estimates for 1965 and 1966. Percentage deviations of the projections from the actuals are then computed. For a few counties which have a high percentage deviation, their ratio are adjusted according to trend lines and available information concerning the source of growth. The crucial idea underlying this methodology is to project county income in the context of state income projections. Because projection for larger geographic units may be made with greater reliability than those for smaller ones, and because estimates for a smaller unit developed by the ratio method will reflect, in addition to purely local forces and factors, those that will condition state personal income trends, this method is likely to yield more realistic and otherwise more satisfactory estimates than those made without consideration of state income trends. Supported

by time series analysis, this method generated useful results in county income projections in Oklahoma.

The findings show that the ratio method produces sastisfactory projections for a large number of counties over a short term, such as two years, because there is sufficient continuity in most county income series. The projections for the large counties (especially Oklahoma and Tulsa) agree closely with the actual estimates obtained a couple of years later. For most of other counties, projections are close to the actual estimates. These counties account for about 80 per cent of the personal income in the State. In the case of a few counties, the projections are not satisfactory. These are sparsely populated counties and account for only a small part of the state personal income. In some cases, we have been able to iron out the difficulty, but a few remain. Generally, the difficulties arise in counties where the amount of total income is largely determined by military employment, or in counties which experienced extreme fluctuations in a short period of time in agricultural income, construction or mining activities. In noting these difficulties, we wish to emphasize again that these counties constitute a small part of the total income of the State. For most of the counties, the projections are acceptable. Additional work will make it possible to reduce some of the errors in projections in future years. Some of the difficulties will be resolved by visits to the individual counties. Other difficulties are inherent in the nature of the local economy and, at

times, in the nature of the data.

As stated before, county data are much more limited than those for the state or Nation. The serious gap in this connection is the lack of county information on trade, on public and private capital stock, on the size and skill of available manpower, and on factors which induce people to migrate or remain where they are. Related to these data limitations are a number of basic conceptual problems which are not encountered in so serious a form in national income estimation and projection. These problems emerge on a much larger scale because counties are generally open economies. In a nation, the domestic transactors tend to distinguish in their accounting system between home and foreign business because the nation is a cultural-political unit which for policy considerations is distinct from the rest of the world. But, on a county level, even if the facilities and organization are entirely contained within a given county, these same transactors typically do not distinguish between transactions with parties in the same county and those with parties in other areas. Meanwhile, it is difficult, perhaps impossible, to determine what fraction of an important transactor, such as a large corporation or federal government, is internal to a given county. Furthermore, a situs problem also arises for some counties where a sizeable commuting population crosses boundary lines in the journey to work. These problems and others make it more complicated and difficult to estimate and

project county income.

The art of county income projections as now practiced is in need of refinement. Better data are an obvious first step. The art of county income projections is also in need of methodological refinement. If the important explanatory equations generated through adequate data for key county variables were available, a more refined projection methodology could be developed. However, such equations are currently in short supply. The present method is the only feasible approach to the county income projections. And, on a county level, this method can generate, based primarily on presently available data, a set of generally useful projections without incurring unreasonable costs.

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Unpublished Materials

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Oklahoma Employment Security Commission data on state and local government employment, federal civilian wages, and state unemployment insurance benefits.

Regional Economics Division, Office of Business Economics, U.S. Department of Commerce data on the breakdown of transfer payments.

Social Security Administration data on OASDI programs.

U.S. Department of Defense data on military employment.

APPENDIX I

METHODOLOGY USED FOR UPDATING OKLAHOMA'S COUNTY PERSONAL INCOME

The methodology used for updating county personal income for Oklahoma is similar to that used for the previous estimates for the period of 1950-1961. Some improved data sources have become available since 1962 which enable us to obtain better estimates. This section briefly describes the method used for arriving at the estimates for 1962-1968. In order to simplify the presentation and make it clearer, some mathematical equations are used. For a detailed verbal explanation, the reader is referred to Chapter II of Peach, et. al., County Building Block Data for Regional Analysis: Oklahoma.

The technique employed in our estimation involves the use of the annual state estimates of personal income prepared by the National Income Division of the U.S. Department of Commerce (NID), and locating direct information on each of the specific components to be disaggregated to the county level. In other words, the basic problem is to construct a series of allocators by means of which state totals for various components of personal income can be allocated to counties.

In the construction of allocators for these components of personal income, it is necessary to utilize data that presumably have a direct and reliable relationship to the particular income component being allocated to the counties. The final estimate of personal income in each county is obtained from a summation of county totals for each of these components of personal income.

By definition, county personal income is the sum of wages and salary disbursements, other labor income, proprietors' income, property income, transfer payments, less personal contributions for social insurance. In a mathematical form, the relation is

$$Y_i = W_i + L_i + P_i + C_i + T_i - S_i \quad \text{..... (1)}$$

where Y_i = personal income in county i.

W_i = wages and salaries paid in county i.

L_i = other labor income paid in county i.

P_i = proprietors' income paid in county i.

C_i = property income paid in county i.

T_i = transfer payments paid in county i.

S_i = personal constributions for social insurance in county i.

The procedures for estimating the variables in Eq. (1) can be explained as follows.

(I) WAGE AND SALARY DISBURSEMENTS[1] (W_i)

(i) Total wage and salary disbursements are computed by using the following four sets of technique:

(1) Farm Wages ($W_{1,i}$):

$$W_{1,i} = \frac{w_i^*}{\sum_{i=1}^{77} w_i^*} \cdot W_{1,s} \quad \text{..... (1a)}$$

$$i = 1, 2, ..., 77.$$

where w_i^* = wages paid hired farm workers (data from the U.S. Bureau of the Census, Census of Agriculture).[2]

$W_{1,s}$ = NID state total of farm wages for Oklahoma.

(2) Wages and salaries for mining ($W_{2,i}$), construction ($W_{3,i}$), manufacturing ($W_{4,i}$), trade ($W_{5,i}$), finance, insurance and real estate ($W_{6,i}$), transportation and public utilities ($W_{7,i}$), and service industries ($W_{8,i}$) are derived from the same procedure. (The numbers represent industry, and i, the county.) The wages and salaries for these industries consist of two parts, namely, covered and non-covered wages.

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[1]Total wage and salary disbursements consist of wages and salaries paid in the following sectors: farm, mining, construction, manufacturing, trade, finance, transportation, service, government, and other industries.

[2]The census of agriculture is taken every five years. The Census of Agriculture put out by the Bureau of the Census for 1959 and 1964 were used. Allocators for 1962 and 1963 were derived through interpolation, and 1964 allocators were used for 1965-68.

(A) Covered wages ($W^{c}_{k,j}$) in county j:

$$W^{c}_{k,j} = \frac{\bar{w}^{c}_{k,j}}{\sum_{j=1}^{49} \bar{w}^{c}_{k,j}} \cdot \left(\bar{w}_{m} + \sum_{j=1}^{49} \bar{w}^{c}_{k,j}\right) \quad \text{..... (2a)}$$

$$k = 2,3,\ldots,8.$$

$$j = 1,2,\ldots,49.$$

where $\bar{w}^{c}_{k,j}$ = covered wages and salaries paid in OESC selected counties.[3] (Data from OESC).

$\bar{w}_{m}$ = OESC covered wages and salaries paid in multicounty area.[4]

(B) Non-covered wages ($W^{n}_{k,i}$) in county i:

$$W^{n}_{k,i} = \frac{w'_{k,i} \cdot E_{k,i}}{\sum_{i=1}^{77} w'_{k,i} \cdot E_{k,i}} \cdot \left(W_{k,s} - \sum_{j=1}^{49} W^{c}_{k,j}\right) \quad \text{.... (2b)}$$

$$k = 2,3,\ldots,8.$$
$$j = 1,2,\ldots,49.$$
$$i = 1,2,\ldots,77.$$

where $w'_{k,i}$ = computed annual average wages for industry k. (Data from the U.S. Department of Commerce, County Business Patterns (CBP).)

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[3]There are 49 selected counties and a multi-county which could not be classified by county in OESC's publication entitled County Employment and Wage Data, 1967. Industrial detail is not shown for the remaining 28 counties to avoid publishing information that would identify individual firms.

[4]This includes wages paid to statewide sales personnel with no permanent place of work and other types of roving employment, and all others whose place of work could not be determined.

$E_{k,i}$ = CBP number of reporting units by employment-size "1 to 3" time 2 (the mid-point) for industry k in county i.

$W_{k,s}$ = NID state industry wage and salary totals for industry k in Oklahoma.

(C) Wages and salaries for mining, construction, manufacturing, trade, finance, insurance and real estate, transportation and public utilities, and service industries are equal to the sum of (2a) and (2b):

$$W_{k,i} = W^{c}_{k,j} + W^{n}_{k,i} \quad \text{.....(2c)}$$

$k = 2,3,\ldots,8.$
$j = 1,2,\ldots,49.$
$i = 1,2,\ldots,77.$

(3) Wages and salaries paid in the government sector[5] ($W_{9,i}$):

(A) Federal civilian ($W^{v}_{9,i}$):

$$W^{v}_{9,i} = \frac{G_i}{\sum_{i=1}^{77} G_i} \cdot W^{v}_{9,s} \quad \text{.....(3a)}$$

$i = 1,2,\ldots,77.$

where G = OESC civilian federal wages (unpublished data).

$W^{v}_{9,s}$ = NID state total for federal civilian wages for Oklahoma.

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[5]Total government wages and salaries consist of three parts: federal civilian, federal military, and state and local.

(B) Federal military ($W^m_{9,i}$):

$$W^m_{9,j} = \frac{E^m_j}{\sum_{j=1}^{6} E^m_j} \cdot W^m_{9,s} \quad \text{..... (3b)}$$

where j = the number of county where military bases are located.[6]

E^m_j = military employment in county j where the military bases are located (unpublished data from the Department of Defense).

$W^m_{9,s}$ = NID state total of military wages for Oklahoma.

(C) State and local ($W^s_{9,i}$):

$$W^s_{9,i} = \frac{E^s_i}{\sum_{i=1}^{77} E^s_i} \cdot W^s_{9,s} \quad \text{..... (3c)}$$

$i = 1,2,\ldots,77.$

where E^s_i = state and local government employment in county i (unpublished data from OESC).

$W^s_{9,s}$ = NID state total of state and local government wages for Oklahoma.

(D) Total government wages and salaries ($W_{9,i}$) are obtained by adding (3a), (3b), and (3c):

$$W_{9,i} = W^v_{9,i} + W^m_{9,j} + W^s_{9,i} \quad \text{..... (3d)}$$

$i = 1,2,\ldots,77.$
j = number of counties with military bases.

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[6]There are just a few counties which have military employment. In 1967, for example, only Comanche, Pittsburgh, Jackson, Washita, Oklahoma, and Garfield counties fell into this group.

(4) Wages and salaries for other industries ($W_{10,i}$):

$$W_{10,i} = \frac{\bar{w}_i^C}{\sum_{i=1}^{77} \bar{w}_i^C} \cdot W_{10,s} \quad \ldots\ldots\ldots\ldots\ldots \quad (4a)$$

$$i = 1,2,\ldots,77.$$

where $\bar{w}_i^C$ = total covered wages for county i (data from OESC).

$W_{10,s}$ = NID state total for other industries for Oklahoma.

(ii) Total wages and salaries (W_i) is obtained by adding up (1a), (2c), (3d), and (4a), i.e.,

$$W_i = W_{1,i} + \sum_{k=2}^{8} W_{k,i} + W_{9,i} + W_{10,i} \quad \ldots\ldots\ldots\ldots \quad (5)$$

$$i = 1,2,\ldots,77.$$

(II) OTHER LABOR INCOME (L_i):

$$L_i = \frac{W_i}{\sum_{i=1}^{77} W_i} \cdot L_s \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

where L_s = NID state total of other labor income for Oklahoma.

(III) PROPRIETORS' INCOME [7] (P_i):

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[7]Total proprietors' income consists of farm proprietors' income and nonfarm proprietors' income.

(i) Farm proprietors' income (P_i^f):

$$P_i^f = \frac{V_i}{\sum_{i=1}^{77} V_i} \cdot P_s^f \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7a)$$

$$i = 1,2,\ldots,77.$$

where V_i = value of the farm product sold in county i (data from the Bureau of the Census).[8]

P_s^f = NID state total of farm proprietors' income.

(ii) Nonfarm proprietors' income (P_i^{nf}):

$$P_i^{nf} = \frac{Q_i}{\sum_{i=1}^{77} Q_i} \cdot P_s^{nf} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7b)$$

$$i = 1,2,\ldots,77.$$

where Q_i = sales taxes paid in county i (data from Oklahoma Tax Commission).

P_s^{nf} = NID state total of nonfarm proprietors' income for Oklahoma.

(iii) Total proprietors' income for county i (P_i) is the sum of (7a) and (7b):

$$P_i = P_i^f + P_i^{nf} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

$$i = 1,2,\ldots,77.$$

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[8] 1962 and 1963 allocators are obtained from interpolating the census figures of 1959 and 1964. 1964 allocators are used for 1965-68.

(IV) PROPERTY INCOME (C_i):

$$C_i = \frac{D_i}{\sum_{i=1}^{77} D_i} \cdot C_s \quad \text{..... (9)}$$

$$i = 1,2,\ldots,77.$$

where D_i = total bank deposits in county i (data from the Federal Deposit Insurance Corporation (FDIC)).[9]

C_s = NID state total property income for Oklahoma.

(V) TRANSFER PAYMENTS (T_i):

The NID subcomponents of total transfer payments for Oklahoma are grouped into six categories and allocated to counties in the following manner.

(i) OASDI (I_i):

$$I_i = \frac{I_i^*}{\sum_{i=1}^{77} I_i^*} \cdot I_s \quad \text{..... (10a)}$$

$$i = 1,2,\ldots,77.$$

where I_i^* = annual OASDI payments in county i (data from the Social Security Administration).

I_s = NID state total of OASDI for Oklahoma.

(ii) Veterans Benefits (B_i):

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[9]Federal Deposit Insurance Corporation data are available for every two years. Interpolate for the intervening years.

$$B_i = \frac{N_i}{\sum_{i=1}^{77} N_i} \cdot B_S \qquad \text{..... (10b)}$$

$$i = 1,2,\ldots,77.$$

where N_i = number of county residents of veterans in county i (data from the Veterans Administration).

B_S = NID state total of veterans benefits for Oklahoma.

(iii) State Unemployment Insurance Benefits (U_i):

$$U_i = \frac{\bar{u}_i}{\sum_{i=1}^{77} \bar{u}_i} \cdot U_S \qquad \text{..... (10c)}$$

$$i = 1,2,\ldots,77.$$

where $\bar{u}$ = state unemployment insurance payments in county i (data from OESC).

U_S = NID state total of state unemployment insurance benefits for Oklahoma.

(iv)Medicare (M_i):

$$M_i = \frac{m_i}{\sum_{i=1}^{77} m_i} \cdot M_S \qquad \text{..... (10d)}$$

$$i = 1,2,\ldots,77.$$

where m_i = number of persons enrolled in both the hospital and the medical benefits programs in county i (data from the U.S. Department of Health, Education, and Welfare).

M_S = NID state total of Medicare for Oklahoma.

(v) State and local direct relief (R_i):

$$R_i = \frac{A_i}{\sum_{i=1}^{77} A_i} \cdot R_i \quad \text{..... (10e)}$$

$$i = 1,2,\ldots,77.$$

where A_i = total payments of public assistance in county i (data from Oklahoma Department of Public Welfare).

R_s = NID state total of state and local direct relief for Oklahoma.

(vi) Other -- i.e., the remaining components of transfer payments -- (X_i):

$$X_i = \frac{H_i}{\sum_{i=1}^{77} H_i} \cdot (T_s - I_s - B_s - U_s - M_s - R_s) \ldots (10f)$$

$$i = 1,2,\ldots,77.$$

where X_i = population in county i.

(vii) Total transfer payments is the sum of (10a), (10b), (10c), (10d), (10e), and (10f):

$$T_i = I_i + B_i + U_i + M_i + R_i + X_i \quad \text{..... (10g)}$$

$$i = 1,2,\ldots,77.$$

(VI) PERSONAL CONTRIBUTIONS FOR SOCIAL INSURANCE (S_i):

$$S_i = \frac{w_i^t}{\sum_{i=1}^{77} w_i^t} \cdot S_i \quad \text{..... (11)}$$

$$i = 1,2,\ldots,77.$$

where w_i^t = taxable payrolls of county i (data from CBP).

S_s = NID state total of personal contributions for social insurance.

(VII) The sum of (5), (6), (8), (9), and (10g) minus (11) will yield (1), the equation for total personal income for each county of Oklahoma.

APPENDIX II

ADDITIONAL STATISTICAL TABLES

TABLE A-1

TOTAL PERSONAL INCOME IN OKLAHOMA, BY COUNTY,
1950, 1960, 1967, 1968 AND PROJECTED 1969
(IN THOUSANDS OF DOLLARS)

COUNTY	1950	1960	1967	1968	1969*
Adair	4,597	8,469	13,794	15,201	16,574
Alfalfa	10,689	16,367	20,427	20,424	21,808
Atoka	5,082	7,304	12,441	13,211	14,433
Beaver	10,168	12,685	13,836	14,638	15,860
Beckham	22,318	27,026	34,021	37,744	41,236
Blaine	12,306	16,867	25,385	28,116	30,689
Bryan	16,149	26,046	44,575	49,121	53,686
Caddo	27,237	37,410	57,337	61,758	67,484
Canadian	23,977	35,250	56,018	60,800	66,374
Carter	43,273	63,365	85,863	93,985	102,614
Cherokee	6,214	21,941	30,785	34,274	37,826
Choctaw	8,907	13,178	22,126	25,260	27,596
Cimarron	7,872	10,371	10,025	9,972	10,864
Cleveland	26,625	56,086	111,311	125,707	137,665
Coal	3,303	4,680	6,950	7,410	8,089
Comanche	75,761	175,133	290,872	315,743	344,796
Cotton	6,939	8,941	10,803	11,751	12,688
Craig	10,795	20,804	31,380	34,589	37,747
Creek	32,012	46,792	67,278	74,817	81,282
Custer	18,055	33,112	53,090	58,016	63,361
Delaware	4,749	9,608	15,495	17,354	18,952
Dewey	5,640	8,253	10,829	11,945	12,847
Ellis	6,831	8,194	9,988	10,557	11,102
Garfield	74,873	96,868	145,368	154,824	169,068
Garvin	23,796	39,531	56,623	59,967	65,502
Grady	26,745	40,029	58,442	63,491	69,308
Grant	11,934	13,942	17,417	17,695	19,032
Greer	9,426	10,428	13,683	14,353	15,701
Harmon	8,542	8,426	9,592	9,585	10,071
Harper	6,778	9,414	11,395	11,873	13,005
Haskell	4,621	6,966	9,464	10,623	11,578
Hughes	11,413	15,010	21,428	23,078	25,217
Jackson	19,772	47,687	67,624	71,850	78,507
Jefferson	7,653	9,366	11,337	12,196	13,084
Johnston	4,660	7,559	10,435	11,008	12,054
Kay	66,748	100,203	141,897	154,937	169,226
Kingfisher	11,933	17,819	29,694	31,386	34,258
Kiowa	17,347	20,239	26,989	27,978	30,530
Latimer	3,294	5,809	11,863	12,655	13,798
LeFlore	15,709	25,213	44,252	48,656	53,131

(continued)

TABLE A-1 (continued)

COUNTY	1950	1960	1967	1968	1969*
Lincoln	14,327	22,803	33,054	36,855	40,284
Logan	16,371	22,013	32,363	36,094	39,412
Love	3,901	6,053	7,074	7,088	7,771
McClain	7,618	12,852	16,792	18,243	19,904
McCurtain	12,733	19,319	40,532	44,741	48,849
McIntosh	6,583	10,186	15,799	16,192	17,605
Major	7,484	10,227	14,029	14,463	15,384
Marshall	5,253	8,788	11,614	13,307	14,512
Mayes	9.905	23,290	37,968	40,311	44,012
Murray	7,278	12,659	20,015	22,659	25,138
Muskogee	57,339	92,715	138,315	150,562	164,468
Noble	10,198	16,920	25,586	27,567	30,134
Nowata	8,757	15,669	17,120	18,182	19,825
Okfuskee	7,600	10,798	15,892	16,669	18,239
Oklahoma	599,577	1,106,250	1,894,472	2,094,256	2,288,122
Okmulgee	39,950	53,751	70,332	75,881	82,868
Osage	23,959	35,581	44,244	45,910	50,118
Ottawa	33,651	44,420	69,328	80,249	87,626
Pawnee	8,265	11,528	13,854	14,955	16,653
Payne	42,019	63,249	104,541	114,027	124,898
Pittsburg	31,337	44,441	104,054	112,488	122,836
Pontotoc	28,562	41,369	58,641	65,611	71,687
Pottawatomie	34,261	57,115	72,004	81,663	89,212
Pushmataha	4,159	6,567	10,097	10,675	11,657
Roger Mills	5,470	6,818	8,403	8,600	9,199
Rogers	10,621	24,369	33,471	39,670	43,456
Seminole	29,621	34,153	48,432	51,649	56,382
Sequoyah	5,649	10,794	26,801	30,096	33,306
Stephens	44,501	70,282	94,883	102,558	111,972
Texas	21,992	28,760	41,777	45,347	49,562
Tillman	18,529	22,282	29,940	32,372	34,971
Tulsa	518,926	994,935	1,414,065	1,588,592	1,735,485
Wagoner	6,517	11,271	22,958	25,392	27,993
Washington	69,687	137,906	180,656	198,092	216,330
Washita	15,979	30,470	38,895	40,853	44,646
Woods	13,946	19,798	29,375	30,994	33,623
Woodward	13,750	23,197	36,484	39,589	43,218
OKC SMSA	650,179	1,197,586	2,061,801	2,280,763	2,492,161
Tulsa SMSA	574,897	1,077,308	1,525,578	1,709,319	1,866,885
State Total	2,514,000	4,296,000	6,595,000	7,261,000	7,930,000

SOURCE: Peach, et. al., op. cit. and unpublished data on county income.

*Projected.

TABLE A-2

PER CAPITA PERSONAL INCOME IN OKLAHOMA, BY COUNTY, 1950, 1960, 1967, 1968, AND PROJECTED 1969

COUNTY	1950	1960	1967	1968	1969*
Adair	308	646	985	1,078	1,167
Alfalfa	999	1,938	2,432	2,431	2,596
Atoka	356	706	1,208	1,270	1,375
Beaver	1,372	1,821	2,035	2,153	2,332
Beckham	1,032	1,520	1,990	2,157	2,356
Blaine	818	1,397	2,031	2,231	2,416
Bryan	557	1,074	1,714	1,-82	2,049
Caddo	780	1,307	1,874	2,012	2,192
Canadian	a	a	a	a	a
Carter	1,187	1,623	2,230	2,429	2,639
Cherokee	327	729	1,539	1,697	1,854
Choctaw	437	843	1,427	1,619	1,759
Cimarron	1,715	2,307	2,331	2,319	2,527
Cleveland	a	a	a	a	a
Coal	410	844	1,264	1,372	1,526
Comanche	1,373	1,929	2,402	2,577	2,781
Cotton	682	1,113	1,522	1,655	1,787
Craig	591	1,276	1,890	2,071	2,247
Creek	b	b	b	b	b
Custer	856	1,574	2,329	2,533	2,756
Delaware	322	728	1,091	1,231	1,354
Dewey	642	1,364	1,805	2,025	2,215
Ellis	932	1,502	1,921	2,030	2,135
Garfield	1,418	1,829	2,564	2,731	2,982
Garvin	807	1,397	1,994	2,119	2,323
Grady	767	1,353	1,948	2,109	2,295
Grant	1,141	1,713	2,292	2,359	2,572
Greer	802	1,175	1,520	1,613	1,784
Harmon	1,057	1,440	1,810	1,843	1,975
Harper	1,134	1,581	2,150	2,283	2,550
Haskell	347	764	1,018	1,130	1,219
Hughes	552	991	1,438	1,549	1,692
Jackson	985	1,604	2,247	2,387	2,608
Jefferson	688	1,143	1,435	1,544	1,656
Johnston	439	888	1,288	1,359	1,488
Kay	1,365	1,963	2,724	2,968	3,236
Kingfisher	928	1,676	2,376	2,491	2,697
Kiowa	917	1,365	1,811	1,890	2,077
Latimer	340	751	1,465	1,582	1,747
LeFlore	445	866	1,370	1,497	1,635

(continued)

TABLE A-2 (continued)

COUNTY	1950	1960	1967	1968	1969*
Lincoln	648	1,214	1,704	1,890	2,055
Logan	738	1,180	1,788	1,994	2,177
Love	505	1,033	1,199	1,201	1,317
McClain	529	1,009	1,263	1,361	1,474
McCurtain	403	747	1,427	1,575	1,720
McIntosh	369	823	1,244	1,275	1,386
Major	728	1,310	1,754	1,831	1,972
Marshall	642	1,210	1,591	1,823	1,988
Mayes	502	1,160	1,808	1,901	2,057
Murray	675	1,192	1,853	2,098	2,328
Muskogee	874	1,499	2,260	2,456	2,679
Noble	839	1,631	2,584	2,757	2,984
Nowata	688	1,444	1,662	1,765	1,925
Okfuskee	448	922	1,499	1,573	1,721
Oklahoma	a	a	a	a	a
Okmulgee	897	1,455	1,965	2,131	2,341
Osage	b	b	b	b	b
Ottawa	1,044	1,570	2,416	2,777	3,011
Pawnee	607	1,059	1,226	1,328	1,474
Payne	905	1,430	2,121	2,290	2,483
Pittsburg	764	1,293	2,859	3,040	3,267
Pontotoc	925	1,473	2,156	2,403	2,616
Pottawatomie	787	1,377	1,723	1,949	2,124
Pushmataha	347	723	1,097	1,173	1,295
Roger Mills	740	1,339	1,616	1,686	1,840
Rogers	544	1,182	1,455	1,710	1,857
Seminole	728	1,217	1,828	1,942	2,112
Sequoyah	286	600	1,289	1,426	1,556
Stephens	1,306	1,850	2,557	2,764	3,018
Texas	1,545	2,031	2,767	2,983	3,239
Tillman	1,063	1,521	2,065	2,233	2,412
Tulsa	b	b	b	b	b
Wagoner	389	719	1,510	1,660	1,818
Washington	2,119	3,257	3,936	4,306	4,693
Washita	905	1,681	1,995	2,095	2,290
Woods	960	1,659	2,408	2,561	2,802
Woodward	956	1,669	2,400	2,605	2,843
OKC SMSA	1,657	2,340	3,464	3,791	4,099
Tulsa SMSA	1,753	2,571	3,366	3,741	4,056
State Average	1,126	1,845	2,627	2,876	3,123

SOURCE: Same as Table A-1.

*Projected.
a -- See OKC SMSA.
b -- See Tulsa SMSA.

TABLE A-3

ANNUAL AVERAGE RATE OF CHANGE OF PERSONAL INCOME IN OKLAHOMA, BY COUNTY, 1950-1967 (IN PER CENT)

COUNTY	ANNUAL AVERAGE RATE	COUNTY	ANNUAL AVERAGE RATE
Adair	6.8	Lincoln	5.1
Alfalfa	4.7	Logan	4.2
Atoka	5.6	Love	3.9
Beaver	3.0	McClain	5.0
Beckham	2.7	McCurtain	7.2
Blaine	4.7	McIntosh	5.9
Bryan	6.2	Major	4.4
Caddo	4.8	Marshall	5.8
Canadian	5.3	Mayes	8.4
Carter	4.3	Murray	6.6
Cherokee	10.0	Muskogee	5.4
Choctaw	5.7	Noble	5.8
Cimarron	2.5	Nowata	4.1
Cleveland	10.2	Okfuskee	4.5
Coal	4.7	Oklahoma	7.0
Comanche	8.9	Okmulgee	3.4
Cotton	2.9	Osage	3.9
Craig	6.6	Ottawa	4.5
Creek	4.6	Pawnee	3.2
Custer	6.8	Payne	5.5
Delaware	7.6	Pittsburg	7.6
Dewey	4.6	Pontotoc	4.4
Ellis	3.0	Pottawatomie	4.6
Garfield	4.1	Pushmataha	5.5
Garvin	5.3	Roger Mills	3.0
Grady	4.8	Rogers	7.2
Grant	3.0	Seminole	3.0
Greer	2.6	Sequoyah	9.8
Harmon	1.3	Stephens	4.6
Harper	3.7	Texas	4.2
Haskell	4.4	Tillman	3.2
Hughes	3.8	Tulsa	6.2
Jackson	8.0	Wagoner	5.9
Jefferson	2.6	Washington	5.8
Johnston	5.2	Washita	6.1
Kay	4.6	Woods	4.8
Kingfisher	6.2	Woodward	6.2
Kiowa	3.0		
Latimer	8.1		
LeFlore	6.4	State Average	5.9

SOURCE: Same as Table A-1.

TABLE A-4

COUNTY SHARES OF TOTAL PERSONAL INCOME IN OKLAHOMA, 1950, 1960, 1967, AND 1968 (IN PER CENT)

COUNTY	1950	1960	1967	1968
Adair	0.183	0.197	0.209	0.209
Alfalfa	0.426	0.381	0.310	0.281
Atoka	0.202	0.170	0.189	0.182
Beaver	0.405	0.295	0.210	0.202
Beckham	0.889	0.629	0.516	0.520
Blaine	0.490	0.393	0.385	0.387
Bryan	0.643	0.606	0.676	0.677
Caddo	1.085	0.871	0.869	0.851
Canadian	0.995	0.820	0.849	0.837
Carter	1.723	1.475	1.302	1.294
Cherokee	0.247	0.301	0.467	0.472
Choctaw	0.355	0.307	0.335	0.348
Cimarron	0.313	0.241	0.152	0.137
Cleveland	1.060	1.305	1.688	1.731
Coal	0.132	0.109	0.105	0.102
Comanche	3.017	4.076	4.410	4.348
Cotton	0.276	0.208	0.164	0.162
Craig	0.430	0.484	0.476	0.476
Creek	1.275	1.089	1.020	1.030
Custer	0.719	0.771	0.805	0.799
Delaware	0.189	0.224	0.235	0.239
Dewey	0.225	0.192	0.164	0.165
Ellis	0.272	0.191	0.151	0.145
Garfield	2.982	2.254	2.204	2.132
Garvin	0.948	0.920	0.859	0.826
Grady	1.065	0.932	0.886	0.874
Grant	0.475	0.324	0.264	0.244
Greer	0.375	0.243	0.207	0.198
Harmon	0.340	0.196	0.145	0.132
Harper	0.270	0.219	0.173	0.164
Haskell	0.184	0.162	0.144	0.146
Hughes	0.455	0.349	0.325	0.318
Jackson	0.787	1.110	1.025	0.990
Jefferson	0.305	0.218	0.172	0.168
Johnston	0.186	0.176	0.158	0.152
Kay	2.658	2.332	2.152	2.134
Kingfisher	0.475	0.415	0.450	0.432
Kiowa	0.690	0.471	0.409	0.385
Latimer	0.131	0.135	0.180	0.174
LeFlore	0.626	0.587	0.671	0.670

(continued)

TABLE A-4 (continued)

COUNTY	1950	1960	1967	1968
Lincoln	0.571	0.531	0.501	0.508
Logan	0.652	0.512	0.491	0.497
Love	0.155	0.141	0.107	0.098
McClain	0.303	0.299	0.255	0.251
McCurtain	0.507	0.450	0.615	0.616
McIntosh	0.262	0.237	0.225	0.223
Major	0.298	0.238	0.213	0.199
Marshall	0.209	0.205	0.176	0.183
Mayes	0.394	0.542	0.576	0.555
Murray	0.290	0.295	0.303	0.312
Muskogee	2.283	2.158	2.097	2.074
Noble	0.406	0.394	0.388	0.380
Nowata	0.349	0.365	0.260	0.250
Okfuskee	0.303	0.251	0.241	0.230
Oklahoma	23.878	25.745	28.765	28.843
Okmulgee	1.591	1.251	1.066	1.045
Osage	0.954	0.828	0.671	0.632
Ottawa	1.340	1.034	1.051	1.105
Pawnee	0.329	0.268	0.210	0.210
Payne	1.673	1.472	1.585	1.570
Pittsburg	1.248	1.034	1.578	1.549
Pontotoc	1.137	0.963	0.889	0.904
Pottawatomie	1.364	1.329	1.092	1.125
Pushmataha	0.166	0.153	0.153	0.147
Roger Mills	0.218	0.159	0.127	0.118
Rogers	0.423	0.567	0.508	0.546
Seminole	1.180	0.795	0.734	0.711
Sequoyah	0.225	0.251	0.406	0.414
Stephens	1.772	1.636	1.439	1.412
Texas	0.876	0.669	0.633	0.625
Tillman	0.738	0.519	0.454	0.446
Tulsa	20.666	23.154	21.480	21.878
Wagoner	0.260	0.262	0.348	0.350
Washington	2.775	3.209	2.739	2.728
Washita	0.636	0.709	0.590	0.563
Woods	0.555	0.461	0.445	0.427
Woodward	0.548	0.540	0.553	0.545
OKC SMSA	25.893	27.870	31.263	31.411
Tulsa SMSA	22.895	25.071	23.132	23.540

SOURCE: Same as Table A-1.

TABLE A-5

RESULTS OF SIMPLE REGRESSION FOR COUNTY PERSONAL INCOME IN OKLAHOMA FOR THE PERIOD, 1950-1967

COUNTY	MEAN PERCENTAGE DEVIATION	SLOPE OF REGRESSION LINE	STANDARD ERROR OF ESTIMATE	CORRELATION COEFFICIENT
Adair	5.02	0.027	187.6	0.98
Alfalfa	11.88	0.017	186.7	0.84
Atoka	8.46	0.022	392.9	0.94
Beaver	16.19	0.011	226.1	0.58
Beckham	6.82	0.011	643.2	0.84
Blaine	9.62	0.020	365.8	0.90
Bryan	4.99	0.025	1,059.7	0.98
Caddo	8.29	0.018	1,626.2	0.90
Canadian	8.02	0.022	1,093.8	0.94
Carter	9.46	0.010	1,364.2	0.74
Cherokee	7.75	0.041	831.4	0.99
Choctaw	5.95	0.025	356.3	0.97
Cimarron	16.19	0.012	36.6	0.59
Cleveland	11.68	0.029	1,706.7	0.93
Coal	7.62	0.018	178.6	0.92
Comanche	8.32	0.024	9,790.9	0.95
Cotton	7.35	0.009	209.2	0.79
Craig	4.27	0.028	83.3	0.99
Creek	3.05	0.017	897.2	0.98
Custer	6.53	0.027	930.9	0.97
Delaware	7.90	0.030	171.8	0.97
Dewey	12.09	0.018	132.3	0.84
Ellis	12.98	0.011	201.3	0.68
Garfield	6.03	0.016	3,819.9	0.93
Garvin	2.09	0.023	418.2	0.99
Grady	3.29	0.019	538.9	0.99
Grant	10.55	0.007	429.4	0.53
Greer	10.42	0.011	359.5	0.72
Harmon	11.98	0.029	260.4	0.25
Harper	11.72	0.014	199.5	0.78
Haskell	3.81	0.018	84.4	0.98
Hughes	3.57	0.014	421.0	0.96
Jackson	9.73	0.032	2,381.9	0.96
Jefferson	7.43	0.010	221.9	0.82
Johnston	8.59	0.021	173.4	0.93
Kay	2.57	0.017	1,581.7	0.99
Kingfisher	12.38	0.024	575.5	0.89
Kiowa	8.54	0.011	554.1	0.79
Latimer	10.20	0.034	250.5	0.97
LeFlore	5.77	0.025	1,407.7	0.97

(continued)

TABLE A-5 (continued)

COUNTY	MEAN PERCENTAGE DEVIATION	SLOPE OF REGRESSION LINE	STANDARD ERROR OF ESTIMATE	CORRELATION COEFFICIENT
Lincoln	4.00	0.019	417.2	0.97
Logan	3.96	0.016	585.9	0.97
Love	7.73	0.014	97.8	0.89
McClain	5.62	0.018	201.7	0.96
McCurtain	9.81	0.030	1,214.8	0.96
McIntosh	8.05	0.025	108.5	0.95
Major	10.94	0.015	319.0	0.82
Marshall	4.12	0.016	224.0	0.97
Mayes	3.56	0.032	159.3	0.99
Murray	5.40	0.024	108.2	0.98
Muskogee	2.36	0.022	1,020.3	0.99
Noble	6.96	0.024	159.4	0.96
Nowata	5.97	0.015	182.7	0.92
Okfuskee	4.30	0.018	242.0	0.97
Oklahoma	2.61	0.028	18,970.7	0.99
Okmulgee	2.79	0.013	537.1	0.98
Osage	3.99	0.014	87.5	0.95
Ottawa	5.85	0.017	1,076.0	0.95
Pawnee	4.22	0.011	165.4	0.95
Payne	4.05	0.023	1,970.5	0.99
Pittsburg	10.41	0.024	6,791.4	0.91
Pontotoc	2.05	0.016	714.3	0.99
Pottawatomie	4.24	0.015	397.3	0.96
Pushmataha	5.14	0.022	211.1	0.97
Roger Mills	13.64	0.012	191.0	0.67
Rogers	3.36	0.028	120.9	0.99
Seminole	4.18	0.011	918.9	0.92
Sequoyah	8.59	0.036	1,254.5	0.97
Stephens	3.40	0.016	802.6	0.97
Texas	11.39	0.019	883.3	0.85
Tillman	9.01	0.014	312.2	0.83
Tulsa	6.51	0.021	13,681.8	0.95
Wagoner	4.73	0.023	207.2	0.98
Washington	4.33	0.024	1,813.5	0.99
Washita	15.09	0.027	31.4	0.88
Woods	8.54	0.020	503.7	0.92
Woodward	8.60	0.028	512.2	0.95
State Total	2.36	0.022	87,998.7	0.99

SOURCE: Computed from the same source as Table A-1.

TABLE A-6

RESULTS OF SIMPLE REGRESSION FOR COUNTY INCOME SHARES IN OKLAHOMA FOR THE PERIOD, 1950-1967

COUNTY	MEAN PERCENTAGE DEVIATION	SLOPE OF REGRESSION LINE	STANDARD ERROR OF ESTIMATE	CORRELATION COEFFICIENT
Adair	4.03	0.053	0.0001	0.78
Alfalfa	11.03	-0.047	0.0013	-0.40
Atoka	6.92	-0.002	0.0038	-0.02
Beaver	15.31	-0.011	0.0007	-0.57
Beckham	6.48	-0.011	0.0031	-0.83
Blaine	8.85	-0.002	0.0005	-0.21
Bryan	3.89	0.003	0.0075	0.59
Caddo	7.10	-0.004	0.0138	-0.48
Canadian	6.73	-0.000	0.0056	-0.04
Carter	8.56	-0.012	0.0036	-0.80
Cherokee	6.93	0.019	0.0068	0.95
Choctaw	5.81	0.003	0.0009	0.37
Cimmaron	16.08	-0.010	0.0015	-0.54
Cleveland	10.00	0.007	0.0037	0.54
Coal	6.57	-0.004	0.0013	-0.52
Comanche	7.08	0.002	0.0950	0.32
Cotton	5.95	-0.013	0.0011	-0.91
Craig	4.81	0.006	0.0080	0.79
Creek	1.63	0.005	0.0000	-0.96
Custer	5.86	0.005	0.0036	0.64
Delaware	6.95	0.008	0.0006	0.76
Dewey	11.07	-0.004	0.0002	-0.31
Ellis	11.60	-0.011	0.0010	-0.67
Garfield	4.62	-0.008	0.0303	-0.87
Garvin	3.46	0.005	0.0188	0.14
Grady	2.78	-0.003	0.0039	-0.71
Grant	9.45	-0.015	0.0032	-0.84
Greer	9.72	-0.011	0.0027	-0.74
Harmon	10.94	-0.019	0.0021	-0.87
Harper	10.68	-0.008	0.0008	-0.58
Haskell	2.92	-0.005	0.0006	-0.83
Hughes	2.19	-0.009	0.0022	-0.97
Jackson	11.42	0.009	0.0527	0.64
Jefferson	6.22	-0.012	0.0012	-0.87
Johnston	7.59	-0.001	0.0005	-0.17
Kay	1.19	-0.005	0.0048	-0.97
Kingfisher	11.63	0.002	0.0028	0.14
Kiowa	7.70	-0.011	0.0031	-0.80
Latimer	9.15	0.012	0.0015	0.81
LeFlore	4.29	0.003	0.0132	0.48

(continued)

TABLE A-6 (continued)

COUNTY	MEAN PERCENTAGE DEVIATION	SLOPE OF REGRESSION LINE	STANDARD ERROR OF ESTIMATE	CORRELATION COEFFICIENT
Lincoln	3.21	-0.003	0.0004	-0.73
Logan	2.70	-0.006	0.0026	-0.92
Love	6.69	-0.008	0.0001	-0.73
McClain	3.98	-0.004	0.0003	-0.72
McCurtain	9.01	0.008	0.0109	0.68
McIntosh	8.33	0.003	0.0050	0.33
Major	9.85	-0.007	0.0021	-0.56
Marshall	3.47	-0.006	0.0011	-0.85
Mayes	4.39	0.010	0.0105	0.91
Murray	3.75	0.002	0.0027	0.47
Muskogee	2.75	0.000	0.0132	0.04
Noble	6.60	0.002	0.0029	0.31
Nowata	6.97	-0.007	0.0065	-0.74
Okfuskee	3.18	-0.004	0.0005	-0.74
Oklahoma	1.88	0.006	0.1005	0.95
Okmulgee	2.15	-0.009	0.0065	-0.97
Osage	3.94	-0.008	0.0108	-0.87
Ottawa	5.26	-0.005	0.0024	-0.68
Pawnee	2.58	-0.011	0.0003	-0.97
Payne	2.83	0.001	0.0092	0.19
Pittsburg	8.83	0.002	0.0870	0.20
Pontotoc	1.44	-0.006	0.0011	-0.97
Pottawatomie	4.00	-0.007	0.0089	-0.87
Pushmataha	3.97	0.000	0.0012	0.06
Roger Mills	12.51	-0.010	0.0012	-0.63
Rogers	3.76	0.006	0.0051	0.82
Seminole	3.70	-0.012	0.0044	-0.96
Sequoyah	7.11	0.014	0.0144	0.90
Stephens	3.01	-0.006	0.0073	-0.88
Texas	10.80	-0.003	0.0051	-0.28
Tillman	8.51	-0.008	0.0014	-0.70
Tulsa	6.00	-0.002	0.0829	-0.27
Wagoner	3.66	0.001	0.0004	0.16
Washington	5.51	0.002	0.0678	0.30
Washita	15.55	0.006	0.0068	0.35
Woods	7.57	-0.002	0.0017	-0.28
Woodward	8.48	0.006	0.0004	0.52
OKC SMSA	1.83	0.006	0.0874	0.95
Tulsa SMSA	5.54	-0.002	0.0914	-0.35

SOURCE: Same as Table A-5.