THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

A METHOD OF PROJECTING MANUFACTURING ACTIVITY IN OKLAHOMA, 1970-2020

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1970

A METHOD OF PROJECTING MANUFACTURING ACTIVITY IN OKLAHOMA, 1970-2020

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ACKNOWLEDGMENT

My greatest indebtedness and appreciation are expressed to Dr. W. N. Peach, George Lynn Cross Research Professor of Economics, Chairman of my Advisory Committee, without whose advice, encouragement, and assistance, this study would never have been completed.

My sincere appreciation is also conveyed to Dr. Jim E. Reese, David Ross Boyd Professor of Economics, Dr. James A. Constantin, David Ross Boyd Professor of Marketing and Transportation, Dr. Jack L. Robinson, Associate Professor of Economics, and Dr. Gerald H. Anderson, Associate Professor of Economics, members of my dissertation committee for their valuable advice and constructive suggestions. Special thanks are extended to Dr. Ed F. Crim, Jr., Professor of Economics and Assistant Dean of the Graduate College for his valuable guidance.

I am also deeply grateful to many of my friends without whose help I would not have found the time nor the means to complete this study. Among them are Dr. Pat Choate, formerly Director for Planning and Research at the Industrial Development and Park Department of the State of Oklahoma, Dr. Seward E. Robb, Director of the Oklahoma

Economic Development Foundation, Inc., Mr. Verne C. Kennedy, Jr., Vice President for Operations at the University of Oklahoma, Mr. Charles S. Standley, Jr., Deputy Director of the University of Oklahoma Research Institute, and Dr. Alexander J. Kondonassis, Chairman of the Department of Economics.

My special gratitude goes to Dr. Robert Graham, Chief of the Office of Business Economics, U.S. Department of Commerce, Washington, D.C., and his competent associate Dr. Lowell Ashby. Without their valuable assistance in furnishing me with the unpublished documents of the National Projections, this dissertation would not have been possible.

I am also thankful to Mr. W. J. Bowman, Chief of Research and Planning of the Oklahoma Employment Security Commission.

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A METHOD OF PROJECTING MANUFACTURING ACTIVITY IN OKLAHOMA, 1970-2020

CHAPTER I

INTRODUCTION

Economic development of states and regions is occupying the minds of public and private officials in the United States. Since 1965 when the Economic Development Act was passed by Congress, the efforts of the states and regions in trying to grow economically have been gigantic. These efforts are expected to increase considerably when some of the present military expenditures are diverted to social and economic amelioration in the United States.

Economic development is a broad concept which may include the number of jobs in the economy in one year, the productive capacity of the economic unit, or the rate of increase in productivity per man-hour. One way of estimating economic growth is in terms of increases in per capita personal income. Another way is in terms of increases in the index of industrial production. "The most common and

perhaps best measure of economic growth, however, is the Gross National Product."[1]

For states and regions, the ideal measure would be the gross state product or gross regional product. However, such measures are presently not available for all states and estimation thereof is extremely difficult. The difficulty arises from the lack of statistics on the state or regional levels and the inaccuracy of the available data. The real problem, however, is that states purchase raw materials, semi-finished goods, and finished products from many other states. At the national level, we are dealing with a closed economy where data on international trade are readily available. Such is not the case at the state level.

The Office of Business Economics of the U.S. Department of Commerce has stated the difficulty of state and regional projections in a recent unpublished report:[2]

> National trends . . . are generally more stable and measurable than those of the constituent regions. This is another way of saying that national measurements can be made more accurately than can regional.

This Commerce Department report deals with national projections to the year 2020. It was made for the Water Resources

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[1]Thomas J. Hailstones, Bernard L. Martin, and George A. Wing, Contemporary Economic Problems and Issues (Cincinnati, Ohio: South-Western Publishing Co., 1966), p. 3.

[2]U.S. Department of Commerce, Office of Business Economics, "National Projections" (unpublished report, 1968), p. 1. (Hereafter, Office of Business Economics is referred to as O.B.E.).

Council which is required by law to have projections for 50 years in the future and use these projections for water planning purposes. Two years ago the Council requested the Office of Business Economics to project the economy of the water regions of the United States to the year 2020. To undertake such a task, the Office of Business Economics projected the national economy to the year 2020 and broke down these projections into regional estimates.[3] So far as is known, similar projections have not been attempted at the state or regional level.

The task of estimating and projecting economic production for the State of Oklahoma is too large a task for a study such as this one. Projecting gross national product for the nation is somewhat easier than comparable projections for a state. One reason is the availability of gross national product figures since 1929. Another reason is that at the national level, allowances are easily made for imports and exports because we are dealing with a closed economy. At the Oklahoma level, the problem is complicated by the fact that imports (such as the automobiles from Michigan) and exports (such as petroleum and natural gas) are vastly more important for Oklahoma than they are for the nation. Thus, in this study, an effort is made to prepare projections of the manufacturing sector of the Oklahoma

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[3]Discussion of O.B.E. projections are in Chapter II.

economy. It is hoped that others will prepare projections of the remaining sectors of the State's economy.

Objectives

The objectives of this study are:

1. To generate some of the data needed as a basis for estimating gross state product for Oklahoma for the years 1958 to 1966 and projecting this gross state product to the year 2020.

2. To gather and present data on the manufacturing industry in Oklahoma for 1958 to 1966, and project the manufacturing activity of the State to the year 2020.

Data on manufacturing activity in Oklahoma for the recent past, the current situation, and projection may be of assistance to the State in its efforts to assess the current standing of Oklahoma in relation to the nation. It is hoped that the projections can point the way to realistic and promising paths for the future.

Method

This study is empirical in nature. The data have been published by the Federal and the State governments. Information that was withheld for "disclosure reasons" has been estimated and the methods of estimation are specifically stated. However, in the preliminary work needed for estimating gross state product for Oklahoma, the methodology

used by the Office of Business Economics in the national projections is followed as closely as possible.

In Chapter II there is information about national projections made by the Office of Business Economics and a brief account of national projections made by some private organizations. The data needed for estimating and projecting Oklahoma's economy follow the national projections.

In Chapters III and IV there is an historic picture of the manufacturing industry of Oklahoma from 1958 to 1966. The intention of the author was to build a manufacturing profile for Oklahoma from 1954 or 1947 to the present time. However, due to the lack of comparability of the manufacturing data of the State before 1958 with data for 1958 and later, it was decided to limit the analysis to the period from 1958 to 1966.

In Chapter V, projections of the data on the manufacturing industry in Oklahoma from 1970 to 2020 are presented and analyzed. The projections indicate future paths of manufacturing productivity in Oklahoma under various assumptions.

In Chapter VI there is a summary and concluding observations.

Sources

The primary sources used in this study are the unpublished reports of the Office of Business Economics concerning national projections from 1970 to 2020, and the

Census and Annual Survey of Manufactures published by the U.S. Bureau of the Census from 1958 to 1966. Supplementary sources are published and unpublished reports of the Oklahoma Employment Security Commission and other various federal and state agencies, books, reports, and articles in periodicals and public documents.

During the period 1958-1966 there were two Censuses of Manufactures, one in 1958 and another in 1963. The data for the intercensus years are contained in the Annual Survey of Manufactures. Generally speaking, data in the 1958 Census of Manufacturers is comparable to that of 1963. However, certain detailed data for three-digit groups of four-digit industries for the State of Oklahoma are available only in the 1963 census.[4] This is due to the growth in the manufacturing of several types of products between 1958 and 1963 in Oklahoma. Such growth rendered the data publishable in 1963 while they were withheld in 1958 in order to avoid disclosure of the activities of individual firms.

The annual surveys of manufactures for the intercensus years are condensed and incomplete as to information

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[4]The data published in the Census of Manufactures and the Annual Surveys of Manufactures follow the divisions of the Standard Industrial Classification (SIC). Manufacturing is divided into 21 two-digit Major Groups which are subdivided into 149 three-digit industry groups, or subgroups. The industry groups comprise 427 four-digit industries. For greater details see the Census of Manufactures, 1963, p. 6 and the Standard Industrial Classification Manual, 1967, published by the U.S. Bureau of the Budget.

on regions and states. However, the annual surveys for 1964 and the following years contain more information by two and three-digit groups than the previous ones. The percentage of the published data on two-digit groups of Oklahoma as a percent of total manufacturing data of the State appear in Table 1. Although the missing data which were withheld to avoid disclosure account for a small part of total manufacturing activity in Oklahoma, estimates were prepared in order to provide a complete picture of this activity.

TABLE 1

SELECTED DATA ON TWO-DIGIT MANUFACTURING GROUPS IN OKLAHOMA AS A PER CENT OF THE STATE TOTAL, SELECTED YEARS, 1959-1966*

Year	Employees	Man-hours	Value Added
	Per cent of state total		
1959	85.8	86.1	86.8
1960	83.5	83.7	87.2
1961	82.7	83.2	84.2
1962	81.8	81.8	84.0
1964	91.2	91.2	90.0
1965	99.5	99.5	99.5
1966	99.5	99.5	99.6

Source: Computed from data in Annual Survey of Manufactures, 1959-1962 and 1964-1966.

*The difference between the percentages shown in the table and 100.0 per cent refers to information withheld to avoid disclosure of data on individual firms.

CHAPTER II

NATIONAL PROJECTIONS AND PROJECTIONS OF LABOR FORCE DATA FOR OKLAHOMA

The degree of sophistication and accuracy in the field of projecting economic data, together with the advances in computer technology, have encouraged economists in the United States and elsewhere to estimate future national economic performance. The availability of data at the national level contributed to the relative ease of such tasks. But on the state and regional levels, the economic literature does not contain as much basic data as on the national level. However, various state and regional estimates have been undertaken, especially in conjunction with state planning programs.

Presently, the financial influence of the Federal Government is great in the field of state and regional studies and researches which are a requirement for state and regional planning for economic development. Consequently, a state following as closely as possible the methodology used by a federal agency in a certain study would have a quicker and more favorable response from the federal government than

a new methodology that may require time and study before it is accepted.

National Projections by the Office of Business Economics

In 1968 the Office of Business Economics of the U.S. Department of Commerce completed an unpublished report on economic projections for the United States and selected regions. The report is part of a study for the Water Resources Council, Washington, D.C., covering the period 1929-2020. It is a nation-wide economic base study designed for use in water and related land resource development planning. The report covers 58 of more than 200 water resource planning areas.

The general procedure followed by the Office of Business Economics "calls for projections of summary national aggregates. This is followed second by projection of national industry components. Finally, the national industry projections serve as controls on regional projections of corresponding measures."[1]

National economic analysis and projections are based on a comprehensive body of economic intelligence known as the national economic accounts. These include the national income and product accounts, flow of funds, input-output tables, and balance sheets. These accounts provide a

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[1] Office of Business Economics, "National Projections," p. 2.

reasonably accurate picture of the national economy and through them direct and indirect economic relationships can be measured and traced over time. The core of these accounts is production. "The controlling measure of total economic activity and accomplishment shall be production of valued goods and services for end users."[2]

Where such information would normally start with regional projections and then be summed up to national aggregates, the approach of the Office of Business Economics in starting with national projections is due to the fact that state and regional data are less stable and sometimes not measurable. Thus, the key national aggregate in the projections of the Office of Business Economics is the gross product originating by industry. This measure is derived as the ultimate product of six basic assumptions concerning:

1. Population
2. Labor force
3. Total employment
4. Private employment
5. Hours worked per man per year
6. Product per man-hour

In each of the six areas, three different assumptions were laid down resulting in three levels of projections for each area: high, middle, and low. Consequently, 729 possible

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[2]John P. Lewis, Business Conditions Analysis (New York: McGraw-Hill Book Co., Inc., 1959), p. 18.

combinations were generated for Gross National product between 1965 and 2020.

The projections of the Office of Business Economics are in 1958 dollars and assume a constant productivity in the military, civilian general government, and government enterprise sectors. Other assumptions are involved but they have little effect on the projected aggregates. The results of the study show that the middle projection of gross national product is approximately $5.3 trillion in the year 2020, in 1958 dollars. This compares with a gross national product of somewhat less than $500 billion in 1960 and $707 billion in 1968, in 1958 dollars. The projections of gross national product by ten year intervals from 1970 to 2020 are presented in Table 2.

National Projections by Resources For the Future

In 1963 Resources for the Future, Inc. published a study entitled "Resources in America's Future: Patterns of Requirements and Availabilities, 1960-2000." The purpose of this study was to estimate the needs of the United States from 1960 to 2000 of the resources necessary for the social, industrial, and economic development of the nation. In order to estimate the future need for resources, Resources for the Future, Inc., first projected gross national product in 1960 dollars. The basis for their three levels of projection (high, middle, and low) are the corresponding

TABLE 2

PROJECTIONS OF GROSS NATIONAL PRODUCT,
BY DECADE, 1970-2020

Year	High	Middle	Low
	--------Billions of 1958 dollars----------		
1970	$ 792	$ 769	$ 741
1980	1,248	1,152	1,049
1990	1,969	1,675	1,409
2000	3,142	2,480	1,928
2010	4,969	3,622	2,605
2020	7,914	5,258	3,466

Source: Office of Business Economics, "National Projections", p. II-18.

population projections published by the U.S. Bureau of the Census. These same projections are used by the Office of Business Economics in deriving their national projections.

Resources for the Future proceeded from total population to population 14 years and older and total labor force. The annual output per worker (gross national product divided by total labor force) was projected under specified assumptions to the year 2000. These projections per worker were applied to the projected labor force to arrive at the annual projections of gross national product from 1960 to 2000. The results are broken down by the four components of Gross National Product (purchases by consumers, purchases by government, investment, and net exports) and also by major type of product (durables, non-durables, construction, and services). In Table 3 the major findings of Resources for the Future, Inc. and those of the Office of Business Economics are presented.

The results of the study of Resources for the Future, Inc., could not give a one sentence conclusion to the projections of resources:[3]

> . . . no single conclusion can legitimately be drawn for the resource outlook as a whole. We must turn instead to a separate consideration of each of the major resource categories--land, for agriculture, grazing, forestry, outdoor recreation, and urban living; water; the energy fuels, and nonfuel minerals.

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[3]Hans H. Landsberg, Leonard L. Fischman, and Joseph L. Fisher, Resources in America's Future: Patterns of Requirements and Availabilities, 1960-2000 (Baltimore, Maryland: The John Hopkins Press, 1963), p. 21.

TABLE 3

GROSS NATIONAL PRODUCT, 1960, AND PROJECTIONS BY THE OFFICE OF BUSINESS ECONOMICS AND RESOURCES FOR THE FUTURE FOR 1980 AND 2000

Year	Level	Office of Business Economics (Billions of 1958 dollars)	Resources for the Future (Billions of 1960 dollars)
1960	Actual	$ 488	$ 504
1980	High	1,248	1,250
	Middle	1,152	1,060
	Low	1,049	965
2000	High	3,142	3,290
	Middle	2,480	2,200
	Low	1,928	1,680

Source: Office of Business Economics, National Projections, p. II-18.

Hans H. Landsberg, Leonard L. Fischman, and Joseph L. Fisher, Resources in America's Future: Patterns of Requirements and Availabilities, 1960-2000 (Baltimore, Maryland: The John Hopkins Press, 1963), p. 71.

National Projections by the National Planning Association

Since 1964 the Center for Economic Projections of the National Planning Association has published detailed five and ten year projections of national output, income, employment, and related economic indicators. These projections are continuously revised in order to present up-to-date figures for use by public and private planners. These projections are presented in three ways:

1. A "target projection" based on the assumption of full employment and full output.
2. A "present-policy projection" which assumes the continuation of present economic public and private conditions.
3. A "judgment projection" representing the most probable set of estimates based on dropping some policies and adopting new ones.

The breakdown of the gross national product projection follows the conventional sectors: private consumption, investment, government purchases and net foreign transactions. The population projections, which are the first step leading to the ultimate estimates, are those of the U.S. Bureau of the Census, as periodically revised. Labor force, unemployment rate, employment, average weekly hours, and output per man-hour are also projected and reviewed periodically. All dollar projections are in 1964 dollars.

Thus, it is evident that the three above mentioned organizations use the same basis for projecting the national economy. This basis is the projections of the population by the U.S. Bureau of the Census. The differences, however are in the breakdown of the projections and the constant dollar basis for each of the three projections. The final results are close to each other.

Projections of the Labor Force in Oklahoma

The projection of manufacturing activity in Oklahoma contained in this study are presented in three series: high, middle, and low. These series are consistent with the series published by the U.S. Bureau of the Census in its projections of the population of the United States and the 50 states. The assumptions underlying each series are the following:[4]

High --Migration: 1950-1960 rates will remain constant throughout the projection period.

Fertility: A very moderate decline in fertility rates to the year 2020.

Middle--Migration: Gradual decline resulting in no net migration among states in 50 years.

Fertility: A substantial drop from present fertility rates.

Low --Migration: 1950-1960 rates will remain constant throughout the projection period.

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[4]U.S., Bureau of the Census, Current Population Reports, Series P-25, No. 375, October 3, 1967, p. 8.

Fertility: A substantial drop from present fertility rates.

Although differences in mortality rates among states exist, the projections of the population of the states by the U.S. Bureau of the Census apply one set of age-sex-color mortality rates. This is based on the assumption that mortality rates will decline in the future for all groups and a convergence of mortality rates between whites and non-whites will occur.[5]

Population of Oklahoma

The population of Oklahoma increased from 2,233,351 in 1950 to 2,328,284 in 1960 and to an estimated 2,461,000 in 1965. These increases represent an average annual compound rate of growth of 0.7 per cent from 1950 to 1965, compared with 1.6 per cent for the nation during the same period.

The Bureau of the Census of the U.S. Department of Commerce in its Current Population Reports, Series P-25, No. 375, has published projections of the population of Oklahoma at five year intervals through 1985. These projections have been extended to the year 2020 by the application of the Census rate of growth for the State (Table 4). The population of Oklahoma may reach 3,338,000 by 2020 in the middle series but the average annual rates of growth

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[5]Office of Business Economics, op. cit., p. 6.

TABLE 4

POPULATION OF OKLAHOMA, BY FIVE YEAR INTERVALS, 1950-1965, AND PROJECTIONS THROUGH 2020

Year	High	Middle	Low
1950	---	2,233,351	---
1955	---	2,186,000	---
1960	---	2,328,284	---
1965	---	2,461,000	---
1970	2,536,000	2,510,000	2,507,000
1975	2,655,000	2,569,000	2,559,000
1980	2,793,000	2,643,000	2,619,000
1985	2,934,000	2,731,000	2,686,000
1990	3,079,000	2,808,000	2,754,000
1995	3,231,000	2,888,000	2,823,000
2000	3,391,000	2,969,000	2,893,000
2005	3,559,000	3,054,000	2,967,000
2010	3,736,000	3,157,000	3,042,000
2015	3,921,000	3,247,000	3,118,000
2020	4,115,000	3,338,000	3,198,000

Source: Data for 1950 from U.S. Bureau of Census, Census of Population, 1950;
Data for 1960 from U.S. Bureau of Census, Census of Population, 1960.
Data for 1955 and 1965 from U.S. Bureau of Census, Current Population Reports, P-25 Series.
Data for 1970 to 1985 from U.S. Bureau of Census, Current Population Reports, P-25 Series.
Data for 1990-2020 based on average annual rate of growth, 1965-1985.

for selected periods in the future are expected to be below the national average (Table 5). Thus, given the previously mentioned assumptions of migration rate, fertility rate, and mortality rate, and assuming a continuation in the future of the economic conditions of recent years, the middle projection of the population of Oklahoma is that it may be expected to decrease as a per cent of the population of the United States, from 1.26 per cent in 1965 to 0.84 per cent in 2020 (Table 6).

Population 14 Years and Older

The Bureau of the Census published projections by five year intervals of the population 14 years and older for the nation through 2020, and projections for the states through 1985. Because of the availability of data on births and deaths, the projections through 1985 can be considered as having a high degree of reliability.

According to these projections, the high projection of the population 14 years and older of the United States is 70.4 per cent of the total population in 1985; the middle projection is 72.9 per cent and the low projection is 75.6 per cent. The corresponding percentages for Oklahoma are 71.3 per cent, 76.4 per cent, and 76.5 per cent. For the purpose of this study, the assumption is made for Oklahoma that these percentages will remain constant after 1985. Consequently, they are applied to the total population of Oklahoma to estimate the population 14 years and older for

TABLE 5

AVERAGE ANNUAL RATES OF GROWTH OF THE POPULATION OF THE UNITED STATES AND OKLAHOMA, SELECTED PERIODS, 1965-2020

	Per cent per year					
	United States			Oklahoma		
Period	High	Middle	Low	High	Middle	Low
1965-1985	1.6	1.3	1.1	0.9	0.5	0.4
1965-2000	1.6	1.3	1.1	0.9	0.5	0.5
1965-2020	1.6	1.3	1.0	0.9	0.5	0.5

Sources: U.S. data from U.S. Department of Commerce, Office of Business Economics, Regional Economics Division, National Projections (Unpublished Report), p. 7.

Oklahoma data: Calculated from data in Table 4.

TABLE 6

POPULATION OF OKLAHOMA AS A PER CENT OF THE POPULATION OF THE UNITED STATES, 1965, AND PROJECTIONS THROUGH 2020

Year	Per cent		
	High	Middle	Low
1965	----	1.26	----
1985	1.11	1.08	1.11
2000	1.01	0.96	1.02
2020	0.88	0.84	0.94

Source: Calculated from data in Table 4 and Office of Business Economics, "National Projections."

the State from 1990 to 2020. This assumption is adopted because of the lack of data on migration, except for census years, and because prior to 1985, Oklahoma's population 14 years and older as a per cent of the total population of the State is expected to be higher than the corresponding percentages for the nation.

The middle projections for Oklahoma show that the population of working age may increase from 1,787,000 in 1965 to 2,551,000 in 2020 (Table 7). The annual average rate of growth is 0.6 per cent compared to 1.4 per cent for the United States during the same period.

Labor Force (Including Military)

The labor force is derived by applying the labor force participation rate to the population 14 years and older. The labor force participation rate is defined as "the propensity of this population of working age to seek employment."[6] The projections of the labor force, whether for the nation or for Oklahoma, have a degree of uncertainty. Those of the nation are based mainly on the Cooper and Johnston study published in 1965.[7] Their labor force outlook is being used by many who are working with projections for the nation. Although the labor force for 1975 can

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[6] Ibid., p. 10.

[7] Sophia Cooper and Denis F. Johnston, Labor Force Projection for 1970-1980, U.S. Bureau of Labor Statistics, Monthly Labor Review, February, 1965 (Washington: U.S. Government Printing Office, 1965), pp. 129-140.

TABLE 7

POPULATION 14 YEARS AND OLDER, OKLAHOMA, 1960 AND 1965, AND PROJECTIONS BY FIVE YEAR INTERVALS, 1970-2020

	High	Middle	Low
1960	---	1,668,310	---
1965	---	1,787,000	---
1970	1,868,000	1,869,000	1,867,000
1975	1,958,000	1,964,000	1,954,000
1980	2,028,000	2,044,000	2,027,000
1985	2,093,000	2,087,000	2,055,000
1990	2,197,000	2,146,000	2,107,000
1995	2,304,000	2,207,000	2,160,000
2000	2,419,000	2,269,000	2,213,000
2005	2,539,000	2,334,000	2,270,000
2010	2,665,000	2,413,000	2,327,000
2015	2,797,000	2,481,000	2,385,000
2020	2,936,000	2,551,000	2,446,000

Source: Data for 1960-1985 from U.S. Bureau of Census, Current Population Reports, Series P-25. Data for 1990-2020 based on the anticipated percentage of the population 14 years and older to the total population in 1985.

be estimated with considerable reliability, there are uncertainties between 1980 and 2020 regarding women in the labor force, how long youth will attend school, and the retirement age of the working class.[8] On the other hand, there is general agreement among those knowledgeable in the field that the labor force participation rate will continue to rise gradually through 1990 and most writers are of the opinion that it will remain fairly constant from 1990 to 2020.

The Bureau of Labor Statistics of the United States Department of Labor expects the labor force participation rate of Oklahoma to rise from 52.1 per cent in 1965 to 54.0 per cent in 1970, and 56.5 per cent in 1980.[9] The nation's participation rate for these years is 56.7 per cent for 1965, 57.3 per cent for 1970, and 57.8 per cent for 1980.[10] It is expected that the participation rate for the United States will rise in the middle projections to 59.8 per cent by 1990 and remain constant thereafter. For Oklahoma, the assumption is made that the percentage change in the labor force participation rate of the State from 1980 to

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[8]Clopper Almon, Jr., The American Economy to 1975, An Interindustry Forecast (New York: Harper and Row, 1966), p. 121.

[9]Manpower Report of the President Transmitted to the Congress April 1967 (Washington: U.S. Government Printing Office, 1967), p. 273. (Hereafter referred to as Manpower Report of the President.)

[10]Office of Business Economics, op. cit., p. II-4.

1990 will be equal to that of the nation and will remain constant thereafter through 2020. This results in a probable labor force participation rate for Oklahoma of 56.9 per cent by 1990 in the middle projection (Table 8). Accordingly, the labor force for Oklahoma may increase from 904,000 in 1960 to 1,452,000 in 2020 (Table 9). This reflects an annual average rate of growth of 0.8 per cent compared to the nation's 1.4 per cent for 1965-2020.

Civilian Labor Force

The difference between total labor force and civilian labor force is the number in the armed forces. The military personnel in Oklahoma rose from 32,000 persons in 1960 to 34,000 in 1965. Since then, the number increased substantially because of the Vietnam War to 48,000 in 1967. It was 45,000 in 1968. Although this increase is affecting the civilian labor force, it is assumed that it is temporary in nature. In the national projections of the Office of Business Economics, the number in the armed forces is shown as 2,722,000 in 1965 and the projected figures are 2,700,000 for 1970 and 2,600,000 from 1975 to 2020. "The projected armed forces are neutral in character--that is "high," "middle," and "low" assumptions are not distinguished, since we are not prepared to offer appropriate conventional armament level alternatives."[11] This approach is adopted for

[11] Ibid., p. 14.

TABLE 8

LABOR FORCE PARTICIPATION RATE FOR OKLAHOMA, 1960 AND 1965, AND PROJECTIONS,* BY FIVE YEAR INTERVALS, 1970-1990

Year	High	Middle	Low
	Per cent of population 14 years and older		
1960	----	54.2	----
1965	----	52.1	----
1970	54.2	54.0	53.4
1975	54.8	54.2	53.5
1980	57.4	56.5	55.4
1985	57.9	56.7	55.4
1990	58.4	56.9	55.4

Source: Data for 1960, 1970, and 1980 from U.S. Department of Commerce, Bureau of Labor Statistics, Monthly Labor Review, October, 1966, p. 1170.

*Projections based on application of the percentage increase in the labor for a participation rate of the nation, as projected by O.B.E.

TABLE 9

LABOR FORCE OF OKLAHOMA, 1960 AND 1965, AND PROJECTIONS BY FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1960	---	904,000	---
1965	---	901,000	---
1970	1,012,000	1,009,000	997,000
1975	1,073,000	1,064,000	1,045,000
1980	1,164,000	1,155,000	1,123,000
1985	1,212,000	1,183,000	1,138,000
1990	1,283,000	1,221,000	1,167,000
1995	1,346,000	1,256,000	1,197,000
2000	1,413,000	1,291,000	1,226,000
2005	1,483,000	1,328,000	1,258,000
2010	1,556,000	1,373,000	1,289,000
2015	1,633,000	1,412,000	1,321,000
2020	1,715,000	1,452,000	1,355,000

Source: Calculated from data in Tables 7 and 8.

Oklahoma and the number in the armed forces in the State is estimated at 33,000 yearly from 1970 to 2020. This represents the average number of armed forces personnel in Oklahoma between 1960 and 1965.

The civilian labor force for Oklahoma increases from 897,000 in 1965 to 1,419,000 in 2020 in the middle projections (Table 10). For the year 2020, the civilian labor force of the State will account for 98.1 per cent of the total labor force in the high projections, 97.7 per cent in the middle projections, and 97.6 per cent in the low projections. The nation's percentages for these three series are 98.7 per cent, 98.5 per cent, and 98.3 per cent, respectively (Table 11).

Total Civilian Employment

Total civilian employment is derived "from the civilian labor force. Its size depends upon the success of civilian labor force participants in finding employment."[12] In other words, civilian employment depends on the unemployment rate. The unemployment rates for Oklahoma and other states are published annually in the Manpower Report of the President where the source of the data is given as "State employment security agencies cooperating with the U.S. Department of Labor."[13] Consequently, the unemployment

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[12]Office of Business Economics, op. cit., p. 15.

[13]Manpower Report of the President, op. cit., p. 260.

TABLE 10

CIVILIAN LABOR FORCE OF OKLAHOMA, 1960 AND 1965, AND PROJECTIONS AT FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1960		871,000	
1965		897,000	
1970	979,000	976,000	964,000
1975	1,040,000	1,031,000	1,012,000
1980	1,131,000	1,122,000	1,090,000
1985	1,179,000	1,150,000	1,105,000
1990	1,250,000	1,188,000	1,134,000
1995	1,313,000	1,223,000	1,164,000
2000	1,380,000	1,258,000	1,193,000
2005	1,450,000	1,295,000	1,225,000
2010	1,523,000	1,340,000	1,256,000
2015	1,600,000	1,379,000	1,288,000
2020	1,682,000	1,419,000	1,322,000

Source: Data for 1960 and 1965 from U.S. Bureau of the Census, Current Population Reports, Series P-25. Projections calculated from data in Tables 8 and 9.

TABLE 11

CIVILIAN LABOR FORCE AS A PER CENT OF TOTAL LABOR FORCE, OKLAHOMA AND THE UNITED STATES, SELECTED YEARS, 1965 TO 2020

	High		Middle		Low	
Year	U.S.	Oklahoma	U.S.	Oklahoma	U.S.	Oklahoma
1965			96.5	96.3		
1985	97.6	97.3	97.6	97.2	97.5	97.1
2000	98.2	97.7	98.0	97.4	97.9	97.3
2020	98.7	98.1	98.5	97.7	98.3	97.6

Source: Calculated from data in Tables 9 and 10.

rates for Oklahoma published by the Oklahoma Employment Security Commission are used in this study. These rates were 4.9 per cent in 1960 and 4.3 per cent in 1965, while the national rates were 5.6 per cent and 4.6 per cent, respectively (Table 12).

Data on unemployment rates published in the Manpower Report of the President for the past two years, 1967 and 1968, are not comparable with those of previous years because the total labor force figures are now based on the population 16 years and older instead of 14 years and older. The Oklahoma Employment Security Commission figures of the labor force in Oklahoma are based on the population 14 years old and over. The unemployment rates for the State in recent years are 3.6 per cent in 1966 and 3.5 per cent in 1967 and 1968.

In deriving the projections of total civilian employment for the nation, the Office of Business Economics assumed a constant unemployment rate from 1990 throughout 2020 of 3.5 per cent for the high projections, 4.0 per cent for the middle, and 4.5 per cent for the low. Although the annual unemployment rate for Oklahoma has been below that of the nation in 1960 and 1965, the three assumptions used in deriving the national estimates of civilian employment are adopted for Oklahoma.

Total civilian employment in Oklahoma may increase in the middle projections from 858,000 in 1965 to 1,362,000

TABLE 12

UNEMPLOYMENT RATE FOR OKLAHOMA AND THE UNITED STATES, ANNUALLY, 1960 TO 1965

Year	Unemployment rate (Per cent)	
	United States	Oklahoma
1960	5.6	4.9
1961	6.7	5.9
1962	5.6	5.1
1963	5.7	5.1
1964	5.2	4.7
1965	4.6	4.3

Source: U.S. data from Manpower Report of the President, April, 1965, p. 218.
Oklahoma data from Oklahoma Employment Security Commission, Handbook of Oklahoma Employment Statistics, 1939-1967, pp. 10-17.

by 2020 (Table 13). This represents an average annual rate of growth from 1965 to 2020 of 0.9 per cent. The nation's rate for that period is 1.5 per cent.

Private Employment

Between 1960 and 1965, private civilian employment in Oklahoma increased from 730,000 to 739,000. This represents an average annual rate of growth of 0.3 per cent. The private employment in the United States during that same period increased at an annual rate of 1.3 per cent. To obtain estimates of private employment in Oklahoma from 1970 to 2020, the same assumptions used in the national projections were applied to the State. Consequently, the percentage of national private employment to civilian employment from 1970 to 2020, for each level of projections, were multiplied by the projections of total civilian employment of Oklahoma. These national percentages are shown in Table 14. This method results, in the middle projections, of a private civilian employment figure for Oklahoma of 1,085,000 in 2020 (Table 15). Such an increase represents an average annual rate of growth of 0.7 per cent for the State between 1965 and 2020, while the rate for the nation is 1.3 per cent during the same period.

The reason Oklahoma is expected to have a lower rate than the nation is due to the role of government civilian employment in the State. Private civilian employment is normally obtained by deducting civilian government

TABLE 13

TOTAL CIVILIAN EMPLOYMENT IN OKLAHOMA, 1960 AND 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1960	---	828,000	---
1965	---	858,000	---
1970	945,000	937,000	921,000
1975	1,004,000	990,000	966,000
1980	1,091,000	1,077,000	1,041,000
1985	1,138,000	1,104,000	1,055,000
1990	1,206,000	1,140,000	1,083,000
1995	1,267,000	1,174,000	1,112,000
2000	1,332,000	1,208,000	1,139,000
2005	1,399,000	1,243,000	1,170,000
2010	1,470,000	1,286,000	1,199,000
2015	1,544,000	1,324,000	1,230,000
2020	1,623,000	1,362,000	1,263,000

Source: Calculated from data in Tables 10 and 12.

TABLE 14

PRIVATE CIVILIAN EMPLOYMENT IN THE UNITED STATES AS A PER CENT OF TOTAL CIVILIAN EMPLOYMENT, BY FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1970	86.428	86.028	85.628
1975	86.188	85.388	84.588
1980	85.948	84.748	83.548
1985	85.708	84.108	82.508
1990	85.468	83.468	81.468
1995	85.228	82.828	80.428
2000	84.988	82.188	79.388
2005	84.748	81.548	78.348
2010	84.508	80.908	77.308
2015	84.268	80.268	76.268
2020	84.028	79.628	75.228

Source: Office of Business Economics, National Projections, pp. II-10.

TABLE 15

PRIVATE EMPLOYMENT IN OKLAHOMA, 1960 AND 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1960		730,000	
1965		739,000	
1970	817,000	806,000	789,000
1975	865,000	845,000	817,000
1980	938,000	913,000	870,000
1985	975,000	929,000	870,000
1990	1,031,000	952,000	882,000
1995	1,080,000	972,000	894,000
2000	1,132,000	993,000	904,000
2005	1,186,000	1,014,000	917,000
2010	1,242,000	1,040,000	927,000
2015	1,301,000	1,063,000	938,000
2020	1,364,000	1,085,000	950,000

Source: Calculated from data in Tables 13 and 14.

employment from total civilian employment. Thus, a high private employment results from a low government employment, and vice versa. Consequently, in the following presentation, a high, middle, and low private civilian employment will result in a low, middle, and high government employment.

Government employment in the United States increased from 7.9 million in 1960 to 9.6 million in 1965. This represents an annual rate of growth of 3.9 per cent. The increase in Federal civilian employment during this period was at an annual rate of 1.6 per cent while State and local government employment rose at a rate of 4.8 per cent.

The average annual rate of growth of total government employment in Oklahoma between 1960 and 1965 was close to that of the nation: 4.0 per cent for the State compared to 3.9 per cent for the nation. However, Federal government employment in Oklahoma rose at a rate of 9.0 per cent per year from 1960 to 1965 while State and local government employment increased at 3.1 per cent annually. Thus, Oklahoma in the aggregate has been parallel to the nation, but higher in Federal employment, and lower in State and local government employment (Table 16).

The Office of Business Economics assumed that "The larger portion of [civilian government employment] expansion is expected to come in State and local rather than in Federal government."[14] It is assumed in this study that due to the

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[14]Office of Business Economics, op. cit., p. 16.

TABLE 16

COMPONENTS OF TOTAL GOVERNMENT EMPLOYMENT AND ANNUAL RATE OF GROWTH FOR THE UNITED STATES AND OKLAHOMA, 1960 AND 1965

	1960	1965	Annual Rate of Growth 1960-1965
	Thousands of employees		Per cent
United States			
Total	7,943	9,623	3.9
Federal	2,207	2,385	1.6
State and local	5,736	7,238	4.8
Oklahoma			
Total	98	119	4.0
Federal	13	20	9.0
State and local	85	99	3.1

Source: U.S. data from Office of Business Economics, National Projections, p. 17. Oklahoma Data from Oklahoma Employment Security Commission, Oklahoma Employment Statistics, 1939-1967, March, 1968, pp. 12 and 17.

high average annual rate of growth in Federal government employment in Oklahoma for the past decade and a half, the annual increase in Federal employment in the State will not be as high as before, not even as high as that of the nation in the future. Most of the increase in government employment is expected to be on the State and local level. The implicit projections of the national figures of government civilian employment resulting from the difference between total civilian employment and private civilian employment suggest that it may increase at an average annual rate of 2.3 per cent. Oklahoma's government employment is expected to increase by only 1.5 per cent per year, resulting in a government employment figure of 277,000 in the middle projection for 2020 (Table 17).

Additional Work Leading to Gross State Product

The projections of population and labor force of Oklahoma, up to private civilian employment, represent the halfway mark in the number of steps needed to estimate gross state product for Oklahoma and to project it to the year 2020. However, the amount of work needed to complete the remaining portion exceeds that already spent on population and labor force. Estimating gross state product for Oklahoma entails more work than originally encountered by the Office of Business Economics in projecting the national economy. The steps followed by that Office are the following:

TABLE 17

GOVERNMENT CIVILIAN EMPLOYMENT IN OKLAHOMA, 1960 AND 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	High	Middle	Low
1960	---	98,000	---
1965	---	119,000	---
1970	128,000	131,000	132,000
1975	139,000	145,000	149,000
1980	153,000	164,000	171,000
1985	163,000	175,000	185,000
1990	175,000	188,000	201,000
1995	187,000	202,000	218,000
2000	200,000	215,000	235,000
2005	213,000	229,000	253,000
2010	228,000	246,000	272,000
2015	243,000	261,000	292,000
2020	259,000	277,000	313,000

Source: Calculated from Tables 13 and 15.

1. Total population
2. Population 14 years old and over
3. Total labor force
4. Armed forces
5. Civilian labor force
6. Civilian employment
7. Government employment (excluding government enterprise)
8. Government enterprise
9. Private civilian employment
10. Hours worked per year per man: the private economy
11. Product per man-hour: the private economy, in 1958 dollars
12. Product per man-year: the private economy, in 1958 dollars
13. Private gross product, in 1958 dollars
14. Civilian general government gross product, in 1958 dollars
15. Government enterprise gross product, in 1958 dollars
16. Military gross product, in 1958 dollars
17. Gross national product, in 1958 dollars

National historical data needed for the above steps are readily available. Once the national projections were completed, the Office of Business Economics turned its attention to the main purpose behind its study, namely, projections of regional economy for the Water Resources Council. Such regional projections were not possible by way of

following the steps that led to the national projections. "Because of technical problems, it is not yet possible to construct gross product measurements on a less-than-national basis. Accordingly, we now turn our attention to derivative measures which can be disaggregated geographically."[15] The measure used was personal income for states and regions, in 1958 dollars. By using the constant dollar ratio of personal income to gross product originating by industry, estimates of the economy of regions in the United States were made. The results of these regional estimates coincided closely with the results of projections of gross national product.

The national projections had to be checked with other figures to ascertain their reliability. Thus, the Office of Business Economics prepared projected industry breakdowns in order to obtain national control measures for their projections of gross national product. The results of projecting industrial products came very close to the aggregate projections. The main industrial breakdown which formed the analytical basis for industrial projections are:[16]

1. Agriculture, forestry, fisheries
2. Mining
3. Contract construction

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[15]Office of Business Economics, op. cit., p. 31.

[16]The detailed list of interindustry components is in Appendix A.

4. Manufacturing
5. Transportation, communication, and public utilities
6. Wholesale and retail trade
7. Finance, insurance, and real estate
8. Services
9. Government
10. Rest of the world

These industries and their components were divided into two groups, manufacturing and non-manufacturing. In the remaining chapters of this study, product of the manufacturing industry in Oklahoma is estimated and projected to the year 2020. What remains for the State is the estimation and projection of the non-manufacturing group. The methodology to use in undertaking estimates and projections of the remaining group is beyond the scope of this dissertation. Various methods could be followed and the one to use is left to the discretion of those interested in pursuing this study. However, for the sake of conformity with the national methodology adopted by the Office of Business Economics, the basis used in their estimates of national projections (not projections by industry) is presented in Tables A-1 and A-2 in the Appendix.

CHAPTER III

MANUFACTURING IN OKLAHOMA FROM 1958 TO 1966

An established principle associated with economic growth of regions and nations is the degree of their development in the manufacturing sector. The main reasons for such an importance are the continuous shifting of employees from various other sectors to manufacturing, especially from agriculture, and the fact that manufacturing inputs use the greatest share of the resource sectors.[1] One has only to look at the development that took place in such states as Florida, California, and Texas since 1940 to realize that manufacturing contributes most to the increase in employment and per capita income. The same applies to the nations that built a solid economy after World War II through manufacturing, although they had come out defeated from the armed conflict of the early forties. No one doubts that Germany and Japan are presently the two industrial nations that bulk large in the world market through exports of their manufactured goods.

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[1]Harvey S. Perloff, How a Region Grows (New York: Committee for Economic Development, 1963), p. 103.

Many states in the United States have come to realize the importance of the manufacturing sector to their economy and they are presently geared toward expanding their existing manufacturing firms and luring new ones to their area. Economic studies and research for location purposes, transportation needs, and factors essential for establishing new industries are being daily undertaken by those regions and states where the unemployment rate is higher and per capita income is lower than the national average. Oklahoma has, especially during the past five or six years, started on the path of industrializing the State. The primary effort of Oklahoma's executive body is geared toward this goal. However, many states and regions in the United States, including the State of Oklahoma, find it difficult to use or generate comprehensive data on manufacturing. The main sources of information for this activity are the Oklahoma Employment Security Commission for employment figures, and the U.S. Bureau of the Census for indicators of productivity. But the Census of Manufactures and the Annual Survey of Manufactures are published after a considerable time lapse, rendering some of the main benefits from these sources three to five years late. Furthermore, because of disclosure policies, information concerning many industries is withheld from publication.

In the present chapter there is an historical picture of manufacturing in Oklahoma from 1958 to 1966. This period

was selected for the following reasons. First, the years 1958 and 1963 are census years for the manufacturing industry in the United States. Second, the censuses published for these years are comparable to each other, but those prior to 1958, i.e. 1954 and 1947, are not comparable with later ones due to changes in the definition of several industries and revisions of the Standard Industrial Classification system in 1957. Third, the latest manufacturing statistics available during work on this dissertation were those for 1966. Manufacturing data for the U.S. and the states for intercensus years between 1958 and 1966 are published in the Annual Survey of Manufactures. The information contained in these surveys are not census data, but are based on sampling of the manufacturing establishments in each state. The degree of accuracy of the statistics in the annual surveys is indicated through the publication therein of the standard error of estimate for each industry.

Because of the omission of data on many Oklahoma industries in the census and annual surveys, an attempt was made to fill the gaps in these federal publications. Detailed explanation for the methodology is presented for the year 1963, although a similar approach was followed for the year 1958 and the intercensus years. Because of the more detailed statistics contained in the Census of Manufactures, and as the 1963 Census is the latest available, it was easier to provide a more complete picture of manufacturing

in Oklahoma for that year. It is hoped that when the Census of Manufactures for 1967 becomes available, the same methodology can be used to fill in the gaps, thus providing an historically consistent picture of the growth of manufacturing in Oklahoma since 1958.

Data for 1963

Throughout this study, and in presenting and projecting information about manufacturing in Oklahoma, primary concern is on the number of employees, total man-hours, man-hours per employee, and value added by manufacture. The basic references for the manufacturing data in that year are the 1963 Census of Manufactures and the 1963 and 1967 Oklahoma Directory of Manufacturers and Products.

The Census of Manufactures gives detailed industry statistics on all manufacturing activities in the United States. The data are broken down according to the Standard Industrial Classification system. The groups included therein are from Group 20 to Group 39, plus Group 19 and the Central Administrative Offices or Auxiliary Units. These groups and their designations are:

Group 20--Food and Kindred Products
Group 21--Tobacco Manufactures
Group 22--Textile Mill Products
Group 23--Apparel and Related Products
Group 24--Lumber and Wood Products

Group 25--Furniture and Fixtures
Group 26--Paper and Allied Products
Group 27--Printing and Publishing
Group 28--Chemicals and Allied Products
Group 29--Petroleum and Coal Products

Group 30--Rubber and Miscellaneous Plastics Products
Group 31--Leather and Leather Products
Group 32--Stone, Clay, and Glass Products
Group 33--Primary Metal Industries
Group 34--Fabricated Metal Products

Group 35--Machinery, Except Electrical
Group 36--Electrical Machinery
Group 37--Transportation Equipment
Group 38--Instruments and Related Products
Group 39--Miscellaneous Manufacturing
Group 19--Ordnance and Accessories

For the purpose of this study, Group 19 is included with Group 39 and both are treated as "miscellaneous manufacturing." The activities of the Central Administrative Offices or Auxiliary Units are left out because of the lack of published information about this group.

In Volume II of the Census of Manufactures, detailed data on the manufacturing industries are grouped in chapters according to the Standard Industrial Classification System (hereafter called SIC). In Table 2 in each chapter there is the following information about each 4-digit industry:

Total number of establishments
Number of establishments with 20 employees or more
Total number of all employees
Payroll of all employees
Total number of production workers

Man-hours of production workers
Wages of production workers
Value added by manufacture, adjusted
Cost of materials
Value of shipments

Capital expenditures, new
Number of all employees in 1958
Value added by manufacture, adjusted, in 1958

Data in Table 2 in the Census are grouped according to geographical area. Oklahoma is in the West South Central Division, together with Arkansas, Louisiana, and Texas. However, many states are omitted from Table 2 to avoid disclosure:[2]

> The Bureau of the Census is prohibited by law from publishing any statistics that disclose information reported by individual companies. In the 1963 census, as in previous censuses, preference was given to geographic regions and divisions over individual States in applying disclosure rules; . . .
>
> For each producing State not shown separately in table 2 of the Industry Volume, a footnote gives the number of establishments and either an employment range or the actual employment figure.

Statistics on manufacturing in Oklahoma are mentioned in full in Table 2 of the 1963 Census of Manufactures for 54 four-digit industries out of a total of 259 that exist in the State. Meanwhile, there were 158 four-digit industries where Oklahoma had no manufacturing activity in

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[2]U.S. Bureau of the Census, Census of Manufactures: 1963. Vol. II, Part 1, p. 29.

1963 (see Table A-3). These statistics do not include Group 19, Ordnance and Accessories, for which information about Oklahoma is unavailable.

Number of Establishments

The exact number of manufacturing establishments in Oklahoma for 1963 is mentioned in the body of Table 2 whenever the data is published for the State, and in the footnotes to that table when the information about the State is withheld. Moreover, in the beginning of each chapter in Volume II of the Census, there is a summary table showing the total number of establishments in the states for the two-digit groups and three-digit sub-groups mentioned in the chapters. Two minor discrepancies in the data published for Oklahoma may be noted. For Group 29, Petroleum and Coal Products, while the total number of establishments according to the information in Table 2 and the Area Statistics Volume of the Census (Volume III) is 40, the summary table at the beginning of the chapter in Volume II shows the number to be 41. For Group 35, Machinery, Except Electrical, Table 2 and summary table by region and state show 387 establishments in this group in Oklahoma, while Area Statistics show 388 establishments.

Number of Employees

For industries for which information is withheld for Oklahoma, the footnotes to Table 2 in the Census of

Manufactures give the number of establishments and employment range of 1-19, 20-99, 100-249, 250-499, 500-999, or 1,000-2,499. In a few instances the exact number of employees is given. For industries where an employment range is given for Oklahoma, the Oklahoma Directory of Manufacturers and Products, 1963, provided the number of employees. There exists a difference in the information on employees and establishments mentioned in the Census of Manufactures and the Oklahoma Directory. The latter shows more manufacturers in the various industries because it lists all establishments in Oklahoma, including those retailing to consumers and households. The Census of Manufactures includes only establishments that produce goods "for the wholesale market, for transfer to other plants of the same company, or to the order of industrial users rather than for direct sale to household consumers."[3]

Reference was made occasionally to the 1967 Oklahoma Directory of Manufacturers and Products when the information in the 1963 edition did not coincide with the range of employment mentioned in the footnotes of Table 2 in the Census of Manufactures. With the aid of the two Oklahoma directories, the total number of employees for Oklahoma establishments was estimated. The degree of accuracy of these estimates cannot be determined precisely because it depends on

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[3]Ibid., p. 5.

the accuracy of the information contained in the Oklahoma Directories.

Total Number of Man-hours of all Employees

For those industries where statistics are shown for Oklahoma, the number of non-production workers was obtained by subtracting the number of production workers from the total number of employees. Man-hours for non-production employees were calculated on the basis of 2,000 hours per employee per year. This figure is slightly lower than the national average for 1963, which was 2,025 hours.[4] The reason for choosing a lower figure is the inclusion of part-time employees in the total number of employees in the Census of Manufactures. "The category 'all employees' comprises all full-time and part-time employees on the payroll of operating manufacturing establishments . . . "[5] The total man-hours of non-production employees were added to total man-hours of production workers published by the census in Table 2 to arrive at total man-hours of all employees.

For industries where detailed statistics for Oklahoma were omitted from the Census of Manufactures, the total number of man-hours of all employees for the West South Central Region or the United States, whichever was available, were estimated on the basis mentioned above and the

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[4]Office of Business Economics, op. cit., p. II-ii.

[5]U.S. Bureau of the Census, op. cit., p. 15.

average number of man-hours per year per employee was multiplied by the estimated number of all employees for Oklahoma to get total man-hours for the State.

Value Added by Manufacture, Adjusted

> Value added by manufacture is derived by subtracting the total cost of materials (including materials, supplies, fuel, electric energy, cost of resales and miscellaneous receipts) from the value of shipments (including resales) and other receipts and adjusting the resulting amount by the net change in finished products and work-in-process inventories between the beginning and end of the year.[6]

Where no data were available for value added by manufacture in Oklahoma, the average value added per employee for the West South Central region or for the United States was computed, and multiplied by the number of employees of the "withheld" industries in Oklahoma. The total value added for the State by three-digit and two-digit groups were used to adjust the value added, estimated through the above mentioned method. A correction factor was then applied to each sub-group to arrive at the totals of Oklahoma published in the 1963 Census of Manufactures. (See Table A-4.) This correction factor was obtained by dividing the value added, published in the Census, by the value added for Oklahoma as estimated above.

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[6]Ibid., p. 22.

Value of Shipments

Contrary to value added by manufacture, value of shipments is not published by the Bureau of the Census for three-digit groups. However, it is given in Table 2 in the census whenever Oklahoma data appear in the body of the table, but not when they are mentioned in the footnotes. Consequently, there are no totals to serve as a checkpoint for the estimation of value of shipments of manufacturing in the State.

For 1963, two methods were followed to estimate value of shipments for Oklahoma. The first method was based on the value of shipments per employee for the West South Central or the United States. The second method was the application of the ratio of shipments to value added in the West South Central or the United States to value added in Oklahoma. In Table 18, the results of value of shipments estimated by the two methods are shown.

Data for 1958

The methodology followed for the year 1963 was used to fill the gaps in the 1958 Census of Manufactures. However, the value of shipments for 1958 was not estimated. The frequency of appearance of Oklahoma in Table 2 of Volume II of the 1958 Census is considerably less than in 1963. This reflects the growth of many industries in Oklahoma between 1958 and 1963 to an extent which permitted publication

TABLE 18

VALUE OF SHIPMENTS BY MANUFACTURING FIRMS IN OKLAHOMA, BY SIC GROUP, BY TWO METHODS, 1963

SIC Group	Value of shipments estimated through value of shipments per employee for the West South Central or the United States (1st method)	Value of shipments estimated through ratio of value of shipments to value added for the West South Central or the United States (2nd method)	Value of shipments estimated by the second method as a per cent of the value of shipments estimated by the first method
	------Thousands of dollars-------		---Per cent----
20	$525,912	$489,713	93.1
22	2,982	2,863	96.0
23	55,582	54,984	98.9
24	27,568	27,703	100.5
25	15,561	16,447	105.7
26	23,987	30,935	129.0
27	82,135	83,106	101.2
28	63,500	42,992	67.7
29	657,806	650,356	98.9
30	87,895	91,209	103.8
31	4,506	3,579	79.4
32	158,620	148,257	93.5
33	98,036	91,032	92.9
34	188,803	190,238	100.8
35	230,485	232,534	100.9
36	181,248	178,702	98.6
37	150,584	115,956	77.0
38	9,737	9,539	98.0
39	15,413	16,129	104.6
19	79	79	100.0
All Groups	2,508,439	2,476,353	98.7

Source: Estimated from data in the 1963 Census of Manufactures.

of their data. It is expected that the 1967 Census of Manufactures, currently in process of publication, will contain the same percentage of information about Oklahoma industries as the 1963 Census, or more.

Data for Intercensus Years

The Annual Survey of Manufactures for 1964, 1965, and 1966 contain more detailed information by two and three-digit industries about Oklahoma than those of 1959-1962. It was thus possible to generate a more complete picture of manufacturing in the State during these intercensus years by following the methodology used for 1963.

The accuracy of the estimation of the data that is withheld in the publications of the Bureau of the Census cannot be precisely established. For the purpose of this study, it was judged that the omitted data on the two-digit groups represent such a small percentage of the total data on manufacturing, that their effect on accuracy is negligible. In Table 19, the percentage of the published data to the totals for the State of Oklahoma for the number of employees, total man-hours, and value added by manufacture from 1958 to 1966 are shown. The data withheld due to disclosure policies range from 19.2 per cent to 0.1 per cent. In 1965 and 1966, less data were withheld than in the previous intercensus years.

TABLE 19

DATA ON TWO-DIGIT MANUFACTURING GROUPS IN OKLAHOMA, PUBLISHED IN THE CENSUS OF MANUFACTURES AND IN THE ANNUAL SURVEYS OF MANUFACTURES, AS A PER CENT OF TOTAL MANUFACTURING, 1958-1966

Year	Number of employees	Total man-hours	Value added by manufacture, adjusted
	Per cent		
1958	94.8	94.9	93.5
1959	85.8	86.1	86.8
1960	83.5	83.7	87.2
1961	82.7	83.2	84.2
1962	81.8	81.8	84.0
1963	99.9	99.9	99.9
1964	91.2	91.2	90.0
1965	99.5	99.5	99.5
1966	99.5	99.5	99.6

Source: Calculated from the Census of Manufactures, 1958 and 1963, and the Annual Survey of Manufactures, 1959-1962 and 1964-1966.

Manufacturing in Oklahoma from 1958 to 1966

The manufacturing industry in Oklahoma shows a considerable growth from 1958 to 1966. The number of all manufacturing employees in Oklahoma, according to the Census of Manufactures and the Annual Survey of Manufactures, has increased from 81,000 in 1958 to 100,000 in 1963 (Table 20). This represents an average annual rate of growth of 2.7 per cent, compared with 2.1 per cent for the nation during the same period. The main increases in manufacturing employment in Oklahoma occurred between 1963 and 1966. During that period, employment in manufacturing increased by approximately 13,000, while from 1958 to 1963, the increase was only six thousand. This reflects in part the intensive industrialization effort undertaken by the State in recent years.

Oklahoma has also ranked above the average for the nation in the rate of growth of wages and salaries received from the manufacturing sector. Total personal income in the State increased from $3,942 million in 1958 to $6,098 million in 1966, an annual rate of growth of 5.6 per cent. Total wages and salaries grew at the rate of 5.7 per cent per year during that period, but wages and salaries received in manufacturing increased at an annual rate of 7.8 per cent (Table 21). This compares with the nation's rate of growth of 6.2 per cent for total personal income and 6.0 per cent for wages and salaries received in manufacturing.

TABLE 20

NUMBER OF ALL EMPLOYEES IN MANUFACTURING ESTABLISHMENTS IN OKLAHOMA AND THE UNITED STATES, ANNUALLY, 1958-1966

Year	Oklahoma	United States
	--------Thousands of employees---------	
1958	81	15,423
1959	81	16,063
1960	81	16,150
1961	79	15,730
1962	79	16,155
1963	87	16,235
1964	89	16,486
1965	93	17,254
1966	100	18,205

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

TABLE 21

WAGES AND SALARIES RECEIVED IN MANUFACTURING IN OKLAHOMA, AS A PER CENT OF TOTAL WAGES AND SALARIES AND TOTAL PERSONAL INCOME, ANNUALLY, 1958-1966

Year	Wages and salaries received in manufacturing	Total wages and salaries	Total personal income	Wages and salaries in manufacturing as a per cent of: Total wages and salaries	Total personal income
	Millions of dollars			Per cent	
1958	$374	$2,388	$3,942	15.7	9.5
1959	396	2,521	4,083	15.7	9.7
1960	396	2,597	4,305	15.2	9.2
1961	405	2,701	4,502	15.0	9.4
1962	440	2,883	4,675	15.3	
1963	486	2,986	4,880	16.3	10.0
1964	544	3,193	5,220	17.0	10.4
1965	598	3,390	5,657	17.6	10.6
1966	684	3,719	6,098	18.4	11.2

Source: Based on data in the August issues of Survey of Current Business, 1960-1968.

The growing importance of manufacturing in Oklahoma between 1958 and 1966 is reflected through the income received from the manufacturing sector as a per cent of total wages and salaries, and as a per cent of total personal income in the State. Although total personal income and total wages did not grow as fast as the nation's, wages and salaries received from manufacturing in the State accounted for 15.7 per cent of total wages in 1958, compared to 18.4 per cent in 1966. As a per cent of total income, manufacturing wages were 9.5 per cent in 1958 and 11.2 per cent in 1966. This may be attributed to the fact that in Oklahoma, the economies of scale in production are not as high as they are for the nation. In Oklahoma, there still exist many small type operations employing fewer than 20 employees. For example, in 1963, of a total number of 2,575 establishments in the State, 1,123 had from 1 to 4 employees, 406 had from 5 to 9 employees, and 398 employed 10 to 19 employees. This adds up to a total of 1,927 establishments with less than 20 employees each, and represents 75 per cent of total manufacturing establishments in Oklahoma. In the United States, in the same year, the number of establishments with fewer than 20 employees was 207,265, or 68 per cent of the total 306,617 establishments.[7]

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[7] Ibid., p. 4.

Value added by manufacture shows a different picture than that shown by employment and wages. Total value added in Oklahoma accounted for 5 per cent of total value added in manufacturing in the United States in 1958 and 1963. There seems to be no increase in the contribution of Oklahoma to the total value added of the nation. As a matter of fact, among all the states in the West South Central Region, only Texas increased its percentage of the national total between 1958 and 1963. The increase amounted to only 0.2 per cent.[8]

Between 1958 and 1966 value added by manufacture in Oklahoma grew from $725 million to $1,242 million, an annual rate of growth of 7.0 per cent, while the nation's rate during the same period was 7.4 per cent (Table 22). It seems that the gigantic efforts undertaken in the industrial sector in Oklahoma from 1958 to 1966 were not enough to enable the State to keep up with the national rate of growth. If Oklahoma continues in its industrialization programs as it did in that period, it is doubtful that the State will be able to keep pace with the national rate.

The increasing importance of producing durable goods rather than non-durables is an indication of the progress that has taken place in the manufacturing activity of Oklahoma between 1958 and 1966. In Table 23 the per cent distribution among durables and non-durables of employees,

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[8] Ibid., p. 10.

TABLE 22

VALUE ADDED BY MANUFACTURE, ADJUSTED, OKLAHOMA AND THE UNITED STATES, ANNUALLY, 1958-1966

Year	Oklahoma	United States
	----------Millions of Dollars----------	
1958	$ 725	$141,541
1959	773	161,536
1960	801	163,999
1961	811	164,281
1962	826	179,071
1963	979	192,103
1964	1,032	206,194
1965	1,101	226,975
1966	1,242	251,014

Source: Census of Manufactures, 1958 and 1963 and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

TABLE 23

PER CENT DISTRIBUTION OF EMPLOYEES, MAN-HOURS, AND VALUE ADDED BY MANUFACTURE IN OKLAHOMA, DURABLE AND NON-DURABLE GOODS, 1958-1966

Year	Employees: Durables	Employees: Nondurables	Man-hours: Durables	Man-hours: Nondurables	Value added: Durables	Value added: Nondurables
	Per cent					
1958	54.3	45.7	54.5	45.5	49.0	51.0
1959	55.2	44.8	55.4	44.6	53.4	46.6
1960	56.7	43.3	56.6	43.4	50.5	49.5
1961	56.5	43.5	55.9	44.1	51.9	48.1
1962	57.2	42.8	56.3	43.7	52.5	47.5
1963	59.2	40.8	59.3	40.7	57.0	43.0
1964	60.0	40.0	60.3	39.7	59.3	40.7
1965	61.6	38.4	62.0	38.0	60.0	40.0
1966	63.5	36.5	64.1	35.9	60.8	39.2

Source: Computed from data in the Census of Manufactures, 1958 and 1963, and the Annual Survey of Manufactures, 1959-1962 and 1964-1966.

man-hours, and value added by manufacturing is presented. The durable goods industries in the State accounted for 54.3 per cent of total manufacturing employment in 1958. By 1966, this had risen to 63.5 per cent. Man-hours in durable goods manufacturing also increased from 54.4 per cent of total man-hours of manufacturing in 1958 to 64.1 per cent in 1966. Value added by the durable goods industries rose from 49.0 per cent of total value added in Oklahoma in 1958 to 60.1 per cent in 1966. The fact that durable goods are gaining in importance in Oklahoma indicates that development in the State is now geared toward those industries that are increasing at a faster rate than those necessitated by population increases.[9]

The "Significant Industries" in Oklahoma

Although data have been compiled for all groups in which Oklahoma has manufacturing activity, detailed examination and analysis have been narrowed to those industries judged most significant in 1966. In Appendix B, a list of all 4-digit industries in Oklahoma is presented. (Oklahoma has no manufacturing establishments in Group 21, Tobacco Manufactures). Thus, for the purpose of this study, discussion is limited to the following groups which have been designated as the "significant industries":

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[9]Perloff, op. cit., p. 105.

Group 20--Food and Kindred Products
Group 27--Printing and Publishing
Group 29--Petroleum and Coal Products
Group 32--Stone, Clay, and Glass Products
Group 33--Primary Metal Industries

Group 34--Fabricated Metal Products
Group 35--Machinery Except Electrical
Group 36--Electrical Machinery
Group 37--Transportation Equipment

The remaining manufacturing groups are grouped together as "all other industries."

The nine "significant industries" in Oklahoma accounted for 84.1 per cent of all manufacturing employment in Oklahoma in 1966. The man-hours worked by these employees accounted for 84.2 per cent of total man-hours in manufacturing, and the value added by these industries was 86.3 per cent of all value added in Oklahoma (Table 24). Thus, "all other industries," or the remaining ten groups, account for approximately 15 per cent of total manufacturing activity in Oklahoma.

Group 20--Food and Kindred Products

Between 1958 and 1963, the two census years for manufacturing, the number of establishments producing food and kindred products decreased from 538 to 457. The largest drop was in establishments employing from one to 19 employees. In 1958 this category had 377 establishments and by 1966 the number had declined to 300. During that period, also, one manufacturing concern employing between 500 and 999 employees went out of business. There is only one food

TABLE 24

NUMBER OF EMPLOYEES, TOTAL MAN-HOURS, AND VALUE ADDED BY MANUFACTURE, ADJUSTED, OF THE "SIGNIFICANT INDUSTRIES" IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of employees	Total man-hours (Thousands)	Value added, adjusted (Thousands of dollars)	Per cent of total manufacturing		
				Employees	Man-hours	Value added
				Per cent		
1958	67,195	134,141	$ 617,186	83.2	83.6	85.1
1959	67,583	137,049	660,002	83.8	84.2	86.1
1960	67,603	137,048	689,491	83.9	84.3	87.3
1961	66,087	132,208	687,010	83.8	84.1	86.3
1962	66,362	131,972	692,823	83.8	83.4	85.9
1963	72,601	146,705	810,825	83.2	83.2	85.1
1964	74,033	151,229	852,698	83.1	83.5	85.2
1965	77,341	157,522	905,550	83.1	83.3	85.6
1966	83,689	171,023	1,009,966	84.1	84.2	86.3

Source: Calculated from data in the Census of Manufactures, 1958 and 1963, and the Annual Survey of Manufactures, 1959-1962 and 1964-1966.

For list and discussion of the "Significant Industries" see pp. 66-7.

company that employs from 1,000 to 2,499 employees in the State. Although the total number of employees dropped from 15,415 in 1958 to 14,212 in 1963, and to 13,146 in 1966, value added by manufacture in this group increased from $132 million in 1958 to $148 million in 1963, and to $167 million in 1966 (Table 25).

Generally speaking, the number of establishments, number of employees, and number of man-hours of the food industry in Oklahoma have decreased since 1958. Yet, value added by manufacture has been increasing. The industries that show substantial increases in employment and value added are canned and frozen foods, candy and related products, and beverages. Employment in the canned and frozen food industry increased by only 8 per cent from 1958 to 1963, but value added by this industry grew by 44 per cent. Candy and related products, a small industry in Oklahoma, registered the highest relative increase in employment. From 1958 to 1963, its employment increased by 125 per cent and value added by 93 per cent. The beverage industry had only a 23 per cent increase in employment but its value added showed rapid growth from 1958 to 1963. The increase was from $10 million to $19 million, an increase of almost 100 per cent.

TABLE 25

COMPONENTS OF GROUP 20, FOOD AND KINDRED PRODUCTS, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establishments	Number of Employees	Total Man-hours (Thousands)	Value Added (Thousands of dollars)
201	Meat products	1958	82	3,977	8,112	$ 32,687
		1963	88	3,073	6,488	32,673
202	Dairies	1958	72	3,305	6,919	31,798
		1963	51	2,869	6,073	32,485
203	Canned and frozen foods	1958	20	951	1,363	4,658
		1963	27	1,026	1,633	6,730
204	Grain mills	1958	55	1,671	3,576	20,201
		1963	51	1,412	3,047	20,173
205	Bakery products	1958	94	2,498	5,012	18,991
		1963	80	2,378	4,868	22,532
207	Candy and related products	1958	14	237	474	1,180
		1963	14	534	1,027	2,272
208	Beverages	1958	89	1,332	2,637	9,815
		1963	76	1,634	3,306	19,402
209	Miscellaneous food products	1958	112	1,444	3,064	12,571
		1963	70	1,286	2,828	11,906
Total Group 20	Food and kindred products	1958	538	15,415	31,157	131,901
		1963	457	14,212	29,270	148,173
		1966	NA	13,146	27,169	166,847

Source: Census of Manufactures, 1958 and 1963 and Annual Survey of Manufactures, 1966.

NA: not available.

TABLE 26

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT FOOD AND KINDRED PRODUCTS GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value Added as per cent of total manufacturing Oklahoma	U.S.	Oklahoma Value added per man-hour (in 1958 dollars)
1958	15,415	31,157	$131,901	$131,901	18.2	12.5	$4.23
1959	15,016	30,852	127,196	127,323	16.5	11.5	4.13
1960	14,913	30,814	133,077	131,499	16.6	12.0	4.27
1961	14,583	29,828	138,508	135,659	17.1	12.2	4.55
1962	14,433	29,610	139,243	135,187	16.9	11.6	4.57
1963	14,212	29,270	148,173	142,474	15.1	11.4	4.87
1964	14,325	29,805	154,567	147,628	15.0	11.2	4.95
1965	12,922	27,168	155,817	145,760	14.2	10.3	5.37
1966	13,146	27,169	166,847	150,993	13.4	9.9	5.56

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

CHAPTER IV

MANUFACTURING IN OKLAHOMA FROM 1958 TO 1966 (Continued)

At the end of the last chapter, a detailed presentation and analysis was made of Group 20, Food and Kindred Products, one of the groups included in the "Significant Industries" category. This presentation covered the historical picture from 1958 to 1966. In the present chapter a similar discussion of the remaining groups is provided.

Group 27--Printing and Publishing

Among all the significant manufacturing industries in Oklahoma, Printing and Publishing has the slowest rate of growth in productivity. Value added per man-hour, in 1958 dollars, for this industry increased from $4.10 in 1958 to $4.73 in 1966 (Table 27). This represents an annual rate of growth of 1.8 per cent. Generally speaking, the number of employees increased from 1958 to 1966. However, one sub-group, greeting card manufacturing, disappeared during that period.

Between the two census years, employment in Printing and Publishing declined by only 2.1 per cent, while value

TABLE 27

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT PRINTING AND PUBLISHING GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	6,026	11,438	$46,950	$46,950	6.5	5.6	$4.10
1959	5,950	11,436	48,925	48,974	6.3	5.4	4.28
1960	6,116	11,734	50,369	49,772	6.3	5.7	4.24
1961	6,069	11,677	50,111	49,080	6.2	5.8	4.20
1962	6,047	11,655	51,559	50,057	6.2	5.6	4.29
1963	5,898	11,767	57,053	54,859	5.8	5.5	4.66
1964	5,900	11,655	60,765	58,037	5.9	5.4	4.98
1965	6,551	13,081	66,261	61,984	6.0	5.2	4.74
1966	6,578	13,375	69,837	63,201	5.6	5.3	4.73

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

added in current dollars increased by 21.5 per cent. The greatest gain in employment and value added was in sub-group 273 which include printing and publishing of books. In this industry, employment increased 115 per cent, while value added in current dollars rose 122 per cent between 1958 and 1963 (Table 28).

Group 29--Petroleum and Coal Products

Petroleum and Coal Products in Oklahoma declined in relative importance from 1958 to 1966. In 1958 this industry was second, having a value added figure of $108 million. The food industry was first in rank with a value added of $132 million in 1958. By 1966, Petroleum and Coal Products dropped to fourth place. The percentage of value added in this group to all value added in manufacturing declined from 15.0 per cent in 1958 to 11.0 per cent in 1966 (Table 29).

The number of employees in this manufacturing industry decreased 19 per cent between 1958 and 1966. There was a decline in employment each year except 1963. However, value added by manufacture fluctuated during this period and the 1966 figure was 26 per cent greater than that of 1958. This drops to 14 per cent when comparison is made in constant dollars.

The main benefit to the state of Oklahoma from this industry is due to petroleum rather than coal products.

TABLE 28

COMPONENTS OF GROUP 27, PRINTING AND PUBLISHING, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
271	Newspapers	1958	180	3,679	6,926	$28,155
		1963	190	3,580	7,037	33,981
272	Periodicals	1958	10	339	637	3,928
		1963	16	146	314	4,229
273	Books	1958	7	96	180	1,020
		1963	11	206	415	2,261
274	Miscellaneous publishing	1958	9	54	115	249
		1963	9	62	122	310
275	Commercial Printing	1958	174	1,488	2,860	10,649
		1963	194	1,554	3,193	13,397
276	Manifold Busi-ness Forms	1958	8	57	124	590
		1963	5	49	97	444
277	Greeting Card Manufacturing	1958	1	3	7	20
		1963	0	0	0	0
278	Bookbinding and Related Work	1958	9	154	301	989
		1963	10	168	324	1,158
279	Printing Trade Services	1958	18	156	288	1,350
		1963	19	133	265	1,273

TABLE 28--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
27	Printing and Publishing	1958	416	6,026	11,438	$46,950
		1959		5,950	11,436	48,925
		1960		6,116	11,734	50,369
		1961		6,069	11,677	50,111
		1962		6,047	11,655	51,559
		1963	454	5,898	11,767	57,053
		1964		5,900	11,655	60,765
		1965		6,551	13,081	66,261
		1966		6,578	13,375	69,837

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures 1959-1962 and 1964-1966.

TABLE 29

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT PETROLEUM AND COAL PRODUCTS GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	6,547	13,104	$108,447	$108,447	15.0	1.8	$ 8.28
1959	6,266	12,597	99,754	99,854	12.9	1.8	7.93
1960	6,025	12,425	138,182	136,543	17.3	2.0	10.99
1961	5,703	11,755	123,605	121,063	15.2	2.1	10.30
1962	5,329	10,780	120,412	116,905	14.6	1.9	10.84
1963	5,599	11,025	113,276	108,919	11.6	1.9	9.88
1964	5,352	10,689	98,812	94,376	9.6	1.8	8.83
1965	5,385	10,468	110,455	103,326	10.0	1.8	9.87
1966	5,330	10,231	136,928	123,917	11.0	1.9	12.11

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

Petroleum refining, sub-group 291, accounts for nearly 96 per cent of value added by this industry in 1966, while employment is 90 per cent of total employment in the group. Although the group is referred to as Petroleum and Coal Products, it is mainly concerned with petroleum refining and related products. Coal enters this category only in industry number 2999, Petroleum and Coal Products, not elsewhere classified. The coal products contained in this four-digit industry are fuel briquets, boulets, packaged fuel and powdered fuel. It does not include wood charcoal briquets which are part of Group 28, Chemicals and Allied Products.

Although the number of refining plants in Oklahoma increased from 19 to 23 between 1958 and 1963, the number of employees decreased 15 per cent, from 6,136 to 5,198 during that period. Value added was up only 3 per cent (Table 30). The greatest percentage increase in both employees and value added is in sub-group 295, Paving and Roofing Materials. The number of establishments in this industry increased from 4 to 9 between census years and employment doubled during this period. Value added for this sub-group and sub-group 299, Petroleum and Coal Products, not elsewhere classified both increased 90 per cent between 1958 and 1963 although the number of establishments and employees for the second sub-group declined appreciably.

TABLE 30

COMPONENTS OF GROUP 29, PETROLEUM AND COAL PRODUCTS, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
291	Petroleum Refining	1958	19	6,136	12,460	$106,606
		1963	23	5,198	10,220	109,779
295	Paving and Roofing Materials	1958	4	100	171	607
		1963	9	201	407	1,156
299	Petroleum and Coal Products, n.e.c.	1958	11	311	473	1,234
		1963	8	200	398	2,341
Group 29	Petroleum and Coal Products	1958	34	6,547	13,104	108,447
		1959		6,266	12,597	99,754
		1960		6,025	12,425	138,182
		1961		5,703	11,755	123,605
		1962		5,329	10,780	120,410
		1963	40	5,599	11,025	113,276
		1964		5,352	10,689	98,812
		1965		5,385	10,468	110,455
		1966		5,330	10,231	136,928

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

Group 32--Stone, Clay, and Glass Products

The Stone, Clay, and Glass Products industry is one of the most important manufacturing activities in the State of Oklahoma. Since 1960 value added by this industry has been steadily rising to $112 million in 1966 from a level of $66 million in 1958. Value added by manufacture in constant 1958 dollars has also been increasing since 1960. However, the relative importance of value added by this group to total value added by manufacture in Oklahoma declined slightly from 9.2 per cent in 1958 to 9.0 per cent in 1966 (Table 31).

Flat glass, pressed and blown glassware, hydraulic cement, and pottery and related products account for most of the activity in this industry (Table 32). In 1958, value added by these four sub-groups was 92 per cent of value added by the total group. In 1963 this percentage increased to 96 per cent. Employment in these sub-groups in 1958 included 86 per cent of all employment in the whole group. In 1963, this percentage climbed to 96 per cent.

There are only nineteen counties in Oklahoma that do not have manufacturers of stone, clay, and glass products. Of a total of 200 establishments in the State, Oklahoma and Tulsa counties are the homes of 48 producers of these products. Only 17 establishments have more than 100 employees and 154 have fewer than 20.

TABLE 31

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT STONE, CLAY, AND GLASS PRODUCTS GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value added (In current dollars) $000	Value added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	6,748	$13,488	$ 66,649	$ 66,649	9.2	3.9	$4.94
1959	6,968	14,025	79,646	78,315	10.3	4.0	5.58
1960	6,442	12,874	71,216	70,026	8.9	3.9	5.44
1961	6,387	12,794	75,179	73,922	9.3	3.8	5.78
1962	6,354	12,913	77,300	75,857	9.4	3.7	5.87
1963	6,886	14,078	89,836	88,334	9.2	3.7	6.27
1964	6,700	13,734	94,188	92,341	9.1	3.6	6.72
1965	7,574	14,522	104,359	102,113	9.5	3.5	7.03
1966	7,808	15,199	111,954	108,483	9.0	3.4	7.14

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

TABLE 32

COMPONENTS OF GROUP 32, STONE, CLAY, AND GLASS PRODUCTS, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
321	Flat Glass	1958	3	1,067	2,165	$ 12,711
		1963	2	1,245	2,441	15,349
322	Pressed and Blown Glassware	1958	8	2,320	4,607	21,472
		1963	8	2,363	4,700	26,801
323	Products of Purchased Glass	1958	8	52	153	446
		1963	5	35	68	320
324	Cement, Hydraulic	1958	2	503	1,013	7,167
		1963	5	446	943	16,823
325	Structural Clay Products	1958	13	521	1,094	3,077
		1963	12	425	864	1,837
326	Pottery and Related Products	1958	7	164	309	982
		1963	4	103	194	447
327	Concrete and Plaster Products	1958	112	1,920	3,835	19,830
		1963	149	2,139	4,607	27,412
328	Cut Stone and Stone Products	1958	9	97	183	415
		1963	7	77	154	426
329	Nonmetallic Minerals Products	1958	5	67	129	549
		1963	8	53	107	421

TABLE 32--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
Group 32	Stone, Clay, and Glass Products	1958	167	6,748	13,488	$ 66,649
		1959		6,968	14,025	79,646
		1960		6,442	12,874	71,216
		1961		6,387	12,794	75,179
		1962		6,354	12,913	77,300
		1963	200	6,886	14,078	89,836
		1964		6,700	13,734	94,188
		1965		7,574	14,522	104,379
		1966		7,808	15,199	111,954

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

The Metal Industries

The remainder of the "significant industries" in Oklahoma, which are the Primary Metal Industries, Fabricated Metal Products, Machinery except Electrical, Electrical Machinery, and Transportation Equipment, constitute the core of the manufacturing industry in the United States. These industries are the most important because of their interdependence and their orientation to national and international markets rather than to local and regional ones. These industries also account for the most dynamic and largest manufacturing units.[1]

Employment in the metal industries in the United States increased from 40.2 per cent of total employment in manufacturing in 1958 to 44.3 per cent in 1966. Man-hours during that same period increased from 40.4 per cent to 45.2 per cent, while value added rose from 41.9 per cent to 46.4 per cent (Table 33). These increases in the national manufacturing sector represent an annual rate of growth between 1958 and 1966 of 1.2 per cent in employment, 1.4 per cent in man-hours, and 1.3 per cent in value added.

Oklahoma has surpassed the nation in its effort to increase employment, man-hours, and value added in the metal industries. Between 1958 and 1966 employment in the metal industries in the State was 40.2 per cent of total

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[1]Harvey S. Perloff, How a Region Grows (New York: Committee for Economic Development, 1963), p. 111.

TABLE 33

COMPARISON OF EMPLOYMENT, MAN-HOURS, AND VALUE-ADDED BY MANUFACTURE IN THE METAL INDUSTRIES OF OKLAHOMA AND THE UNITED STATES, 1958, 1963 AND 1966

	Per cent						Dollars	
	Employment in the metal industries as a per cent of total employment in manufacturing		Man-hours in the metal industries as a per cent of total man-hours in manufacturing		Value added in the metal industries as a per cent of total value added in manufacturing		Value added per man-hour in 1958 dollars	
Year	U.S.	Oklahoma	U.S.	Oklahoma	U.S.	Oklahoma	U.S.	Oklahoma
1958	40.2	40.2	40.4	40.5	41.9	36.3	4.86	4.05
1963	41.8	54.8	42.4	45.7	43.8	43.2	6.00	5.17
1966	44.3	51.1	45.2	51.7	46.4	46.8	6.75	5.36

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1966.

employment in manufacturing at the beginning of the period, and 51.7 per cent in 1966. Man-hours increased from 40.5 per cent to 51.7 per cent, while value added increased from 36.3 per cent in 1958 to 46.8 per cent in 1966. Thus, Oklahoma started the period in 1958 with percentages below those of the nation in value added, above the nation's in man-hours, and equal to the nation in employment. Production activity of the metal industries in the State was thus below that of the nation, as value added for the State was 36.3 per cent of all value added by manufacture in 1958, while the nation's was 41.9 per cent. By 1966 the picture had altered significantly for the State. Oklahoma in that year surpassed the national percentages in employment, man-hours, and value added. Employment grew at a yearly rate of 3.0 per cent in Oklahoma while for the nation the growth was only 1.2 per cent per year. Man-hours increased at a yearly rate of 3.1 per cent in Oklahoma, compared to 1.4 per cent for the United States. Value added in these metal industries increased at a yearly rate of 3.2 per cent, while the nation's rate was only 1.3 per cent.

However, these increases do not present an encouraging picture of the growth of the metal industries in Oklahoma. The gap between the nation's productivity rate in these industries and the State's is widening in spite of the significant growth in manufacturing which has taken place in Oklahoma since 1960. This is reflected in the value added

per man-hour in constant dollars. While value added per man-hour in the metal industries in the United States, in constant 1958 dollars, increased at a yearly rate of 4.2 per cent to bring it up from $4.86 in 1958 to $6.75 in 1966, value added in constant 1958 dollars for the State was $4.05 in 1958 and $5.36 in 1966. The annual rate of growth was 3.6 per cent in Oklahoma.

At the time this report was completed, more recent data on manufacturing in Oklahoma were not available. It is expected that the Census of Manufactures for 1967 and the Annual Survey of Manufactures for 1968 and 1969 will reflect a faster growth rate of the manufacturing industry, and particularly in the metal industries in the State of Oklahoma. In the February issue of Program for Economic Prosperity (PEP), the monthly publication of the Industrial Development and Park Department of the State of Oklahoma, data published about capital investments of new and expanding manufacturing industries in Oklahoma, 1963 through 1968, show the growth of these investments from about $32 million in 1963 to $150 million in 1968. According to the publication, it is estimated that in 1969 these investments will reach between $300 million and $400 million.[2] Should this expectation be realized, the rate of growth of the manufacturing sector in Oklahoma, and particularly that of the metal industries, may

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[2]"Capital Investments of New Expanding Manufacturing Industries in the State of Oklahoma, 1963 Through 1968," Program for Economic Prosperity (PEP) V, February, 1969, p. 6.

be higher than that of the 1958-1966 period. With such an expected higher rate of increase, Oklahoma may be able to close part of the gap now existing in the productivity rate of the State and that of the nation.

Group 33--Primary Metal Industries

Primary Metal Industries in Oklahoma have shown an increase from 1958 to 1966. The number of establishments in the census years of 1958 and 1963 increased from 39 to 47 and the number of employees in this industry grew from 2,940 in 1958 to 3,795 in 1963. In 1966 there were 4,204 employees engaged in this manufacturing activity (Table 34). Except for the years 1962 and 1964, employment has been steadily increasing since 1958. Value added by manufacture in this industry more than doubled, from $23 million in 1958 to $52 million in 1966. Also, the importance of this industry is reflected through its value added in 1958 as a per cent of total value added in all manufacturing. This increased from 3.2 per cent in 1958 to 4.2 per cent in 1966. In constant 1958 dollars, value added per man-hour was $4.13 in 1958 and $5.92 in 1966. In 1963 and 1964, this productivity measure was more than $6.00. It decreased to $5.46 in 1965 and then increased to $5.92 in 1966. One of the main reasons for this irregularity is the erratic production of zinc in the State.

TABLE 34

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT PRIMARY METAL INDUSTRIES GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value added (In current dollars) $000	Value added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	2,940	5,598	$23,121	$23,121	3.2	8.2	$4.13
1959	3,156	6,619	32,309	31,769	4.2	8.5	4.80
1960	3,241	6,508	38,339	37,698	4.8	8.1	5.79
1961	3,292	6,493	31,638	31,109	3.9	7.9	4.79
1962	3,228	6,100	27,724	27,207	3.4	7.7	4.46
1963	3,795	7,329	45,796	45,030	4.7	7.9	6.14
1964	3,606	7,229	45,141	44,256	4.4	8.1	6.12
1965	4,050	8,319	46,438	45,438	4.2	8.3	5.46
1966	4,204	8,571	52,388	50,764	4.2	8.3	5.92

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

The most important activities in this group are primary nonferrous smelting of metal, iron and steel foundries, and miscellaneous primary metal industries (Table 35). The last group includes establishments producing iron and steel forgings on a job or order basis for sale to other manufacturers, and manufacturers of nonferrous nails, brads, and spikes. In 1963 the primary nonferrous metal industry, which includes zinc refining, led all the sub-groups of the primary metal industries. Value added by this manufacture was over $27 million, or 60 per cent of total value added in all primary metal industries. Employment was at its peak in 1963 with 1,717 employees out of a total of 3,795 for the entire group. This is 45 per cent of all employees in Group 33.

Iron and steel foundries in Oklahoma follow the pattern of the primary nonferrous metal industry, although value added by the foundries was only a little over $7 million in 1963. Employment in this industry increased 21 per cent from 1958 to 1966, while value added was up more than 43 per cent. The steel rolling and finishing sub-group has not increased in the number of establishments from 1958 to 1963 but the number of employees increased from 260 to 300 and value added rose from $2.6 million to $3.7 million. This represents an increase of 42 per cent over 1958. The establishment that exists in Oklahoma in this sub-group is classified in the Census of Manufactures as a partially integrated

TABLE 35

COMPONENTS OF GROUP 33, PRIMARY METAL INDUSTRIES, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
331	Steel Rolling and Finishing	1958	1	260	491	$ 2,638
		1963	1	300	590	3,733
332	Iron and Steel Foundries	1958	12	853	1,522	5,024
		1963	14	1,035	1,851	7,190
333	Primary Non-Ferrous Metal	1958	3	1,439	2,806	12,112
		1963	5	1,717	3,393	27,331
334	Secondary Non-Ferrous Metal	1958	3	41	78	362
		1963	2	42	81	535
335	Non-Ferrous Rolling and Drawing	1958	2	63	132	706
		1963	2	96	196	1,184
336	Non-Ferrous Foundries	1958	12	123	248	801
		1963	15	288	606	2,602
339	Primary Metal Indus-tries, n.e.c.	1958	6	161	321	1,478
		1963	8	317	612	3,221

TABLE 35--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
Total Group 33	Primary Metal Industries	1958	39	2,940	5,598	$23,121
		1959		3,156	6,619	32,309
		1960		3,241	6,508	38,339
		1961		3,292	6,493	31,638
		1962		3,228	6,100	27,724
		1963	47	3,795	7,329	45,796
		1964		3,606	7,229	45,141
		1965		4,050	8,319	46,438
		1966		4,204	8,571	52,388

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures 1959-1962 and 1964-1966.

works without blast furnaces. The main production of this establishment is hot iron and steel from pig iron, scrap iron, and scrap steel. Such a manufacturing activity, with the absence of iron ore from the State, could not be expected to grow much in size or proportion. Its production seems to be limited to sales in Oklahoma to manufacturers of other metal goods and machinery that use steel and iron sheets in their line of production.

The last important sub-group in this category is primary metal industries not elsewhere classified. The growth in employment in this sub-group nearly doubled between 1958 and 1966, while value added rose approximately 118 per cent. On the whole, the growth that Oklahoma has witnessed in the primary metal industries seems to be significant, given the limitation of the resources that are utilized by this industry and the degree of their availability in the State.

Group 34--Fabricated Metal Products

Of all the three-digit components of the Fabricated Metal Products industry, the most significant ones are structural metal products and the metal cans industry. In 1958 there were no establishments in Oklahoma that manufactured metal cans. With the increases in the canned and frozen food industry and the beverage industry in the State since 1958, two establishments for producing metal cans came into

existence in Oklahoma by 1963. In that year, value added by this industry amounted to more than $1 million (Table 36).

Structural metal products in Oklahoma are relatively important in the fabricated metal products group. The value added by this industry in 1963 accounted for 75 per cent of the value added of the group. This industry includes fabricated structural steel; metal doors, sash, frames, molding and trim; fabricated plate work (boiler shops); sheet metal work; architectural and ornamental metal work; and miscellaneous metal work. The most important among these industries is the fabricated plate work industry. Its value added in 1963 amounted to nearly half of the value added by the whole sub-group of fabricated structural metal products.

The only two industries that declined between 1958 and 1963 are the cutlery, hand tools, and hardware goods and plumbing and heating products, except electrical. However, the relative importance of these two sub-groups is small and their value added accounts for only 2.5 per cent of the entire industry.

From 1958 to 1966 the Fabricated Metal Products industry increased considerably. While the percentage increases in employment and man-hours from 1958 to 1966 in this industry were 45 per cent and 46 per cent, respectively, the increase in value added was 78 per cent (Table 37). Compared to total value added by all manufacturing in Oklahoma, value added by this group rose from 10.0 per cent in 1958 to

TABLE 36

COMPONENTS OF GROUP 34, FABRICATED METAL PRODUCTS, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
341	Metal Cans	1958	0	0	0	$ 0
		1963	2	65	136	1,146
342	Cutlery, Hand-tools, Hardware	1958	3	32	68	245
		1963	7	23	47	229
343	Plumbing and Heating, Except Electric	1958	5	238	457	2,510
		1963	3	134	267	1,876
344	Structural Metal Products	1958	116	5,699	11,751	52,447
		1963	133	6,011	12,541	63,032
345	Screw Machine Products, Bolts, etc.	1958	7	115	245	1,084
		1963	7	171	347	1,647
346	Metal Stampings	1958	6	85	172	727
		1963	6	89	208	1,036
347	Metal Services, n e.c.	1958	22	218	384	1,845
		1963	27	390	750	2,700
348	Fabricated Wire Products, n.e.c.	1958	10	435	841	2,271
		1963	13	235	479	2,951
349	Fabricated Metal Products, n.e.c.	1958	26	1,040	2,124	11,215
		1963	33	771	1,616	9,315

TABLE 36--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
Total Group 34	Fabricated Metal Products	1958	195	7,862	16,042	$ 72,344
		1959		8,313	17,173	77,680
		1960		8,819	18,492	83,884
		1961		9,445	18,885	86,537
		1962		9,018	18,114	85,415
		1963	231	7,889	16,391	83,932
		1964		8,661	17,749	100,769
		1965		9,929	20,496	113,889
		1966		11,394	23,466	128,468

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufacture, 1959-1962 and 1964-1966.

TABLE 37

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT FABRICATED METAL INDUSTRIES GROUP IN OKLAHOMA, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	7,862	16,042	$ 72,344	$ 72,344	10.0	6.7	$4.51
1959	8,313	17,173	77,680	76,382	10.1	6.5	4.45
1960	8,819	18,492	83,884	82,482	10.5	6.3	4.46
1961	9,445	18,885	86,537	85,090	10.7	6.3	4.51
1962	9,018	18,114	85,415	83,822	10.3	6.2	4.63
1963	7,889	16,391	83,932	82,529	8.6	6.1	5.04
1964	8,661	17,749	100,769	98,793	9.8	6.2	5.57
1965	9,929	20,496	113,889	111,437	10.3	6.3	5.44
1966	11,394	23,466	128,468	124,484	10.3	6.3	5.30

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

10.3 per cent in 1966. The trends of this productivity in Oklahoma is different from the trend of the group in the nation where value added by the fabricated metal products declined from 6.7 per cent of total value added by all manufacturing in 1958 to 6.3 per cent in 1966.

Group 35--Machinery, except Electrical

The production of Machinery, except Electrical, in Oklahoma seem to be closely tied to the most important natural resource in the State. This resource is petroleum. The growth in this industry is clearly apparent in two specific industries: petroleum mining machinery, and pumps, compressors and pumping equipment. The first is part of the three-digit group 353, Construction and like Equipment and the second is part of sub-group 356, General Industry Machinery. In 1966 employment in these two industries was 52 per cent of total employment in all machinery, except electrical, and value added was 57 per cent of all value added for the group. Thus, the remaining industries, which are 30 in number, account for less than 50 per cent of employment and only 43 per cent of value added.

The production of oil field machinery in the United States seems to be closely tied to an essential resource market. This is why Texas, California, and Oklahoma lead the nation in the production of such equipment. The production of this highly specialized machinery runs parallel to the

services provided by the producers of this equipment. As long as crude oil remains one of the most important natural resources of the State of Oklahoma, the mining machinery industry will likely remain of prime importance.

Value added by manufacturers of Machinery, except Electrical in Oklahoma increased from $77 million in 1958 to $160 million in 1966 (Table 38). Value added per man hour in constant 1958 dollars, which is the productivity measure for the industry, rose from $4.21 in 1958 to $5.94 in 1966. This represents an annual rate of growth of 6.8 per cent.

The sub-groups of the Machinery, except Electrical industry are presented in Table 39. The main three-digit sub-groups are 352 and 356, construction and like equipment, and general industry machinery. There is a third sub-group that grew significantly in Oklahoma from 1958 to 1966. This is sub-group 358, Service Industry Machines, which includes the production of automatic vending machines, commercial laundry equipment, refrigeration machinery, measuring and dispensing pumps, and service industry machines, not elsewhere classified, such as floor sanding machines, scrubbing machines, commercial cooking and food warming equipment, and commercial dishwashing machines. Employment and value added in this sub-group more than quadrupled between 1958 and 1963. However, most of the increase in this sub-group is attributed to the production of refrigeration machinery.

TABLE 38

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT MACHINERY, EXCEPT ELECTRICAL GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	9,334	18,326	$ 77,190	$ 77,190	10.6	8.8	$4.21
1959	9,851	20,184	104,922	103,168	13.6	9.0	5.11
1960	9,945	19,842	88,448	86,970	11.0	8.8	4.38
1961	9,974	19,934	101,488	99,792	12.5	8.7	5.01
1962	9,813	19,246	97,525	95,707	11.8	9.0	4.97
1963	11,032	22,238	120,244	118,234	12.3	9.0	5.32
1964	11,177	22,978	133,343	130,728	12.9	9.8	5.69
1965	11,683	23,659	139,226	136,229	12.6	10.1	5.76
1966	12,725	26,181	160,383	155,410	19.9	10.8	5.94

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

TABLE 39

COMPONENTS OF GROUP 35, MACHINERY, EXCEPT ELECTRICAL GROUP
IN OKLAHOMA, ANNUALLY, 1958-1966

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
351	Engines and Turbines	1958	1	5	10	$ 38
		1963	1	5	10	49
352	Farm Machinery and Equipment	1958	18	263	508	1,644
		1963	16	369	734	3,383
353	Construction and Like Equipment	1958	91	5,332	10,632	46,428
		1959	96	5,780	11,720	67,696
354	Metalworking Machinery	1958	17	157	309	1,355
		1963	12	133	297	1,266
355	Special Industry Machinery	1958	17	603	1,065	3,799
		1963	23	466	922	5,048
356	General Industry Machinery	1958	40	1,628	3,268	13,433
		1963	44	2,237	4,489	26,108
357	Office Machines, n.e.c.	1958	3	27	52	156
		1963	3	72	155	638
358	Service Industry Machines	1958	13	207	385	1,703
		1963	24	852	1,691	6,914
359	Miscellaneous Machinery	1958	161	1,112	2,097	8,634
		1963	168	1,118	2,220	9,142

TABLE 39--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
Total Group 35	Machinery, Except Electrical	1958	362	9,334	18,326	$ 77,190
		1959		9,851	20,184	104,922
		1960		9,945	19,842	88,448
		1961		9,974	19,934	101,488
		1962		9,813	19,246	97,525
		1963	387	11,032	22,238	120,244
		1964		11,177	22,978	133,343
		1965		11,683	23,659	139,226
		1966		12,725	26,181	160,383

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

The refrigeration machinery, which is industry number 3585, comprises the manufacturing of refrigerators, refrigeration machinery except household, and complete air-conditioning units. The growth in Oklahoma of this industry is mainly in households and auto air conditioning units, and commercial refrigeration machinery and their related parts. Although the Census of Manufactures gives the value of shipments of this industry in Oklahoma as more than $16 million, the data published in the census about shipments of this industry contain extensive duplication because products of many establishments in this industry are consumed by establishments in the same industry. However, the growth in value added from $1.5 million in 1958 to over $6 million in 1963 reflects the rapid development of this industry.

Group 36--Electrical Machinery

The manufacturing of Electrical Machinery in the State of Oklahoma was so comparatively small in 1958 that information about the divisions of the group was withheld in the 1958 Census of Manufactures. It has not been possible to estimate the data for the sub-groups of this industry by using the method for estimating all other groups of manufacturing for 1958. Furthermore, any attempt to derive the data would have disclosed the manufacturing activity of specific large manufacturers of communication equipment in

Oklahoma. Had the estimated figures in this study been close to the actual ones, such a disclosure might have created problems for the manufacturer, the U.S. Bureau of the Census, and the author. Nevertheless, the 1963 figures for the sub-groups and the yearly data for the whole group from 1958 to 1966 indicate the growth of the manufacturing of Electrical Machinery in Oklahoma.

The production of Electrical Machinery in Oklahoma has grown to such an extent that the Bureau of the Census started publishing detailed data about it beginning in 1963. Employment in the group increased from 2,161 in 1958 to 8,769 in 1966. The number of establishments grew from 32 to 52 between these two years and the value added jumped from $19 million in 1958 to $105 million in 1963 (Table 40). The Annual Survey of Manufactures for 1966 shows value added by this industry to be $94 million. As the Annual Survey of Manufactures is based on a sample, it is likely that the 1967 Census of Manufactures will show a substantial increase in value added from 1966 to 1967, just as the 1963 Census showed a large increase in value added from 1962 to 1963. In 1962 value added by the group was $62 million and in 1963 it was $106 million.

Value added per man-hour in electrical machinery, in constant 1958 dollars, increased in Oklahoma from $4.67 in 1958 to $5.86 in 1966, an annual rate of growth of 2.9 per cent. This is below the rate of growth of value added per

TABLE 40

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT ELECTRICAL MACHINERY GROUP IN OKLAHOMA, ANNUALLY, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	2,161	4,088	$19,088	$ 19,088	2.6	7.3	$4.67
1959	3,470	6,684	33,655	33,092	4.4	7.8	4.95
1960	5,533	10,851	45,166	44,411	5.6	8.0	4.09
1961	6,081	11,550	58,530	57,552	7.2	8.3	4.98
1962	6,654	12,663	62,039	60,882	7.5	8.7	4.81
1963	9,489	18,850	105,802	104,033	10.8	8.9	5.52
1964	7,664	15,333	99,931	97,972	9.7	8.6	6.39
1965	6,947	14,158	89,176	87,256	8.1	8.9	6.16
1966	8,769	17,611	94,476	91,547	7.6	9.4	5.86

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

man-hour in 1958 dollars for all manufacturing activity in Oklahoma, which was 3.1. It is also below the average growth rate of all significant industries in the State, which was 3.2. But this industry seems to be growing in the State as employment between 1958 and 1966 for this group increased at an average yearly rate of 19.1 per cent and value added by 22.1 per cent.

The production of communication equipment in Oklahoma accounted for more than 81 per cent of all value added in the electrical machinery group in 1963 (Table 41). This sub-group 366 is composed of two industries: telephone and telegraph apparatus, and radio and television transmitting, signaling, and detection equipment and apparatus. In 1963 telephone manufacturing in the State employed 2,770 persons and value added by this industry was $32 million. Employment in the production of radio and television was 4,776 in the same year, and value added amounted to $54 million. The importance of the latter industry is the result of new establishments that are producing electrical and electronic equipment and apparatus for aircraft, missiles, and space vehicles. During the past few years there has been a great activity in this manufacturing field in Oklahoma. It is expected that future censuses will reveal the growing importance of the communication equipment industry in the State.

TABLE 41

COMPONENTS OF GROUP 36, ELECTRICAL MACHINERY, IN OKLAHOMA, 1958-1966

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-Hours 000	Value Added $000
361	Electric Distribution Products	1958	2	D	D	D
		1963	6	687	1,364	$ 7,862
362	Electric Industrial Apparatus	1958	4	D	D	D
		1963	8	500	1,014	3,458
363	Household Appliances	1958	4	D	D	D
		1963	7	116	231	1,594
364	Lighting and Wiring Devices	1958	2	D	D	D
		1963	4	41	81	537
365	Radio and TV Receiving Equipment	1958	2	D	D	D
		1963	2	206	399	2,341
366	Communication Equipment	1958	4	D	D	D
		1963	11	7,546	14,968	85,816
367	Electronic Components	1958	8			
		1963	7	231	456	1,997
369	Electrical Products, n e.c.	1958	6			
		1963	7	162	337	2,197

TABLE 41--Continued

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-Hours 000	Value Added $000
Total Group 36	Electrical Machinery	1958	32	2,161	4,088	$ 19,088
		1959		3,470	6,684	33,655
		1960		5,533	10,851	45,166
		1961		6,081	11,550	58,530
		1962		6,654	12,663	62,039
		1963	52	9,489	18,850	105,802
		1964		7,664	15,333	99,931
		1965		6,947	14,158	89,176
		1966		8,769	17,611	94,476

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

D: Withheld

Group 37--Transportation Equipment

The main industries in the Transportation Equipment group that are important in Oklahoma are the motor vehicles and equipment, and the aircrafts and parts industries. This does not mean that Oklahoma is becoming a manufacturing center for automobiles and airplanes, but the State more than doubled its production activity in the transportation equipment group from 1958 to 1966. Value added by this industry increased 104 per cent during that period. It was $71 million in 1958 and rose to $146 million in 1966 (Table 42). This was 9.9 per cent of total value added by manufacture in the State in 1958 and 11.7 per cent in 1966. The relative importance of value added by this industry in 1966 is the same as that of the nation. However, Transportation Equipment group followed a downward trend between 1958 and 1961, then picked up and began growing. Value added in this industry jumped from 4.2 per cent of total value added in manufacturing in the State in 1961 to 11.7 per cent in 1966. Value added per man-hour, in 1958 dollars, increased from $3.42 in 1958 to $4.83 in 1966, an average annual rate of growth of 4.4 per cent. This is above the average for the "significant industries" in the State. Employment in the motor vehicles and equipment industry rose from 716 in 1958 to 1,523 in 1963. Value added increased during that period from $5 million to $19 million (Table 43).

TABLE 42

EMPLOYMENT, MAN-HOURS, AND VALUE ADDED FOR 2-DIGIT TRANSPORTATION EQUIPMENT GROUP IN OKLAHOMA, 1958-1966

Year	Number of Employees	Total Man-hours 000	Value Added (In current dollars) $000	Value Added (In 1958 dollars) $000	Value added as per cent of total manufacturing Oklahoma	Value added as per cent of total manufacturing U.S.	Oklahoma value added per man-hour (in 1958 dollars)
1958	10,162	20,900	$ 71,496	$ 71,496	9.9	10.8	$3.42
1959	8,593	17,479	62,164	61,125	8.0	11.2	3.50
1960	6,569	13,508	50,942	50,090	6.4	11.2	3.71
1961	4,553	9,291	34,317	33,743	4.2	10.7	3.63
1962	5,486	10,891	48,094	47,197	5.8	11.7	4.33
1963	7,801	15,757	67,542	66,413	6.9	11.9	4.21
1964	10,648	22,057	90,338	88,567	8.8	11.6	4.02
1965	12,300	25,651	114,471	112,007	10.4	12.2	4.37
1966	13,735	29,220	145,684	141,167	11.7	11.7	4.83

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures, 1959-1962 and 1964-1966.

TABLE 43

COMPONENTS OF GROUP 37, TRANSPORTATION EQUIPMENT, IN OKLAHOMA, 1958 AND 1963

SIC Group	Designation	Year	Number of Establish-ments	Number of Employees	Total Man-hours 000	Value Added $000
371	Motor Vehicles and Equipment	1958	32	716	1,455	$ 5,490
		1963	35	1,523	3,127	19,186
372	Aircrafts and Parts	1958	12	8,474	17,598	61,438
		1963	16	5,633	11,325	43,337
373	Ship and Boat Building	1958	11	45	93	279
		1963	12	54	115	312
375	Motorcycles, Bicycles and Parts	1958	1	4	8	64
		1963	2	14	27	119
379	Transportation Equipment, n.e.c.	1958	13	923	1,746	4,225
		1963	23	577	1,163	4,588
Total Group 37	Transportation Equipment	1958	69	10,162	20,900	71,496
		1959		8,593	17,479	62,164
		1960		6,569	13,508	50,942
		1961		4,553	9,291	34,317
		1962		5,486	10,891	48,094
		1963	88	7,801	15,757	67,542
		1964		10,648	22,057	90,338
		1965		12,300	25,651	114,471
		1966		13,735	29,220	145,684

Source: Census of Manufactures, 1958 and 1963, and Annual Survey of Manufactures 1959-1962 and 1964-1966.

Summary data on manufacturing in Oklahoma is presented in Table 44. Data are provided for the "significant industries" which account for more than 85 per cent of the value added in all manufacturing establishments in the State, for "all other industries" group, and for total manufacturing activity. In the following chapter projections of manufacturing data for the period 1970-2020 are presented.

TABLE 44

SELECTED DATA ON MANUFACTURING IN OKLAHOMA, FOR GROUPS OF THE "SIGNIFICANT INDUSTRIES," "ALL OTHER INDUSTRIES," AND TOTAL MANUFACTURING, 1966

SIC Group	Number of Employees	Man-hours 000	Value Added Current Dollars 000	Value Added 1958 Dollars 000	Value Added in Current Dollars as a per cent of total value added Oklahoma %	Value Added in Current Dollars as a per cent of total value added U.S. %	Average annual growth rate of value added in current dollars 1958-1966 Oklahoma %	Average annual growth rate of value added in current dollars 1958-1966 U.S. %	Value added per man-hour in 1958 dollars Oklahoma $	Value added per man-hour in 1958 dollars U.S. $
20	13,146	27,169	$ 166,847	$ 150,993	13.4	9.9	3.5	3.5	$ 5.56	$6.77
27	6,578	13,375	69,837	63,201	5.6	5.3	1.8	2.9	4.73	5.99
29	5,330	10,231	136,928	123,917	11.0	1.9	4.9	10.0	12.11	15.32
32	7,808	15,199	111,954	108,483	9.0	3.4	4.7	3.4	7.14	6.57
33	4,204	8,571	52,388	50,764	4 2	8.3	4.6	4.0	5.92	7.64
34	11,394	23,466	128,468	124,484	10.3	6.3	2.1	3.4	5.30	5.86
35	12,725	26,181	160,383	155,410	12.9	10.8	4.4	5.0	5.94	6.92
36	8.769	17,611	94,476	91,547	7.6	9.4	2.9	3.6	5.86	6.20
37	13,735	29,220	145,684	141,167	11.7	11.7	4.4	4.7	4.83	7.08
Significant industries	83,689	171,023	1,066,965	1,009,966	85.7	67.0	3.3	4.0	5.91	6.78
All Others	15,841	32,033	174,948	160,943	14.3	33.0	2.3	3.8	5.02	5.72
All Manufacturing	99,530	203,056	1,241.913	1,170,909	100.0	100.0	3.1	3.9	5.77	6.39

Source: Annual Survey of Manufactures, 1966.

CHAPTER V

PROJECTIONS OF MANUFACTURING ACTIVITY IN OKLAHOMA

In this chapter the results of the projections of manufacturing activity in Oklahoma are presented. The ultimate goal of the projections is to estimate productivity measures in the industrial sector of the State. Such a measure, which differs from state to state, is achieved through the estimation of value added by manufacture. Among the various factors that cause such differences in productivity are the capital-labor ratio and the shape of the production function. No attempt has been made in this study to examine the level or shape of these two factors in Oklahoma. If the estimates published by the Oklahoma Industrial Development and Park Department of future capital to be invested in Oklahoma prove to be accurate, there is the possibility that manufacturing productivity in the State will grow by the end of the present century to higher levels than the projections in this study.

As capital and labor can both be defined in such a way so that their returns would be equal to value added,

projections of this last measure can be expected to generate useful estimates of growth in manufacturing without the need to make assumptions about the amount of capital or the shape of the production function.[1] Thus, the projections mentioned in this chapter do not assume any significant changes in the capital-labor ratio or any extraordinary shift in the manufacturing processes in the State. The projections are an extension of the trend of nine years, from 1958 to 1966. The three levels of projections, high, middle, and low, give the range of what value added by manufacture in the State would be on the basis of previously mentioned levels of projection of the population and labor force of Oklahoma through the year 2020. If significant changes occur in the population and the labor force of Oklahoma during the coming years, the substitution of new figures in the estimating equations used in this study will provide users with new productivity figures of manufacturing in the State.

The general approach adopted for deriving the value added figures for Oklahoma is the following. Based on the projections of population and labor force undertaken in the preceding chapters, total employment in manufacturing and employment in the industrial SIC groups are estimated. Projections of man-hours per man per year and value added per

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[1]Richard R. Nelson, "A Diffusion Model of International Productivity Differences in Manufacturing Industry," The American Economic Review (LVIII, December, 1968), pp. 1219-1248.

man-hour, in 1958 dollars, are made according to the methodology adopted for projecting these two measures for the nation. From these three basic measures--number of employees, man-hours per man per year, and value added per man-hour, in 1958 dollars--total value added by manufacture in Oklahoma is estimated.

The report of the Office of Business Economics on national projections for the United States presented a methodology for estimating national annual man-hours per employee and production per man-hour for the entire economy in 1958 dollars. The same methodology was followed to derive the projections of these two measures for Oklahoma.

Man-hours per Man per Year in Manufacturing in Oklahoma

The national trends show a decline in man-hours worked per week per man from 2,125 hours in 1950 to 2,020 hours in 1965. Simultaneously, the number of weeks worked in a year has declined from 51.0 to 49.9. In their projections of man-hours per man per year for the entire economy, the Office of Business Economics assumed that from 1965 on, the average annual rate of decrease for this measure for the high projections will be 0.07 per cent. The middle projections assume a decreasing rate of 0.26 per year and the low projections are based on the assumption of an average annual rate of decline of 0.48 per cent.

Although man-hours per man per year for all manufacturing in Oklahoma in 1965 were slightly above the national average (2,032 for the State compared to 2,020 for the nation) the assumptions made for the three levels of the national projections were applied to the 1965 figure of man-hours worked per man per year in the manufacturing sector of the State to arrive at future estimates of this measure for Oklahoma. In Table 45, the results of these estimates are provided. According to the middle projections, the manufacturing employee in Oklahoma may be expected to work 1,761 man-hours per year in 2020. The national projections show that in the private economy of the United States, man-hours per man per year in 2020 will decline to 1,749 hours.

Value Added per Man-hour

In 1965 gross product per man-hour in 1958 dollars in the private economy of the United States was $4.42.[2] In that same year value added per man-hour in manufacturing in the nation, in 1958 dollars, was $5.68. As Oklahoma's value added per man-hour in manufacturing, in 1958 dollars, was $5.60 in 1965, it may be that the gross product per man-hour for the State for 1965 will be slightly below the national figure of $4.42.

The estimated annual rates of growth in the gross private product of the United States are assumed by the

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[2]Office of Business Economics, op. cit., p. II-12.

TABLE 45

MAN-HOURS PER MAN PER YEAR IN MANUFACTURING IN OKLAHOMA, 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	--------Man-hours per man per year-------- High	Middle	Low
1965	---	2,032	---
1970	2,025	2,006	1,984
1975	2,018	1,980	1,936
1980	2,011	1,954	1,890
1985	2,004	1,929	1,846
1990	1,997	1,904	1,806
1995	1,990	1,879	1,769
2000	1,984	1,855	1,717
2005	1,977	1,831	1,676
2010	1,970	1,807	1,636
2015	1,963	1,784	1,597
2020	1,956	1,761	1,559

Source: Computed at the rates of growth of national projections.

Office of Business Economics to be 3.2 per cent, 3.0 per cent, and 2.8 per cent for the high, middle, and low levels, respectively. Although value added per man-hour in Oklahoma has been increasing at an average annual rate of 4.4 per cent between 1958 and 1966, the national rates of growth used by the Office of Business Economics in projecting gross private product for the nation were used to estimate value added per man-hour in manufacturing in Oklahoma from 1970 to 2020. The results of the middle projections show that in 2020, value added per man-hour in Oklahoma in the manufacturing sector will be $28.47 in constant 1958 dollars (Table 46). The national figure for gross productivity for the entire economy in the United States in 2020 is projected by the Office of Business Economics to $22.47 in 1958 dollars. It is expected that the corresponding figure for Oklahoma, once the productivity rates of the remaining sectors of the State's economy are estimated, will be slightly below the national figure of $22.47 in 2020. Such expectation is based on the assumption that if the economic conditions prevailing in the State from 1958 to 1966 continue, the State will remain below the national average.

Manufacturing Employment

The projection of manufacturing employment in Oklahoma was obtained by linear multiple regression analysis. The historical data covered the years 1958 to 1966.

TABLE 46

VALUE ADDED PER MAN-HOUR IN MANUFACTURING IN OKLAHOMA, 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	Value added per man-hour		
	High	Middle	Low
	1958 dollars		
1965	---	$ 5.60	---
1970	$ 6.56	6.49	$ 6.43
1975	7.67	7.52	7.38
1980	8.98	8.72	8.47
1985	10.51	10.11	9.73
1990	12.31	11.73	11.17
1995	14.41	13.60	12.82
2000	16.86	15.76	14.72
2005	19.74	18.27	16.90
2010	23.11	21.68	19.40
2015	27.05	24.56	22.27
2020	31.67	28.47	25.56

Source: Computed at the rates of growth of national projections.

The chosen independent variables are population, total labor force, and civilian employment. Although several attempts were made with other variables to derive estimating equations for manufacturing employment in Oklahoma, those mentioned above were selected finally because of their availability from year to year through the Oklahoma Employment Security Commission. The equation for estimating total employment in manufacturing in Oklahoma is:

$$ME = -146.7740 - 0.0006\,P - 0.1483\,LF + 0.4397\,CE$$

where ME = Manufacturing employment

P = Total population in the State

LF = Labor force

CE = Civilian employment.

The projection of total manufacturing employment in Oklahoma from 1970 to 2020, at five year intervals, is shown in Table 47. The three levels of projections were obtained by substituting in the estimating equation the projected figures of population, labor force, and civilian employment (presented in Tables 4, 10, and 13, respectively). According to the middle projections, Oklahoma is expected to have approximately 235,000 persons engaged in manufacturing in 2020. If the basic figures of the independent variables are changed, or if other assumed figures are employed, a substitution in the estimating equation will generate a new figure for the number of manufacturing employees. For example, in 1990, we have projected the population as 2,808,000 persons,

TABLE 47

MANUFACTURING EMPLOYMENT IN OKLAHOMA, 1965, AND PROJECTIONS, BY FIVE YEAR INTERVALS, 1970-2020

Year	Number of Employees		
	High	Middle	Low
	--------Thousands of Employees----------		
1965	---	93	---
1970	117	114	109
1975	134	129	121
1980	159	154	143
1985	172	162	147
1990	191	172	155
1995	209	181	163
2000	227	191	170
2005	246	201	179
2010	267	213	187
2015	288	224	196
2020	310	235	206

Source: Computer projections.

the labor force as 1,221,000, and civilian employment as 1,140,000. This results in a manufacturing employment of 172,000 employees in 1990. Should the population estimates by other methods be 2,754,000 while labor force is 1,221,000 and civilian employment is 1,174,000, the projected number of manufacturing employees will be 187,000 in 1990.

Value Added by Manufacture in Oklahoma

The results of the projections to estimate total value added by manufacture in Oklahoma from 1970 to 2020 are shown in Table 48. In the middle projections, the number of manufacturing employees is estimated to be 235,000 in 2020. Value added per man-hour in 1958 dollars is projected to rise from $5.60 in 1965 to $28.47 in 2020 in the middle projection. Thus, total value added for the State in constant dollars is estimated at $11.8 billion in 2020, compared to $1.1 billion in 1965. The average annual rate of growth of value added by manufacture is thus 4.5 per cent for the middle projection. The rates for the high and low levels are 5.4 per cent and 3.8 per cent, respectively. From 1958 to 1966, the growth rate was 6.2 per cent. Unfortunately, comparable data on value added by manufacture for the United States from 1965 to 2020 is not available. However, the comparison of total value added by manufacture in Oklahoma in 1965 and 2020 with total gross national product gives an indication of the growth expected in this industry in the State.

TABLE 48

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED IN ALL MANUFACTURING IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	93	2,032	$ 28.47	$ 1,058	---	---	---	---
1970	117	2,025	$ 6.56	$ 1,554	114	2,006	6.49	1,484	109	1,984	$ 6.43	$1,391
1975	134	2,018	7.67	2,074	129	1,980	7.52	1,921	121	1,936	7.38	1,729
1980	159	2,011	8.98	2,871	154	1,954	8.72	2,624	143	1,890	8.47	2,289
1985	172	2,004	10.51	3,623	162	1,929	10.11	3,159	147	1,846	9.73	2,640
1990	191	1,997	12.31	4,695	172	1,904	11.73	3,841	155	1,806	11.17	3,127
1995	209	1,990	14.41	5,993	181	1,879	13.60	4,625	163	1,769	12.82	3,697
2000	227	1,984	16.86	7,593	191	1,855	15.76	5,584	170	1,717	14.72	4,297
2005	246	1,977	19.74	9,600	201	1,831	18.27	6,724	179	1,676	16.90	5,070
2010	267	1,970	23.11	12,156	213	1,807	21.68	8,344	187	1,636	19.40	5,935
2015	288	1,963	27.05	15,293	224	1,784	24.56	9,815	196	1,597	22.27	6,971
2020	310	1,956	31.67	19,203	235	1,761	28.47	11,782	206	1,559	25.56	8,209

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

In 1965, this ratio is 0.00172. By 2020 value added by manufacturing in Oklahoma in the high projection will be 0.00243 per cent of gross national product, while in the middle and low projections, the percentages will be 0.00224 per cent and 0.00237 per cent, respectively.

The "Significant Industries" in Oklahoma

Among the SIC groups that form the "Significant Industries" in Oklahoma, two groups show a decline in employment between 1958 and 1966.[3] Value added of all the groups, on the other hand, showed yearly increases. The two groups that declined in employment are Group 20, Food and Kindred Products, and Group 29, Petroleum and Coal Products. These two industries show an average annual rate of decrease in employment from 1958 to 1966 of 2.0 per cent and 2.7 per cent respectively. Value added by manufacture in food and petroleum has shown an average yearly increase of 1.7 per cent between 1958 and 1966. In projecting employment in these two groups, linear multiple regression analysis with population, labor force, civilian employment and manufacturing employment generated unusable results. Consequently, the projection of employment in these two groups followed a

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[3]The "significant" groups are 20, Food and Kindred Products; Group 27, Printing and Publishing; Group 29, Petroleum and Coal Products; Group 32, Stone, Clay, and Glass Products; Group 33, Primary Metal Industries; Group 34, Fabricated Metal Products; Group 35, Machinery, Except Electrical; Group 36, Electrical Machinery; and Group 37, Transportation Equipment. (See infra pp. 66-7.)

different approach from the projections of employment in the other industrial groups.

Value added in these two industries is assumed in this study to increase from 1965 to 2020 in the middle projections at an annual rate of 1.7 per cent, which is the average annual rate of growth of value added in these two groups from 1958 to 1966. Having projected this value added, and after projecting man-hours per man per year and value added per man-hour, the number of employees from 1970 to 2020 in each of these two groups was calculated. The results of the middle projections show an average decline in employment of 1.0 per cent in both industries from 1970 to 2020. The declining rate for the high projections and the low projections are 0.9 per cent and 1.0 per cent. Because of the special circumstances of food and petroleum production, the first being a consumable product closely related to population increase and the second being limited by the proved oil reserves in the State, the projections of these two industries as undertaken in this study do not seem to be far off from what could be logically expected in the future of these two industries. Furthermore, the highly automated industries of food and petroleum are expected to increase their degree of automation in future years. The available evidence seems to indicate that in a decade or two from now, employment in these two groups will be largely limited to managerial levels and maintenance crews.

The projection of the number of employees for the remaining "Significant Industries" followed the same method used to project manufacturing employment in the State. A linear multiple regression analysis with the independent variables as population, labor force, civilian employment, and manufacturing employment resulted in the estimating equations shown in Table 49. By the year 2020, the data suggest that the "Significant Industries" will increase in importance among all manufacturing groups in Oklahoma. Employment therein will account for 89.3 per cent of all manufacturing employment in the middle projections. Man-hours will be 89.7 per cent and value added, in 1958 dollars, will account for 87.9 per cent (Table 50). As to the projections of man-hours per man per year and value added per man-hour, in 1958 dollars, the national rates of growth in these two measures were also applied to those of 1965 of the "Significant Industries," just as was the procedure in total manufacturing.

In Tables 51 to 59 the projections of employment, man-hours per man per year, value added per man-hour in 1958 dollars, and total value added by the "Significant Industries" in the State are shown. These projections are presented in high, middle, and low levels.

Examination of the middle projections of the "Significant Industries" shows that the growth in these groups from 1970 to 2020 may be less than might have been expected.

TABLE 49

ESTIMATING EQUATIONS FOR PROJECTING EMPLOYMENT IN SELECTED MANUFACTURING GROUPS IN OKLAHOMA

SIC Group	Designation	Estimating Equation*
27	Printing and publishing	- 2.96270 - 0.00206 P + 0.00876 LF + 0.00617 CE + 0.00918 ME
32	Stone, clay and glass products	1.52853 - 0.00282 P - 0.00909 LF + 0.01845 CE + 0.05768 ME
33	Primary metal industries	- 6.40950 + 0.00173 P - 0.00318 LF + 0.00715 CE + 0.03107 ME
34	Fabricated metal products	-47.66837 - 0.00629 P + 0.04917 LF + 0.03513 CE - 0.03449 ME
35	Machinery, except electrical	-11.80372 + 0.00279 P - 0.01011 LF + 0.01965 CE + 0.09923 ME
36	Electrical machinery	-61.75099 + 0.02685 P + 0.01379 LF - 0.00911 CE - 0.01447 ME
37	Transportation equipment	53.14761 - 0.01152 P - 0.06266 LF - 0.01380 CE + 0.61323 ME

Source: Computer results.

*P = Population
LF = Labor Force
CE = Civilian Employment
ME = Manufacturing Employment

TABLE 50

MIDDLE PROJECTIONS OF NUMBER OF EMPLOYEES, TOTAL MAN-HOURS, AND VALUE ADDED BY MANUFACTURE, ADJUSTED, IN 1958 DOLLARS, OF THE "SIGNIFICANT INDUSTRIES" IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970 TO 2020

Year	Number of Employees	Total Man-hours (Thousands)	Value Added, adjusted (Millions of 1958 dollars)	Per Cent of Total Manufacturing Employees	Man-hours	Value Added
				----------Per Cent----------		
1965	77,341	157,522	$ 906	83.1	83.3	85.6
1970	96,200	193,500	1,269	84.4	84.6	85.5
1975	110,000	218,500	1,647	85.3	85.5	85.7
1980	133,000	261,000	2,254	86.4	86.7	85.9
1985	140,700	272,500	2,725	86.9	87.2	86.3
1990	150,000	286,600	3,316	87.2	87.5	86.3
1995	158,500	299,100	4,008	87.6	87.9	86.7
2000	167,800	312,600	4,725	87.9	88.2	84.6
2005	177,400	326,300	5,859	88.3	88.7	87.1
2010	188,800	342,800	7,128	88.6	89.1	85.4
2015	198,600	355,900	8,566	88.7	89.1	87.3
2020	209,800	371,100	10,354	89.3	89.7	87.9

Source: Tables 50 to 58.

For list and discussion of the "Significant Industries" see pp. 66-7.

TABLE 51

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF GROUP 20, FOOD AND KINDRED PRODUCTS, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	12.9	2,102	$ 5.37	$145.8	---	---	---	---
1970	12.3	2,094	$ 6.29	$162.0	12.3	2,075	6.22	158.7	12.2	2,052	$ 6.16	$154.2
1975	11 8	2,087	7.36	181.2	11.7	2,048	7.22	173.0	11.6	2,003	7.08	164.5
1980	11.3	2,080	8.61	202.4	11.1	2,022	8.37	187.9	11.0	1,956	8.12	174.7
1985	10.8	2,073	10.08	225.7	10.6	1,995	9.70	205.1	10.4	1,909	9.33	185.2
1990	10.3	2,066	11.80	251.1	10.0	1,970	11.25	221.6	9.8	1,864	10.71	195.6
1995	9.8	2,059	13.82	278.9	9.5	1,944	13.04	240.8	9.3	1,819	12.29	207.9
2000	9.4	2,052	16.17	311.9	9.1	1,919	15.11	263.9	8.8	1,776	14.11	220.5
2005	9.0	2,045	18.93	348.4	8.6	1,894	17.52	285.4	8.4	1,734	16.20	236.0
2010	8.6	2,038	22.16	388 4	8.2	1,870	20.31	311.4	7.9	1,693	18.60	248.8
2015	8.2	2,031	25.94	432.0	7.8	1,846	23.55	339.1	7.2	1,652	22.36	266.0
2020	7.9	2,024	30.36	485.4	7.4	1,822	27.30	368.1	7.1	1,613	24.51	280.7

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 52

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 27, PRINTING AND PUBLISHING, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	6.6	1,997	$ 4.74	$ 62.0	---	---	---	---
1970	7.6	1,990	$ 5.55	$ 83.9	7.5	1,971	5.50	81.3	7.3	1,950	$ 5.44	$ 77.4
1975	8.4	1,983	6.50	108.3	8.4	1,946	6.37	104.1	8.0	1,903	6.25	95.2
1980	9.7	1,976	7.60	145.7	9.7	1,921	7.39	137.7	9.2	1,858	7.17	122.6
1985	10.2	1,970	8.90	178.8	10.1	1,896	8.56	163.9	9.3	1,814	8.23	138.8
1990	11.1	1,963	10.42	227.0	10.6	1,871	9.93	196.9	9.3	1,771	9.45	155.6
1995	11.9	1,956	12.20	284.0	11.0	1,847	11.51	233.8	10.1	1,729	10.85	189.5
2000	12.7	1,950	14 28	353.6	11.4	1,823	13.34	277.2	10.4	1,687	12.46	218.6
2005	13.6	1,943	16.71	441.6	11.9	1,800	15.47	331.4	10.8	1,647	14.30	254.4
2010	14.5	1,936	19.56	549.1	12.4	1,776	17.93	394.9	11.2	1,608	16.42	295.7
2015	15.4	1,929	22.90	680.3	12.9	1,753	20.79	470.1	11.6	1,570	18.85	343.3
2020	16.4	1,923	26.80	845.2	13.4	1,731	24.10	559.0	12.0	1,533	21.64	398.1

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 53

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 29, PETROLEUM AND COAL PRODUCTS, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	5.4	1,944	$ 9.87	$103.3	---	---	---	---
1970	5.1	1,937	$11.55	$114.1	5.1	1,919	11.44	112.0	5.1	1,898	$11.33	$109.7
1975	4.9	1,931	13.52	127.9	4.9	1,894	13.27	123.2	4.8	1,853	13.01	115.7
1980	4.7	1,924	15.83	143.1	4.6	1,870	15.38	132.3	4.6	1,809	14.93	124.2
1985	4.5	1,917	18.53	159.8	4.4	1,845	17.83	144.7	4.3	1,766	17.14	130.2
1990	4.3	1,911	21.69	178.2	4.2	1,822	20.67	158.2	4.1	1,724	19.68	139.1
1995	4.1	1,904	25.39	198.2	4.0	1,798	23.96	172.3	3.9	1,683	22.60	148.3
2000	3.9	1,898	29.73	220.1	3.8	1,775	27.78	187.4	3.7	1,643	25.94	157.7
2005	3.7	1,891	34.80	243.5	3.6	1,752	32.20	203.1	3.5	1,604	29.78	167.2
2010	3.6	1,885	40.73	276.4	3.4	1,729	37.34	219.5	3.3	1,566	34.19	176.7
2015	3.4	1,878	47.68	304.4	3.2	1,707	43.28	236.4	3.1	1,528	39.25	185.9
2020	3.3	1,872	55.81	344.8	3.1	1,685	50.18	262.1	3.0	1,492	45.06	201.7

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 54

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 32, STONE, CLAY, AND GLASS PRODUCTS, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	7.6	1,917	$ 7.03	$ 102.1	---	---	---	---
1970	9.4	1,910	$ 8.23	$ 147.8	9.1	1,892	8.15	140.3	8.7	1,871	$ 8.07	$131.4
1975	10.5	1,904	9.63	184.3	10.3	1,868	9.45	181.8	9.6	1,827	9.26	162.4
1980	12.4	1,897	11.28	265.3	12.3	1,844	10.95	248.4	11.4	1,784	10.64	216.4
1985	13.2	1,891	13.20	329.5	12.8	1,820	12.70	295.9	11.6	1,741	12.21	246.6
1990	14.4	1,884	15.45	419.2	13.5	1,796	14 72	356.9	12.1	1,700	14.02	336.3
1995	15.6	1,878	18.09	530.0	14.1	1,773	17.07	426.7	12.6	1,659	16.09	336.3
2000	16.8	1,871	21.17	710.2	14.7	1,750	19.79	509.1	13.1	1,620	18.48	392.2
2005	18.0	1,865	24.78	831.9	15.4	1,728	22.94	610.5	13.6	1,581	21.21	456.0
2010	19.4	1,858	29.01	1,045.7	16.2	1,705	26.59	734.4	14.1	1,544	24.35	530.1
2015	20.7	1,852	33.96	1,301.9	16.7	1,683	30.83	866.5	14.7	1,507	27.96	619.4
2020	22.2	1,846	39.75	1,629.0	17.6	1,661	35.74	1,044.8	15.4	1,471	32.09	726.9

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 55

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 33, PRIMARY METAL INDUSTRIES IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	4.0	2,054	$ 5.46	$ 45.4	---	---	---	---
1970	5.1	2,047	$ 6.39	$ 66.7	5.0	2,027	6.33	64.2	4.7	2,005	$ 6.27	$ 59.1
1975	6.1	2,040	7.48	93.1	5.7	2,001	7.34	83.7	5.4	1,958	7.20	76.1
1980	7.5	2,033	8.76	133.6	7.0	1,975	8.51	117.7	6.4	1,911	8.26	101.0
1985	8.3	2,026	10.25	172.4	7.5	1,950	9.86	144.2	6.7	1,866	9.48	118.5
1990	9.4	2,019	12.00	227.7	8.1	1,925	11 43	178.2	7.2	1,821	10.89	142.8
1995	10.4	2,012	14.05	294.0	8.6	1,900	13.26	216.7	7.7	1,778	12.50	171.1
2000	11.5	2,005	16.44	379.1	9.2	1,875	15.37	265.1	8.1	1,736	14.35	201.8
2005	12.7	1,998	19.25	488.5	9.8	1,851	17.82	323.3	8.7	1,694	16.47	242.7
2010	13.9	1,991	22.53	623.5	10.5	1,827	20.65	396.1	9.1	1,654	18.91	284.6
2015	15.2	1,984	26.37	795.2	11.1	1,803	23.94	479.1	9.7	1,615	21.71	340.1
2020	16.5	1,977	30.87	1,007.0	11.8	1,780	27.76	583.1	10.3	1,576	24.93	404.7

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 56

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 34, FABRICATED METAL PRODUCTS, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	9.9	2,064	$ 5.44	$ 111.4	---	---	---	---
1970	15.3	2,057	$ 6.37	$ 200.5	15.1	2,037	6.31	194.1	14.2	2,015	$ 6.24	$ 178.5
1975	19.0	2,050	7.45	290.2	18.8	2,011	7.31	276.4	17.4	1,967	7.17	245.4
1980	24.8	2,043	8.73	442.3	25.0	1,985	8.48	420.8	22.7	1,920	8.23	358.7
1985	27.5	2,036	10.21	571.7	26.5	1,959	9.83	510.3	23.4	1,875	9.45	414.6
1990	31.8	2,029	11.96	771.7	28.8	1,934	11.39	634.4	25.1	1,830	10.85	498.4
1995	35.5	2,022	14.00	1,004.9	30.9	1,909	13.21	779.2	26.9	1,787	12.45	598.5
2000	39.4	2,015	16.38	1,300.4	33.0	1,884	15.31	951.9	28.6	1,744	14.30	713.3
2005	43.5	2,008	19.18	1,675.3	35.2	1,860	17.75	1,162.1	30.4	1,703	16.41	849.6
2010	47.8	2,001	22.45	2,147.3	37.8	1,836	20.58	1,428.3	32.2	1,662	18.84	1,008.2
2015	52.3	1,994	26.28	2,740.6	39.7	1,812	23.86	1,716.4	34.1	1,623	21.63	1,197.1
2020	57.1	1,987	30.76	3,490.0	42.5	1.789	27.66	2,103.1	36.1	1,584	24.83	1,419.8

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 57

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 35, MACHINERY, EXCEPT ELECTRICAL, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	11.7	2,025	$ 5.76	$ 136.2	---	---	---	---
1970	15.2	2,018	$ 6.74	$ 206.7	14.7	1,999	6.68	196.3	14.0	1,977	$ 6.61	$ 183.0
1975	17.8	2,011	7.89	282.4	16.9	1,973	7.74	258.1	15.8	1,930	7.59	231.4
1980	21.4	2,004	9.24	396.3	20.3	1,947	8.98	354.9	18.8	1,884	8.72	308.9
1985	23.6	1,997	10.81	509.5	21.6	1,922	10.40	431.8	19.5	1,839	10.01	359.0
1990	26.5	1,990	12.66	667.6	23.2	1,897	12.06	530.8	20.7	1,795	11.49	426.9
1995	29.2	1,984	14.82	858.6	24.6	1,873	13.98	644.1	22.0	1,753	13.19	508.7
2000	32.1	1,977	17.35	1,101.1	26.1	1,849	16.21	782.3	23.1	1,711	15.14	598.4
2005	35.0	1,970	20.31	1,400.4	27.7	1,825	18.79	949.9	24.5	1,670	17.38	711.1
2010	38.3	1,963	23.77	1,787.1	29.5	1,801	21.79	1,157.7	25.8	1,631	19.95	839.5
2015	41.5	1,956	27.82	2,258.3	31.0	1,778	25.26	1,392.3	27.2	1,592	22.90	991.6
2020	45.0	1,950	32.57	2,858.0	32.9	1,755	29.28	1,690.6	28.7	1,554	26.29	1,172.5

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 58

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 36, ELECTRICAL MACHINERY, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	6.9	2,038	$ 6.16	$ 87.3	---	---	---	---
1970	10.0	2,031	$ 7.21	$ 146.4	9.4	2,012	7.14	135.0	9.3	1,990	$ 7.07	$ 130.8
1975	13.2	2,024	8.44	225.5	11.0	1,986	8.28	180.9	10.8	1,942	8.12	170.3
1980	17.0	2,017	9.88	338.8	13.1	1,960	9.60	246.5	12.5	1,896	9.32	220.9
1985	20.9	2,010	11.57	486.0	15.5	1,935	11.13	333.8	14.3	1,851	10.70	283.2
1990	24.9	2,003	13.54	675.3	17.6	1,900	12.90	431.4	16.2	1,807	12.28	359.5
1995	29.0	1,996	15.85	917.5	19.8	1,885	14.95	558.0	18.1	1,764	14.10	450.2
2000	33.4	1,989	18.55	1,232.3	22.0	1,861	17.34	709.9	20.0	1,722	16.19	557.6
2005	38.0	1,982	21.72	1,635.9	24.3	1,837	20.10	897.2	22.0	1,681	18.59	687.5
2010	42.8	1,976	25.42	2,149.8	27.2	1,813	23.30	1,149.0	24.1	1,641	21.34	844.0
2015	47.8	1,969	29.76	2,801.0	29.7	1,789	27.01	1,435.1	28.3	1,602	24.50	1,110.7
2020	53.1	1,962	34.83	3,628.7	32.1	1,766	31.32	1,775.5	28.3	1,564	28.12	1,244.6

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

TABLE 59

PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF SIC GROUP 37, TRANSPORTATION EQUIPMENT, IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020

	High				Middle				Low			
Year	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)	Employees (000)	Man-hours per man per year	Value added per man-hour (1958 dollars)	Total value added (000)
1965	---	---	---	---	12.3	2,085	$ 4.37	$ 112.0	---	---	---	---
1970	19.2	2,078	$ 5.12	$ 204.3	18.0	2,058	5.07	187.8	15.9	2,035	$ 5.02	$ 162.4
1975	23.7	2,071	5.99	294.0	22.3	2,031	5.87	265.9	19.1	1,987	5.76	218.6
1980	30.5	2,064	7.01	441.3	29.9	2,005	6.81	408.3	25.9	1,940	6.61	332.1
1985	33.2	2,056	8.20	559.7	31.7	1,979	7.89	495.0	26.5	1,894	7.59	380.9
1990	37.8	2,049	9.60	743.5	34.0	1,954	9.15	607.9	28.4	1,849	8.71	457.4
1995	42.3	2,042	11.24	970.9	36.0	1,928	10.61	736.4	30.2	1,805	10.00	545.1
2000	46.4	2,035	13.16	1,242.6	38.5	1,904	12.30	777.8	31.5	1,762	11.49	637.7
2005	50.8	2,028	15.41	1,587.6	40.9	1,879	14.26	1,095.9	33.8	1,720	13.19	766.8
2010	56.1	2,021	18.03	2,044.2	43.6	1,855	16.53	1,336.9	35.5	1,679	15.14	902.4
2015	61.0	2,014	21.11	2,593.4	46.5	1,831	19.16	1,631.0	37.7	1,639	17.38	1,073.9
2020	66.0	2,007	24.71	3,273.1	49.0	1,807	22.22	1,967.4	40.3	1,600	19.95	1,286.4

Source: Computer projections of employees. Man-hours per man per year and value added per man-hour projected at rates of growth of national projections.

These middle projections for 1990 and 2020, which are presented in Tables 60 and 61, indicate that in 1990, value added per man-hour, in 1958 dollars, of the industrial groups in that category is expected to be $11.57 while the corresponding figure for "All Other Industries" will be $12.86. In 2020, these figures are $27.90 and $33.45, respectively. In 1966, value added per man-hour, in 1958 dollars, was $5.91 for the "Significant Industries" and $5.02 for "All Others." This leads to the conclusion that some of the industrial groups in the "All Others" category may grow significantly in Oklahoma between the present time and the year 2020. Such growth may be the result of expansion in certain groups such as Group 30, Rubber and Plastics Products. For example, at present a national plant for producing tires for automobiles is in the process of being erected in Oklahoma City. Another is planned near Ardmore.

An encouraging result of the middle projections of the "Significant Industries" is the change in ranking of the industrial groups contained in this category. By 2020, the available data indicates that the industries producing nondurable goods may move to lower ranks than those they occupied in 1966. For example, value added by Group 20, Food and Kindred Products, which occupied second place among the "Significant Industries" in 1966, is projected to move to eighth place by 1990 and 2020. Group 29, Petroleum and Coal Products, is projected to move from fifth place in 1966 to

TABLE 60

MIDDLE PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF THE "SIGNIFICANT INDUSTRIES," "ALL OTHER INDUSTRIES," AND TOTAL MANUFACTURING IN OKLAHOMA, 1990

SIC Group	Number of employees (Thousands)	Man-hours per man per year	Value added per man-hour	Total Value added (Millions)
			---------1958 dollars----------	
20	10.0	1,970	$11.25	$ 221.6
27	10.6	1,871	9.93	196.9
29	4.2	1,822	20,67	158.2
32	13.5	1,796	14.72	356.9
33	8.1	1,925	11.43	178.2
34	28.8	1,934	11.39	634.4
35	23.2	1,897	12.06	530.8
36	17.6	1,900	12.90	431.4
37	34.0	1,954	9.15	607.9
Total, Significant industries	150.0	1,911	11.57	3,316.3
"All other" industries	22.0	1,856	12.86	525.1
Total Manufacturing	172.0	1,904	11.73	3,841.4

Source: Tables 50-58.

For list and discussion of the "Significant Industries" see pp. 66-7.

TABLE 61

MIDDLE PROJECTIONS OF EMPLOYMENT, MAN-HOURS, AND VALUE ADDED OF THE "SIGNIFICANT INDUSTRIES," "ALL OTHER INDUSTRIES," AND TOTAL MANUFACTURING IN OKLAHOMA, 2020

SIC Group	Number of employees (Thousands)	Man-hours per man per year	Value added per man-hour	Total Value added (Millions)
			1958 dollars	
20	7.4	1,822	$27.30	$ 368.1
27	13.4	1,731	24.10	559.0
29	3.1	1,685	50.18	262.1
32	17.6	1,661	35.74	1,044.8
33	11.8	1,780	27.76	583.1
34	42.5	1,789	27.66	2,103.1
35	32.9	1,755	29.28	1,690.6
36	32.1	1,766	31.32	1,775.5
37	49.0	1,807	22.22	1,967.4
Significant industries	209.8	1,769	27.90	10,353.7
All other industries	25.2	1,694	33.45	1,428.1
Total Manufacturing	235.0	1,761	28.47	11,781.8

Source: Tables 50-58.

For list and discussion of the "Significant Industries" see pp. 66-7.

ninth place in 1990 and 2020. Thus, it seems that the future efforts of industrialization in Oklahoma may be geared toward the production of durable goods rather than non-durables. This is a sign of growth in manufacturing in a state or a region, because, generally, when activities shift from producing non-durables to durables, it is considered a sign of growth.[4]

Alternative Methods for Projecting Value Added

Some persons who are enthusiastic about the State of Oklahoma may prefer a higher basis for projecting value added by manufacture in the State. Such a basis could be the rate of growth in total value added of each industrial group or value added per man-hour of each industry, from 1958 to 1966. The growth rate in value added by the groups for the period 1958-1966 is considerably higher than that resulting from the high level projections which were presented in the beginning of this chapter. In Table 62 the rates of growth in value added by manufacture for the "Significant Industries" and all manufacturing in Oklahoma are shown.

A study of that table reveals two groups that can not reasonably be expected to continue to increase at the same rate they increased from 1958 to 1966. These two groups are Group 33, Primary Metal Products, and Group 36, Electrical Machinery. During that period, these two groups increased at

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[4]Perloff, op. cit., p. 111.

TABLE 62

AVERAGE ANNUAL RATE OF GROWTH OF VALUE ADDED BY MANUFACTURE FOR THE "SIGNIFICANT INDUSTRIES" AND TOTAL MANUFACTURING IN OKLAHOMA, 1958-1966, AND OF THE MIDDLE PROJECTION, 1965-2020

Group	Average annual rate of growth 1958-1966	1965-2020 High	1965-2020 Middle	1965-2020 Low
	Per cent			
20	1.7	2.2	1.7	1.2
27	3.8	4.9	4.1	3.4
29	1.7	2.2	1.7	1.2
32	6.0	5.2	4.3	3.6
33	10.3	5.8	4.8	4.1
34	7.0	6.5	5.5	4.7
35	9.1	5.7	4.7	4.0
36	21.6	7.0	5.6	4.9
37	8.9	6.3	5.3	4.5
All Manufacturing	6.2	5.4	4.5	3.8

Source: 1958-1966 data computed from Census of Manufactures, 1958 and 1963, and the Annual Survey of Manufacutrers, 1959-1962 and 1964-1966.

1965-2020 data computed from Tables 50-58.

the rates of 10.3 per cent and 21.6 per cent, respectively. However, the Primary Metal Industries are limited mainly by the amount of primary metals existing in the State. As mentioned previously, zinc is the main metal in this group in Oklahoma. If projection of value added by this group continues in the future at a yearly rate of 10.3 per cent, the amount of value added by 2020, estimated at over $10 billion, will probably exceed the value of all zinc concentrates that will ever be mined in the State. As to electrical machinery, estimating its value added at a yearly rate of 21.6 per cent would result in a value added figure of $3.5 billion in 2020. This seems unreasonable as total value added by all manufacture in Oklahoma in that year is projected in the middle series to be $12 billion.

Another method for estimating value added by manufacture in Oklahoma from 1970 to 2020 would be on the basis of projections of value added per man-hour by SIC groups according to the average annual rate of growth of such a measure in Oklahoma from 1958 to 1966. As shown in Table 45, these rates together with the rates of the high, middle, and low projections are in line with national estimates. The analysis of projections made on this basis will not be detailed in this study. However, such projections for the "Significant Industries" appear in Tables A-5-A-13. As Oklahoma's rate of growth in value added per man-hour from 1958 to 1966 was in most industries higher than the nation's,

value added, in 1958 dollars, based on both rates differs greatly. For example, in Group 29, Petroleum and Coal Products, a rate of 3.0 versus a rate of 1.8 results in nearly doubling of value added by 2020.

The results of the projections contained in this study coincided closely with similar ones obtained from other methods where different independent variables were used in the regression analysis. However, after testing several approaches that yielded similar results, it is believed that the projections in this chapter depend for their accuracy on the accuracy of the basic data used to derive them. These projections are mainly based on government figures of population, labor force, and national income. Whether this basis makes them reliable or not is a matter of controversy among economists. Professor Morgenstern of Princeton University says:[5]

> National income is a total of composites that differ in reliability from sector to sector and year to year, and hence the error of the composite is, as economist Simon Kuznets has said, a "complex amalgam of errors in the parts whose magnitude is not easily determined."

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[5]Oskar Morgenstern, "Qui Numerare Incipit Errare Incipit," Readings in Economics from Fortune (New York: Holt, Rinehart, and Winston, Inc., 1967), pp. 128-129.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study grew out of a study by the Regional Economics Division of the United States Office of Business Economics of the U.S. Department of Commerce, undertaken on behalf of the Water Resources Council. The Water Resources Council is interested in projections for various water resource areas of the nation and needs projections of income, employment, production, and population through the year 2020. In many instances the Congress requires projections covering a fifty year period before making appropriations for water resource projects.

The Regional Economics Division first undertook to make projections at the national level after which it disaggregated the national projections into regional projections. In many instances, it is much easier to make national projections than to make projections for a region or state. The reason is that at the national level data on exports and imports are readily available and have a high degree of reliability. When allowance is made for exports and imports, the U.S. economy can be considered a closed

economy. At the state or regional level, this is not possible. The reason is the large volume of imports and exports. For example, Oklahoma does not produce any automobiles but produces a considerable volume of petroleum products. The petroleum is traded for automobiles and other items which Oklahoma does not produce.

A preliminary report of the Regional Economics Division study became available in the spring of 1968. So far as is known, no one has attempted to do this for an individual state. The present study is an attempt to find out some of the major problems involved in trying to make similar estimates for a state. Due to limitations of time and money, it was necessary to limit the present study to an examination of the population and labor force of Oklahoma and to the manufacturing segment of the Oklahoma economy.

At the national level, the first task was to estimate the total population of the United States through the year 2020. This was followed by estimates of the population of working age (14 years of age and over); an estimate of the civilian labor force, civilian employment, private civilian employment, hours worked per year, and product per man hour. Similar estimates, with appropriate adjustments, were made for the state of Oklahoma.

Data for the present study were published mainly by the federal government and the government of the state of Oklahoma. In a number of cases, it was necessary for the

Bureau of the Census to withhold data on individual manufacturing firms in Oklahoma in order to avoid disclosure of the activities of these firms. In these cases, it was sometimes necessary to use data for the West South Central region or data for the nation.

There was a Census of Manufacturing in 1958 and in 1963. The data for the intercensus years are found in the Annual Survey of Manufactures, which is based on a sample. In general the data in the 1958 Census of Manufactures are comparable with that of 1963. Prior to 1958 the data are not comparable and could not be used in the present study.

Three levels of projection were made for each item. They are the high, middle, and low. The projections made by the Office of Business Economics are in dollars of constant 1958 purchasing power. This was followed in the present study. At the national level, the middle projection of gross national product is $5.3 trillion in the year 2020. Similar projections by the Resources for the Future and by the National Planning Association are broadly similar in their results. One of the reasons is that the bases for projecting the national economy were similar.

The population of Oklahoma increased from 2.2 million in 1950 to 2.3 million in 1960 and to an estimated 2.5 million in 1965. This was a slower rate of growth than that for the nation during the same period. According to

our projections, the population of Oklahoma may reach 3.3 million by the year 2020 in the middle range.

The U.S. Bureau of the Census has published projections at five year intervals of the population, 14 years of age and over, of the nation through the year 2020 and projections for the states through 1985. Because of the availability of data on births and deaths, the projections through 1985 can be considered to have a high degree of reliability. In 1985, the population 14 years of age and over is expected to be in the nation in the middle range, 72.9 per cent of the total population, and in Oklahoma 76.4 per cent. The assumption was made for Oklahoma that this percentage will remain constant after 1985. Consequently, it is applied to the total population of Oklahoma to estimate the population 14 years of age and over. The middle projections for Oklahoma show that the population of working age may rise from 1,787,000 in 1965 to 2,551,000 in the year 2020. The annual average rate of growth is 0.6 per cent, compared to 1.4 per cent for the United States during the same period.

The labor force participation rate for Oklahoma, in the middle projections, is expected to be 59.8 per cent by the year 1990 and to remain constant thereafter. This is similar to the labor participation rate for the United States. In Oklahoma the labor force participation rate in 1990 is expected to be 56.9 per cent in the middle range.

Accordingly, the labor force for Oklahoma is projected to rise from 904,000 in 1960 to 1,452,000 in the year 2020.

The civilian labor force in Oklahoma rises from 897,000 in 1965 to 1,419,000 in the middle projections. The difference between the total labor force and the civilian labor force is the number of persons in the armed forces.

Total civilian employment is derived from the civilian labor force. Its size depends on the success of the civilian labor force participants in finding employment. The unemployment rates, published by the Oklahoma Employment Security Commission indicate that unemployment in Oklahoma amounted to 4.9 per cent in 1960 and 4.3 per cent in 1965. National rates were 5.6 and 4.6 respectively. In making projections of total civilian employment for the nation, the Office of Business Economics assumed a constant unemployment rate from 1990 through 2020 of 3.5 per cent for the high projection, 4.0 per cent for the middle, and 4.5 per cent for the low projection. Although the annual rate of unemployment for Oklahoma has been below that of the nation in 1960 and 1965, the three assumptions used at the national level were adopted for Oklahoma. As a result, in the middle projections total civilian employment in Oklahoma is projected to rise from 858,000 in 1965 to 1,362,000 in the year 2020.

Private civilian employment in Oklahoma grew at a substantially lower rate than was true for the nation as a whole. It was 0.3 per cent in Oklahoma during the period 1960 to 1965 and 1.3 per cent for the nation. In the middle projections private civilian employment in Oklahoma is expected to be 1,085,000 in the year 2020.

The next step was to present an historical picture of manufacturing activity in Oklahoma from 1958 through 1966. The reason for selecting this period was that the years 1958 and 1963 were census years for the manufacturing industry. The Censuses published for these years are comparable with each other, but Censuses prior to 1958, (for example 1954 and 1947) are not comparable with the later ones because of changes in the definition of several industries and revisions of the Standard Industrial Classification system in 1957. The latest manufacturing statistics available during the work on the thesis were those for 1966. Manufacturing data for intercensus years between 1958 and 1966 are published in the Annual Survey of Manufactures. The information contained in the surveys are based on sampling of the manufacturing establishments in each state. The Standard Industrial Classification (SIC) groups included in the study of manufacturing in Oklahoma are:

Group 20--Food and Kindred Products
Group 22--Textile Mill Products
Group 23--Apparel and Related Products
Group 24--Lumber and Wood Products
Group 25--Furniture and Fixtures

Group 26--Paper and Allied Products
Group 27--Printing and Publishing
Group 28--Chemicals and Allied Products
Group 29--Petroleum and Coal Products
Group 30--Rubber and Miscellaneous Plastics Products

Group 31--Leather and Leather Products
Group 32--Stone, Clay, and Glass Products
Group 33--Primary Metal Industries
Group 34--Fabricated Metal Products
Group 35--Machinery, Except Electrical

Group 36--Electrical Machinery
Group 37--Transportation Equipment
Group 38--Instruments and Related Products
Group 39--Miscellaneous Manufacturing
Group 19--Ordnance and Accessories

Examination of individual manufacturing industries in Oklahoma revealed that nine of them accounted for about 85 per cent of total manufacturing activity in the State. These were designated as "Significant Industries." The remaining categories were grouped together and referred to as "All other" manufacturing industries. The significant industries are:

Group 20--Food and Kindred Products
Group 27--Printing and Publishing
Group 29--Petroleum and Coal Products
Group 32--Stone, Clay, and Glass Products
Group 33--Primary Metal Industries

Group 34--Fabricated Metal Products
Group 35--Machinery Except Electrical
Group 36--Electrical Machinery
Group 37--Transportation Equipment

Data on some Oklahoma manufacturing industries, in the Census and Annual Survey, are not published and an attempt was made to fill the gaps in these publications. The Bureau of the Census is prohibited by law from publishing any statistics that disclose information reported by individual companies. The first step was to estimate the number of manufacturing establishments in Oklahoma and then to determine the number of employees in manufacturing. The next step was to determine the total number of man-hours of employees in manufacturing. Total man-hours for employees in manufacturing in Oklahoma were estimated by multiplying the average number of man-hours per year per employee by the estimated number of all employees. In those cases for which data were lacking in the Census, data for employees for the West South Central region, or for the United States, were used.

The number of manufacturing employees in Oklahoma increased from 81,000 in 1958 to 100,000 in 1963, an average annual rate of growth of 2.7 per cent, compared with 2.1 per cent for the nation during that period. Oklahoma ranked above the average for the nation in the rate of growth of wages and salaries received from manufacturing. The average rate of growth in Oklahoma from 1958 through 1966 was 7.8 per cent, compared with 6.0 per cent for the nation. Wages and salaries received from manufacturing in Oklahoma grew

from 9.5 per cent of total income in the state in 1958 to 11.2 per cent in 1966.

Between 1958 and 1966, value added by manufacturing in Oklahoma grew from $725,000,000 to $1,242,000,000, an annual rate of growth of 7 per cent, while the nation's rate of growth during the same period was 7.4 per cent.

One of the encouraging features of the manufacturing industries in Oklahoma is the fact that productions of durable goods has been increasing. For example, value added by the durable goods industries rose from 49.0 per cent of total value added in Oklahoma in 1958 to 60.1 per cent in 1966. Productivity is measured by estimating value added by manufacture. Value added by manufacture varies because of the capital-labor ratio and the shape of the production function. The projections used in the present study do not assume any significant changes in the capital-labor ratio or any noteworthy shift in the manufacturing processes in the State. The projections are simply an extension of the trend of nine years, from 1958 to 1966. The three levels of projections (high, middle, and low) give the range of what value added by manufacturing in the state might be on the basis of projections of the population and labor force of Oklahoma through the year 2020. If significant changes occur in the population and the labor force during the coming years, the projections will need to be modified.

Value added in manufacturing in Oklahoma in constant 1958 dollars is based on three essential measures: the number of employees, the man-hours per man per year, and the value added per man hour. This is in accordance with the methodology used for projecting these measures for the nation. In 1965 Oklahoma's value added per man hour in manufacturing in 1958 dollars was $5.60, while for the nation it was $5.68. The results of the middle projections show that in 2020 value added per man hour in Oklahoma in the manufacturing sector will be $28.47, in constant 1958 dollars. The equation for estimating total employment in manufacturing in Oklahoma is:

$$ME = 146.7740 - 0.0006\ P - 0.1483\ LF + 0.4397\ CE$$

where ME = Manufacturing employment

P = Total population in the State

LF = Labor force

CE = Civilian employment.

According to the middle projections, Oklahoma is expected to have approximately 235,000 persons engaged in manufacturing in 2020. Total value added by manufacturing for the State in constant 1958 dollars is estimated to be $11.8 billion in 2020, compared with $1.1 billion in 1965. In the middle projections the average annual rate growth of value added by manufactures is 4.5 per cent.

As a result of the efforts undertaken in this study, a few final comments may be made. It is feasible to make

reasonably good estimates of the total population, the total labor force, the civilian labor force, and the private civilian labor force for the State of Oklahoma and to make projections similar to those for the nation. Sufficient information is also available to obtain a picture of the trends in manufacturing activity in the State and to make projections. Where data for the State were not available or were withheld to avoid disclosure of the activities of individual firms, it was possible to use data for the West South Central Region or data for the nation.

Differences in output per man per hour per year are due mainly to differences in the industrial mix, the size of firm, and the modernity of equipment. For example, there is little evidence that there are significant differences between the output per man-hour in a plant in Oklahoma employing 100 production workers, producing the same or similar commodities, and built about the same time as a plant in Texas or Louisiana, or New Jersey. Hence, if data are available on the number of employees in a given type plant in Oklahoma, but data on output per man hour are withheld, it is possible to arrive at the missing data for Oklahoma by using data on similar plants in other states. Fortunately, in most cases where the activity in Oklahoma is significant, complete or almost complete data are generally available in published form. It is in the areas where the activity is relatively small and where only one or a few

plants engage in the activity that it is necessary to use data from outside the state.

Since data on the labor force and the manufacturing segment of Oklahoma's economy have been completed, the remaining task for estimating gross productivity of Oklahoma, consists of preparation of similar data on the non-manufacturing segment of the State. The experience gained in preparation of data on the manufacturing segment suggests that useful data can be prepared for the non-manufacturing segment in a similar manner.

As additional information becomes available through new Censuses and from other sources, revisions of the current projections can be made. As is true at the national level, the projections are in constant need of updating, although the basic data have been assembled. Additional information will make it possible to improve the projections.

APPENDIX

TABLE A-1

INDUSTRIAL COMPONENTS WHICH FORM ANALYTICAL BASIS FOR NATIONAL PROJECTIONS

1. Agriculture, forestry, fisheries
   - Farms
   - Agriculture services, forestry, and fisheries

2. Mining
   - Metal mining
   - Coal mining
   - Crude petroleum and natural gas
   - Mining and quarrying (nonmetallic)

3. Contract construction

4. Manufacturing
   - Food and kindred products
   - Tobacco
   - Textile mill products
   - Apparel and other fabricated textile products
   - Lumber and wood products, except furniture
   - Furniture and fixtures
   - Paper and allied products
   - Printing, publishing and allied industries
   - Chemicals and allied products
   - Petroleum refining and allied products
   - Rubber and miscellaneous plastic products
   - Leather and leather products
   - Stone, clay, and glass products
   - Primary metal industries
   - Fabricated metal products
   - Machinery, except electrical
   - Electrical machinery
   - Motor vehicles and motor vehicle equipment
   - Transportation equipment (except motor vehicles)
   - Instruments and miscellaneous manufacturing

5. Transportation, communication, and public utilities
   - Transportation
   - Telephone and telegraph
   - Radio broadcasting and television
   - Electric, gas, and sanitary services

6. Wholesale and retail trade

7. Finance, insurance, and real estate

TABLE A-1--Continued

8.	Services
	Hotels, personal services, miscellaneous repair services
	Miscellaneous business services, legal services, miscellaneous professional services
	Automobile repair, automotive services and garages
	Motion pictures, amusements and recreational services, except motion pictures.
	Medical and other health services, educational services, and non-profit organizations
	Private households services
9.	Government
	State and local government
	Federal civilian general and federal enterprise
	Federal military
10.	Rest of the world

Source: Office of Business Economics, National Projections, p. 44.

TABLE A-1--Continued

8.	Services
	Hotels, personal services, miscellaneous repair services
	Miscellaneous business services, legal services, miscellaneous professional services
	Automobile repair, automotive services and garages
	Motion pictures, amusements and recreational services, except motion pictures.
	Medical and other health services, educational services, and non-profit organizations
	Private households services
9.	Government
	State and local government
	Federal civilian general and federal enterprise
	Federal military
10.	Rest of the world

Source: Office of Business Economics, National Projections, p. 44.

TABLE A-2

STEPS AND ASSUMPTIONS BEYOND PRIVATE CIVILIAN EMPLOYMENT FOLLOWED BY THE OFFICE OF BUSINESS ECONOMICS IN DERIVING NATIONAL PROJECTIONS

A. Hours Worked per Man per Year in the Private Economy

Rates of decline from 1965:
High : - 0.07 per cent per year
Middle : - 0.26 per cent per year
Low : - 0.48 per cent per year

B. Product per Man-hour in the Private Economy, in 1958 Dollars

Rates of increase from 1965:
High : + 3.2 per cent per year
Middle : + 3.0 per cent per year
Low : + 2.8 per cent per year

C. Product per man-year in the Private Economy, in 1958 Dollars

(A) (B)

D. Private Gross Product, in 1958 Dollars

(Private Civilian Employment) (C)

E. Civilian General Government Gross Product, in 1958 Dollars

(Civilian Government Employment) ($4,685.8319)*

F. Government Enterprise Gross Product, in 1958 Dollars

(Government Enterprise Employment) ($6,451.6995)*

G. Military Gross Product, in 1958 Dollars

(Number of the Armed Forces) ($4,012.4908)*

H. Gross National Product, in 1958 Dollars

(D + E + F + G)

Source: Office of Business Economics, National Projections.

*These constants were derived by dividing total product by the number of employees in each measure for the year 1965.

TABLE A-3

MANUFACTURING ACTIVITY IN OKLAHOMA, 1963

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
20	Food and Kindred Products			
	*2011	Meat slaughtering plants		
	2013	Meat processing plants		
	*2015	Poultry dressing plants		
	2021	Creamery butter		
	2022	Natural and process cheese		
	2023	Condensed and evaporated milk		
	*2024	Ice cream and frozen desserts		
	*2026	Fluid milk		
	2032	Canned specialties	2031	Canned and cured seafoods
	*2033	Canned fruits and vegetables	2034	Dehydrated foods products
	2035	Pickles, sauces, salad dressings	2036	Fresh and frozen packaged fish
	2037	Frozen fruits and vegetables		
	2041	Flour mills	2044	Rice milling
	*2042	Prepared animal feeds	2046	Wet corn milling
	2043	Cereal preparations		
	2045	Blended and prepared flour		
	2051	Bread and related products		
	2052	Biscuits, crackers, and cookies		
			2061	Raw cane sugar
			2062	Cane sugar refining
			2063	Beet sugar

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	*2071	Confectionery products	2072	Chocolate and cocoa products
			2073	Chewing gum
	2082	Malt liquors	2083	Malt
	*2086	Bottled and canned soft drinks	2084	Wines and brandy
			2085	Distilled liquor, except brandy
	2087	Flavorings		
	2091	Cottonseed oil mills	2093	Vegetable oil mills, n.e.c.
	2092	Soybean oil mills	2098	Macaroni and spaghetti
	*2094	Animal and marine fats and oils		
	2096	Shortening and cooking oils		
	2095	Roasted coffee		
	*2097	Manufactured ice		
	*2099	Food preparations, n.e.c.		
21	Tobacco Manufactures		2111	Cigarettes
			2121	Cigars
			2131	Chewing and smoking tobacco
			2141	Tobacco stemming and redrying
22	Textile Mill Products		2211	Weaving mills, cotton
			2221	Weaving mills, synthetic

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
		2231 Weaving, finishing mills, wool
		2241 Narrow fabric mills
	2251 Women's hosiery, except socks	2252 Hosiery, n.e.c. 2253 Knit outerwear mills 2254 Knit underwear mills 2256 Knit fabric mills 2259 Knitting mills, n.e.c.
	2261 Finishing plants, cotton 2269 Finishing plants, n.e.c.	2262 Finishing plants, synthetic
		2271 Woven carpets and rugs 2272 Tufted carpets and rugs 2279 Carpets and rugs, n.e.c.
		2281 Yarn mills, except wool 2282 Throwing and winding mills 2283 Wool yarn mills 2284 Thread mills
	2293 Padding and upholstery filling	2291 Felt goods, n.e.c. 2292 Lace goods 2294 Processed textile waste 2295 Coated fabric, not rubberized 2296 Tire cord and fabric 2297 Scouring and combing plants 2298 Cordage and twine 2299 Textile goods, n.e.c.

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
23	Apparel and related products			
	2311	Men's and boys' suits and coats		
	2322	Men's and boys' underwear	2321	Men's dress shirts and nightwear
	2327	Separate trousers	2323	Men's and boys' neckwear
	*2328	Work clothing	2329	Men's and boys' clothing, n.e.c.
	2335	Dresses	2331	Blouses
	2337	Women's suits, coats, and skirts		
	2339	Women's outerwear, n.e.c.		
	2341	Women's and children's underwear		
	2342	Corsets and allied garments		
	2352	Hats and caps	2351	Millinery
	2361	Children's dresses and blouses	2363	Children's coats and suits
	2369	Children's outerwear, n.e.c.		
			2371	Fur goods
	2381	Fabric dress and work gloves	2384	Robes and dressing gowns
	2386	Leather and sheeplined clothing	2385	Waterproof outergarments
	2387	Apparel belts	2389	Apparel, n.e.c.

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	2381	Fabric dress and work gloves	2384	Robes and dressing gowns
	2386	Leather and sheeplined clothing	2385	Waterproof outergarments
	2387	Apparel belts	2389	Apparel, n.e.c.
	2391	Curtains and draperies	2393	Textile bags
	2392	Housefurnishings, n.e.c.	2395	Pleating and stitching
	2394	Canvas products	2396	Apparel findings
	2399	Textile products, n.e.c.	2397	Schiffli machine embroideries
24	Lumber and Wood Products			
	*2411	Logging camps and contractors		
	2421	Sawmills and planing mills		
	2426	Hardwood dimension and flooring		
	2429	Special product sawmills, n.e.c.		
	*2431	Millwork plants	2432	Veneer and plywood plants
	*2433	Prefabricated wood products		
			2441	Nailed wooden boxes and shook
			2442	Wirebound boxes and crates
			2443	Veneer and plywood containers
			2445	Cooperage
	*2491	Wood preserving		
	*2499	Wood products, n.e.c.		

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
25	Furniture and Fixtures	
	*2511 Wooden furniture, not upholstered	2519 Household furniture, n.e.c.
	2512 Wood furniture, upholstered	
	2514 Metal household furniture	
	*2515 Mattresses and bedsprings	
	2522 Metal office furniture	2521 Wood office furniture
	2531 Public building furniture	
	2541 Wood partitions and fixtures	
	2542 Metal partitions and fixtures	
	2591 Venetian blinds and shades	2599 Furniture and fixtures, n.e.c.
26	Paper and Allied Products	
		2611 Pulp mills
		2621 Paper mills, except building
	2631 Paperboard mills	
	2642 Envelopes	2641 Paper coating and glazing
	2643 Bags, except textile bags	2644 Wallpaper
	2649 Sanitary paper products and converted paper products, n.e.c.	2645 Die cut paper and board
		2646 Pressed and molded pulp goods
		2647 Sanitary paper products

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
	2651 Folding paperboard boxes	2652 Set-up paperboard boxes
	2653 Corrugated shipping containers	
	2654 Sanitary food containers	
	2655 Fiber cans, tubes, drums, etc.	
	2661 Building paper and board mills	
27	Printing and publishing	
	*2711 Newspapers	
	*2721 Periodicals	
	2731 Books, publishing and printing	
	2732 Book printing	
	2741 Miscellaneous publishing	
	*2751 Printing, except lithographic	
	2752 Printing, lithographic	
	2753 Engraving and plate printing	
	2761 Manifold business forms	
		2771 Greeting card manufacturing
	2782 Blankbooks; looseleaf binders	
	2789 Bookbinding and related work	

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
	2791 Typesetting 2793 Photoengraving 2794 Electrotyping and stereotyping	
28	Chemicals and Allied Products	
	*2813 Industrial gases 2818 Organic chemicals, n.e.c. 2819 Inorganic chemicals, n.e.c.	2812 Alkalies and chlorine 2814 Cyclic (coal tar) crudes 2815 Intermediate coal tar products 2816 Inorganic pigments
	2821 Plastics materials and resins	2822 Synthetic rubber 2823 Cellulosic man-made fibers 2824 Organic fibers, noncellulosic
	2831 Biological products 2833 Medicinals and botanicals 2834 Pharmaceutical preparations	
	2841 Soap and other detergents 2842 Polishes and sanitation goods 2844 Toilet preparations	2843 Surface active agents
	*2851 Paints and allied products	
	*2861 Gum and wood chemicals	

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
	*2871 Fertilizers	
	2872 Fertilizers, mixing only	
	2879 Agricultural chemicals, n.e.c.	
	2891 Glue and gelatin	2893 Printing ink
	2892 Explosives	
	2895 Carbon black	
	2899 Chemical preparations, n.e.c.	
29	Petroleum and Coal Products	
	*2911 Petroleum refining	
	2951 Paving mixtures and blocks	
	2952 Asphalt felts and coatings	
	2992 Lubricating oils and greases	
	2999 Petroleum and coal products, n.e.c.	
30	Rubber and Plastics Products, N.E.C.	
	3011 Tires and inner tubes	
		3021 Rubber footwear
		3031 Reclaimed rubber

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
	3069 Rubber products, n.e.c.	
	3079 Plastics products, n.e.c.	
31	Leather and Leather Products	
		3011 Leather tanning and finishing
		3121 Industrial leather belting
	3131 Footwear cut stock	
		3141 Shoes, except rubber 3142 House slippers
		3151 Leather gloves
	3161 Luggage	
	3171 Handbags and purses 3172 Small leather goods	
	3199 Leather goods, n.e.c.	
32	Stone, Clay, and Glass Products	
	3211 Flat glass	

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	3221	Glass containers		
	3229	Pressed and blown glass, n.e.c.		
	3231	Products of purchased glass		
	*3241	Cement, hydraulic		
	*3251	Brick and structural tile	3253	Ceramic wall and floor tile
			3255	Clay refractories
			3259	Structural clay products, n.e.c.
	3262	Vitreous china food utensils	3261	Vitreous plumbing fixtures
	3263	Fine earthenware food utensils	3264	Porcelain Electrical supplies
	3269	Pottery products, n.e.c.		
	3271	Concrete block and brick		
	*3272	Other concrete products		
	*3273	Ready mixed concrete		
	3274	Lime		
	3275	Gypsum products		
	3281	Cut stone and stone products		
	3293	Gaskets and insulations	3291	Abrasive products
	3295	Minerals, ground or treated	3292	Asbestos products
	3299	Nonmetallic products, n.e.c.	3296	Mineral wool
			3297	Nonclay refractories

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
33	Primary Metal Industries			
	3312	Blast Furnaces and steel mills	3313	Electrometallurgical products
			3315	Steel wire drawing, etc.
			3316	Cold finishing of steel shapes
			3317	Steel pipe and tube
	3321	Gray iron founderies	3322	Malleable iron foundries
	3323	Steel foundries		
	*3333	Primary zinc	3331	Primary copper
	3339	Primary nonferrous metals, n.e.c.	3332	Primary lead
			3334	Primary aluminum
	3341	Secondary nonferrous metals		
	3356	Rolling and drawing, n.e.c.	3351	Copper rolling and drawing
	3357	Nonferrous wire drawing, etc.	3352	Aluminum rolling and drawing
	3361	Aluminum castings		
	3362	Brass, bronze, copper castings		
	3369	Nonferrous castings, n.e.c.		
	3391	Iron and steel forgings	3392	Nonferrous forgings
	3399	Primary metal industries, n.e.c.		

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
33	Fabricated Metal Products			
	3411	Metal cans		
	3423	Hand and edge tools	3421	Cutlery
	3429	Hardware, n.e.c.	3425	Hand saws and saw blades
	3433	Heating equipment, except electric	3431	Metal plumbing fixtures
			3432	Plumbing fittings, brass goods
	*3441	Fabricated structural steel		
	*3442	Metal doors, sash, and trim		
	*3443	Boiler shop products		
	*3444	Sheet metal work		
	*3446	Architectural metal work		
	*3449	Miscellaneous metal work, n.e.c.		
	3451	Screw machine products		
	3452	Bolts, nuts, rivets, and washers		
	3461	Metal stampings		
	*3471	Plating and polishing		
	*3479	Metal coatings, engraving, etc.		
	*3481	Fabricated wire products, n.e.c.		

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	3491	Metal barrels, drums, and pails	3492	Safes and vaults
	*3494	Valves and pipe fittings	3493	Steel springs
	3498	Fabricated pipes and fittings	3496	Collapsible tubes
	3499	Fabricated metal products, n.e.c	3497	Metal foil and leaf
35	Machinery, Except Electrical			
	3519	Internal combustion engines	3511	Steam engines and turbines
	3522	Farm machinery and equipment		
	3531	Construction machinery	3534	Elevators and moving stairways
	3532	Mining machinery and equipment		
	*3533	Oil field machinery		
	3535	Conveyors		
	3536	Hoists, cranes, and monorails		
	3537	Industrial trucks and tractors		
	3541	Metal-cutting machine tools	3545	Machine tool accessories
	3542	Metal-forming machine tools		
	3544	Special dies and tools		
	3548	Metalworking machinery, n.e.c		
	3551	Food products machinery	3552	Textile machinery

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	3554	Paper industries machinery	3553	Woodworking machinery
	3555	Printing trades machinery		
	*3559	Special industry machines, n.e.c.		
	*3561	Pumps and compressors		
	3562	Ball and roller bearings		
	3564	Blowers and fans		
	3565	Industrial patters		
	3566	Power transmission equipment		
	3567	Industrial furnaces and ovens		
	3569	General industry machines, n.e.c.		
	3571	Computing and related machines	3572	Typewriters
	3576	Scales and balances		
	3579	Office machines, n.e.c.		
	3581	Automatic vending machines		
	3582	Commercial laundry equipment		
	*3585	Refrigeration machinery		
	3586	Measuring and dispensing pumps		
	3589	Service industry machines, n.e.c.		
	*3599	Miscellaneous machinery		

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
36	Electrical Machinery	
	3611 Electric measuring instruments	3612 Transformers 3613 Switchgears and switchboards
	3621 Motors and generators 3622 Industrial controls 3623 Electric welding apparatus 3629 Electric industrial goods, n.e.c.	3624 Carbon and graphite products
	3631 Household cooking equipment 3634 Electric housewares and fans 3635 Household vacuum cleaners 3639 Household appliances, n.e.c.	3632 Household refrigerators 3633 Household laundry equipment 3636 Sewing machines
	3641 Electric lamps 3642 Lighting fixtures 3643 Current carrying devices	3644 Noncurrent carrying devices
	3651 Radio and TV receiving sets	3652 Phonograph records
	3661 Telephone; telegraph apparatus 3662 Radio, TV communications equipment	
	3672 Cathode Ray picture tubes 3679 Electronic components, n.e.c.	3671 Electron tubes, receiving type 3673 Electron tubes, transmitting 3674 Semiconductors

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:		Oklahoma has no manufacturing activity in:	
	3691	Storage batteries	3692	Primary batteries, dry and wet
	3694	Engine electrical equipment	3693	X ray apparatus and tubes
	3699	Electrical products, n.e.c.		
37	Transportation Equipment			
	3713	Truck and bus bodies		
	3715	Truck trailers		
	*3717	Motor vehicles and parts		
	3721	Aircraft	3723	Aircraft propellers and parts
	3722	Aircraft engines and parts		
	*3729	Aircraft equipment, n.e.c.		
	3731	Ship building and repairing		
	3732	Boat building and repairing		
			3741	Locomotives and parts
			3742	Railroad and street cars
	3751	Motorcycles, bicycles, and parts		
	*3791	Trailer coaches		
	*3799	Transportation equipment, n.e.c.		

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
38	Instruments and Related Products	
	3811 Scientific instruments	
	*3821 Mechanical measuring devices	3822 Automatic temperature controls
	3831 Optical instruments and lenses	
	3841 Surgical and medical instruments	
	3842 Surgical appliances and supplies	
	3843 Dental equipment and supplies	
	3851 Ophthalmic goods	
		3861 Photographic equipment
	3871 Watches and clocks	
	3872 Watchcases	
39	Miscellaneous Manufacturing	
	3911 Jewelry, precious metal	3912 Jewelers' findings and materials
	3914 Silverware and plated ware	3913 Lapidary work
		3931 Musical instruments and parts

TABLE A-3--Continued

SIC Group	Oklahoma has manufacturing activity in:	Oklahoma has no manufacturing activity in:
	3941 Games and toys	3942 Dolls
	3949 Sporting and athletic goods	3943 Children's vehicles
	3951 Pens and mechanical pencils	3952 Lead pencils and art goods
	3953 Marking devices	3955 Carbon paper and inked ribbons
	3962 Artificial flowers	3961 Costume jewelry
	3964 Needles, pins, and fasteners	3963 Buttons
	3981 Brooms and brushes	3982 Hard surface floor covering
	*3988 Morticians' goods	3983 Matches
		3984 Candles
		3987 Lamp shades
	*3993 Signs and advertising displays	3992 Furs, dressed and dyed
	3999 Miscellaneous products, n.e.c.	3995 Umbrellas, parasols, and canes

Source: 1963 Census of Manufactures.

*Industries mentioned in Table 2, Vol. II of the Census of Manufactures, 1963.

TABLE A-4

CORRECTION FACTORS USED FOR ESTIMATING VALUE ADDED BY MANUFACTURE FOR OKLAHOMA, 1963

Group	Sub-group	Correction factor
20	201	.761 253 662
	202	.955 869 169
	203	.761 253 662
	204	.881 075 110
	205	.975 960 497
	208	.761 253 662
	209	.464 244 716
23	231	1.088 974 850
	232	.942 441 054
	233	1.088 974 850
	234	1.088 974 850
	235	1.088 974 850
	236	1.088 974 850
	238	1.118 320 610
	239	.769 407 705
24	242	.898 606 811
25	251	.682 666 666
	252	.810 457 516
	253	.810 457 516
	254	1.247 524 752
	259	.810 457 516
26	263	1.386 042 240
	264	1.386 042 240
	265	1.209 060 681
	266	1.386 042 240
27	273	1.090 689 821
	274	.691 743 119
	275	.840 958 605
	276	.691 743 119
	278	.840 958 605
	279	.865 397 688

TABLE A-4--Continued

Group	Sub-group	Correction factor
28	281	.486 433 095
	282	.754 304 102
	283	.754 304 102
	284	.754 304 102
	287	.534 437 663
	289	.754 304 102
29	295	.514 643 119
	299	.514 643 119
30	301	.993 899 092
	306	.993 899 092
	307	.993 899 092
31	313	.793 969 849
	316	.793 969 849
	317	.793 969 849
	319	.793 969 849
32	321	.771 747 042
	323	.771 747 042
	326	.771 747 042
	327	.877 166 212
	328	.771 747 042
	329	.771 747 042
33	331	.885 629 775
	332	.820 214 464
	333	.885 629 775
	334	.885 629 775
	335	.885 629 775
	336	.906 936 214
	339	.885 629 775

TABLE A-4--Continued

Group	Sub-group	Correction factor
34	341	1.186 800 000
	342	1.186 800 000
	343	.870 950 610
	345	.870 950 610
	346	.870 950 610
	349	.870 950 610
35	353	1.110 208 816
	354	.926 793 557
	355	.860 100 376
	356	.947 853 425
	357	.742 702 702
	359	.742 702 702
	358	1.246 846 846
36	361	1.012 635 182
	362	.527 455 765
	363	1.012 635 182
	364	1.012 635 182
	365	1.012 635 182
	366	1.012 635 182
	367	1.012 635 182
	369	1.012 635 182
37	371	.614 007 703
	372	.614 007 703
38	381	.919 089 759
	383	.919 089 759
	384	.919 089 759
	385	.919 089 759
	387	.919 089 759
39	394	1.246 428 571
	395	1.246 428 571
	396	1.246 428 571

Source: Computed by the author.

TABLE A-5

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 20, FOOD AND KINDRED PRODUCTS IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 3.5 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent -------1958 dollars------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	12.9	2,102	$ 5.37	---	$145.8	---
1970	12.3	2,075	6.38	$ 6.22	162.8	$158.7
1975	11.7	2,048	7.58	7.22	181.6	173.0
1980	11.1	2.022	9.00	8.37	202.0	187.0
1985	10.6	1,995	10.68	9.70	225.8	205.1
1990	10.0	1.970	12.69	11.25	250.0	221.6
1995	9.5	1,944	15.07	13.04	278.3	240.8
2000	9.1	1,919	17.90	15.11	312.6	263.9
2005	8.6	1,894	21.26	17.52	346.3	285.4
2010	8.2	1,870	25.25	20.31	387.2	311.4
2015	7.8	1,846	29.99	23.55	431.8	339.1
2020	7.4	1,822	35.62	27.30	480.3	368.1

Source: Tables 25 and 50.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth, as set forth by the Office of Business Economics.

TABLE A-6

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 27, PRINTING AND PUBLISHING IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 1.8 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent ------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	6.6	1,997	$ 4.74		$ 62.0	
1970	7.5	1,971	5.18	5.50	76.6	$ 81.3
1975	8.4	1,946	5.67	6.37	92.7	104.1
1980	9.7	1,921	6.20	7.39	115.5	137.7
1985	10.1	1,896	6.77	8.56	129.6	163.9
1990	10.6	1,871	7.40	9.93	146.8	196.9
1995	11.0	1,847	8.10	11.51	164.6	233.8
2000	11.4	1,823	8.85	13.34	183.9	277.2
2005	11.9	1,800	9.68	15.47	207.3	331.4
2010	12.4	1,776	10.58	17.93	233.0	394.9
2015	12.9	1,753	11.57	20.79	261.6	470.1
2020	13.4	1,731	12.65	24.10	293.4	559.0

Source: Tables 27 and 51.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-7

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 29, PETROLEUM AND COAL PRODUCTS IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 4.9 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent -------1958 dollars------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	5.4	1,944	$ 9.87		$103.3	
1970	5.1	1,919	12.54	$11.44	122.7	$112.0
1975	4.9	1,894	15.93	13.27	147.8	123.2
1980	4.6	1,870	20.23	15.38	174.0	132.3
1985	4.4	1,845	25.70	17.83	208.6	144.7
1990	4.2	1,822	32.65	20.67	249.9	158.2
1995	4.0	1,798	41.47	23.96	298.3	172.3
2000	3.8	1,775	52.68	27.78	355.3	187.4
2005	3.6	1,752	66.91	32.20	422.0	203.1
2010	3.4	1,729	85.00	37.34	499.7	219.5
2015	3.2	1,707	108.25	43.28	591.3	236.4
2020	3.1	1,685	137.58	50.18	718.6	262.1

Source: Tables 29 and 52.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-8

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 32, STONE, CLAY, AND GLASS PRODUCTS IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 4.7 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent -------1958 dollars------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	7.6	1,917	$ 7.03		$ 102.1	
1970	9.1	1,892	8.85	$ 8.15	152.4	$ 140.3
1975	10.3	1,868	11.13	9.45	214.1	181.8
1980	12.3	1,844	14.00	10.95	317.5	248.4
1985	12.8	1,820	17.62	12.70	410.5	295.9
1990	13.5	1,796	22.17	14.72	537.5	356.9
1995	14.1	1,773	27.89	17.07	697.2	426.7
2000	14.7	1,750	35.09	19.79	902.7	509.1
2005	15.4	1,728	44.15	22.94	1,174.9	610.5
2010	16.2	1,705	55.55	26.59	1,534.3	734.4
2015	16.7	1,683	69.90	30.83	1,964.6	866.5
2020	17.6	1,661	87.94	35.74	2,570.8	1,044.8

Source: Tables 31 and 53.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-9

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 33, PRIMARY METAL INDUSTRIES IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 4.6 per cent -------1958 dollars------- *	Projected at annual rate of 3.0 per cent **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	at national annual rate of growth
1965	4.0	2,054	$ 5.46		$ 45.4	
1970	5.0	2,027	6.84	$ 6.33	69.3	$ 64.2
1975	5.7	2,001	8.56	7.34	97.6	83.7
1980	7.0	1,975	10.72	8.51	148.2	117.7
1985	7.5	1,950	13.42	9.86	196.3	144.2
1990	8.1	1,925	16.80	11.43	262.0	178.2
1995	8.6	1,900	21.04	13.26	343.8	216.7
2000	9.2	1,875	26.35	15.37	454.5	265.1
2005	9.8	1,851	32.99	17.82	598.4	323.3
2010	10.5	1,827	41.31	20.65	792.5	396.1
2015	11.1	1,803	51.72	23.94	1,035.1	479.1
2020	11.8	1,780	64.76	27.76	1,360.2	583.1

Source: Tables 33 and 54.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-10

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 34, FABRICATED METAL PRODUCTS IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 2.1 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	9.9	2,064	$ 5.44		$ 111.4	
1970	15.1	2,037	6.04	$ 6.31	185.8	$ 194.1
1975	18.8	2,011	6.70	7.31	253.3	276.4
1980	25.0	1,985	7.43	8.48	368.7	420.8
1985	26.5	1,959	8.24	9.83	427.8	510.3
1990	28.8	1,934	9.15	11.39	509.6	634.4
1995	30.9	1,909	10.15	13.21	598.7	779.2
2000	33.0	1,884	11.26	15.31	700.1	951.9
2005	35.2	1,860	12.50	17.75	818.4	1,162.1
2010	37.8	1,836	13.87	20.58	962.6	1,428.3
2015	39.7	1,812	15.38	23.86	1,106.4	1,716.4
2020	42.5	1,789	17.07	27.66	1,297.9	2,103.1

Source: Tables 35 and 55.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-11

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 35, MACHINERY, EXCEPT ELECTRICAL IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 4.4 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent -------1958 dollars------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	11.7	2,025	$ 5.76		$ 136.2	
1970	14.7	1,999	7.14	$ 6.68	209.8	$ 196.3
1975	16.9	1,973	8.86	7.74	295.4	258.1
1980	20.3	1,947	10.99	8.98	434.4	354.9
1985	21.6	1,922	13.63	10.40	565.9	431.8
1990	23.2	1,897	16.90	12.06	743.8	530.8
1995	24.6	1,873	20.96	13.98	965.7	644.1
2000	26.1	1,849	26.00	16.21	1,254.7	782.3
2005	27.7	1,825	32.24	18.79	1,629.8	949.9
2010	29.5	1,801	39.99	21.79	2,124.6	1,157.7
2015	31.0	1,778	49.59	25.26	2,733.3	1,392.3
2020	32.9	1,755	61.51	29.28	3,551.6	1,690.6

Source: Tables 37 and 56.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-12

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 36, ELECTRICAL MACHINERY IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 2.9 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth
1965	6.9	2,038	$ 6.16		$ 87.3	
1970	9.4	2,012	7.11	$ 7.14	134.5	$ 135.0
1975	11.0	1,986	8.20	8.28	179.1	180.9
1980	13.1	1,960	9.46	9.60	242.9	246.5
1985	15.5	1,935	10.91	11.13	327.2	333.8
1990	17.6	1,900	12.59	12.90	421.0	431.4
1995	19.8	1,885	14.53	14.95	542.3	558.0
2000	22.0	1,861	16.76	17.34	686.2	709.9
2005	24.3	1,837	19.34	20.10	863.3	897.2
2010	27.2	1,813	24.24	23.30	1,195.4	1,149.0
2015	29.7	1,789	25.74	27.01	1,478.2	1,435.1
2020	32.1	1,766	29.69	31.32	1,683.1	1,775.5

Source: Tables 39 and 57.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

TABLE A-13

MIDDLE PROJECTIONS OF VALUE ADDED IN GROUP 37, TRANSPORTATION EQUIPMENT IN OKLAHOMA, BY FIVE YEAR INTERVALS, 1970-2020, BY TWO METHODS

Year	Number of Employees (Thousands)	Man-hours per man per year	Value added per man-hour Projected at annual rate of 4.4 per cent -------1958 dollars------- *	Value added per man-hour Projected at annual rate of 3.0 per cent -------1958 dollars------- **	Total value added at Oklahoma annual rate of growth -Millions of 1958 dollars-	Total value added at national annual rate of growth -Millions of 1958 dollars-
1965	12.3	2,085	$ 4.37		$ 112.0	
1970	18.0	2,058	5.42	$ 5.07	200.8	$ 187.8
1975	22.3	2,031	6.72	5.87	304.4	265.9
1980	29.9	2,005	8.34	6.81	500.0	408.3
1985	31.7	1,979	10.34	7.89	648.7	495.0
1990	34.0	1,954	12.82	9.15	851.7	607.9
1995	36.0	1,928	15.90	10.61	1,103.6	736.4
2000	38.5	1,904	19.72	12.30	1,445.6	777.8
2005	40.9	1,879	24.46	14.26	1,879.8	1,095.9
2010	43.6	1,855	30.34	16.53	2,453.8	1,336.9
2015	46.5	1,831	37.63	19.16	3,203.9	1,631.0
2020	49.0	1,807	46.66	22.22	4,131.4	1,967.4

Source: Tables 41 and 58.

*Annual rate of growth from 1958 to 1966 in Oklahoma.

**National assumptions of annual rate of growth as set forth by the Office of Business Economics.

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