A SIMULATION MODEL FOR ANALYZING ALTERNATIVE CHANGES OF THE OKLAHOMA ECONOMY AND PROJECTING ECONOMIC VARIABLES FROM 1967 TO 1985

By

A. UNAL SARIGEDIK

Agricultural Engineer
University of Ankara
Ankara, Turkey
1964

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1972

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF PHILOSOPHY
December, 1975

A SIMULATION MODEL FOR ANALYZING ALTERNATIVE CHANGES OF THE OKLAHOMA ECONOMY AND PROJECTING ECONOMIC VARIABLES FROM 1967 TO 1985

Thesis Approved:

Gerald A. Doeksen
Thesis Adviser

Dean F. Schreiner

Darrell E. Ray

Julian H. Bradshaw

N. N. Durham
Dean of the Graduate College

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to Dr. Gerald A. Doeksen, my major adviser, for his encouragement and assistance throughout my Ph.D. program. His guidance, assistance, and suggestions in conducting this study and preparing the manuscript are deeply appreciated. Appreciation is also extended to the other members of the committee: Dr. Julian H. Bradsher, Dr. Dean F. Schreiner, and Dr. Daryll E. Ray. Special thanks are due to Dr. James S. Plaxico, Head of the Department of Agricultural Economics, for his encouragement and support.

I am grateful to the Ministry of Agriculture of Turkey and the Department of Agricultural Economics, Oklahoma State University, for making my graduate program feasible.

Thanks are extended to Ms. Dixie Anne Mosier for her encouragement during this study and help in preparing this manuscript; to Mr. James Chang for programming the simulation model; to Ms. Eileen Garrison for typing the rough copy; to Ms. Grayce Wynd for typing the final draft; to Ms. Judy Hays for the figures, and to Ms. Raye Stucker for the tables.

Finally, special gratitude is expressed to my mother, Emine, and my father, M. Seyfeddin, for their encouragement, understanding, and support throughout my education program. I gratefully dedicate this dissertation to them.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A. Need for the Study

Economic development plans are important at the state level. Robert S. Herman [15] indicates a great and growing need for improved, long-range economic and social programming by the states.[1] Part of the need is related to increasing urbanization and other population movements, to changing structural social and economic conditions, to advancing technologies, and to increasing state and local government budgets. In addition, other pressures are generating demands for improving programming by state governments. Requirement for long-range program planning to qualify for federal planning is one of them. The Community Mental Health Facilities Act and Economic Opportunity Act are recent examples of this type of pressure. State governments are also being pushed into planning by local governments.

> As local planning activities expand, local officials will become more aware of the need for broader planning efforts by the state... Too often a town and county finds its road-building program upset by a state decision to buy land for a recreation area, or for a new hospital, or for some other purpose which the local government was unable to anticipate in terms of probability, placement, or timing. [15, p. 143].

---

[1] Numerals appearing in [ ] refer to bibliography references in the dissertation.

Neighboring states also pressure for planning as states become increasingly aware of the importance of coordinating their programs with neighboring states. Water supply, air pollution control, and transportation represent some of the examples of this nature where these are, in general, long-term projects. The case of Oklahoma supports all of these points made by Herman.

Economic projections are useful for economic planning. Through these projections, the direction of the economy is established and the need for resources can be determined. Projections are also necessary for evaluation of various development strategies. Selection of the strategy which satisfies the objectives with available resources can be determined through evaluation processes. Research provides information for regional plans and is needed to evaluate development programs. Research is needed for evaluating the programs in government, agriculture, and industry activities. The effects of various governmental decisions need to be evaluated through these studies.

There is very little research completed for Oklahoma which may be used to project State economic variables and to evaluate alternative development strategies. The economic and social changes which occurred from 1950 to 1960 in Oklahoma are analyzed by Charles H. Little [20]. Two input-output studies [21],[22] measured the interrelationships of industry sectors of the State economy and of three districts in the State. Another study [11] analyzed selected aspects of recent economic growth in Oklahoma. The most extensive study about the Oklahoma economy is completed by Gerald A. Doeksen and Dean F. Schreiner [7]. This is a simulation model of Oklahoma centered around input-output analysis. Different from the previous studies, this dynamic analysis

provides economic projections from 1963 to 1980 and can be useful in evaluating various development strategies. An economic impact approach was applied to compare economic variables in terms of generating income and employment and cost per job created or one million dollars generated.

The Oklahoma simulation model developed in this study is designed to satisfy four needs. First, projections of the state economic variables through 1985 are needed by state planners. Second, an analysis of human resource is needed for analyzing future manpower needs. Third, a method is needed to measure the impact of changes in the private sector. Fourth, there is a growing need for analysis of government programs.

B. The Oklahoma Economy

Oklahoma is basically an agricultural state where grain and livestock production are equally important. Total farm marketings were $2,047,000,000, and ranked 15th among the states in 1973. Mineral production is also an important element of the Oklahoma economy. Petroleum and natural gas provide the greatest share in mineral production of the state, which was ranked sixth among the states in 1972. Median family income of Oklahoma was $7,720, and it was ranked as 42nd in 1969. Percent of persons below the low income level was 18.8 and percent of families was 15.0 in 1969. Personal income per capita was $4,189, which was below the United States average and ranked 37th in 1973 [77].

C. The Objectives of the Study

The major objective of this study is to develop a social accounting

system for Oklahoma for 1967 and to utilize this information to develop an economic model for purposes of projecting economic variables and evaluating planning strategies. More specifically, the objectives are:

A. To develop a social accounting system for Oklahoma which includes:
   1. a transaction account,
   2. a capital account,
   3. a human resource account, and
   4. a government account.

B. To develop a dynamic simulation model applicable to Oklahoma which will:
   1. project employment, population, income, revenue and other state economic variables from 1967 through 1985,
   2. provide manpower analysis for each sector and for Oklahoma, and
   3. provide a tool which can be used for analyzing the impact of alternative development strategies.

D. The Organization of the Study

Chapter II presents the Oklahoma social accounting system. Chapter III presents the interindustry account and the capital account. Chapter IV includes the human resource account and the government account. In Chapter V, the simulation model is developed and presented. Projections and discussions of economic variables (such as employment, income, revenue, etc.) and the manpower analysis are presented in Chapter VI. An illustration of how the model can be used to measure

the impact of a change in the economy is presented in Chapter VII. Summary, conclusions and implications are contained in Chapter VIII. Data sources are discussed in detail in Chapters III through V, and in Appendix A.

CHAPTER II

THE OKLAHOMA SOCIAL ACCOUNTING SYSTEM

The Oklahoma social accounting system is an extension of Doeksen's system [4] which was adopted from Perloff and Leven's proposed model [40]. Stock-flow and flow-stock relationships are included in this model.[1] Perloff and Leven find these relationships essential for most dynamic regional analyses. In this chapter, sector specification is discussed, followed by an overview of the Oklahoma social accounting system.

A. Sector Aggregation and Data Sources

The base year of this study is 1967 because secondary data are more complete for this year than for any other recent year. Secondary data are used because collection of primary data requires much time and is also very expensive. Most of the data needed for the model are available in census and other government documents.[2]

The criteria used for aggregating the economy into a workable number of sectors are (1) the sectors' importance in Oklahoma economy, and

---

[1] Stock-flow relationship is described as the increase in flows which results from a given increase in stocks. Flow-stock relationship refers to the induced effect on capital formation of an increased demand in the regions output.

[2] Data sources are discussed in detail in Chapters III through V and in Appendix A.

(2) their consistency with available data as classified by the Bureau of Labor Statistics.

Agricultural activities are divided into two sectors: (1) livestock and livestock products, and (2) crops and other agricultural products. Crude oil mining is an important part of the Oklahoma economy; therefore, a separate sector for mining activity is included.

Aggregation of manufacturing sectors is necessary. Criteria used to aggregate manufacturing activity are (1) similarities among industries, and (2) their importance to the State's economy. Manufacturing industries are aggregated into nine sectors. These nine sectors are: (a) food and kindred products; (b) petroleum refining and related industries; (c) lumber and wood products, furniture and fixtures, and paper and allied products; (d) apparel and other finished products made from fabrics and similar materials, (e) printing and publishing and allied industries; (f) machinery, electrical machinery equipment and supplies; (g) transportation equipment; (h) primary metal industries, fabricated metal products except ordnance, machinery, and transportation equipment; and (i) all other manufacturing industries.

The service-type activities of the economy are combined into five sectors: (a) construction; (b) transportation, communication, and public utilities; (c) wholesale and retail trade; (d) finance, insurance, and real estate; and (e) services.

Each of these activities, previously described, represents one of the endogenous sectors of the model. The model also has five exogenous or final demand sectors. These are (a) federal government, (b) state and local government, (c) private capital formation, (d) households, and (e) exports. A complete listing of the endogenous and exogenous

sectors, along with the associated sector numbers which are referred throughout this study is presented in Table I.

B. The Oklahoma Accounts

Oklahoma social accounting system includes four major accounts and is outlined as a flow chart in Figure 1. The accounts included in the system are a capital account, an interindustry account, a human resource account, and a government account. The interindustry account is the base of the system. Capital, human resource, and government accounts are directly related to the interindustry account.

1. The Interindustry Account

As outlined in Figure 1, the interindustry account of the Oklahoma social accounting system consists of three major parts: a transaction or interindustry flow table, a direct coefficients table, and a direct and indirect coefficients table. The transaction table forms the base of the interindustry account, and other tables are derived directly from it.

The transaction table represents a double entry accounting system. Reading down the colums of the endogenous sectors, purchases of the column sectors are determined. Likewise, reading across each row of the endogenous sectors, sales of each row sector are determined. Exogenous sectors are included in the final demand section. Exogenous sectors' purchases of goods and services from the producing sectors are included in this section. The primary input section consists of federal government, state and local government , imports, households, and depreciation. The amount of primary inputs purchased by the processing

TABLE I

SECTORS OF THE OKLAHOMA MODEL

Endogenous Sectors

Sector Name	Sector No.
Agriculture	
Livestock and livestock products	(1)
Crops and other agricultural products	(2)
Mining	
All mining	(3)
Manufacturing	
Food and kindred products	(5)
Petroleum refining and related industries	(6)
Lumber and wood products, furniture and fixtures, paper and allied products	(7)
Apparel and other finished products made from fabrics and similar materials	(8)
Printing, publishing, and allied industries	(9)
Machinery, electrical machinery equipment and supplies	(10)
Transportation equipment	(11)
Primary metal industries, fabricated metal products except ordnance, machinery, and transportation equipment	(12)
Miscellaneous and all other manufacturing industries	(13)
Services	
Construction	(4)
Transportation, communication, and public utilities	(14)
Wholesale and retail trade	(15)
Finance, insurance, and real estate	(16)
Services	(17)

Exogenous Sectors

Sector Name	Sector No.
Government	
Federal government	(18)
State and local government	(19)
Others	
Private capital formation	(20)
Households	(21)
Exports	(22)

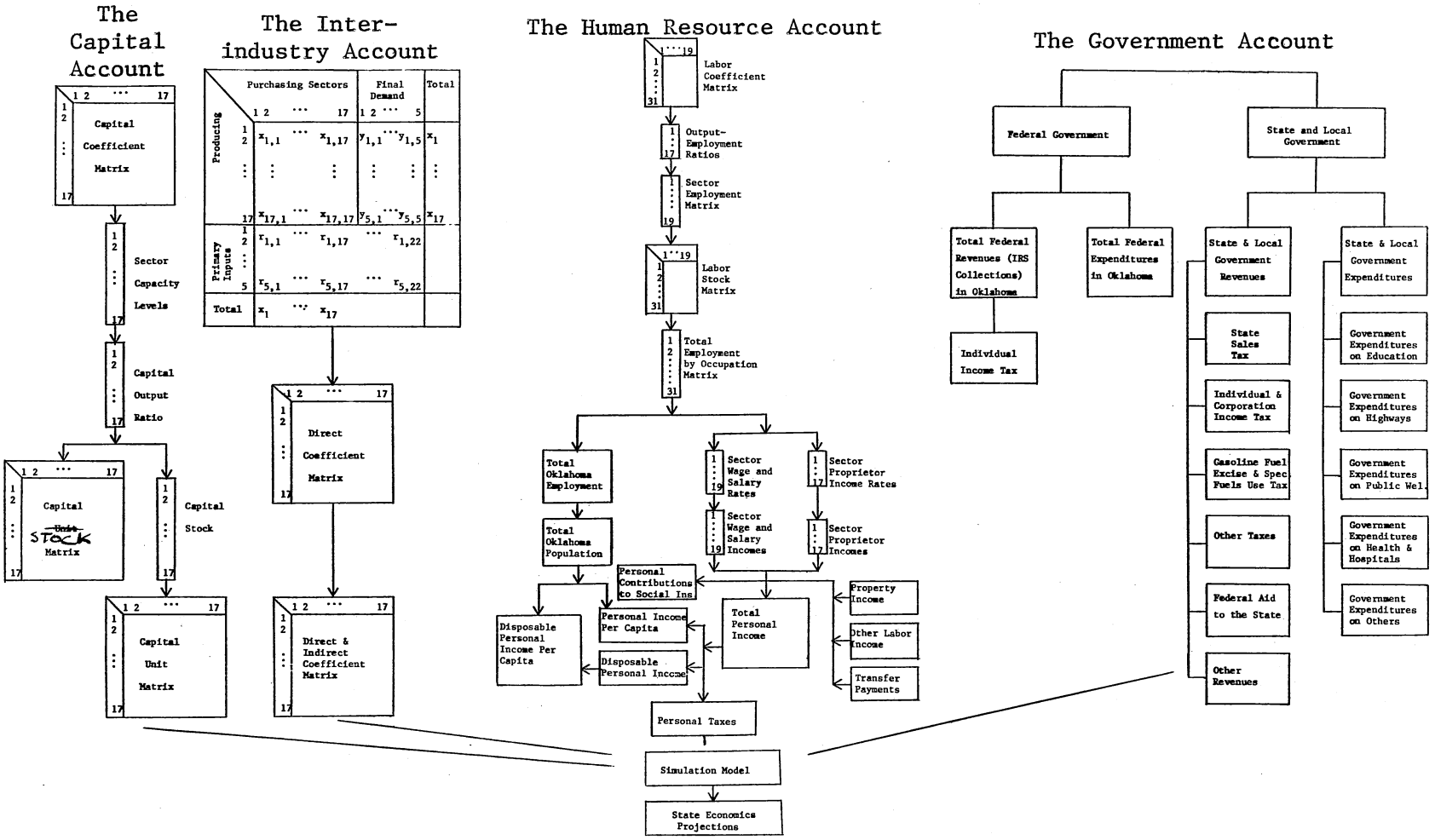

Figure 1. The Oklahoma Social Accounting System

and final demand sectors are given as entries of each row sector in this section.

The direct or technical coefficients are obtained by dividing each entry of a column by the total input of that column sector. These coefficients indicate input requirements per dollar of output. They are relevant only for the processing sectors; therefore, they are computed only for 17 purchasing sectors. The direct and indirect coefficients indicate the total change which includes direct and indirect effects in input requirements as a result of a one dollar change in final demand.

2. The Capital Account

Oklahoma Capital analysis which is discussed in detail in Chapter III is formed around the capital coefficient matrix. The capital coefficients indicate the amount of capital goods required from each row sector for every dollar's worth of capital expenditures made by each column sector.

Capital-output ratios are defined as the ratio of the total cost of plant and equipment to output at capacity. These ratios are computed for the 17 endogenous sectors only. Capacity level of each sector is estimated by using employment data.

Capital coefficient matrix and the capital-output ratios are utilized along with output estimates to obtain the capital stock matrix. Multiplication of output estimates by the capital-output ratios yield the capital estimates by sector. Each sector's total capital is distributed to obtain the composition of each sector's capital stock, by the corresponding column of that sector's capital coefficient matrix. Each entry of the capital stock matrix indicates the total value of

capital goods produced by a row sector that is also invested by corresponding column sectors.

The capital unit matrix is derived from the capital coefficient matrix and the capital-output ratios. Every coefficient of this matrix indicates the amount of capital goods required by a column sector from every row sector to produce one unit of output capacity for that column sector. These coefficients are obtained by multiplying the capital coefficients of each sector and the capital-output ratio of that sector. To complete the capital analysis, depreciation rates need to be estimated. These coefficients are computed as the ratio of depreciation to the depreciable assets.

3. The Human Resource Account

The human resource analysis is important in a social accounting system. In this study, special emphasis is given to the human resource section. Oklahoma human resource analysis is formed around the labor coefficient matrix. The labor coefficients indicate the amount of labor required from each occupation group for every one unit change in the total employment of the column sector.

Output-employment ratios are defined as the value of output produced per laborer. These ratios are computed for the 17 endogenous sectors. Multiplication of the output estimates by the reciprocal of output-employment ratios (which are labor-output ratios) yields the sector employment matrix. The last two elements (federal government sector and state and local government sector) of sector employment matrix are obtained by using the previous year's employment. Each sector's total employment is distributed by the corresponding column

of that sector's labor coefficient matrix to obtain the composition of each sector's labor stock. Each entry of the labor stock matrix indicates the number of employees in each row occupation group that is working in column sector. Total employment by occupation matrix is obtained by row-wise summation of labor stock matrix. Each element of this column vector indicates the total number of employees in each occupation group.

Total employment by occupation matrix is utilized to estimate total Oklahoma employment which is used to determine Oklahoma population. Labor stock matrix is utilized to determine sector wage and salary rates and sector proprietor income rates. With these incomes and with separate estimation of property income, other labor income, and transfer payments, it is possible to compute total personal income. Disposable income is obtained by subtracting personal taxes from total personal income. Personal income per capita and disposable income per capita are calculated from total personal income, disposable income, and population information. Data sources and computation procedures are discussed in detail in Chapters IV and V.

4. The Government Account

A complete social accounting system should include a government section. In this study, government activities are analyzed in two sub-sections: federal government and state and local government (Figure 1). Federal government activities are brought together around two major points: federal government revenues and federal government expenditures. Individual income tax collections which are a part of total federal revenues are estimated separately so that disposable

income can be determined.

The second section of Oklahoma government account consists of state and local government activities. As in the federal government sub-section, state and local government activities are centered around two major points: state and local government revenues and state and local government expenditures.

State and local government revenues are studied in six categories which may be outlined as: (1) state sales tax; (2) individual and corporation income tax; (3) gasoline, fuels excise, and special fuels-use tax; (4) all other state and local taxes; (5) federal aid to the state and local government; and (6) all other revenues. State and local government expenditures are analyzed in five categories. These may be outlined as state and local government expenditures on: (1) education, (2) highways, (3) public welfare, (4) health and hospitals, and (5) others. Further discussion of the individual parts of this section is given in Chapters IV and V.

CHAPTER III

THE INTERINDUSTRY ACCOUNT AND THE CAPITAL ACCOUNT

A. The Interindustry Account

The interindustry account is presented in three tables: a transaction or industry flow table, direct coefficients table, and direct and indirect coefficients table. The latter two tables are derived from the first one. W. H. Miernyk [26] provides good background information which might be helpful to review the basic theory of input-output analysis. Data sources, definitions, assumptions, and techniques used in constructing the interindustry flow matrix are presented in Appendix A.

1. The Interindustry Flow Table

The interindustry flow of goods and services (Table II) provides the base for analysis of the interindustry account. Column sectors of an interindustry flow table represent the consuming sectors, whereas row sectors represent the producing sectors.

The entries in each column indicate the purchases made by the column sector from the corresponding row sector. Thus, they represent the input structure of each consuming sector. For illustration purposes, consider the food and kindred products sector (sector 5) in Table II. The food and kindred products sector purchases $137,976,000

TABLE II

INTERINDUSTRY FLOW TABLE, OKLAHOMA, 1967
(thousands of dollars)

Sector	1 Live-stock	2 Crops	3 Mining	4 Construc-tion	5 Food	6 Petro-leum	7 Wood	8 Apparel	9 Print-ing	10 Machin-ery	11 Trans. Equip.	12 Metal	13 Other Manu.	14 Ts.,Cm., Pub. Ut.	15 Trade	16 Fn.,Ins. Rl. Est.	17 Services	18 Fed. Gov't	19 S&L Gov't	20 Pvt. Cpl. Formation	21 House-holds	22 Exports	Total
1. Livestock & livestock products	98,900	0	0	0	137,976	0	0	284	0	0	0	0	78	0	0	18,090	658	1,860	291	0	25,647	203,386	487,170
2. Crops	139,893	17,648	0	2,876	50,963	0	2,046	1,468	0	0	0	0	4,508	762	2,489	21,846	2,503	2,889	1,356	62	61,471	234,029	546,809
3. Mining	95	2,177	112,735	10,189	354	329,524	294	23	5	171	40	14,882	5,761	59,770	151	4,028	162	1,539	236	1,700	1,814	670,350	1,216,000
4. Construction	3,767	4,229	42,582	279	1,527	8,750	372	85	312	1,342	330	1,783	1,371	44,450	7,478	99,588	10,756	162,540	255,222	381,595	0	0	1,028,358
5. Food & kindred products	2,682	172	0	0	60,752	514	149	29	0	21	0	27	1,587	1,709	8,758	1,303	2,829	15,887	5,972	0	506,884	0	609,275
6. Petroleum refining	6,002	35,273	13,500	22,156	1,529	51,883	455	55	185	1,597	356	1,153	6,466	40,530	22,984	13,032	7,328	56,848	13,349	5,422	144,306	335,336	779,745
7. Lumber & wood products	8	295	1,589	17,761	5,241	1,280	6,016	125	4,386	1,669	359	1,036	2,749	763	8,508	1,509	1,032	2,717	2,214	13,303	23,165	0	95,725
8. Apparel	3	218	886	811	266	22	366	5,830	135	172	458	128	1,331	773	1,275	418	816	1,694	784	0	63,336	0	79,722
9. Printing & publishing	4	38	51	17	1,994	49	184	13	6,395	439	9	424	209	974	3,593	5,196	54,562	588	5,973	0	33,063	0	113,775
10. Machinery & electricity machinery	1,004	13,552	45,457	30,527	1,118	1,817	412	132	140	72,906	7,974	10,545	5,210	8,427	10,154	8,364	15,349	84,490	8,406	141,581	85,072	0	552,637
11. Transportation equipment	2	58	302	22	13	37	22	3	2	3,296	15,160	1,254	1,951	5,881	1,403	1,216	5,476	41,629	5,731	59,401	102,766	0	245,625
12. Primary & fabricated metal products	63	344	32,136	114,139	11,589	3,014	1,920	61	897	50,511	15,463	84,792	10,474	7,632	6,678	2,061	12,862	6,623	567	64,960	11,967	0	438,753
13. All other manufacturing industries	86	3,991	23,442	39,753	6,352	8,985	1,686	1,662	1,344	8,029	2,277	3,791	28,213	4,060	13,121	4,596	20,523	15,746	9,553	29,127	153,206	0	379,543
14. Transportation, communication & public utilities	14,049	17,951	73,055	32,121	23,838	51,570	3,750	1,075	2,814	10,360	3,088	18,784	13,265	238,720	87,868	50,484	77,537	72,774	42,663	15,571	455,484	0	1,306,821
15. Wholesale & retail trade	9,549	18,947	28,466	82,125	20,912	7,831	2,428	1,420	2,324	15,689	3,089	10,435	9,179	32,008	51,558	32,353	38,091	12,343	2,414	69,125	1,412,075	0	1,862,361
16. Finance, insurance & real estate	5,614	19,775	108,816	7,101	3,606	11,804	660	376	2,349	5,507	801	2,490	3,678	25,304	77,821	110,997	38,139	5,149	9,329	4,836	584,217	0	1,028,369
17. Services	5,611	20,681	45,127	53,806	22,092	20,587	1,722	736	4,426	13,329	3,897	8,261	15,376	64,197	167,867	127,310	90,042	105,508	30,837	6,785	663,332	0	1,471,529
18. Federal government	4,529	18,322	31,331	28,491	24,159	78,274	4,141	3,381	5,874	26,980	11,102	19,360	19,758	59,904	116,041	45,999	48,618	36,656	28,091	0	760,908	0	1,371,919
19. State & local government	30,906	32,770	34,438	28,595	17,094	21,877	2,684	2,238	3,192	15,504	6,892	12,311	10,650	37,059	54,281	28,403	41,990	343,208	26,765	0	482,935	0	1,233,792
20. Imports	6,743	26,713	133,359	202,144	81,622	30,803	21,617	19,785	20,852	92,154	38,949	59,609	74,878	60,763	114,790	90,011	133,052	200,669	97,705	348,740	1,443,997	0	3,298,955
21. Households	115,330	241,557	411,071	337,234	124,859	120,765	41,490	40,297	55,279	215,541	129.033	175,141	147,508	480,400	1,036,020	335,951	772,589	1,109,528	609,542	0	44,521	0	6,543,656
22. Depreciation	42,330	72,098	77,657	18,211	11,419	30,359	3,311	644	2,864	17,420	6,348	12,547	15,343	132,735	69,523	25,614	96,615						
Total	487,170	546,809	1,216,000	1,028,358	609,275	779,745	95,725	79,722	113,775	552,637	245,625	438,753	379,543	1,306,821	1,862,361	1,028,369	1,471,529	2,280,885	1,157,000	1,142,208	7,060,166		

worth of goods and services from the livestock and livestock products sector (sector 1), and $50,963,000 from the crops sector (sector 2). The food and kindred products sector purchases $354,000 and $1,527,000 worth of goods and services from the mining sector (sector 3) and construction sector (sector 4), respectively, etc.

Entries in each row represent the values of goods and services sold to every purchasing sector. For example, consider the petroleum refining sector (sector 6) in Table II. Purchases of agricultural sectors from the petroleum refining sector are $6,002,000 by the livestock and livestock products sector (sector 1); and $35,273,000 by the crops sector (sector 2). The mining sector (sector 3) purchases $13,500,000 and the construction sector (sector 4) purchases $22,156,000 of goods and services from the petroleum refining sector, etc.

As can be deduced from Table II, only livestock and livestock products (sector 1), crops (sector 2), mining (sector 3), and petroleum refining (sector 6) sectors are exporting sectors and all others are importing sectors. Calculations of exports and imports are given in detail in Appendix A; however, it is useful to point out that the terms "exports" and "imports" are used to indicate the "net" values of exports and imports in this study.

2. Direct Coefficients

The direct coefficients are given in Table III. Entries in each column indicate the direct purchases of the column sector from each row sector per dollar's worth of output. These coefficients show only the first round effects of a change in output of a column sector on the sectors from which that sector purchases goods and services. Direct

TABLE III

DIRECT COEFFICIENTS, OKLAHOMA, 1967

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.20301	.00000	.00000	.00000	.22646	.00000	.00000	.00356	.00000	.00000	.00000	.00000	.00021	.00000	.00000	.01759	.00045
2	.28715	.03227	.00000	.00280	.08365	.00000	.02137	.01841	.00000	.00000	.00000	.00000	.01188	.00058	.00134	.02124	.00170
3	.00020	.00398	.09271	.00991	.00058	.42260	.00307	.00029	.00004	.00031	.00016	.03392	.01518	.04574	.00008	.00392	.00011
4	.00773	.00773	.03502	.00027	.00251	.01122	.00389	.00107	.00274	.00243	.00134	.00406	.00361	.03401	.00402	.09684	.00731
5	.00551	.00031	.00000	.00000	.09971	.00066	.00156	.00036	.00000	.00004	.00000	.00006	.00418	.00131	.00470	.00127	.00192
6	.01232	.06451	.01110	.02155	.00251	.06654	.00475	.00069	.00163	.00289	.00145	.00263	.01704	.03101	.01234	.01267	.00498
7	.00002	.00054	.00131	.01727	.00860	.00164	.06285	.00157	.03855	.00302	.00146	.00236	.00724	.00058	.00457	.00147	.00070
8	.00001	.00040	.00073	.00079	.00044	.00003	.00382	.07313	.00119	.00031	.00186	.00029	.00351	.00059	.00068	.00041	.00055
9	.00001	.00007	.00004	.00002	.00327	.00006	.00192	.00016	.05621	.00079	.00004	.00097	.00055	.00075	.00193	.00505	.03708
10	.00206	.02478	.03738	.02969	.00183	.00233	.00430	.00166	.00123	.13192	.03246	.02403	.01373	.00645	.00545	.00813	.01043
11	.00000	.00011	.00025	.00002	.00002	.00005	.00023	.00004	.00002	.00596	.06172	.00286	.00514	.00450	.00075	.00118	.00372
12	.00013	.00063	.02643	.11099	.01902	.00387	.02006	.00077	.00788	.09140	.06295	.19326	.02760	.00584	.00359	.00200	.00874
13	.00018	.00730	.01928	.03866	.01043	.01152	.01761	.02085	.01181	.01453	.00927	.00864	.07433	.00311	.00705	.00447	.01395
14	.02884	.03283	.06008	.03124	.03913	.06614	.03917	.01348	.02473	.01875	.01257	.04281	.03495	.18267	.04718	.04909	.05269
15	.01960	.03465	.02341	.07986	.03432	.01004	.02536	.01781	.02043	.02839	.01258	.02378	.02418	.02449	.02768	.03146	.02589
16	.01152	.03616	.08949	.00691	.00592	.01514	.00689	.00472	.02065	.00996	.00326	.00568	.00969	.01936	.04179	.10793	.02592
17	.01152	.03782	.03711	.05232	.03626	.02640	.01799	.00923	.03890	.02412	.01587	.01883	.04051	.04912	.09014	.12380	.06119

coefficients are computed only for the endogenous sectors, since they are the only relevant ones.[1] For example, consider the livestock and livestock products sector (sector 1). If output of the livestock and livestock products sector increases by one dollar, this increases purchases from the industries within the sector by 20.3 cents; purchases from the crops sector (sector 2) increase by 28.7 cents. Effects of this on purchases from the mining sector (sector 3) are very insignificant; less than one cent increase in purchases from the construction sector (sector 4) takes place. Increases in purchases from the manufacturing sectors are .6 cents from food and kindred products sector (sector 5); 1.2 cents from the petroleum refining sector (sector 6); and .2 cents or less from all manufacturing sectors (sector 7 through sector 13). The amount of increase is about 2.9 cents in the transportation, communication, and public utilities sector (sector 14); 20 cents in the wholesale and retail trade sector (sector 15); 1.2 cents in the finance, insurance, and real estate sector (sector 16); and 1.2 cents in the services sector (sector 17). This implies that the livestock and livestock products sector has a large direct relationship with firms within that sector and with the crops sector. The only manufacturing sectors having relatively importand direct relationships are food and kindred products and petroleum refining sectors.

3. Direct and Indirect Coefficients

The direct and indirect coefficients, given in Table IV, show the

---

[1]Table III meets stability conditions for the table of technical coefficients since (a) at least one column in the table adds up to less than unity, (b) no column in the table adds up to more than unity [26, p. 23].

TABLE IV

DIRECT AND INDIRECT COEFFICIENTS, OKLAHOMA, 1967

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.25805	.00153	.00300	.00088	.31711	.00227	.00106	.00529	.00086	.00063	.00030	.00063	.00240	.00167	.00301	.02597	.00225
2	.37533	1.03557	.00455	.00515	.19181	.00343	.02499	.02284	.00237	.00124	.00066	.00116	.01551	.00296	.00467	.03402	.00412
3	.02884	.04466	1.12165	.03495	.02028	.51591	.01378	.00441	.00607	.01161	.00713	.05522	.03502	.08618	.01379	.02489	.01062
4	.02146	.01873	.05629	1.00833	.01477	.04394	.00925	.00372	.00847	.00787	.00429	.01230	.01077	.05116	.01399	.11689	.01537
5	.00842	.00105	.00092	.00110	1.11354	.00165	.00235	.00081	.00054	.00058	.00029	.00061	.00554	.00239	.00596	.00269	.00280
6	.04762	.07678	.02213	.02987	.02617	1.08625	.01105	.00444	.00545	.00732	.00397	.00859	.02505	.04589	.01884	.02653	.01082
7	.00145	.00192	.00391	.02035	.01171	.00449	1.06801	.00233	.04431	.00486	.00244	.00416	.00937	.00270	.00610	.00534	.00347
8	.00040	.00072	.00131	.00140	.00094	.00084	.00464	1.07907	.00172	.00066	.00231	.00066	.00434	.00110	.00103	.00096	.00093
9	.00243	.00308	.00409	.00384	.00722	.00388	.00377	.00106	1.06213	.00309	.00135	.00317	.00342	.00470	.00706	.01317	.04297
10	.01807	.03497	.05567	.04358	.01359	.03127	.00948	.00423	.00454	1.15853	.04383	.03941	.02276	.01774	.01088	.02113	.01643
11	.00089	.00113	.00200	.00179	.00116	.00179	.00103	.00045	.00070	.00834	1.06667	.00475	.00685	.00669	.00190	.00295	.00503
12	.00865	.01133	.05438	.14916	.03370	.03529	.03140	.00370	.01516	.13533	.09018	1.24984	.04472	.02343	.01117	.02621	.01858
13	.00739	.01340	.03006	.04811	.01839	.02948	.02302	.02554	.01659	.02158	.01340	.01552	1.08467	.01126	.01190	.01580	.01923
14	.07643	.06417	.10745	.06793	.09017	.14401	.06278	.02444	.04437	.04333	.02735	.07873	.06336	1.24882	.07629	.09695	.08059
15	.04759	.04721	.04479	.09559	.06188	.03849	.03484	.02353	.02903	.04196	.02003	.03855	.03597	.04370	1.03862	.05828	.03651
16	.04113	.05409	.12170	.02257	.02969	.07894	.01558	.00981	.03009	.01977	.00833	.01922	.02210	.04222	.05627	1.13738	.03807
17	.04965	.06367	.07843	.08117	.07393	.07833	.03372	.01835	.05610	.04386	.02679	.04059	.06201	.08467	.11491	.17315	1.08336

total effects on input requirements as a result of one dollar change in sector final demand. Total effects include the indirect effects as well as the direct effects.[2] Indirect effects indicate the chain of secondary changes. For illustration purposes, consider the livestock and livestock products (sector 1). A one-dollar change in final demand for products of the livestock sector causes a change of 20.3 cents as a result of direct interindustry transactions which is the first-round effect (Table III). A one-dollar change in final demand for products of the livestock sector causes a change of 25.8 cents as a result of total effects (Table IV). Since the value of change as a result of direct effects is 20.3 cents, the value of change as a result of indirect effects can be obtained only by subtracting this amount from the value of change as a result of total effects, which is 25.8 cents. In this way, 5.5 cents represents the indirect effects. The magnitude of the indirect effects on the crops sector (sector 2) as a result of a dollar change in the final demand for the products of the livestock sector can be obtained by subtracting 28.7 cents (Table III) from 37.5 cents (Table IV), which yields 8.8 cents, etc. The direct and indirect coefficients provide the basis for the simulation model. These coefficients are multiplied by final demand estimates to obtain the sectors' output estimates. Projections of all other economic variables are based on sector output estimates.

B. The Capital Account

It is difficult to have an objective evaluation of alternative

---

[2]Since Table IV does not have any negative value, Hawkins-Simmon condition is met so the coefficients are stable [26, p. 27].

development strategies without a capital account. This section discusses the capital account which is presented in six tables: capital coefficient matrix, sector capacity estimates, capital-output ratios, capital stock matrix, capital unit matrix, and depreciation rates. The capital account analysis of this study is based on Doeksen and Schreiner's extensive work about capital structure in Oklahoma.[3]

1. Capital Coefficient Matrix

The capital coefficient matrix of the Oklahoma capital analysis is represented in Table V. Reading down a column indicates the purchases of capital goods from producing sectors per dollar of investment by that column sector. For instance, for each dollar investment by the mining sector (sector 3), $.00010 of capital goods are purchased within itself and $.01608 of capital goods purchased from the construction sector (sector 4), etc. The largest purchases of capital goods and purchases by the mining sector (sector 3) are $.61086 from the machinery and electrical machinery sector (sector 10), $.18267 from the transportation equipment sector (sector 11), and $.13700 from the wholesale and retail trade sector (sector 15).

2. Capacity Estimates

A similar method to that developed by the Wharton School Econometrics Unit [17] is used to estimate capacity levels. Even though this is a simple method, it is considered as good as any other

---

[3]For a complete discussion of concept and definitions used in deriving the Oklahoma Capital Account, see [5].

TABLE V

CAPITAL COEFFICIENT MATRIX, OKLAHOMA, 1967

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
2	.00000	.00000	.00000	.00000	.00033	.00050	.00041	.00038	.00041	.00038	.00043	.00040	.00040	.00000	.00000	.00000	.00000
3	.00150	.00085	.00010	.00206	.00365	.00461	.00430	.00412	.00443	.00427	.00444	.00401	.00407	.00157	.00101	.00162	.00154
4	.23430	.13281	.01608	.32193	.30833	.37220	.34021	.34433	.34260	.33288	.33834	.33294	.33661	.24555	.15758	.25332	.24135
5	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
6	.00648	.00368	.00044	.00891	.00516	.00499	.00630	.00671	.00697	.00642	.00632	.00523	.00578	.00680	.00436	.00701	.00668
7	.03124	.01741	.00822	.04247	.02994	.01658	.03486	.04275	.03948	.03380	.03891	.02942	.02725	.03946	.08101	.07518	.07022
8	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
9	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
10	.25266	.41255	.61086	.27872	.28475	.20215	.31221	.31281	.31342	.33245	.31879	.32066	.31414	.25426	.22852	.18290	.16548
11	.17786	.16669	.18267	.04206	.10374	.02353	.01558	.01563	.01444	.01224	.01077	.01983	.01891	.14032	.21827	.15169	.19260
12	.10285	.06288	.01694	.13135	.09775	.17432	.10567	.09239	.09524	.09944	.10181	.11454	.11454	.13857	.06855	.11876	.10410
13	.08149	.04585	.00589	.11872	.07250	.09369	.07784	.07834	.08026	.07543	.07679	.07077	.07620	.08311	.08355	.08770	.10826
14	.01180	.01680	.02180	.00841	.01369	.01570	.01496	.01501	.01502	.01500	.01512	.01492	.01492	.04204	.01533	.01027	.01210
15	.09982	.14048	.13700	.04537	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.04832	.14182	.11155	.09767
16	.00000	.00000	.00000	.00000	.03601	.04121	.03937	.03932	.03941	.03938	.03965	.03922	.03916	.00000	.00000	.00000	.00000
17	.00000	.00000	.00000	.00000	.04415	.05052	.04829	.04821	.04832	.04831	.04863	.04806	.04802	.00000	.00000	.00000	.00000

method.[4] Employment data are used as proxies for the production indices of Oklahoma in 1967, since these are the best statistics available. Employment of each sector is averaged into quarterly figures. These are plotted on a graph, and peaks are determined. Each peak period is assumed to represent one hundred percent capacity. A straight line connecting peaks is used to describe capacity between peaks. If the latest peak has not been reached, extrapolation of the closest straight line is used to determine the capacity level for that specific period. Capacity estimates by sector are presented in Table VI.

3. Capital-Output Ratios

These ratios indicate the dollar value of capital required in order to obtain one dollar's worth of output. Since capital-output ratios are not available for Oklahoma, estimates of the U. S. capital-output ratios are used [10]. The average capital-output ratios are defined as total assets divided by total receipts.

Sector capital-output ratios are presented in Table VII. Type I capital-output ratios (column 1) reflect capital needs at average output, whereas Type II capital-output ratios (column 2) are defined as capital needs at capacity output levels. Consider the livestock sector (sector 1) as an example. Capital stock needs of the livestock sector must be increased by $1.20536 to increase the sector's output by one

---

[4] The capacity-estimating procedure by the Wharton School was tested against other techniques by Krishnamurty [18]. It was found to be as good as other sophisticated techniques and much easier to derive, especially for the manufacturing and service-type sectors. For agriculture, other procedures which measure such variables as land availability and use might provide a more accurate estimate.

TABLE VI

CAPACITY LEVELS BY SECTOR, OKLAHOMA, 1967

	Sectors	Capacity Level, 1967 (Percent)
1.	Livestock	90.69
2.	Crops	90.69
3.	Mining	97.16
4.	Construction	97.89
5.	Food and kindred products	93.90
6.	Petroleum refining and related industries	100.00
7.	Lumber and wood, furniture and fixtures, paper and allied products	79.14
8.	Apparel and other finished products made from fabrics and similar materials	88.48
9.	Printing, publishing, and allied industries	96.48
10.	Machinery, electrical machinery equipment and supplies	89.94
11.	Transportation equipment	76.17
12.	Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	100.00
13.	Miscellaneous and all other manufacturing industries	100.00
14.	Transportation, communication, and public utilities	95.65
15.	Wholesale and retail trade	96.32
16.	Finance, insurance, and real estate	98.54
17.	Services	96.23

TABLE VII

CAPITAL-OUTPUT RATIOS BY SECTOR, OKLAHOMA, 1967

	Sectors	Capital-Output Ratios Type I	Type II
		(1)	(2)
1.	Livestock	1.20536	1.09314
2.	Crops	1.33839	1.21379
3.	Mining	.95761	.93041
4.	Construction	.17494	.17125
5.	Food and kindred products	.26858	.25220
6.	Petroleum refining and related industries	.82418	.82418
7.	Lumber and wood, furniture and fixtures, paper and allied products	.56622	.44811
8.	Apparel and other finished products made from fabrics and similar materials	.10757	.09518
9.	Printing, publishing, and allied industries	.35993	.34726
10.	Machinery, electrical machinery equipment and supplies	.35845	.32239
11.	Transportation equipment	.34334	.26152
12.	Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	.50544	.50544
13.	Miscellaneous and all other manufacturing industries	.60244	.60244
14.	Transportation, communication, and public utilities	2.27891	2.17978
15.	Wholesale and retail trade	.45392	.43722
16.	Finance, insurance, and real estate	.50246	.49512
17.	Services	.59693	.57443

Source: U. S. Department of the Treasury, Statistics of Income: 1970 Business Income Tax Returns.

dollar. Type II ratios represent the capital-output ratios at capacity levels of output. They are obtained by multiplying the average capital-output ratios and the capacity estimates. They indicate the capital goods needed by each sector to increase the sector's output by a dollar when the sector's output is at the capacity levels. The livestock sector's need for capital goods when output is at capacity level is $1.09314.

4. Capital Stock Matrix

The amount of capital in each sector is obtained by multiplying the capital output ratio (defined at capacity level output) by the estimated output at capacity. By multiplying the amount of capital in each sector by that sector's capital coefficients column, the composition of capital in each sector is obtained. The capital stock matrix of the Oklahoma model for 1967 is presented in Table VIII. Each entry represents the amount of capital goods produced by the row sector and invested in the column sector. For instance, in the construction sector (sector 4), total capital investment in 1967 is $179,901,000. Of this investment, $371,000 is from the mining sector (sector 3), $57,915,000 from industries in that sector, $1,603,000 is from the petroleum refining sector (sector 6), etc.

5. Capital Unit Matrix

Capital unit matrix is constructed by using the capital coefficient matrix and the capital output ratios. The coefficients of this matrix are computed by multiplying the capital coefficients of a sector (Table V) and the corresponding capital output ratio (Table VII). Each

TABLE VIII

CAPITAL STOCK MATRIX, OKLAHOMA, 1967

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	54	321	22	3	17	75	36	89	91	0	0	0	0
3	881	622	117	371	597	2,962	233	35	181	846	375	889	931	4,676	854	837	1,353
4	137,584	97,196	18,724	57,915	50,455	239,194	18,440	2,953	14,030	65,941	28,533	73,834	76,966	731,279	133,212	130,894	212,002
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	3,805	2,693	512	1,603	844	3,207	342	58	285	1,272	533	1,160	1,322	20,251	3,686	3,622	5,868
7	18,345	12,742	9,572	7,640	4,899	10,655	1,889	367	1,617	6,696	3,281	6,524	6,231	117,517	68,483	38,847	61,681
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	148,366	301,923	711,318	50,142	46,596	129,912	16,922	2,683	12,835	65,856	26,885	71,110	71,829	757,219	193,182	94,507	145,358
11	104,442	121,991	212,711	7,567	16,976	15,121	845	134	591	2,425	908	4,398	4,324	417,891	184,517	78,380	169,180
12	60,395	46,018	19,726	23,630	15,996	112,027	5,727	792	3,900	19,698	8,586	25,401	26,190	412,679	57,950	61,365	91,441
13	47,852	33,555	6,859	21,358	11,864	60,210	4,219	672	3,287	14,942	6,476	15,694	17,423	247,512	70,630	45,316	95,095
14	6,929	12,295	25,385	1,513	2,240	10,090	811	129	615	2,971	1,275	3,309	3,411	125,200	12,960	5,307	10,629
15	58,616	102,809	159,530	8,162	0	0	0	0	0	0	0	0	0	143,903	119,889	57,639	85,793
16	0	0	0	0	5,893	26,484	2,134	337	1,614	7,801	3,344	8,697	8,954	0	0	0	0
17	0	0	0	0	7,225	32,467	2,617	413	1,979	9,570	4,101	10,658	10,980	0	0	0	0
Total	587,215	731,844	1,164,454	179,901	163,639	642,650	54,201	8,576	40,951	198,093	84,333	221,763	228,652	2,978,127	845,363	516,714	878,400

coefficient of Table IX indicates the value of capital goods required from producing sectors (row sector) to produce one dollar's worth of additional output by consuming sectors (column sector) at capacity level. For instance, consider the crops sector (sector 2). For each additional dollar of output at capacity, the crops sector requires $.00103 worth of capital goods from the mining sector (sector 3), $.16121 worth of capital goods from the construction sector (sector 4), etc. This matrix is useful to compute the composition of required capital to increase output in a particular sector.

6. Depreciation Coefficients

The last component of this capital analysis consists of depreciation coefficients. These coefficients are estimated as the ratio of annual depreciation to total depreciable assets. U. S. Internal Revenue Service [102] data are used for these estimates. Depreciation rates, as listed in Table X, indicate the annual depreciation rate for various sectors from four to eleven percent.

TABLE IX

CAPITAL UNIT MATRIX, OKLAHOMA, 1967

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	--	--	--	--	.00008	.00041	.00018	.00004	.00014	.00012	.00011	.00020	.00024	--	--	--	--
3	.00164	.00103	.00009	.00035	.00092	.00380	.00193	.00039	.00154	.00138	.00116	.00203	.00245	.00342	.00044	.00080	.00088
4	.25612	.16121	.01496	.05513	.07776	.30676	.15246	.03277	.11897	.10732	.08848	.16828	.20279	.53525	.06890	.12542	.13864
5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	.00708	.00447	.00041	.00153	.00130	.00411	.00282	.00064	.00242	.00207	.00165	.00265	.00348	.01482	.00191	.00347	.00384
7	.03415	.02113	.00765	.00727	.00755	.01367	.01562	.00407	.01371	.01090	.01018	.01487	.01642	.08601	.03542	.03722	.04034
8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10	.27619	.50075	.56835	.04773	.07182	.16661	.13991	.02977	.10884	.10718	.08337	.16208	.18925	.55423	.09991	.09056	.09506
11	.19443	.20233	.16996	.00720	.02616	.01939	.00698	.00149	.00501	.00395	.00282	.01002	.01139	.30587	.09543	.07511	.11063
12	.11243	.07632	.01576	.02250	.02465	.14367	.04735	.00879	.03307	.03206	.02663	.05789	.06900	.30205	.02997	.05880	.05980
13	.08908	.05565	.00548	.02033	.01829	.07722	.03488	.00746	.02787	.02432	.02008	.03577	.04591	.18116	.03653	.04342	.06219
14	.01290	.02039	.02028	.00144	.00345	.01294	.00670	.00143	.00522	.00483	.00395	.00754	.00899	.09164	.00670	.00509	.00695
15	.10912	.17051	.12747	.00777	--	--	--	--	--	--	--	--	--	.10533	.06201	.05523	.05610
16	--	--	--	--	.00908	.03396	.01764	.00374	.01369	.01269	.01037	.01982	.02359	--	--	--	--
17	--	--	--	--	.01114	.04164	.02164	.00459	.01678	.01557	.01272	.02429	.02893	--	--	--	--
Capital-Output Ratio	1.09314	1.21379	.93041	.17125	.25220	.82418	.44811	.09518	.34726	.32239	.26152	.50544	.60244	2.17978	.43722	.49512	.57443

TABLE X

DEPRECIATION RATES, BY SECTOR, OKLAHOMA, 1967

Sectors	Depreciation Rate
1. Livestock	.07208
2. Crops	.09851
3. Mining	.06669
4. Construction	.10123
5. Food and kindred products	.06978
6. Petroleum refining and related industries	.04724
7. Lumber and wood, furniture and fixtures, paper and allied products	.06109
8. Apparel and other finished products made from fabrics and similar materials	.07515
9. Printing, publishing, and allied industries	.06993
10. Machinery, electrical machinery equipment and supplies	.08794
11. Transportation equipment	.07527
12. Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	.05658
13. Miscellaneous and all other manufacturing industries	.06710
14. Transportation, communication, and public utilities	.04457
15. Wholesale and retail trade	.08224
16. Finance, insurance, and real estate	.04957
17. Services	.10999

Source: U. S. Department of the Treasury, Statistics of Income: 1967 Corporation Income Tax Returns.

CHAPTER IV

THE HUMAN RESOURCE ACCOUNT AND THE GOVERNMENT ACCOUNT

A. The Human Resource Account

The human resource account is a vital portion of a simulation study. Manpower needs are increasing and changing over time, thus making this an important area for research input. The major matrices include labor coefficient matrix, output-employment ratios, sector employment matrix, labor stock matrix, sector wage and salary and proprietor employment matrix, total Oklahoma employment by occupation matrix, sector wage and proprietor income rates matrices, and sector wage and salary and proprietor income matrices.

1. Employment

Total employment in Oklahoma in 1973 was 1,064,000 compared to 859,700 in 1960, 944,100 in 1967, and 974,000 in 1970. The rate of increase in employment has been larger than the rate of increase in population. The labor participation rate has increased recently, due mainly to more women joining the work force. Economic and social reasons are the main stimulators for this change. Components of the Oklahoma labor force for recent years are given in Table XI.

Employment in most sectors has increased over time. Agriculture,

TABLE XI

LABOR FORCE, OKLAHOMA, 1960, 1963, 1967-1973

Year	Agri-culture	Non-agricultural Wage and Salary Employment	Self Employed	Total Employment	Unem-ployed[1]	Force
	(000)	(000)	(000)	(000)	(000)	(000)
1960	155.5	581.6	122.6	859.7	44.5	904.3
1963	143.5	611.5	118.8	873.8	47.0	920.8
1967	120.8	706.3	117.0	944.1	34.0	978.5
1968	119.9	727.2	115.9	963.0	35.1	998.6
1969	118.7	755.2	115.3	989.2	34.1	1024.1
1970	54.0[2] (117.5)[3]	789.9 (769.5)[3]	130.5 (115.0)[3]	974.4 (1002.0)[3]	44.5 (46.6)[3]	1018.9 (1048.6)[3]
1971	52.0 (115.7)[3]	800.2 (779.8)[3]	133.2 (114.3)[3]	985.4 (1009.8)[3]	51.2 (53.1)[3]	1036.6 (1063.0)[3]
1972	55.2 (114.7)[3]	835.4 (806.7)[3]	134.8 (113.9)[3]	1025.4 (1035.3)[3]	48.7 (52.3)[3]	1074.1 (1087.6)[3]
1973	57.4	871.4	135.3	1064.1	47.1	1111.2

[1]Includes those unemployed as a result of labor disputes.

[2]Starting from 1970, the concept and estimating procedure have been changed.

[3]The source for these figures is Oklahoma Employment Security Commission, Handbook of Oklahoma Employment Statistics, 1958-1972, pp. 18-20.

Source: Oklahoma Employment Security Commission, Handbook of Oklahoma Employment Statistics, 1973.

mining, and federal government are the sectors where decreases have occurred. Labor force, total employment, self-employment, and non-agricultural wage and salary employment have increased.

a. Labor Coefficient Matrix. The labor coefficient matrix is presented in Table XII. This table includes labor coefficients for the 17 endogenous sectors, federal government sector, and state and local government sector. Each coefficient indicates the amount of change in labor requirements in each occupation group as a result of one unit change in the total employment of each column sector. For example, if the total employment of construction sector (sector 4) increases by one unit, this increases the employment requirements from engineers (occupation group 1) by .00602; scientists (occupation group 2) by .00022; technicians (occupation group 3) by .00411; etc. Total wage and salary employment increases by .65495, and the total proprietor employment by .34505.

The elements of the labor coefficient matrix are derived from unpublished data provided by the Oklahoma Employment Security Commission [35]. Industry-occupation matrices for Oklahoma provide the total employment in 1970 in each sector by occupation and component. Rows of each sector's industry-occupation matrix distinguish 440 occupations in the eight-digit statistical industry code (SIC), whereas columns include private wage and salary, unpaid family, self-employed, federal government, state government, and local government employment. For this study, the 440 occupations are aggregated to 29.[1] In addition, unpaid family and self-employed workers are aggregated to obtain the

---

[1]For information relating to the manner in which occupations are aggregated, see Appendix B.

TABLE XII

LABOR COEFFICIENT MATRIX, OKLAHOMA, 1967

Occupation Group \ Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Engineers (02)	.00019	.00019	.05336	.00602	.00438	.07781	.00356	.00053	.00048	.04127	.05452	.01818	.01304	.01900	.00285	.00189	.00386	.03904	.00661
2. Scientists (04 + 06)	.00022	.00023	.03097	.00022	.00114	.03798	.00056	.00000	.00000	.00159	.00180	.00182	.00217	.00327	.00025	.00045	.00109	.00754	.00475
3. Technicians (including health) (08 + 10 + 12)	.00089	.00090	.02898	.00411	.00349	.07533	.00300	.00053	.00108	.03115	.02184	.02678	.00930	.00635	.00668	.00114	.05176	.03109	.01513
4. Computer and Other Machine Specialists (14 + 16)	.00044	.00044	.01654	.00089	.00063	.02313	.00000	.00000	.00144	.00598	.01011	.00240	.00165	.00943	.00112	.00484	.00190	.02914	.01820
5. Economists and Planners and Teachers (18 + 20)	.00000	.00000	.00208	.00026	.00025	.00742	.00000	.00132	.00060	.00268	.00190	.00000	.00047	.00168	.00091	.00030	.02619	.00772	.00535
6. Miscellaneous Artists (22)	.00061	.00061	.00306	.00060	.00133	.00594	.00150	.00132	.12016	.00439	.00569	.00052	.00453	.00995	.00216	.00216	.00945	.00602	.00284
7. Other Professional and Technical Workers (24 + 99)	.00064	.00065	.06147	.00470	.01237	.10972	.00750	.00172	.00874	.02110	.02654	.01813	.01918	.02096	.00695	.02076	.04553	.04748	.07668
8. Financial Managers (02)	.00004	.00006	.01677	.00260	.02011	.02103	.00562	.00119	.02648	.01317	.01462	.01078	.00959	.00536	.02371	.09061	.00206	.00809	.00382
9. Other Managers and Administrators (04 − 99)	.00209	.00208	.04922	.04758	.04778	.03760	.03579	.01359	.05499	.03603	.04288	.03563	.03618	.05670	.07430	.06238	.03369	.08145	.14330
10. Sales Workers (00)	.00134	.00134	.01052	.00500	.06009	.00680	.02249	.01847	.11549	.02175	.00767	.01865	.04104	.01242	.19161	.17206	.00854	.00211	.00242
11. Secretaries (02)	.00106	.00107	.06677	.01344	.01656	.08387	.02043	.01069	.05487	.03163	.02564	.02730	.02484	.03189	.01804	.13019	.04064	.06506	.09376
12. Other Machine Operators (04)			.01626	.00046	.00793	.03451	.00262	.00119	.00862	.00740	.00885	.00536	.00401	.00827	.00469	.02592	.00373	.01324	.01224
13. Other Clerical Workers (06 − 99)	.00397	.00396	.08824	.02735	.06542	.12605	.04198	.03206	.14077	.07514	.07104	.06256	.06745	.18573	.11733	.26315	.06816	.31185	.14246
14. Construction Traders (02)	.00153	.00153	.01939	.27806	.00508	.02227	.05285	.00132	.00000	.01915	.04658	.03782	.01705	.01566	.00546	.00541	.00490	.02516	.01890
15. Foremen (04)	.00120	.00118	.05552	.02231	.04410	.04602	.04104	.03285	.02013	.04835	.04884	.04818	.04161	.02937	.00943	.00233	.00251	.01516	.00568
16. Metal Workers (06)	.00018	.00017	.00757	.00848	.00774	.00866	.01068	.00145	.00048	.09275	.07510	.07558	.01842	.00640	.00183	.00015	.00112	.01974	.00019
17. Mechanics and Repairmen (08)	.00054	.00054	.02754	.01709	.02360	.02771	.01574	.01161	.00479	.02801	.10914	.01870	.02513	.09996	.03908	.00151	.02593	.12428	.01899
18. Printing Trades (10)	.00000	.00000	.00065	.00014	.00057	.00210	.00693	.00000	.22738	.00122	.00144	.00349	.00142	.00054	.00056	.00087	.00050	.00234	.00047
19. Electrical Workers (12)	.00000	.00000	.00021	.00322	.00000	.00086	.00075	.00000	.00048	.01370	.00072	.00036	.04695	.07212	.00004	.00015	.00018	.00148	.00098
20. Other Miscellaneous Craftsmen (14 − 00)	.00074	.00074	.07662	.03857	.03661	.02697	.06765	.02850	.00371	.00907	.01670	.02203	.01639	.02225	.01481	.00541	.00959	.01273	.00796
21. Metal and Machine Shop Workers (02)	.00055	.00055	.01278	.01582	.00552	.01274	.01893	.00119	.00216	.12231	.09596	.21562	.00619	.00874	.00288	.00012	.00338	.01290	.00172
22. Textile Machine Workers (02)	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.02310	.00000	.00000	.00000	.00000	.00000	.00000
23. Final Processors (06)	.00022	.00021	.00062	.00020	.09867	.01373	.00037	.07546	.00647	.04469	.03340	.02120	.06793	.00360	.00743	.00010	.00028	.00598	.00019
24. Miscellaneous Operatives (08 − 00)	.00650	.00648	.27526	.04661	.39430	.12705	.02474	.70040	.06841	.26539	.22774	.24182	.36341	.22253	.09595	.00415	.03746	.05848	.03035
25. Janitorial Workers (02)	.00080	.00080	.00750	.00216	.01244	.01509	.33227	.00594	.00851	.01142	.00749	.01146	.01266	.01184	.00767	.02582	.04156	.01721	.03096
26. Food Workers (04)	.00014	.00015	.00074	.00054	.00692	.00359	.01406	.00053	.00168	.00130	.00000	.00229	.00071	.00175	.10541	.00164	.06523	.00446	.00456
27. Personnel Service Workers (06 + 08 + 12 + 20)	.00057	.00057	.00053	.00032	.00114	.00074	.00075	.00079	.00000	.00012	.00000	.00000	.00094	.00194	.00210	.00335	.17910	.00302	.00731
28. Public Service Workers (10)	.00028	.00029	.00317	.00266	.00476	.00396	.00431	.00251	.00120	.00553	.00371	.00380	.01346	.00400	.01083	.00546	.01862	.01304	.31196
29. Laborers (00)	.13255	.13253	.01728	.10554	.09422	.03092	.12594	.01794	.00743	.01956	.02401	.05407	.05110	.05244	.04420	.00698	.01275	.03419	.03222
Total W & S	.15729	.15727	.94962	.65495	.97715	.98960	.86207	.96306	.88655	.97585	.98393	.98453	.93992	.92415	.79828	.83931	.69971	1.00000	1.00000
Prop.	.84271	.84273	.05038	.34505	.02285	.01040	.13793	.03694	.11345	.02415	.01607	.01547	.06008	.07585	.20172	.16070	.30029		
TOTAL	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

proprietorship employment. Federal government and state and local governments are analyzed separately; thus, there is an industry-occupation matrix for each endogenous sector and for each government sector.

The labor coefficient of each occupation group is obtained by dividing the number of employees in each occupation group by the total employment in each sector. The coefficient for the proprietorship employment in each sector is obtained by dividing the total proprietorship employment by the total employment in each sector. Total proprietorship employment in each sector is obtained by adding the number of proprietors in each occupation of each sector.

b. Output-Employment Coefficients. Output-employment coefficients indicate the value of output produced by each employee in each sector. They are obtained by dividing sector's output by sector's employment, and are presented in Table XIII.

Comparing the output-employment ratios found in Table XIII indicates that the petroleum refining sector (sector 6) has the highest output-employment ratio at $96,432. This is a result of the high degree of capital intensity in this sector. Food and kindred products sector (sector 5) is the second highest with $38,655. Next, in order of magnitude, are the mining sector (sector 3), and finance, insurance, and real estate sector (sector 16) with $28,161 and $25,536, respectively.

c. Sector Employment Matrix. The sector employment matrix is presented in Table XIV. Each entry indicates the total employment (wage and salary employment plus proprietor employment) in that

TABLE XIII

OUTPUT-EMPLOYMENT RATIOS BY SECTOR, OKLAHOMA, 1967

Sectors	Output-Labor Ratio
1. Livestock	$ 7,112
2. Crops	10,455
3. Mining	28,161
4. Construction	20,725
5. Food and kindred products	38,655
6. Petroleum refining and related industries	96,432
7. Lumber and wood, furniture and fixtures, paper and allied products	20,210
8. Apparel and other finished products made from fabrics and similar materials	10,517
9. Printing, publishing, and allied industries	13,631
10. Machinery, electrical machinery equipment and supplies	22,472
11. Transportation equipment	22,173
12. Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	22,857
13. Miscellaneous and all other manufacturing industries	17,928
14. Transportation, communication, and public utilities	24,396
15. Wholesale and retail trade	9,457
16. Finance, insurance, and real estate	25,536
17. Services	10,349

TABLE XIV

SECTOR EMPLOYMENT MATRIX, OKLAHOMA, 1967

Sectors	Total Employment
1. Livestock	68,500
2. Crops	52,300
3. Mining	43,175
4. Construction	49,621
5. Food and kindred products	15,760
6. Petroleum refining and related industries	8,084
7. Lumber and wood, furniture and fixtures, paper and allied products	4,736
8. Apparel and other finished products made from fabrics and similar materials	7,580
9. Printing, publishing, and allied industries	8,347
10. Machinery, electrical machinery equipment and supplies	24,594
11. Transportation equipment	11,078
12. Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	19,197
13. Miscellaneous and all other manufacturing industries	21,172
14. Transportation, communication, and public utilities	53,563
15. Wholesale and retail trade	196,923
16. Finance, insurance, and real estate	40,271
17. Services	142,199
18. Federal government	59,500
19. State and local government	116,900
Total employment	944,100

Source: Oklahoma Employment Security Commission, Handbook of Oklahoma Employment Statistics, 1958-1972, p. 15.

Oklahoma Employment Security Commission, Industry-Occupation Matrices for Oklahoma, 1970.

sector. For example, in 1967, employment was 15,760 in the food and kindred products sector (sector 5). The sectors with the largest employment according to the model sector's specification are the wholesale and retail trade sector, services sector, and state and local government sector.

d. Labor Stock Matrix. The labor stock matrix presented in Table XV indicates the occupational mix of employment by sector. Each element of the matrix is obtained by multiplying sector employment by the column of labor coefficients for that sector from Table XII.

Each entry indicates the number of employees working in that occupation in each sector. For example, the mining sector (sector 3) has 2,304 engineers (occupation group 1); 1,337 scientists (occupation group 2); 1,251 technicians (occupation group 3); etc. Total wage and salary employment in the mining sector is 41,000; total proprietor employment is 2,175; and total employment is 43,175.

e. Total Oklahoma Employment by Occupation Matrix. Total Oklahoma employment by occupation in 1967 is given in Table XVI. Each entry in this column vector is obtained by adding the number employed in that occupation across all sectors. They indicate the total number of employees in each occupation group, total wage and salary employment, and total proprietor employment. Total Oklahoma employment can be determined by summing total wage and salary employment and total proprietor employment.

2. Population

Oklahoma population has been increasing continuously since 1950. There were 2,328,000 people living in Oklahoma in 1960, compared to

TABLE XV

LABOR STOCK MATRIX, OKLAHOMA, 1967

Occupation Group \ Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Engineers (02)	13	10	2,304	299	69	629	19	4	4	1,015	604	349	276	1,018	561	76	549	2,323	773
2. Scientists (04 + 06)	15	12	1,337	11	18	307	3	0	0	39	20	35	46	175	50	18	155	447	555
3. Technicians (including health) (08 + 10 + 12)	61	47	1,251	204	55	609	16	4	9	766	242	514	197	340	1,316	46	7,361	1,850	1,769
4. Computer and Other Machine Specialists (14 + 16)	30	23	714	44	10	187	0	0	12	147	112	46	35	505	220	195	270	1,734	2,128
5. Economists and Planners and Teachers (18 + 20)	0	0	90	13	4	60	0	10	5	66	21	0	10	90	179	12	3,724	459	625
6. Miscellaneous Artists (22)	42	32	132	30	21	48	8	10	1,003	108	63	10	96	533	426	87	1,344	358	332
7. Other Professional and Technical Workers (24 + 99)	44	34	2,654	233	195	887	40	13	73	519	294	348	406	1,123	1,368	836	6,474	2,825	8,964
8. Financial Managers (02)	3	3	724	129	317	170	30	9	221	324	162	207	203	287	4,670	3,649	293	481	447
9. Other Managers and Administrators (04 – 99)	143	109	2,125	2,361	753	304	191	103	459	886	475	684	766	3,037	14,631	2,512	4,791	4,846	16,751
10. Sales Workers (00)	92	70	454	248	947	55	120	140	964	535	85	358	869	665	37,733	6,929	1,214	126	283
11. Secretaries (02)	73	56	2,883	667	261	678	109	81	458	778	284	524	526	1,708	3,553	5,243	5,779	3,871	10,961
12. Other Machine Operators (04)	0	0	702	23	125	279	14	9	72	182	98	103	85	443	923	1,044	531	788	1,431
13. Other Clerical Workers (06 – 99)	272	207	3,810	1,357	1,031	1,019	224	243	1,175	1,848	787	1,201	1,428	9,949	23,105	10,597	9,693	18,556	16,653
14. Construction Traders (02)	105	80	837	13,797	80	180	282	10	0	471	516	726	361	839	1,075	218	697	1,497	2,220
15. Foremen (04)	82	62	2,397	1,107	695	372	219	249	168	1,189	541	925	881	1,573	1,857	94	357	902	664
16. Metal Workers (06)	12	9	327	421	122	70	57	11	4	2,281	832	1,451	390	343	360	6	159	1,175	22
17. Mechanics and Repairmen (08)	37	28	1,189	848	372	224	84	88	40	689	1,209	359	532	5,354	7,695	61	3,687	7,395	2,209
18. Printing Trades (10)	0	0	28	7	9	17	37	0	1,898	30	16	67	30	27	110	35	72	139	55
19. Electrical Workers (12)	0	0	9	160	0	7	4	0	4	337	8	7	994	3,863	8	6	25	88	115
20. Other Miscellaneous Craftsmen (14 – 00)	51	39	3,308	1,914	577	218	361	216	31	223	185	423	347	1,192	2,916	218	1,364	757	931
21. Metal and Machine Shop Workers (02)	38	29	552	785	87	103	101	9	18	3,008	1,063	4,139	131	468	567	5	480	768	201
22. Textile Machine Workers (02)	0	0	0	0	0	0	2	0	0	0	0	0	489	0	0	0	0	0	0
23. Final Processors (06)	15	11	27	10	1,555	111	132	572	54	1,099	370	407	1,438	193	1,464	4	40	356	22
24. Miscellaneous Operatives (08 – 00)	445	339	11,884	2,313	6,214	1,027	1,773	5,309	571	6,527	2,523	4,642	7,694	11,920	18,894	167	5,327	3,480	3,548
25. Janitorial Workers (02)	55	42	324	107	196	122	75	45	71	281	83	220	268	634	1,511	1,040	5,910	1,024	3,619
26. Food Workers (04)	10	8	32	27	109	29	4	4	14	32	0	44	15	94	20,758	66	9,276	265	533
27. Personnel Services Workers (06 + 08 + 12 + 20)	39	30	23	16	18	6	0	6	0	3	0	0	20	104	413	135	25,467	180	855
28. Public Service Workers (10)	19	15	137	132	75	32	23	19	10	136	41	73	285	214	2,133	220	2,648	776	36,467
29. Laborers (00)	9,080	6,931	746	5,237	1,485	250	672	136	62	481	266	1,038	1,082	2,809	8,704	281	1,813	2,034	3,767
Total W & S	10,774	8,226	41,000	32,500	15,400	8,000	4,600	7,300	7,400	24,000	10,900	18,900	19,900	49,500	157,200	33,800	99,500	59,500	116,900
Proprietor	57,726	44,074	2,175	17,121	360	84	736	280	947	594	178	297	1,272	4,063	39,723	6,471	42,699	0	0
TOTAL	68,500	52,300	43,175	49,621	15,760	8,084	5,336	7,580	8,347	24,594	11,078	19,197	21,172	53,563	196,923	40,271	142,199	59,500	116,900

TABLE XVI

TOTAL EMPLOYMENT BY OCCUPATION MATRIX, OKLAHOMA, 1967

	Occupation Group	Total Oklahoma Employment
1.	Engineers (02)	10,895
2.	Scientists (04 + 06)	3,243
3.	Technicians (including health)(08 + 10 + 12)	16,657
4.	Computer and other machine specialists (14 + 16)	6,412
5.	Economists and planners and teachers (18 + 20)	5,368
6.	Miscellaneous artists (22)	4,683
7.	Other professional and technical workers (24 - 99)	27,330
8.	Financial managers (02)	12,329
9.	Other managers and administrators (04 - 99)	55,927
10.	Sales workers (00)	51,887
11.	Secretaries (02)	38,493
12.	Other machine operators (04)	6,852
13.	Other clerical workers (06 - 99)	103,155
14.	Construction traders (02)	23,980
15.	Foremen (04)	14,334
16.	Metal workers (06)	8,052
17.	Mechanics and repairmen (08)	32,111
18.	Printing trades (10)	2,577
19.	Electrical workers (12)	5,635
20.	Other miscellaneous craftsmen (14 - 00)	15,271
21.	Metal and machine shop workers (02)	12,552
22.	Textile machine workers (04)	491
23.	Final processors (06)	7,880
24.	Miscellaneous operatives (08 - 00)	94,597
25.	Janitorial workers (02)	15,627
26.	Food workers (04)	31,320
27.	Personnel service workers (06 + 08 + 12 + 20)	27,315
28.	Public service workers (10)	43,455
29.	Laborers (00)	46,874
	Total wage and salary	725,300
	Total proprietor	218,800
	Total employment	944,100

2,489,000 in 1967, 2,567,000 in 1970, and 2,709,000 in 1974. The direction of migration has changed. In the decade of 1950s, the State was experiencing net outmigration. However, net immigration has occurred recently. Oklahoma's gain in population by migration totaled 81,000 in 1974 [36].

Oklahoma population analysis is based on total employment in Oklahoma. Assuming perfect mobility of labor and full employment, population is estimated by considering a specific portion of the population is employed. A ratio of population to total employment is obtained for the base year, first. Then this ratio is multiplied by the estimated total employment. Since the proportion of population which is employed has been increasing, a coefficient is incorporated into the estimation procedure, making necessary adjustments annually by changing the labor participation.

3. Income

This section of the human resource analysis includes sector wage and salary rates and proprietor income rates, sector wage and salary and proprietor incomes, total personal income, personal income per capita, disposable income, and disposable income per capita.

a. Sector Wage and Salary Rates and Proprietor Income Rates. These ratios indicate wage and salary rates and proprietor income rates per employee by sector, and are computed by using the income figures from Table XVII and employment figures from Table XV. Sector wage and salary rates and proprietor income rates are obtained by dividing each sector's wage and salary payments and proprietor income by wage and

TABLE XVII

SOURCES OF WAGE AND SALARY, PROPRIETOR, AND TOTAL CIVILIAN INCOMES BY SECTOR, OKLAHOMA, 1967

	Wage and Salary Payments* ($000)	Percent of Total W and S Income	Proprietor Income** ($000)	Percent of Total Proprietor Income	Total Civilian Income ($000)	Percent of Total Civilian Income
	(1)	(2)	(3)	(4)	(5)	(6)
1. Livestock	17,012	.42	126,494	14.66	143,506	2.92
2. Crops	12,988	.32	165,506	19.18	178,494	3.63
3. Mining	311,000	7.67	1,881	.22	312,881	6.36
4. Construction	197,000	4.86	53,922	6.25	250,922	5.10
5. Food and kindred products	96,976	2.39	1,824	.21	98,800	2.01
6. Petroleum refining	50,357	1.24	1,000	.11	51,357	1.05
7. Lumber and wood, furniture and fixtures, paper and allied products	28,953	.71	3,477	.40	32,430	.66
8. Apparel and other finished products made from fabrics and similar materials	45,959	1.13	1,482	.17	47,441	.97
9. Printing, publishing, and allied industries	46,619	1.15	3,021	.35	49,640	1.01
10. Machinery, electrical machinery equipment and supplies	151,145	3.73	3,933	.46	155,078	3.15
11. Transportation equipment	68,609	1.69	342	.04	68,951	1.40
12. Primary and fabricated metal products industries except ordnance, machiney, and transportation equipment	119,039	2.93	2,394	.28	121,433	2.47
13. Miscellaneous and all other manufacturing industries	125,343	3.09	3,705	.43	129,048	2.62
14. Transportation, communication, and public utilities	340,000	8.38	14,763	1.71	354,763	7.21
15. Wholesale and retail trade	668,000	16.47	144,039	16.69	812,039	16.51
16. Finance, insurance, and real estate	173,000	4.27	51,984	6.02	224,984	4.57
17. Services	414,000	10.21	283,233	32.82	697,233	14.17
18. Federal government	686,000	16.91	-	-	686,000	13.95
19. State and local government	496,000	12.23	-	-	496,000	10.08
20. Other industries	8,000	.20	-	-	8,000	.16
	4,056,000	100.00	863,000	100.00	4,919,000	100.00

*Wage and salary incomes of agricultural and manufacturing sectors are distributed by wage and salary employment.

**Farm and non-farm proprietor incomes are distributed into included sectors by using the profits of sole proprietorship and partnership of the corresponding sectors.

Source: Estimates were obtained from U. S. Department of Treasury, Statistics of Income: 1967 Business Income Tax Returns, and U. S. Department of Commerce, Survey of Current Business, August, 1970.

salary employment and proprietor employment of the same sector. These ratios are presented in Table XVIII. Sector wage rates are presented in column (1) and are presented for the endogenous and government sectors. Column (2) displays sector proprietor income rates for the endogenous sectors. Federal government pays the highest salary per employee at $11,529. Mining sector (sector 3) pays the highest wages and salaries per employee among endogenous sectors at $7,585. Following closely is the transportation, communication, and public utilities sector (sector 14) at $6,869. Petroleum refining sector (sector 6) shows the highest proprietor income rates at $11,905. Primary and fabricated metal products sector (sector 12) and finance, insurance, and real estate sector (sector 16) are found to have the following highest proprietor income rates at $8,061 and $8,033, respectively.

b. Sector Wage and Salary and Proprietor Income. Table XVII displays the sources of wage and salary and proprietor income. The first column of this table indicates the dollar value of wage and salary income by sector. The second column of the same table presents the percentage distribution of total wage and salary income by sectors. Federal government has the largest share with 16.91 percent, with the wholesale and retail sector next with 16.47. They are followed by state and local government and services sectors, with 12.23 percent and 10.21 percent, respectively.

The third column of Table XVII displays the total value of proprietor income by sector. The fourth column of the same table indicates the percentage distribution of each sector's share. Services sector is the largest at 32.82 percent. It is followed by the crops sector with

TABLE XVIII

WAGE AND SALARY RATES AND PROPRIETOR INCOME RATES, OKLAHOMA, 1967

	Sectors	Wage and Salary Rates	Proprietor Income Rate
		(1)	(2)
1.	Livestock	1,579	2,868
2.	Crops	1,579	2,868
3.	Mining	7,585	865
4.	Construction	6,062	3,149
5.	Food and kindred products	6,297	5,053
6.	Petroleum refining and related industries	6,295	11,905
7.	Lumber and wood, furniture and fixtures, paper and allied products	6,294	4,724
8.	Apparel and other finished products made from fabrics and similar materials	6,296	5,293
9.	Printing, publishing, and allied industries	6,300	3,193
10.	Machinery, electrical machinery equipment and supplies	6,298	6,621
11.	Transportation equipment	6,294	1,921
12.	Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	6,298	8,061
13.	Miscellaneous and all other manufacturing industries	6,299	2,913
14.	Transportation, communication, and public utilities	6,869	3,634
15.	Wholesale and retail trade	4,249	3,626
16.	Finance, insurance, and real estate	5,118	8,033
17.	Services	4,161	6,634
18.	Federal government	11,529	-
19.	State and local government	4,243	-

19.18 percent, wholesale and retail sector with 16.69 percent, and livestock sector with 14.66 percent.

The last two columns of Table XVII present the distribution of total civilian income among sectors and each sector's percentage share in it. In total civilian income, wholesale and retail sector has the lead with $812,039,000 and 16.51 percent of total civilian income. Services sector with $697,233,000 and 14.17 percent, federal government with $686,000,000 and 13.95 percent and state and local government with $496,000 and 10.08 percent follow it, in that order.

c. Personal Income Analysis. This section of the human resource account is concerned with total personal income, personal income per capita, disposable income, and disposable income per capita.

Total personal income in Oklahoma increased from $6,664,000,000 in 1967, to $11,558,000,000 in 1973. Data in Table XIX indicates that every sector's wage and salary payments increased substantially except federal military payments where the increase was minor. Proprietor income, other labor income, property income, and transfer payments also realized significant increases. Actually, all of these, other than property income, more than doubled from 1967 to 1973. It is useful to make a point before closing this analysis. Some sectors--such as agricultural and mining--experienced exceptionally high prices for their products in 1973. As a result, proprietor's income in these sectors increased substantially.

Total personal income is estimated by summation of five components and subtraction of personal contributions to social insurance. The five components are: wage and salary income,

TABLE XIX

TOTAL PERSONAL INCOME, OKLAHOMA, 1967-1973

Sectors	(Millions of Dollars)						
	1967	1968	1969	1970	1971	1972	1973*
Wage and salary payments	4,057	4,459	4,872	5,323	5,646	6,171	6,815
Farms	30	29	32	40	41	50	62
Mining	311	335	359	354	357	386	425
Contract construction	197	225	257	288	326	342	506
Manufacturing	733	825	907	993	1,014	1,142	1,465
Wholesale and retail trade	668	720	784	862	938	1,042	1,402
Finance, insurance, and real estate	173	189	212	234	256	288	429
Transportation, communication, and public utilities	340	374	415	443	482	534	685
Services	414	469	528	591	643	709	1,147
Government	1,182	1,282	1,366	1,503	1,571	1,663	1,839
Federal civilian	408	442	477	539	558	596	641
Federal military	278	294	299	298	283	278	326
State and local	496	547	590	666	729	789	872
Other industries	8	11	13	15	15	15	31
Other labor income	194	219	267	314	350	389	442
Proprietor income	863	861	887	926	857	1,033	1,667
Farm	292	229	302	379	301	397	935
Non-farm	570	632	585	547	556	637	731
Property income	1,059	1,118	1,213	1,343	1,451	1,528	1,575
Transfer payments	696	782	842	979	1,130	1,238	1,423
Less: personal contributions to social insurance	-204	-230	-253	-267	-325	-364	-451
Total personal income	6,664	7,209	7,827	8,617	9,109	9,995	11,558

*Starting from 1973, the data are presented differently. For every sector other than farms and government, under wage and salary heading, total payments are listed instead of wage and salary payments.

Source: U. S. Department of Commerce, Survey of Current Business, various issues, 1970-1974.

property income, transfer payments, other labor income and proprietor income.

Personal income per capita is defined as total personal income divided by population. This measure might be a better indication to trace the well-being of an economy than total personal income. Per capita personal income in Oklahoma has been increasing continuously--it was $2,712 in 1967, $3,127 in 1969, and $3,553 in 1971, compared to $4,340 in 1973 [82]. Total personal income estimate is divided by population estimate to estimate personal income per capita. Disposable income is obtained by subtracting personal taxes from total personal income. Disposable income per capita is obtained by dividing disposable income by population.

B. The Government Account

Government activities are analyzed in two groups: federal government activities and state and local government activities. Revenues and expenditures of federal government and state and local government and the procedures in estimating these are discussed in the following sections.

1. Federal Government Activities

Federal government revenues in Oklahoma consist of federal government taxes collected in Oklahoma. Federal tax collections are grouped in three major parts: individual income tax, corporation income tax, and all other federal taxes. Among these individual income tax collections are the largest component and have the highest rate of increase. Federal individual tax collections were 89.9 percent higher

in 1973 compared to the collections in 1967. Corporation income tax collections indicated declines for 1968-1970. They were about the same level in 1971 and in 1972 as in 1967. In 1973, corporation tax collections increased and were 6.3 percent higher than in 1967. All other tax collections indicated slight drops in 1969 and 1970, but were 29.9 percent higher in 1973 than in 1967. Total federal tax collections increased 58.8 percent from 1967 through 1973. Tax collections for each group for each year and the total are given in Table XX.

TABLE XX

FEDERAL GOVERNMENT TAX COLLECTIONS, OKLAHOMA, 1967-1973

Year	Individual Income Tax	Corporation Income Tax	All Other Federal Tax Collections	Total Federal Tax Collections
	($000)	($000)	($000)	($000)
1967	770,693	277,520	323,706	1,371,919
1968	965,684	213,771	385,005	1,564,460
1969	1,055,728	206,790	335,723	1,598,241
1970	1,160,634	233,127	339,245	1,733,006
1971	1,199,279	272,502	373,044	1,844,825
1972	1,272,227	273,952	400,056	1,946,235
1973	1,463,630	295,008	420,342	2,178,980

Source: Internal Revenue Service, Annual Report, various issues, 1967-1973.

Total federal government tax collections are estimated by regression analysis with total personal income as the independent variable.

Individual income tax collections are estimated separately with total employment as the independent variable.[2]

Total federal government expenditures in Oklahoma increased 18.3 percent from 1968 to 1972. Table XXI shows the federal government outlays in Oklahoma in recent years. Federal government expenditures in Oklahoma are estimated by a trend method.

TABLE XXI

TOTAL FEDERAL OUTLAYS, OKLAHOMA, 1967-1972

Year	Federal Government Outlays in Oklahoma
	($000)
1967	2,280,885*
1968	2,490,872
1969	2,654,447
1970	2,561,408
1971	2,804,307
1972	2,947,633

*Estimated by utilizing a trend method and deflating to 1967 prices.

Source: U. S. Department of Commerce, National Technical Information Service, Federal Outlays in Oklahoma in 1968.

[2]Data were converted to constant 1967 prices for the regression procedure. The equations and relevant statistical information about the equations are presented in Chapter V.

2. State and Local Government Activities

State and local government revenues are composed of three types of sources: state and local government tax collections, federal aid to the state and local governments, and all other state and local government revenues.

Tax collections of state and local governments include state sales tax, gasoline and fuels excise taxes, income tax, and all other state and local taxes. Collections from 1967 through 1974 are presented in Table XXII. Among these, state sales tax collections increased by 86.1 percent, gasoline and fuels excise taxes increased by 30.2 percent, and individual and corporation income taxes increased by 205.0 percent from 1967 through 1974. The greatest single jump took place in 1972 when the tax rates were raised as a result of the "Oklahoma Income Tax Act " which was effective after December 31, 1970.

Total tax collections of state and local governments are given in the first column of Table XXIII. In the six-year period of 1967-1972, total tax collections increased by 63.1 percent. Rates of increase in the second, third, and fourth columns of Table XXIII for the same period are obtained as 56.0 percent, 68.7 percent, and 62.2 percent for federal aid, all other revenues, and total revenues, respectively.

Each component of state and local government revenues is estimated by using a simple regression equation. Total personal income is the independent variable used to estimate state sales taxes and individual and corporation income taxes. Personal income per capita is the independent variable utilized for estimation of gasoline, fuels excise, and special fuels use tax; other state and local government taxes; federal

TABLE XXII

STATE AND LOCAL GOVERNMENT TAX COLLECTIONS, OKLAHOMA, 1967-1974

Year	State Sales Tax	Gasoline and Fuels Excise Taxes	Income Tax	All Other State and Local Taxes
	($000)	($000)	($000)	($000)
1967	72,140	77,925	61,519	174,584
1968	75,655	80,729	73,347	185,542
1969	82,803	86,212	79,802	209,391
1970	88,868	90,868	89,776	218,623
1971	95,038	96,632	92,109	231,818
1972	106,623	93,631	140,731	288,809
1973	116,494	98,634	162,241	299,377
1974	134,286	99,689	187,631	343,826

Source: Oklahoma Tax Commission, Annual Report, Fiscal Year 1974, pp. 4-11.

TABLE XXIII

STATE AND LOCAL GOVERNMENT REVENUES, OKLAHOMA, 1967-1972

Year	Total Tax Collections	Federal Aid	All Other State and Local Revenues	Total Revenues
	($ million)	($ million)	($ million)	($million)
1967	386.2	284.6	227.3	898.1
1968	415.3	334.1	268.9	1018.3
1969	458.2	342.5	285.4	1086.1
1970	488.1	366.1	323.8	1178.0
1971	515.6	383.8	344.5	1243.9
1972	629.8	443.9	383.4	1457.1

Source: U. S. Department of Commerce, Governmental Finances in 1966-1972, various issues.

aid to the state and local government; and other state and local government revenues.[3]

Major state and local government expenditures are: education expenditures, highway expenditures, public welfare expenditures, health and hospital expenditures, and all other state and local government expenditures. These are given in columns (1) through (5) of Table XXIV. The last column of the same table indicates the total value of state and local expenditures. The rates of increase in state and local expenditures are: education by 42.1 percent, highway by 27.5 percent, public welfare by 47.0 percent, health and hospital by 91.9 percent, and all other expenditures by 83.3 percent from 1967 to 1972. Total expenditures rose 52.1 percent for the same six-year period.

Each expenditure component is estimated by a simple regression equation. State and local government expenditures on: education, health and hospitals, and others are estimated by using lagged value of total personal income as the independent variable; highways are estimated by using lagged value of gasoline and fuels excise tax as the independent variable; and public welfare are estimated by using the lagged value of personal income per capita as the independent variable.[4]

---

[3]These equations and relevant statistical information about the equations are presented in Chapter V.

[4]For the equations, their discussion and relevant statistical information about the equations see Chapter V.

TABLE XXIV

STATE AND LOCAL GOVERNMENT EXPENDITURES, OKLAHOMA, 1967-1972

Year	Education Expenditures	Highway Expenditures	Public Welfare	Health and Hospitals	All Other State and Local Expenditures	Total Expenditures
	(1)	(2)	(3)	(4)	(5)	(6)
			(millions of dollars)			
1967	468.9	178.1	208.1	65.2	241.3	1161.6
1968	484.0	208.5	231.8	74.2	275.7	1274.2
1969	524.4	201.7	226.4	76.4	287.2	1316.1
1970	588.0	230.8	248.3	91.5	315.4	1474.0
1971	630.6	218.9	271.2	106.4	398.9	1626.0
1972	666.5	227.1	306.0	125.1	442.2	1766.9

Source: U. S. Department of Commerce, Governmental Finances in 1966-1972, various issues.

CHAPTER V

THE SIMULATION MODEL OF THE OKLAHOMA ECONOMY

Simulation models have been employed in regional development research since the mid 1950s. Availability of the digital computer has increased the application on this type of empirical tool. With the addition of more and more relationships, more complicated models are being solved more easily. In the first part of this chapter, several recent simulation studies which are based on input-output technique are reviewed. This section also includes a discussion of the differences of this study from previous models. In the latter part of the chapter, the Oklahoma Simulation Model is discussed in detail.

A. Previous Simulation Studies

The Iowa State study by Maki, Suttor and Barnard [24] was one of the first regional simulation studies based on the input-output model. Twenty-three major equations of this study described the current economic conditions in Iowa. These included derivation of final demand, estimation of sector output, sector employment, value added, total personal income, and disposable income. Another set of equations provided useful information about the functioning of the model. These auxiliary equations included ten major equations and estimated such variables as imports, exports, federal tax collections, gross area product, population, total labor force, and total employment. All of these equations

were arranged in a recursive sequence. Simulation runs were performed over the 1954-1974 period. Several experimental runs were made about labor productivity and export demand.

Unpublished Ph.D. dissertations by Mullendore [28] and MacMillan [23] are versions of the Maki, Suttor, and Barnard study. Mullendore, in his study, tried

> ...to develop procedures for projecting region's economy and people under a variety of alternative assumptions with respect to certain variables in the model [28, p. 45].

Behavioral and definitional equations were utilized to accomplish the objectives. This model accounted for feedback and time-related relationships in the Iowa economy. The main contribution of this study was the demographic sector whose purpose was:

> ...to account for changes in characteristics of the population which influence the economy. This is accomplished in the present study by accounting for population increases and decreases by age groups over time [28, p. 52].

MacMillan's [23] major objective was:

> ...the preparation of procedures for producing information to facilitate public service system performance by individual agencies and other governmental departments [23, p. 3].

This study also presented a methodology to permit the evaluation of the impact of alternative public service programs for development. Specification of area and sub-area public service and income inequalities and the estimation of state funds required to equalize education services in Iowa planning areas were analyzed. Furthermore, this economic development model was used for experimentations for appraisal of state aid to local education.

Doeksen [4] developed a model similar to that of Maki, Suttor, and Barnard [24] for the Oklahoma economy. His input-output model consisted

of twelve endogenous and five exogenous sectors. The major contribution of this study was the addition of the capital sector. Capital coefficients for Oklahoma were developed. Also sector capacity levels, capital-output ratios, capital unit matrix, and capital stock matrix were included. This model was used to simulate over the 1963-1980 period. Short-run, intermediate-run, and long-run impacts of one million dollar investment in each sector were investigated in terms of new employment and income. This study also investigated the cost of creating employment for 100 persons in each sector and minimizing investment per million dollars of additional income.

Ekholm [9] developed a simulation model to estimate the impact of declining groundwater and petroleum resources for the Texas and Oklahoma Panhandle areas. Different from previous studies, this model was derived primarily by the supply of mined resources. Groundwater, crude oil, and natural gas have an impact on the regional economy. By assuming the agriculture, the petroleum, and the agricultural and petroleum supply related sectors are the primary driving force in the economy, Ekholm's model is an attempt to trace the impact of mined resources production on the regional economy. Household expenditures were estimated by utilizing income elasticities. This model covered the 1967-2010 period.

A recent simulation study was completed by a research team from Michigan State University with a U.S.A.I.D. contract [13]. The objective of this study was

> ...to develop the general simulation approach to studying agricultural development to a point where it would be applicable and operational [13, p. v].

The "population model" was one of the major components of this

study and it was utilized to simulate the growth of the population in each region for the simulation period. The demand for subsistence calories in every crop area of each region and the demand for food staples purchased through the cash market were determined by the interaction of this model with the agricultural simulation model. The "population model" also determined the supply of agricultural labor available by crop area in each region, the total population in the agricultural and non-agricultural sector by region, and the number and growth rate of the farmers in each crop area in each region. The model had three dimensions: occupation, sex, and age coharts. Occupation was considered for only agricultural, non-agricultural, and unemployable. Population coharts which were updated by the model every three years, consisted of 27 three-year groups.

The Susquehanna River Basin study [14] is a widely-cited dynamic regional simulation model which used a set of simultaneous differential equations to describe the current economic conditions. Economic activity was specified in terms of employment: positive or negative feedback loops tied the employment and the demographic sectors together. The "driving force" of this model was market area demand which was operating through export industry employment.

Another study by Miernyk, et al. [27] developed a simulation model of the West Virginia economy. The central focus of this study, whose data were obtained by personal interviews with a sample of establishments, was the use of an input-output model to simulate certain aspects of economic development. The process of structural change in an economy was viewed in a dynamic setting. The climax of the analysis of structural change was given as follows:

> ...the important point is that peak levels of output will occur in the industries that are major suppliers of capital goods to the simulated sectors before the latter go into production [27, pp. 164, 165].

This study underwent the analysis of the costs and the benefits of a development subsidy--namely, for the sulfuric acid industry. Use of multipliers was emphasized as being useful in regional development planning; however, a special caution was given to their interpretations.

Several other simulation studies can be added to the list. Some of these are Byerlee and Halter [1]; Holloway [16]; Tung, MacMillan, and Framingham [45] ; etc. All of these are similar to one or more of the studies mentioned earlier.

Oklahoma Simulation Model is most closely related to the Doeksen [4] study. Sectors' outputs of Oklahoma Simulation Model are estimated through final demand sectors. Household sector's purchases are estimated by using the lagged value of disposable income which is determined endogenously. This is a somewhat similar procedure to that of Ekholm [9]. As differences from the previous studies, Oklahoma Simulation Model incorporated the government account and the expanded human resource account into the model. Government sectors' revenues and expenditures are estimated by utilizing regression equations. These are also disaggregated into several components to obtain the best possible estimates. The major contribution of this study lies in the human resource account. Labor coefficients of Oklahoma are developed in this section. Sectors' employments are obtained by occupational groups. Human resource needs of Oklahoma are studied by sector and as total for the State. By disaggregating the manufacturing activity into nine sectors, the problem of aggregation is somewhat eased. These additions and the

rest of the model are discussed in detail in the following section.

B. The Oklahoma Simulation Model

The Oklahoma Simulation Model is a recursive model involving 62 major equations and is built around the input-output system. The equations which estimate final demand, determine sector output and project state economic variables are discussed in detail. The complete listings of variables, matrices, and scalars are presented in Tables XXV, XXVI, and XXVII, respectively. Variables are presented in letters, brackets for vectors and parentheses for scalars, matrices by the capital letter A, and scalars by the lower-case a. The flow chart which is presented in Figure 2 helps explain the estimates of output. Various State economic variables are obtained by using final demand estimates. All monetary variables, unless otherwise indicated, are in thousands of dollars.

1. Projecting Final Demand

First, each final demand component needs to be estimated. Then, total final demand can be estimated by summing all of these components. Final demand sectors include private capital formation, household demand, export demand, and purchases made by federal government and state and local government.

a. Private Capital Formation. Composition of new investment is obtained by multiplying the capital coefficient matrix by the column vector of total investment. The column vector of total investment is obtained by summing three separate column vectors which are (1) new

TABLE XXV

VARIABLES IN OKLAHOMA SIMULATION MODEL

Variable	Description
$[In]_t$	Column vector of new plant and equipment investment in year t
$[X^d]_t$	Column vector of sector output in year t
$[K]_t$	Column vector of capital stock at the beginning of year t
$[In]_t$	Column vector of new plant and equipment investment made during year t
$[Ir]_t$	Column vector of replacement investment in year t
$[Ih]_t$	Column vector of household expenditures on residential housing in year t
$[I]_t$	Column vector of total investment in year t
$[CA]_t$	Column vector of composition of new investment in year t
$(LDI)_t$	Lagged percentage change in disposable income in year t
$(DI)_t$	Disposable income in year t
$[C_j]_t$	Column vector of personal consumption demand by sector in year t
$[En]_t$	Column vector of export demand for non-durables in year t
$[Ed]_t$	Column vector of export demand for durables in year t
$[Et]_t$	Total export demand in year t
$[TFE]_t$	Column vector of total federal government purchases in Oklahoma in year t
$(EE)_t$	State and local government expenditures on education in Oklahoma in year t
$(TPI)_t$	Total personal income in Oklahoma in year t
$(HE)_t$	State and local government expenditures on highways in Oklahoma in year t
$(GT)_t$	Gasoline and fuels excise and special fuels use tax in Oklahoma in year t

TABLE XXV (Continued)

Variable	Description
$(PW)_t$	State and local government expenditures on public welfare in Oklahoma in year t
$(PIP)_t$	Personal income per capita in Oklahoma in year t
$(HH)_t$	State and local government expenditures on health and hospitals in Oklahoma in year t
$(OE)_t$	State and local government expenditures on others in Oklahoma in year t
$(TSE)_t$	Total state and local government expenditures in Oklahoma in year t
$[TSE]_t$	Column vector of total state and local government purchases in Oklahoma in year t
$[Z]_t$	Column vector of total final demand in Oklahoma in year t
$[OCM_j]_t$	Occupation-component matrix for j^{th} sector in year t
$[LO]_t$	Column vector of labor-output coefficients in Oklahoma in year t
$[L]_t$	Column vector of available labor by sector in year t
$[X^L]_t$	Maximum sector output due to labor restriction in year t
$[X^C]_t$	Maximum sector output due to capital restriction in year t
$[L^e]_t$	Column vector of sector employment in year t
$(E)_t$	Total employment in endogenous sectors in year t
$(L^e_j)_t$	j^{th} sector's total employment in year t (or j^{th} element in the column vector of $[L^e]_t$)
$[OCM_j]^t_{t-1}$	Occupation-component matrix for needed labor by sector from year t-1 to year t
$[OCM]_t$	Occupation-component matrix for the endogenous sectors of Oklahoma in year t
$[L^W L^P]_t$	Matrix of wage and salary and proprietor employment by sector for the endogenous sectors of Oklahoma in year t

TABLE XXV (Continued)

Variable	Description
$[L_w L_p]_t$	Row vector of total wage and salary and proprietor employment of the endogenous sectors of Oklahoma in year t
$[L_f]_t$	Column vector of federal government employment by occupation in Oklahoma in year t
$(TE)_t$	Total Oklahoma employment in year t
$(P)_t$	Total Oklahoma population in year t
$[WS]_t$	Column vector of wage and salary payments in year t
$[L^w]_t$	Column vector of wage and salary employment in year t
$[Y^P]_t$	Column vector of proprietor income in year t
$[L^P]_t$	Column vector of proprietor employment in year t
$(FS)_t$	All governmental wages and salaries in Oklahoma in year t
$(AF)_t$	Military payroll in Oklahoma in year t
$(Y^T)_t$	Total transfer payments in Oklahoma in year t
$(Y^{Py})_t$	Total property income in Oklahoma in year t
$(OY)_t$	Total other labor income in Oklahoma in year t
$[V]_t$	Column vector of value added in Oklahoma in year t
$(X^g)_t$	Gross state product in Oklahoma in year t
$(TFR)_t$	Federal government tax collections in Oklahoma in year t
$(IIT)_t$	Federal individual income tax collections in Oklahoma in year t
$(ST)_t$	State sales tax collections in Oklahoma in year t
$(GT)_t$	Gasoline and fuels excise and special fuels use tax collections in Oklahoma in year t
$(IT)_t$	Individual and corporation income tax withheld by the State in Oklahoma in year t
$(OT)_t$	All other taxes collected by state and local government in Oklahoma in year t

TABLE XXV (Continued)

Variable	Description
$(FA)_t$	Federal aid to state and local government in Oklahoma in year t
$(OR)_t$	Other revenues to state and local government in Oklahoma in year t
$(TSR)_t$	Total state and local government revenues in Oklahoma in year t
$(DI)_t$	Disposable income in Oklahoma in year t
$(DIP)_t$	Disposable income per capita in Oklahoma in year t
$[L_s]_t$	Column vector of state and local government employment by occupation in Oklahoma in year t
$[WSE]_t$	Total wage and salary employment by occupation in Oklahoma in year t
$[OCM1]_t$	Column vector of wage and salary employment by occupation for the endogenous sectors of Oklahoma in year t
$(L_p)_t$	Total proprietor employment in Oklahoma in year t

TABLE XXVI

MATRICES IN OKLAHOMA SIMULATION MODEL

Matrix	Description
A_1	Diagonal matrix of average capital-output ratios
A_2	Diagonal matrix of one plus annual rate of change in capital-output ratios
A_3	Diagonal matrix of depreciation rates
A_4	Diagonal matrix of one plus annual rate of change in households' residential housing expenditures
A_5	Capital coefficient matrix
A_6	Diagonal matrix of estimated income elasticities
A_7	Diagonal matrix of one plus annual growth rate of non-durables
A_8	Diagonal matrix of one plus annual growth rate of durables
A_9	Column vector whose elements are proportions of total state and local government purchases by sector in Oklahoma
A_{10}	Direct and indirect coefficient matrix
A_{11}	Diagonal matrix of labor force-employment ratios
A_{12}	Diagonal matrix of one plus annual growth rate of employment
A_{13}	Diagonal matrix where each element is reciprocal of corresponding labor-output coefficient
A_{14}	Diagonal matrix of one plus annual rate of change in A_{13}
A_{15}	Diagonal matrix of capital-output ratios defined at capacity levels
A_{16}	Diagonal matrix of one plus annual change in labor-output coefficients
A_{17}	Diagonal matrix where elements are representing the corresponding elements of column vector of sector output
A_{18}	Diagonal matrix of sector wage and salary rates

TABLE XXVI (Continued)

Matrix	Description
A_{19}	Diagonal matrix of one plus annual growth rate of wages and salaries by sector
A_{20}	Diagonal matrix of sector proprietor income rate
A_{21}	Diagonal matrix of one plus annual rate of change in proprietor income
A_{22}	Diagonal matrix of the ratio of value added to output

TABLE XXVII

SCALARS IN OKLAHOMA SIMULATION MODEL

Scalar	Description
a_1, a_2 a_3	Weights of percentage change in disposable income for previous three years
a_4	One plus annual growth rate in federal government expenditures
a_5	One plus annual rate of change in federal government employment
a_6	One plus annual rate of change in state and local government employment
a_7	Population-employment ratio in Oklahoma
a_8	One plus annual rate of change in population-employment ratio
a_9	Wage and salary rate of state and local government employees
a_{10}	One plus annual rate of change in state and local government wage and salary rate
a_{11}	Wage and salary rate of federal government employees
a_{12}	One plus annual rate of change in federal wage and salary rate
a_{13}	One plus annual rate of change in military payroll
a_{14}	One plus annual rate of change in transfer payments
a_{15}	One plus annual rate of change in property income
a_{16}	One plus annual rate of change in other labor income
a_{17}	Ratio of social security payments to wage and salary income
a_{18}	One plus annual rate of change in a_{17}

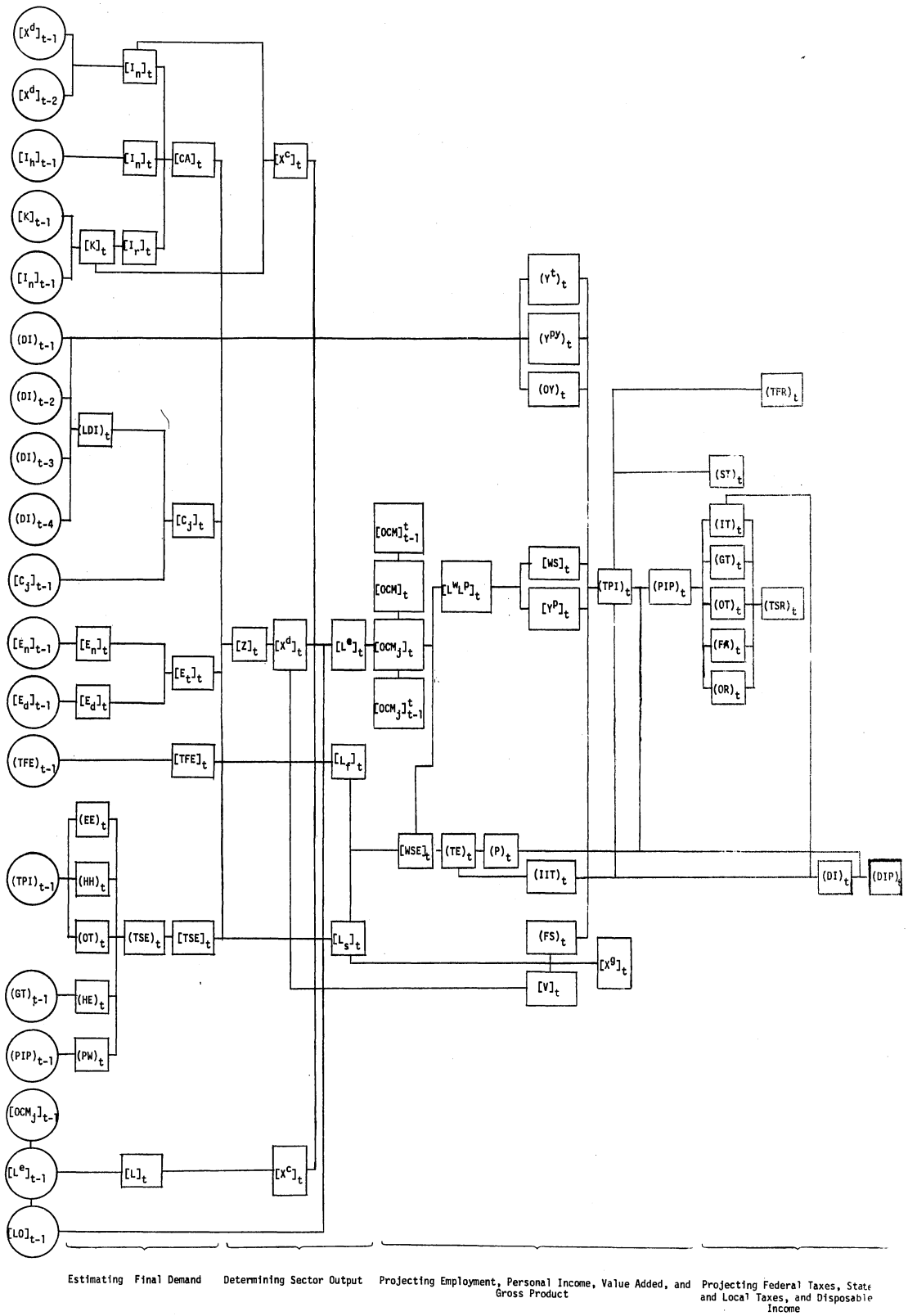

Figure 2. Flow Chart of the Oklahoma Simulation Model

plant and equipment, (2) replacement investment, and (3) households' purchases of residential housing.

New plant and equipment, the first component of total investment, is estimated by using the acceleration principle. It is estimated by multiplying capital-output ratios, annual change in capital-output ratios, and the difference of sector outputs between year t-1 and t-2.

$$[In]_t = [A_1]_{t-1} A_2 [[X^d]_{t-1} - [X^d]_{t-2}] \quad (5.1)$$

where

$[In]_t$ = column vector of new plant and equipment investment in year t

$[A_1]_{t-1}$ = diagonal matrix of average capital-output ratios in year t-1

A_2 = diagonal matrix of one plus annual change in capital-output ratios

$[X^d]_{t-1}$ = column vector of sector output in year t-1.

The diagonal matrix of A_2 reflects the technological change and incorporates this change into future estimates of capital as trends in the capital-output ratios.

Capital stock at the beginning of each period is equal to capital stock at the beginning of the preceding period plus new plant and equipment investment made during the preceding period.

$$[K]_t = [K]_{t-1} + [In]_{t-1} \quad (5.2)$$

where

$[K]_t$ = column vector of capital stock at the beginning of year t

$[In]_{t-1}$ = column vector of new plant and equipment investment made during year t-1.

Replacement investment, the second component of total investment, is obtained by multiplying sector capital stocks by respective depreciation rates.

$$[Ir]_t = A_3 [K]_t \tag{5.3}$$

where:

$[Ir]_t$ = column vector of replacement investment in year t

A_3 = diagonal matrix of depreciation rates.

Households' expenditures, the third component of total investment, on residential housing is estimated as follows:

$$[Ih]_t = A_4 [Ih]_{t-1} \tag{5.4}$$

where:

$[Ih]_t$ = column vector of household expenditures on residential housing in year t

A_4 = diagonal matrix of one plus annual rate of change in households' residential housing expenditures.

Total investment $[I]_t$ is determined by adding the three components.

$$[I]_t = [Ir]_t + [In]_t + [Ih]_t \tag{5.5}$$

The composition of sectors' new investment is determined by multiplying the capital coefficient matrix times total investment.

$$[CA]_t = A_5 [I]_t \tag{5.6}$$

where:

$[CA]_t$ = column vector of composition of new investment in year t

A_5 = capital coefficient matrix.

b. Household Demand. Household demand is estimated by a method which is similar to the one used by Ekholm [9]. For the computation, income elasticity of each sector is utilized. First, the lagged percentage change for the previous three years in disposable income is estimated. Second, weights (a_1,a_2,a_3) for the last three years are used to measure the impact of disposable income on demand. Weights for the previous three years are estimated[1] by utilizing the information in [2] and [12]. If $a_1>a_2>a_3$, this indicates that the more recent income has more impact over the lagged household income.

$$(LDI)_t = a_1((DI)_{t-1} - (DI)_{t-2})/.5((DI)_{t-1} + (DI)_{t-2}) \\ a_2((DI)_{t-2} - (DI)_{t-3})/.5((DI)_{t-2}) + (DI)_{t-3}) \\ a_3((DI)_{t-3} - (DI)_{t-4})/.5((DI)_{t-3} + (DI)_{t-4}) \qquad (5.7)$$

where:

$(LDI)_t$ = lagged percentage change in disposable income for year t

$(DI)_{t-1}$ = disposable income in year t-1

a_1,a_2,a_3 = weights of percentage change in disposable income for the previous three years.

Household demand is estimated by using three pieces of information: (1) the previous year's household demand, (2) lagged percentage change in disposable income, and (3) each sector's income elasticity.

$$[C_j]_t = [C_j]_{t-1} + (LDI)_t \, A_6 \, [C_j]_{t-1} \qquad (5.8)$$

where:

---

[1]The sum of the weights is forced to be equal to one in order to have the impact complete. The weights are estimated as: $a_1 = .605$, $a_2 = .272$, and $a_3 = .123$.

$[C_j]_t$ = column vector of personal consumption demand by sector in year t

A_6 = diagonal matrix of estimated income elasticities by sector.

Sectors' income elasticities are adopted from Mullendore and Ekholm [29].

c. Export Demand. States' export demand are influenced mainly by the United States' demand. Therefore, it is assumed that Oklahoma exports grow in the same proportions as the United States' demand and estimated from [56]. Demand for services sectors (sectors 4, 14, 15, 16, and 17) are assumed to be determined by state economic activity and are not related to the United States' demand. The total export demand is obtained by summing the two components which are export demand for durables and export demand for non-durables.

$$[En]_t = A_7 [En]_{t-1} \tag{5.9}$$

$$[Ed]_t = A_8 [Ed]_{t-1} \tag{5.10}$$

$$[Et]_t = [En]_t + [Ed]_t \tag{5.11}$$

where:

$[En]_t$ = column vector of export demand for non-durables in year t

A_7 = diagonal matrix of one plus annual growth rate of non-durables

$[Ed]_t$ = column vector of export demand for durables in year t

A_8 = diagonal matrix of one plus annual growth rate of durables

$[Et]_t$ = total export demand in year t.

d. Federal Government Purchases in Oklahoma. Federal government purchases in Oklahoma are estimated as a function of the previous year's

purchases. The column vector of federal government purchases in Oklahoma in year t-1 is multiplied by one plus the growth rate in federal government expenditures in Oklahoma (a_4).[2]

$$[TFE]_t = a_4 [TFE]_{t-1} \tag{5.12}$$

where:

$[TFE]_t$ = column vector of total federal government purchases in Oklahoma in year t.

e. State and Local Government Purchases. State and local government expenditures on education, highways, public welfare, health and hospitals, and others are estimated individually. For each of these estimates, the lagged value of the independent variable is used. Here, it is implicitly assumed that changes in independent variables show their effect on dependent variables during the following year. Total personal income and personal income per capita are the variables most frequently used for state and local government expenditure estimates. For the first year estimates, these are fed into the model. For following years, the estimates are obtained within the model. Highway expenditures are projected as a function of gasoline tax collection of the preceding year. State and local government expenditure estimates are

---

[2]All annual growth rates are estimated by utilizing logarithmic approach.

given in five equations[3] as follows:

$$(EE)_t = -113.023 + .08568\ (TPI)_{t-1}/1000 \qquad (5.13)$$
$$(t = 13.77)$$

$$s^2 = 439.45 \quad d = 1.520 \quad \hat{\rho} = .187 \quad R^2 = .9499$$

$$(HE)_t = -33.691 + .000286\ (GT)_{t-1} \qquad (5.14)$$
$$(t = 3.78)$$

$$s^2 = 144.81 \quad d = 1.353 \quad \hat{\rho} = .213 \quad R^2 = .5879$$

$$(PW)_t = -40.180 + .092316\ (PIP)_{t-1} \qquad (5.15)$$
$$(t = 10.08)$$

$$s^2 = 93.49 \quad d = 1.744 \quad \hat{\rho} = .001 \quad R^2 = .9105$$

$$(HH)_t = -33.078 + .01588\ (TPI)_{t-1}/1000 \qquad (5.16)$$
$$(t = 9.20)$$

$$s^2 = 33.84 \quad d = 1.047 \quad \hat{\rho} = .337 \quad R^2 = .8943$$

$$(OE)_t = -100.669 + .05489\ (TPI)_{t-1}/1000 \qquad (5.17)$$
$$(t = 8.53)$$

$$s^2 = 469.77 \quad d = 1.353 \quad \hat{\rho} = .214 \quad R^2 = .8793$$

where:

$(EE)_t$ = state and local government expenditures on education in Oklahoma in year t ($ million)

$(TPI)_{t-1}$ = total personal income in Oklahoma in year t-1

$(HE)_t$ = state and local government expenditures on highways in Oklahoma in year t ($ million)

---

[3]For estimating equations (5.13) through (5.17), it is assumed that the dependent variables do not influence the independent variables.

$(GT)_{t-1}$ = gasoline and fuels excise and special fuels use tax in Oklahoma in year t-1

$(PW)_t$ = state and local government expenditures on public welfare in year t ($ million)

$(PIP)_{t-1}$ = personal income per capita in Oklahoma in year t-1 ($)

$(HH)_t$ = state and local government expenditures on health and hospitals in Oklahoma in year t ($ million)

$(OE)_t$ = other state and local government expenditures in Oklahoma in year t ($ million).

Total state and local government expenditures in year t $(TSE)_t$ are found as follows:

$$(TSE)_t = ((EE)_t + (HE)_t + (PW)_t + (HH)_t + (OE)_t) \cdot 1000 \qquad (5.18)$$

By utilizing the column vector whose elements are proportions of total state and local government purchases by sector in Oklahoma, this total expenditure is distributed into sectors.

$$[TSE]_t = A_9(TSE)_t \qquad (5.19)$$

where:

$[TSE]_t$ = column vector of total state and local government purchases in Oklahoma in year t

A_9 = column vector whose elements are proportions of total state and local government purchases by sector in Oklahoma.

f. Total Final Demand. After estimating each sector in final demand, total final demand can be estimated. To do this, individual final demand sectors need to be totaled.

$$[Z_t] = [CA]_t + [C_j]_t + [Et]_t + [TFE]_t + [TSE]_t \qquad (5.20)$$

where:

$[Z]_t$ = column vector of total final demand in Oklahoma in year t.

2. Determining Sector Output

Sector output estimates provide very important elements for employment projections. These estimates are obtained through multiplying the final demand estimates by the matrix of direct and indirect coefficients.

$$[X^d]_t = A_{10}\,[Z]_t \qquad (5.21)$$

where:

$[X^d]_t$ = column vector of sector output estimates in year t

A_{10} = direct and indirect coefficient matrix.

Sector output estimates which are obtained in equation (5.21) can not be higher than the maximum sector output estimates which are obtained by considering labor and capital restrictions.

To estimate the maximum sector output due to labor restrictions, the first step is to determine the labor-output ratios. For the purpose of this study, labor-output coefficients are defined as the number of laborers required per thousand dollars of output in each sector. They are obtained by dividing each sector's employment by that sector's output and represent the average labor-output ratios. Sector employment is obtained by adding every element of occupation-component matrix of each sector. This is done for every sector and entered in a column vector. Sector employment estimation is given in equation (5.22).

$$[L^e]_{t-1} = \sum_k \sum_i [OCM_j]_{t-1} \qquad \begin{matrix} i = 1,2,\ldots,29 \\ k = 1,2 \\ j = 1,2,\ldots,17 \end{matrix} \qquad (5.22)$$

where:

$[L^e]_{t-1}$ = column vector of employment in Oklahoma in year t-1

$[OCM_j]_{t-1}$ = occupation component matrix for j^{th} sector in year t-1

i = number of occupation groups in each $[OCM_j]$ matrix

k = number of component groups in each $[OCM_j]$ matrix

j = number of $[OCM_j]$ matrices (one for each endogenous sector).

The labor stock matrix (Table XV) may be derived from these 17 occupation-component matrices. First component of each matrix presents wage and salary employment of that sector by 29 occupation groups, whereas the second component presents proprietors by the same occupation groups. To obtain labor stock matrix, the second component needs to be totaled and entered as total proprietor employment. Wage and salary employment by occupation is the same in labor stock matrix and occupation-component matrix.

By using the sector employment column vector and the column vector of sector outputs which is obtained in equation (5.21), it is possible to estimate the labor-output coefficients. Labor-output coefficients [LO] are obtained by dividing every entry in sector employment column vector by corresponding element in sector output column vector as it is given in equation (5.23).

$$[LO]_{t-1} = [L^e]_{t-1}/[X^d]_{t-1} \qquad (5.23)$$

The second step in determining the maximum sector output due to labor restrictions is to estimate the amount of available labor for each sector. Available labor by sector is estimated by utilizing the three pieces of information: (1) labor force-employment ratio, (2) one plus annual growth rate of employment, and (3) sector employment in year

t-1. It is given as follows:

$$[L]_t = A_{11}A_{12}[L^e]_{t-1} \tag{5.24}$$

where:

$[L]_t$ = column vector of available labor by sector in year t

A_{11} = diagonal matrix of labor force-employment ratio

A_{12} = diagonal matrix of one plus growth rate of employment.

The diagonal matrix of labor force-employment ratio is obtained by estimating the capacity employment and adjusting this downward by sector.

The maximum sector output due to labor restriction can be computed as follows:

$$[X^L]_t = [A_{13}]_{t-1} A_{14} [L]_t \tag{5.25}$$

where:

$[X^L]_t$ = maximum sector output due to labor restriction in year t

$[A_{13}]_{t-1}$ = diagonal matrix where each element is reciprocal of corresponding labor-output coefficient in year t-1

$[A_{14}]$ = diagonal matrix of one plus annual rate of change in $[A_{13}]_{t-1}$.

The maximum output due to capital restriction is computed by four pieces of information that are already available and is given in equation (5.26).

$$[X^c]_t = [X^c]_{t-1} + [In]_t/[A_{15}]_{t-1} A_2 \tag{5.26}$$

where:

$[X^c]_t$ = maximum sector output due to capital restriction in year t

$[In]_t$ = column vector of new plant and equipment investment in year t

$[A_{15}]_{t-1}$ = diagonal matrix of capital output ratios defined at capacity levels in year t-1

A_2 = diagonal matrix of one plus annual change in capital-output ratios.

3. Relationships Projecting State Economic Variables

After estimating output, variables such as employment, population, income, value added, federal government and state and local government revenues, personal income, and disposable income can be projected.

a. Employment. Two different procedures are followed to estimate employment for the endogenous sectors and the exogenous sectors. Employment projections are made in this order, and then they are combined to project the total employment in Oklahoma.

(1) Employment Projections for Endogenous Sectors. Sector employment projections are obtained as products of three pieces of information: (1) sector output, (2) labor-output coefficient, and (3) one plus annual rate of change in labor-output coefficient and are given in equation (5.27).

$$[L^e]_t = A_{16} \; [A_{17}]_t \; [LO]_{t-1} \qquad (5.27)$$

where:

$[L^e]_t$ = column vector of sector employment in year t

A_{16} = diagonal matrix of one plus annual change in labor-output coefficient

$[A_{17}]_t$ = diagonal matrix where elements are representing the corresponding elements of column vector of sector output

$[LO]_{t-1}$ = column vector of labor-output coefficients by sector in year t-1.

Total employment in endogenous sectors $(E)_t$ is obtained by totaling all of the entries of column vector of sector employment as follows:

$$(E)_t = \sum_j [L^e]_t \tag{5.28}$$

Sector employment estimates, base year's sector employment, and base year's occupation-component matrices are utilized to project the employment in the form of occupation-component matrices by sector. Equation (5.29) displays this computation procedure.

$$[OCM_j]_t = [OCM_j]_{t-1} \left((L_j^e)_t \; / \; (L_j^e)_{t-1} \right) \tag{5.29}$$

where:

$[OCM_j]_t$ = occupation component matrices by sector in year t

$(L_j^e)_t$ = j^{th} sector's total employment in year t (or j^{th} element in the column vector of $[L^e]_t$).

(2) Manpower Analysis. Manpower analysis of the Oklahoma model is based on 17 matrices which are obtained in equation (5.29) above. By using these matrices and the similar matrices of the base year, it is possible to project the labor needs by occupation and component for each endogenous sector. It is also possible to project the total labor needs for the endogenous sectors of Oklahoma model by occupation and component. The manpower analysis is constructed around the following seven equations.

The first of these seven equations projects the labor needs for the endogenous sectors of this model, and is obtained by subtracting base year's occupation-component matrix from the projected occupation-component matrix for each sector.

$$[OCM_j]^{t}_{t-1} = [OCM_j]_t - [OCM_j]_{t-1} \tag{5.30}$$

where:

$[OCM_j]^{t}_{t-1}$ = occupation-component matrix for needed labor by sector from year t-1 to year t.

The matrices which are projected in equation (5.30) are simply representing the additional demand for labor in each sector. Positive values in each matrix imply an expansion of employment in that sector, whereas negative values indicate a contraction.

By adding all of these 17 matrices together, the occupation-component matrix for needed labor in Oklahoma from year t-1 to year t can be obtained and is given as follows:

$$[OCM]^{t}_{t-1} = \sum_j [OCM_j]^{t}_{t-1} \tag{5.31}$$

The same matrix may be obtained by following a different procedure. In this method, first, occupation component of employment matrices for needed labor in Oklahoma in year t-1 and in year t are obtained. By subtracting the previous matrix from the latter, the same matrix as in equation (5.31) can be obtained. Computations are given in equations (5.32), (5.33), and (5.34).

$$[OCM]_{t-1} = \sum_j [OCM_j]_{t-1} \tag{5.32}$$

$$[OCM]_t = \sum_j [OCM_j]_t \tag{5.33}$$

$$[OCM]^{t}_{t-1} = [OCM]_t - [OCM]_{t-1} \tag{5.34}$$

where:

$[OCM_t]$ = occupation component matrix for the endogenous sectors of Oklahoma in year t.

The last two equations of the manpower analysis project the employment of each sector by their components--wage and salary and proprietor--and the total wage and salary and the total proprietorship employment in Oklahoma. The first equation (5.35) represents a matrix which is obtained by adding the columns of each $[OCM_j]_t$ and entering as corresponding rows of a 17 by 2 matrix. The second equation (5.36) represents a row vector whose elements are obtained by summing the entries of each column of the matrix which is obtained in equation (5.35). These two equations are given as follows:

$$[L^W L^P]_t = \sum_i [OCM_j]_t \quad i = 1,2,\ldots,29 \tag{5.35}$$

$$[L_w L_p]_t = \sum_j [L^W L^P]_t \tag{5.36}$$

where:

$[L^W L^P]_t$ = matrix of wage and salary and proprietor employment by sector for the endogenous sectors of Oklahoma in year t

$[L_w L_p]_t$ = row vector of total wage and salary and proprietor employment of the endogenous sectors of Oklahoma in year t.

(3) Employment Projections for Government Sectors. Projections of federal government and state and local government employment are obtained as follows:

$$[L_f]_t = a_5 [L_f]_{t-1} \tag{5.37}$$

$$[L_s]_t = a_6 [L_s]_{t-1} \tag{5.38}$$

where:

$[L_f]_t$ = column vector of federal government employment by occupation in Oklahoma in year t

a_5 = one plus annual rate of change in federal government employment

$[L_s]_t$ = column vector of state and local government employment by occupation in Oklahoma in year t

a_6 = one plus annual rate of change in state and local government employment.

(4) Total Oklahoma Employment. Total wage and salary employment in Oklahoma can be presented by occupation. To obtain this equation (5.33), (5.37), and (5.38) need to be utilized as in equation (5.39).

$$[WSE]_t = [OCM1]_t + [L_f]_t + [L_s]_t \tag{5.39}$$

where:

$[WSE]_t$ = total wage and salary employment by occupation in Oklahoma by year t

$[OCM1]_t$ = column vector of wage and salary employment by occupation for the endogenous sectors of Oklahoma in year t (first column of $[OCM]_t$ matrix).

Total employment may be obtained by summing the two components--namely, wage and salary employment and proprietor employment as given in equation (5.40).

$$(TE)_t = \sum_i [WSE] + (L_p)_t \tag{5.40}$$

where:

$(TE)_t$ = total Oklahoma employment in year t

$(L_p)_t$ = total proprietor employment in Oklahoma in year t (second element of $[L_w L_p]_t$).

b. Population. In this analysis, population is treated as an endogenous variable and projected within the model. Population-employment ratio in year t-1 $(a_7)_{t-1}$, total Oklahoma employment in

year t, and one plus annual rate of change in the population-employment ratio (a_8) are the variables utilized for this purpose. The projection of population is given in equation (5.41) as follows:

$$(P)_t = (a_7)_{t-1}\ a_8\ (TE)_t\ /\ 1000 \qquad (5.41)$$

where:

$(P)_t$ = total Oklahoma population in year t (000).

The population employment ratio for the base year is computed by dividing the total Oklahoma population by the total employment in Oklahoma. For later years, this coefficient is estimated within the model by using the projections of employment and population which are obtained through the equations (5.40) and (5.41).

c. Income. In this section, wage and salary payments and proprietor income are projected by sector. Also, total value of all government wages and salaries, transfer payments, property income, and other labor income are estimated. With these estimates, it is possible to compute the total personal income and, thus, personal income per capita.

Wage and salary payments for the endogenous sectors are estimated by wage and salary employment, wage and salary income rates (or wage and salary rates), and the coefficients which reflect the annual change in the wage and salary rates. The procedure is given in equation (5.42).

$$[WS_t] = [A_{18}]_{t-1}\ A_{19}\ \ [L^W]_t\ /\ 1000 \qquad (5.42)$$

where:

$[WS]_t$ = wage and salary payments by sector in year t

$[A_{18}]_{t-1}$ = diagonal matrix of wage and salary rates by sector in year t-1 ($)

A_{19} = diagonal matrix of one plus annual growth rate of wages and salaries by sector

$[L^W]_t$ = column vector of wage and salary employment by sector in year t.

To estimate proprietor income, a procedure which is similar to wage and salary income projections is followed. Equation (5.43) displays this computation.

$$[Y^P]_t = A_{20\ t-1}\ A_{21}\ [L^P]_t\ /\ 1000 \qquad (5.43)$$

where:

$[Y^P]_t$ = column vector of proprietor income by sector in year t

$[A_{20}]_{t-1}$ = diagonal matrix of proprietor income rate by sector in year t-1 ($)

A_{21} = diagonal matrix of one plus annual rate of change in proprietor income

$[L^P]_t$ = column vector of proprietor employment in year t.

Governmental wage and salary payments are projected by three components: federal government civilian, federal government military, and state and local government, and are given in equation (5.44).

$$(FS)_t = (\ (a_9)_{t-1}\ a_{10}\ (L_s)_t + (a_{11})_{t-1}\ a_{12}\ (L_f)_t + a_{13}\ (AF)_{t-1})\ /\ 1000 \qquad (5.44)$$

where:

$(FS)_t$ = all governmental wages and salaries in year t

$(a_9)_{t-1}$ = wage and salary rate of state and local government employees in year t-1 ($)

a_{10} = one plus annual rate of change in state and local government wage and salary rate

$(a_{11})_{t-1}$ = wage and salary rate of federal government employees in year t-1 ($)

a_{12} = one plus annual rate of change in federal wage and salary rate

a_{13} = one plus annual rate of change in military payroll

$(AF)_{t-1}$ = military payroll in Oklahoma in year t-1 ($).

Transfer payments, property income, and other labor income are all projected as a function of the previous year's amounts. These computations are given in the following three equations:

$$(Y^T)_t = a_{14} (Y^T)_{t-1} \tag{5.45}$$

$$(Y^{Py})_t = a_{15} (Y^{Py})_{t-1} \tag{5.46}$$

$$(OY)_t = a_{16} (OY)_{t-1} \tag{5.47}$$

where:

$(Y^T)_t$ = total transfer payments in Oklahoma in year t

a_{14} = one plus annual rate of change in transfer payments

$(Y^{Py})_t$ = total property income in Oklahoma in year t

a_{15} = one plus annual rate of change in property income

$(OY)_t$ = total other labor income in Oklahoma in year t

a_{16} = one plus annual rate of change in other labor income.

After completing the projections of all of the income components, the total personal income in Oklahoma can be estimated. For this, the individual components are summed and social security payments of wage and salary employees are subtracted from that total, as given in

equation (5.48).

$$(TPI)_t = \sum_j [WS]_t + \sum_j [Y^P] + (FS)_t + (Y^T)_t + Y^{Py})_t + (OY)_t - a_{17}\, a_{18} \left(\sum_j (WS) + (FS)_t\right) \quad (5.48)$$

where:

$(TPI)_t$ = total personal income in Oklahoma in year t

a_{17} = ratio of social security payments to wage and salary income

a_{18} = one plus annual rate of change in a_{17}.

Dividing total personal income by Oklahoma population in year t yields personal income per capita projections as follows:

$$(PIP)_t = (TPI)_t / (P)_t \quad (5.49)$$

where:

$(PIP)_t$ = personal income per capita in Oklahoma in year t ($)

$(P)_t$ = Oklahoma population in year t (000).

d. Value Added and Gross State Product. Value added by sector is estimated by using the estimate of sector output and the ratio of value added to output and is given in equation (5.50).

$$[V]_t = A_{22}\ [X^d]_t \quad (5.50)$$

where:

$[V]_t$ = value added by sector in Oklahoma in year t

A_{22} = diagonal matrix of the ratio of value added to output.

Gross state product (X^g) is the sum of value added and all government wages and salaries.

$$(X^g)_t = \sum_j V_t + (FS)_t \qquad (5.51)$$

e. Federal Government Revenues. Federal revenues consist of federal government tax collections in Oklahoma. These revenues are estimated in a simple regression equation which is given as follows:

$$(TFR)_t = 60476.909 + \underset{(t = 9.67)}{190.01079}\ (TPI)_t / 1000 \qquad (5.52)$$

$$s^2 = 4801050570 \quad d = 1.618 \quad \hat{\rho} = .177 \quad R^2 = .9033$$

where:

$(TFR)_t$ = federal government tax collections in Oklahoma in year t

$(TPI)_t$ = total personal income in Oklahoma in year t.

Individual income tax which is included in total federal tax revenues is estimated separately so that estimation of disposable income can be possible. Individual income tax is projected in a simple regression whose independent variable is total employment.

$$(IIT)_t = -2226558.032 + \underset{(t = 10.02)}{3240.11673}\ (TE)_t/1000 \qquad (5.53)$$

$$s^2 = 3001074918 \quad d = 1.493 \quad \hat{\rho} = .247 \quad R^2 = .9094$$

where:

$(IIT)_t$ = federal individual income tax collections in Oklahoma in year t

$(TE)_t$ = total Oklahoma employment in year t.

f. State and Local Government Revenues. State and local government revenues are considered in six components, and each component is estimated in a simple regression equation. The six components of state and local government revenues include (1) state sales tax, (2) gasoline

and fuels excise and special fuels use tax, (3) state collections of individual and corporation income tax, (4) other state and local government taxes, (5) federal aid to state and local governments, and (6) all other revenues of state and local governments. These six simple regression equations are given in equations (5.54) through (5.59), as follows:

$$(ST)_t = 32865.220 + 6.02022\ (TPI)_t/1000 \qquad (5.54)$$
$$(t = 11.06)$$
$$s^2 = 3680915 \quad d = 1.289 \quad \hat{\rho} = .139 \quad R^2 = .9244$$

$$(GT)_t = 47133.166 + 10.64550\ (PIP)_t \qquad (5.55)$$
$$(t = 5.21)$$
$$s^2 = 4891574 \quad d = 1.101 \quad \hat{\rho} = .140 \quad R^2 = .7311$$

$$(IT)_t = -43071.533 + 16.57910\ (PIP)_t \qquad (5.56)$$
$$(t = 6.34)$$
$$s^2 = 85056437 \quad d = 1.517 \quad \hat{\rho} = -.084 \quad R^2 = .8006$$

$$(OT)_t = -19619.533 + 73.98709\ (PIP)_t \qquad (5.57)$$
$$(t = 8.42)$$
$$s^2 = 90524959 \quad d = 1.327 \quad \hat{\rho} = .032 \quad R^2 = .8765$$

$$(FA)_t = -208324.648 + 187.18952\ (PIP)_{t-1} \qquad (5.58)$$
$$(t = 13.24)$$
$$s^2 = 222971116 \quad d = 1.869 \quad \hat{\rho} = .002 \quad R^2 = .9460$$

$$(OR)_t = -258787.748 + 183.03666\ (PIP)_t \qquad (5.59)$$
$$(t = 21.96)$$
$$s^2 = 81526609 \quad d = 1.349 \quad \hat{\rho} = .290 \quad R^2 = .9797$$

where:

$(ST)_t$ = total value of state sales tax collections in Oklahoma in year t

$(GT)_t$ = gasoline and fuels excise and special fuels use tax collections in Oklahoma in year t

$(IT)_t$ = individual and corporation income tax withheld by the State in Oklahoma in year t

$(OT)_t$ = all other taxes collected by state and local government in Oklahoma in year t

$(FA)_t$ = federal aid to state and local government in Oklahoma in year t

$(OR)_t$ = other revenues to state and local government in Oklahoma in year t.

Projections of total state and local government revenues $(TSR)_t$ are obtained by adding the six components and is given in equation (5.60).

$$(TSR)_t = (ST)_t + (GT)_t + (IT)_t + (OT)_t + (FA)_t + (OR)_t \qquad (5.60)$$

g. Disposable Income. Disposable income is obtained by subtracting federal individual income tax and state and local individual and corporation income tax collections from total personal income as in equation (5.61).

$$(DI)_t = (TPI)_t - (IIT)_t - (IT)_t \qquad (5.61)$$

where:

$(DI)_t$ = disposable income in Oklahoma in year t

$(IIT)_t$ = federal individual income tax collections in Oklahoma in year t

$(IT)_t$ = individual and corporation income tax withheld by the State in Oklahoma in year t.

Disposable income per capita is projected by merely dividing the disposable income which is obtained in equation (5.61) by Oklahoma

population which is projected in equation (5.41) of the same year.

$$(DIP)_t = (DI)_t/(P)_t \qquad (5.62)$$

where:

$(DIP)_t$ = disposable income per capita in Oklahoma in year t ($)

$(P)_t$ = total Oklahoma population in year t (000).

CHAPTER VI

SIMULATION OF STATE ECONOMIC VARIABLES

Using the data presented in the Oklahoma social accounts from Chapters III, IV, and Appendix A, the Oklahoma Model presented in Chapter V simulates the Oklahoma economy from 1967 through 1985. Data which are not presented in the accounts are presented in Appendix C. The simulation period could be expanded to cover more years. However, the longer the period, the less reliable the projections due to the assumptions of the model. Simulating the variables from 1967 through 1985 is a short enough time period to rely on projections, but also long enough to be useful for planning purposes. This chapter presents and discusses simulation results of state economic variables from 1967 through 1985. Projections include employment, population, income, government revenues, government expenditures, and gross state product. Also, projections and discussions of manpower needs of Oklahoma are presented. The projected values are compared with the published data to measure the closeness of fit provided by the simulation model.

A. Employment Projections

Employment projections are presented in Figures 3, 4, 5, and Table XXVIII. Figure 3 contains the estimates of total employment, wage and salary employment and proprietor employment. Estimated figures are indicated with solid lines, whereas published data are shown with broken

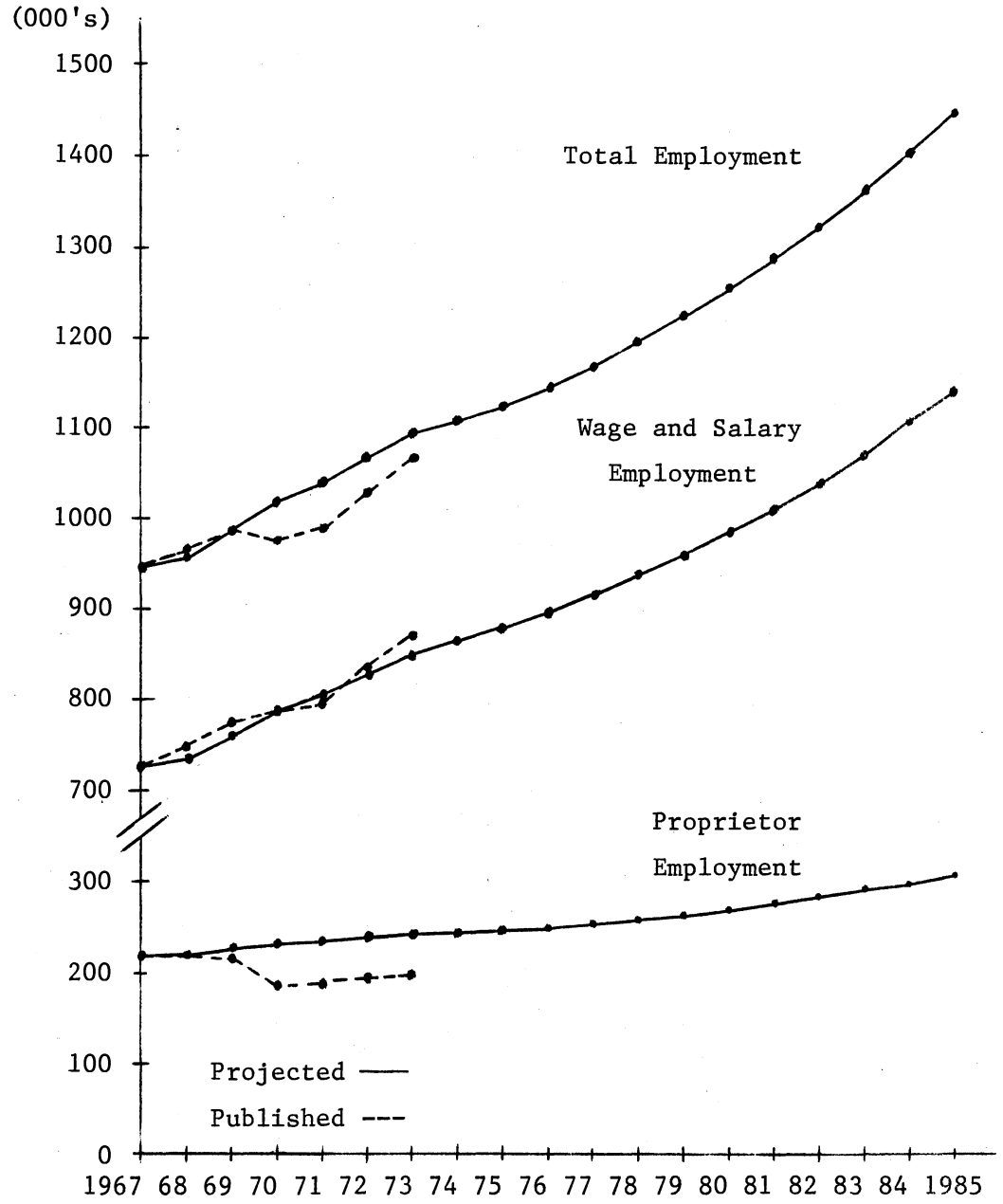

Figure 3. Total Employment, Wage and Salary Employment, and Proprietor Employment Projections, Oklahoma

lines. Published data are obtained from Oklahoma Employment Security Commission [34] and Oklahoma Department of Agriculture [32]. Total employment which is 944,100 in 1967 is forecast to be 1,447,917 in 1985. Projected wage and salary employment is estimated in 1985 to be 1,140,230, compared to 725,300 in 1967, while proprietor employment is estimated at 307,687 in 1985 compared to 218,800 in 1967. The increase in wage and salary employment is more significant than the increase in proprietor employment. Part of this is explained by the agricultural sector. Proprietor employment in the agricultural sector is decreasing and offsetting the increase in proprietor employment of the other sectors. Starting from 1970, the definition of agricultural proprietor employment was changed. The change resulted in proprietor employment being about 50,000 less than it was in 1969. The effect of the change is seen in total employment, as well. However, parallel lines of published and projected values indicate the closeness of the fit in general.

Figure 4 contains projections for the number of wage and salary workers and proprietors for agriculture derived from the simulation model. Total employment in agriculture is expected to decline from 120,800 in 1967 to 97,281 in 1985. The number of proprietors is expected to decline from 101,800 in 1967 to 81,979 in 1985, and the wage and salary employment from 19,000 in 1967 to 15,302 in 1985. Projected figures for agricultural sector employment are obtained from Oklahoma Employment Security Commission [33] and Oklahoma Department of Agriculture publications [32].

Figure 5 contains projections of wage and salary employees in mining, manufacturing, and services sectors. Mining sector employment is the only other sector (other than agriculture) where employment is

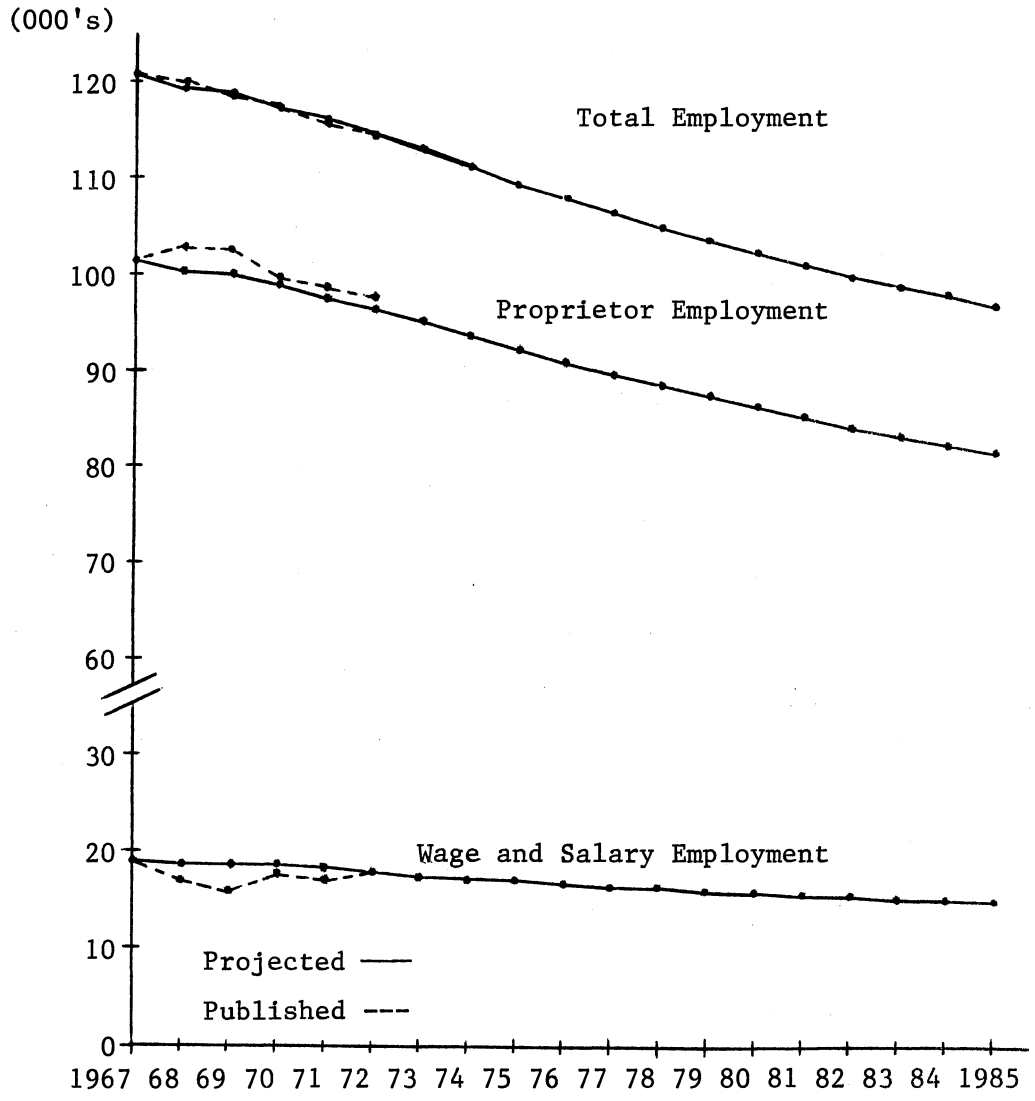

Figure 4. Total Employment, Proprietor Employment, and Wage and Salary Employment Projections in Agriculture, Oklahoma

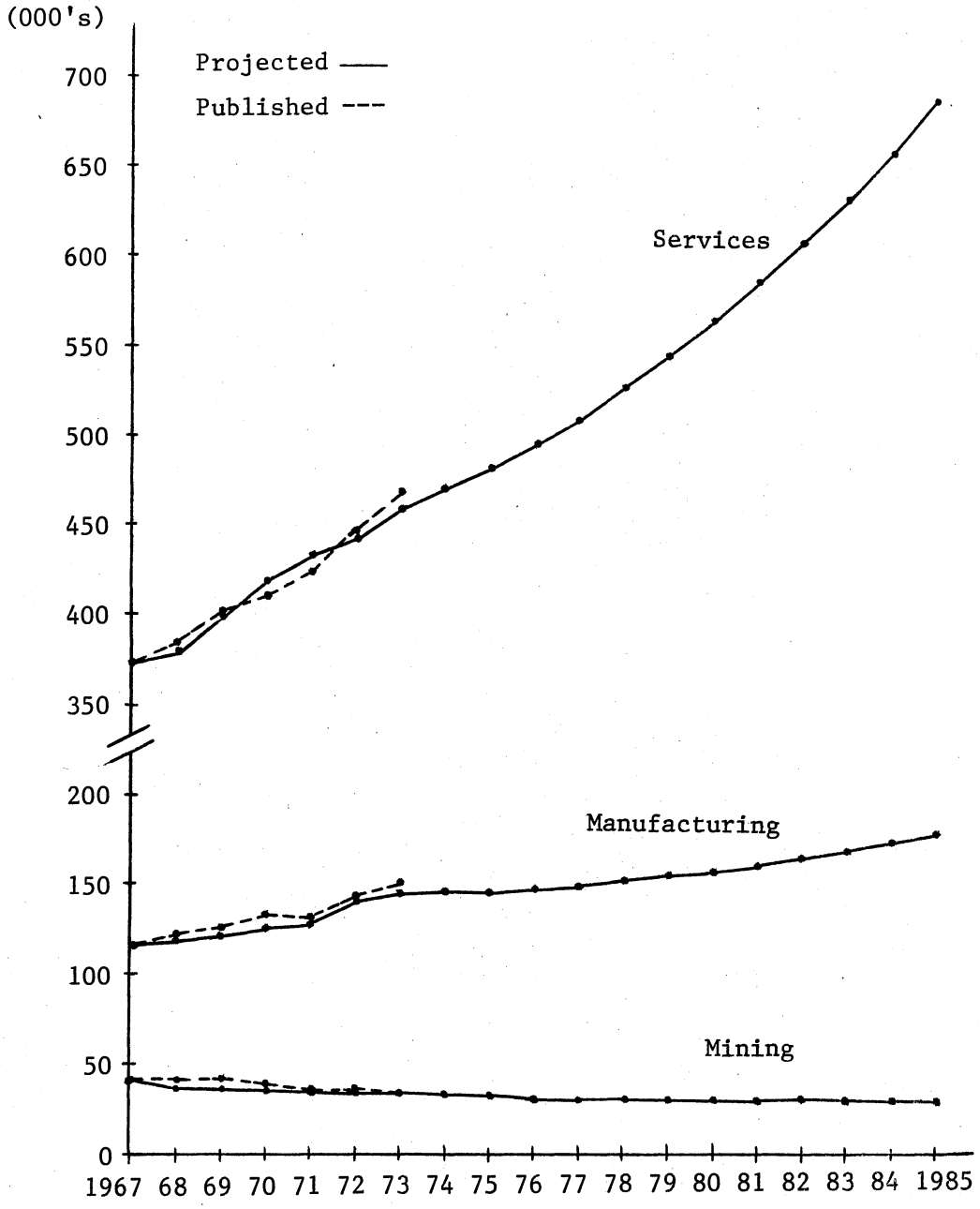

Figure 5. Wage and Salary Employment Projections in Services, Manufacturing, and Mining Sectors, Oklahoma

expected to decline. Wage and salary employment in the mining sector is expected to decline from 41,000 in 1967 to 30,212 in 1985. Employment in manufacturing and services sector are expected to rise. Wage and salary employment in services sectors (sectors 4, 14, 15, 16, and 17) is expected to increase from 372,500 in 1967 to 685,588 in 1985. Wage and salary employment in manufacturing sectors (sectors 8 through 13) is expected to increase from 116,400 in 1967 to 178,955 in 1985. Projected employment figures are very similar in all cases to the published data, which are obtained from Oklahoma Employment Security Commission publications [34].

Table XXVIII contains detailed wage and salary employment projections for each endogenous sector, proprietor employment projections and government employment projections from 1967 through 1985. Published figures obtained from Oklahoma Employment Security Commission publications are included in this table. For instance, wage and salary employment in the other manufacturing sector is expected to increase from 19,900 in 1967, to 25,812 in 1985. Published wage and salary employment figures in this sector are very similar to the projected figures.

B. Manpower Analysis

Persistent high levels of unemployment have focused attention on manpower problems. High levels of unemployment may result from (1) a deficiency of aggregate demand, or (2) from structural maladjustments in the manpower market. Structural maladjustments generally arise from changing technological patterns and shifts in the pattern of economic growth. Problems of structural adjustment can be satisfactorily

TABLE XXVIII

WAGE AND SALARY EMPLOYMENT, PROPRIETOR EMPLOYMENT AND TOTAL EMPLOYMENT PROJECTIONS, OKLAHOMA, 1967-1985

Sector		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Wage & Salary Employment	P[a]		735,801	759,733	785,164	801,591	827,809	849,791	862,981	874,964	891,043	911,369	933,982	957,662	982,524	1,009,229	1,038,247	1,069,725	1,103,687	1,140,230
Wage & Salary Employment	A[b]	725,300	744,200	771,200	787,500	796,800	832,200	866,200												
Agricultural (Sectors 1 + 2)	P		18,786	18,699	18,509	18,270	18,037	17,791	17,533	17,273	17,021	16,783	16,560	16,350	16,149	15,959	15,778	15,609	15,450	15,302
Agricultural (Sectors 1 + 2)	A	19,000	17,000	16,000	18,000	17,000	18,000	17,000												
Mining (Sector 3)	P		39,762	38,824	37,986	37,067	36,271	35,576	34,751	33,957	33,279	32,711	32,214	31,764	31,360	31,012	30,724	30,496	30,326	30,212
Mining (Sector 3)	A	41,000	40,900	40,700	38,900	36,700	36,400	35,600												
Construction (Sector 4)	P		28,860	30,597	33,538	35,644	36,852	40,581	42,066	43,485	45,790	48,904	52,333	55,809	59,390	63,248	67,489	72,131	77,165	82,606
Construction (Sector 4)	A	32,500	34,600	36,700	37,400	38,800	41,100	45,000												
Food & Kindred Prod. (Sector 5)	P		15,566	15,939	16,110	16,191	16,214	16,252	16,288	16,309	16,328	16,361	16,415	16,486	16,570	16,667	16,776	16,900	17,040	17,194
Food & Kindred Prod. (Sector 5)	A	15,400	15,600	15,700	16,100	16,200	16,400	16,200												
Petroleum Refining (Sector 6)	P		7,813	7,733	7,667	7,581	7,521	7,497	7,451	7,413	7,408	7,438	7,493	7,567	7,658	7,770	7,904	8,060	8,239	8,439
Petroleum Refining (Sector 6)	A	8,000	8,000	8,000	8,000	7,800	7,700													
Lumber & Wood (Sector 7)	P		3,807	3,759	3,805	3,710	5,424	5,298	5,082	4,847	4,663	4,520	4,390	4,260	4,132	4,012	3,901	3,800	3,706	3,618
Lumber & Wood (Sector 7)	A	4,600	4,500	4,400	4,400	4,800	5,300													
Apparel & Others (Sector 8)	P		7,830	8,532	9,182	9,809	10,507	11,204	11,926	12,680	13,488	14,367	15,326	16,366	17,491	18,707	20,025	21,458	23,014	24,707
Apparel & Others (Sector 8)	A	7,300	7,700	9,300	9,600	9,900	11,200	12,400												
Printing & Publishing (Sector 9)	P		7,612	8,023	8,334	8,577	8,807	9,069	9,272	9,472	9,691	9,941	10,218	10,515	10,830	11,167	11,529	11,919	12,338	12,788
Printing & Publishing (Sector 9)	A	7,400	7,700	8,000	8,300	8,300	8,800													
Machinery & Elec. Mach. (Sector 10)	P		27,234	27,484	29,394	30,073	35,277	37,245	36,939	36,477	36,786	37,711	38,744	39,648	40,481	41,377	42,402	43,545	44,781	46,101
Machinery & Elec. Mach. (Sector 10)	A	24,000	25,200	29,300	32,200	30,900	32,900	37,600												
Transportation Equip. (Sector 11)	P		10,752	11,053	11,737	11,870	11,922	12,181	12,454	12,518	12,703	13,007	13,350	13,686	14,014	14,356	14,726	15,124	15,547	15,992
Transportation Equip. (Sector 11)	A	10,900	12,500	15,100	13,400	10,600	11,400	12,400												
Primary & Fabricated (Sector 12)	P		18,690	18,665	19,776	19,953	20,321	21,291	21,024	20,582	20,609	20,998	21,447	21,810	22,121	22,456	22,852	23,302	23,788	24,304
Primary & Fabricated (Sector 12)	A	18,900	19,200	19,500	20,000	19,400	20,400	21,700												
Other Manufacturing (Sector 13)	P		20,022	20,387	20,947	21,000	26,153	26,286	25,973	25,573	25,356	25,297	25,292	25,284	25,280	25,305	25,373	25,483	25,630	25,812
Other Manufacturing (Sector 13)	A	19,900	21,300	20,600	21,900	23,400	25,900													
Trans., Comm., & Pub. Util. (Sector 14)	P		50,150	51,728	52,951	53,487	54,002	53,689	54,970	55,130	55,456	55,996	56,668	57,408	58,207	59,088	60,073	61,167	62,370	63,685
Trans., Comm., & Pub. Util. (Sector 14)	A	49,500	51,500	52,800	52,400	52,500	53,400	54,700												
Wholesale & Retail Trade (Sector 15)	P		161,819	170,071	177,373	182,033	186,043	190,935	195,448	199,273	203,638	208,742	214,393	220,388	226,696	233,402	240,593	248,315	256,588	265,436
Wholesale & Retail Trade (Sector 15)	A	157,200	159,800	165,000	168,700	175,200	185,600	194,700												
Finance, Ins., & Real Est. (Sector 16)	P		35,240	35,590	39,383	40,862	42,121	43,724	44,993	46,310	47,746	49,375	51,190	53,164	55,295	57,600	60,106	62,835	65,806	69,038
Finance, Ins., & Real Est. (Sector 16)	A	33,800	34,300	35,800	37,000	38,400	40,500	43,700												
Services (Sector 17)	P		103,252	109,755	115,205	119,740	124,069	129,274	133,189	137,189	141,732	146,861	152,489	158,486	164,867	171,702	179,071	187,022	195,592	204,823
Services (Sector 17)	A	99,500	104,200	110,300	115,900	119,200	124,600	130,400												
Federal Government (Sector 18)	P		58,784	58,077	57,378	56,688	56,006	55,332	54,667	54,009	53,359	52,717	52,083	51,457	50,838	50,226	49,622	49,025	48,435	47,852
Federal Government (Sector 18)	A	59,500	59,200	59,500	57,500	55,700	56,000	54,200												
State & Local Government (Sector 19)	P		119,822	122,818	125,888	129,035	132,261	135,568	138,957	142,431	145,991	149,641	153,382	157,216	161,147	165,175	169,305	173,537	177,875	182,322
State & Local Government (Sector 19)	A	116,900	121,000	124,500	127,800	132,000	136,600	140,500												
Proprietor Employment	P		218,863	224,827	230,134	233,429	236,761	241,320	243,750	245,998	249,184	253,437	258,357	263,655	269,345	275,585	282,500	290,141	298,525	307,687
Proprietor Employment	A	218,800	218,800	218,000	230,000	231,900	231,500													
Agricultural (Sectors 1 + 2)	P		100,644	100,176	99,161	97,881	96,628	95,313	93,931	92,539	91,186	89,912	88,719	87,592	86,518	85,497	84,531	83,622	82,772	81,979
Agricultural (Sectors 1 + 2)	A	101,800	102,900	102,700	99,500	98,700	96,700													
Non-Agricultural (Sectors 3-17)	P		118,219	124,651	130,973	135,548	140,133	146,007	149,819	153,459	157,998	163,525	169,638	176,063	182,827	190,088	197,969	206,519	215,753	225,708
Non-Agricultural (Sectors 3-17)	A	117,000	115,900	115,300	130,500	133,200	134,800	135,300												
Total Employment	P		954,664	984,560	1,015,298	1,035,020	1,064,570	1,091,111	1,106,731	1,120,962	1,140,227	1,164,806	1,192,339	1,221,317	1,251,869	1,284,814	1,320,747	1,359,866	1,402,212	1,447,917
Total Employment	A	944,100	963,000	989,200	974,400	985,400	1,025,400	1,064,100												

[a] Projected Figures.

[b] Published Figures.

managed if a sufficiently high level of aggregate demand is maintained. Thus, an initial concern in manpower analysis and planning is to relate manpower requirements by occupation and level of education accurately to anticipated levels of aggregated demand.

The need for manpower analysis is evident from the preceding paragraph. In this section, the labor structure of the State is analyzed. Relationships between labor requirements and anticipated levels of aggregated demand are specified in the simulation model. Once these relationships are specified, the model can be used (1) to project future manpower needs for the state, or (2) to measure manpower needs for alternative development strategies. State leaders, planners and educators need to know future manpower needs if an adequate supply of labor by occupation will be available. Likewise, if state or local leaders are encouraging a change in the economic structure, such as location of a large army plant, it will be useful to know the types of jobs created by occupation. Then, state and local leaders can evaluate whether or not the region has an adequate supply of labor by occupation and skill level.

Employment data are given by industrial groupings for 440 occupations [35]. For this study, the industrial groupings were aggregated to match the sectors in the Oklahoma model. In addition, the 440 occupations were aggregated to 29 occupational groups.[1] Occupations requiring somewhat similar skills were grouped together, making the data easier to work with and present.

---

[1]For details of the occupational aggregation, see Appendix B.

The aggregation process creates a limitation on the study. Individual occupations cannot be analyzed. However, the aggregation was performed such that occupations with similar skills were groupted together. Thus, the limitation for projection purposes is not quite so crucial. Another limitation arises because substitution does exist between some occupations. Unskilled workers may switch among occupation groups which do not require specific skills.

The Oklahoma Simulation Model projects manpower needs for Oklahoma from 1967 through 1985. Manpower needs of Oklahoma by occupation from 1967 through 1985 are presented in Table XXIX. This table is obtained by adding the number of employees in each occupation group for each sector for each year from 1967 through 1985. For instance, the projected number of wage and salary employees in Oklahoma is 13,513 engineers (occupation group 1); 3,483 scientists (occupation group 2); 27,170 technicians (occupation group 3); etc. Total number of wage and salary employees is 1,140,230; total number of proprietors is 307,687; and total employment is 1,447,917 in Oklahoma in 1985.

Only the total Oklahoma employment by occupation table is presented in Table XXIX. Similar tables--one for each endogenous sector, federal government sector, and state and local government sector--are presented in Appendix D.

Change in total Oklahoma employment by occupation for 1970, 1975, 1980, and 1985 are presented in Table XXX. Each entry is obtained by subtracting the number of employees in each occupation in 1967 from the number of employees in each occupation of the corresponding year in Table XXIX. Each entry indicates the demand for the employment of each occupation group in the corresponding year. For instance, the demand

TABLE XXIX

TOTAL EMPLOYMENT BY OCCUPATION, OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	10,895	10,948	11,034	11,236	11,287	11,604	11,774	11,773	11,747	11,799	11,920	12,068	12,220	12,377	12,554	12,756	12,984	13,236	13,513
2. Scientists (04+06)	3,243	3,220	3,217	3,221	3,211	3,226	3,233	3,223	3,214	3,214	3,225	3,242	3,262	3,286	3,314	3,348	3,388	3,432	3,483
3. Technicians (including health) (08+10+12)	16,657	17,021	17,604	18,204	18,618	19,218	19,776	20,102	20,419	20,831	21,344	21,914	22,514	23,146	23,827	24,566	25,369	26,236	27,170
4. Computer & Other Machine Specialists (14+16)	6,412	6,462	6,545	6,639	6,699	6,797	6,884	6,939	6,992	7,062	7,150	7,248	7,352	7,461	7,578	7,706	7,843	7,991	8,149
5. Economists, Planners & Teachers (18+20)	5,368	5,530	5,798	6,031	6,220	6,417	6,638	6,803	6,971	7,162	7,380	7,620	7,875	8,145	8,435	8,746	9,083	9,444	9,833
6. Misc. Artists (22)	4,683	4,795	4,992	5,166	5,290	5,454	5,603	5,704	5,801	5,918	6,059	6,215	6,382	6,558	6,748	6,953	7,176	7,416	7,764
7. Other Professional & Technical Workers (24+99)	27,330	27,795	28,552	29,302	29,866	30,637	31,346	31,848	32,346	32,943	33,648	34,421	35,236	36,095	37,013	38,000	39,061	40,198	41,414
8. Financial Managers (02)	12,329	12,651	13,204	13,707	14,041	14,456	14,854	15,136	15,395	15,712	16,098	16,530	16,992	17,483	18,012	18,587	19,213	19,890	20,623
9. Other Managers & Administrators (04-99)	55,927	56,837	58,722	60,621	61,972	63,640	65,303	66,508	67,634	68,999	70,623	72,399	74,257	76,201	78,270	80,491	82,874	85,425	88,148
10. Sales Workers (00)	51,887	53,420	56,104	58,481	60,042	61,772	63,488	64,903	66,148	67,604	69,330	71,251	73,295	75,455	77,766	80,258	82,948	85,845	88,962
11. Secretaries (02)	38,493	39,224	40,467	41,662	42,551	43,712	44,810	45,584	46,344	47,255	48,334	49,521	50,776	52,101	53,519	55,048	56,697	58,470	60,372
12. Other Machine Operators (04)	6,852	6,971	7,164	7,351	7,476	7,655	7,815	7,922	8,023	8,151	8,308	8,483	8,670	8,869	9,082	9,315	9,567	9,839	10,132
13. Other Clerical Workers (06-99)	103,155	104,964	108,220	111,275	113,327	116,002	118,514	120,265	121,885	123,888	126,329	129,051	131,937	134,994	138,276	141,835	145,691	149,852	154,332
14. Construction Traders (02)	23,980	22,557	23,480	24,997	26,014	26,960	28,746	29,451	30,103	31,193	32,682	34,329	36,000	37,723	39,579	41,620	43,854	46,275	48,890
15. Foremen (04)	14,334	14,394	14,667	15,117	15,306	16,017	16,400	16,478	16,514	16,682	16,973	17,311	17,655	18,013	18,406	18,846	19,334	19,870	20,453
16. Metal Workers (06)	8,052	8,282	8,379	8,764	8,882	9,551	9,888	9,870	9,803	9,875	10,062	10,277	10,476	10,667	10,875	11,112	11,377	11,665	11,976
17. Mechanics & Repairmen (08)	32,111	32,462	33,334	34,232	34,736	35,479	36,159	36,566	36,899	37,376	38,007	38,724	39,480	40,278	41,139	42,082	43,111	44,227	45,433
18. Printing Trades (10)	2,577	2,638	2,758	2,858	2,929	3,027	3,108	3,164	3,218	3,281	3,356	3,440	3,530	3,625	3,728	3,838	3,957	4,086	4,224
19. Electrical Workers (12)	5,635	5,721	5,879	6,049	6,117	6,499	6,610	6,623	6,619	6,653	6,726	6,814	6,907	7,004	7,112	7,233	7,370	7,521	7,685
20. Other Misc. Craftsmen (14-00)	15,271	15,157	15,537	16,001	16,263	16,763	17,189	17,373	17,531	17,802	18,186	18,625	19,086	19,573	20,105	20,694	21,344	22,053	22,825
21. Metal & Machine Shop Workers (02)	12,552	12,824	12,984	13,660	13,874	14,745	15,354	15,337	15,236	15,378	15,720	16,109	16,468	16,814	17,187	17,609	18,078	18,587	19,133
22. Textile Machine Workers (02)	491	494	503	517	518	645	648	641	631	625	624	624	623	623	624	625	628	632	636
23. Final Processors (06)	7,880	8,119	8,342	8,660	8,802	9,574	9,806	9,868	9,900	10,006	10,182	10,384	10,590	10,804	11,038	11,298	11,586	11,901	12,242
24. Misc. Operatives (08-00)	94,597	95,566	98,136	101,357	102,973	108,261	110,803	111,827	112,599	114,085	116,261	118,757	121,364	124,107	127,097	130,411	134,060	138,043	142.369
25. Janitorial Workers (02)	15,627	16,039	16,696	17,304	17,770	18,368	18,922	19,324	19,723	20,187	20,727	21,319	21,944	22,604	23,308	24,066	24,882	25,758	26,697
26. Food Workers (04)	31,320	32,295	33,334	34,239	36,568	37,531	38,687	39,663	40,559	41,575	42,750	44,046	45,423	46,878	48,429	50,097	51,891	53,817	55,884
27. Personnel Service Workers (06+08+12+20)	27,315	28,311	30,031	31,477	32,678	33,830	35,206	36,248	37,320	38,516	39,876	41,366	42,855	44,643	46,452	48,400	50,500	52,764	55,200
28. Public Service Workers (10)	43,455	44,533	45,780	47,028	48,209	49,505	50,777	51,998	53,236	54,536	55,904	57,327	58,795	60,309	61,876	63,500	65,186	66,934	68,747
29. Laborers (00)	46,872	46,571	47,590	48,735	49,350	50,464	51,450	51,840	52,154	52,735	53,585	54,567	55,598	56,688	57,880	59,207	60,674	62,281	64,031
Total Wage & Salary	725,300	735,801	759,733	785,164	801,592	827,809	849,791	862,981	874,964	891,043	911,369	933,882	957,662	982,524	1,009,229	1,038,247	1,069,726	1,103,688	1,140,230
Total Proprietorship	218,800	218,863	224,827	230,134	233,428	236,761	241,320	243,750	245,998	249,184	253,437	258,357	263,655	269,345	275,585	282,500	290,140	298,524	307,687
Total Employment	944,100	954,664	984,560	1,015,298	1,035,020	1,064,570	1,091,111	1,106,731	1,120,962	1,140,227	1,164,806	1,192,339	1,221,317	1,251,869	1,284,814	1,320,747	1,359,866	1,402,212	1,447,917

TABLE XXX

CHANGE IN TOTAL EMPLOYMENT BY OCCUPATION, OKLAHOMA, 1970, 1975, 1980, AND 1985

	Occupation Group	1967-70	1967-75	1967-80	1967-85
1.	Engineers (02)	341	852	1,482	2,618
2.	Scientists (04 + 06)	-22	-29	43	240
3.	Technicians (including health) (08 + 10 + 12)	1,547	3,762	6,489	10,513
4.	Computer and other machine specialists (14 + 16)	227	580	1,049	1,737
5.	Economists, planners and teachers (18 + 20)	663	1,603	2,777	4,465
6.	Miscellaneous artists (22)	483	1,118	1,875	2,991
7.	Other professional and technical workers (24 - 99)	1,972	5,016	8,765	14,084
8.	Financial managers (02)	1,378	3,066	5,154	8,294
9.	Other managers and administrators (04-99)	4,694	11,707	20,274	32,221
10.	Sales workers (00)	6,594	14,261	23,568	37,075
11.	Secretaries (02)	3,169	7,851	13,608	21,879
12.	Other machine operators (04)	499	1,171	2,017	3,280
13.	Other clerical workers (06-99)	8,120	18,730	31,839	51,177
14.	Construction traders (02)	1,017	6,123	13,743	24,910
15.	Foremen (04)	783	2,180	3,679	6,119
16.	Metal workers (06)	712	1,751	2,615	3,924
17.	Mechanics and repairmen (08)	2,121	4,788	8,167	13,322
18.	Printing trades (10)	281	641	1,048	1,647
19.	Electrical workers (12)	414	984	1,369	2,050
20.	Other misc. craftsmen (14-00)	730	2,260	4,302	7,554
21.	Metal and machine shop workers (02)	1,108	2,684	4,262	6,581
22.	Textile machine workers (04)	26	140	132	145
23.	Final processors (06)	780	2,020	2,924	4,362
24.	Misc. operatives (08-00)	6,760	18,002	29,510	47,772
25.	Janitorial workers (02)	1,677	4,096	6,977	11,070
26.	Food workers (04)	4,192	9,239	15,558	24,564
27.	Personnel service workers (06 + 08 + 12 + 20)	4,162	10,005	17,328	27,885
28.	Public service workers (10)	3,573	9,781	16,854	25,292
29.	Laborers (00)	1,863	5,282	9,816	17,159
	Total wage and salary	59,864	149,664	257,224	414,930
	Total proprietorship	11,334	27,198	50,545	88,887
	Total employment	71,198	176,862	307,769	503,817

for engineers (occupation group 1) are expected to be 2,618 more than the actual number employed in 1967. The greatest demand for employment is expected to occur in other clerical workers (occupation group 13), for 51,177 more employees are projected for 1985. It is followed by miscellaneous operatives (occupation group 24) by 47,772, sales workers (occupation group 10) by 37,075, other managers and administrators (occupation group 9) by 32,221, and personnel service workers (occupation group 27) by 27,885. Employment in each occupation group is expected to increase from 1967 to 1970, 1975, 1980, and 1985 except scientists (occupation group 2). The demand for scientists is projected to be less in 1970 and 1975 than the number of scientists hired in 1967. However, more scientists are expected to be demanded by 1980 and 1985. The demand for wage and salary employees is expected to be 414,930 more than it was in 1967. Also, 88,887 more proprietors are expected to be demanded by 1985 compared to 1967. The total employment is expected to increase by 503,817 in 1985 over the total employment in 1967.

C. Population Projections

Data in Figure 6 contains estimates of Oklahoma population from 1967 through 1985. Oklahoma population is expected to increase from 2,489,000 in 1967 to 2,962,000 in 1985. Figure 6 also contains the published population data which are obtained from Oklahoma Employment Security Commission publications and Oklahoma Employment Security Commission projections of Oklahoma population for 1975, 1980, and 1985. Projected and published population figures are close until 1974, where the difference between the two figures is about 65,000.

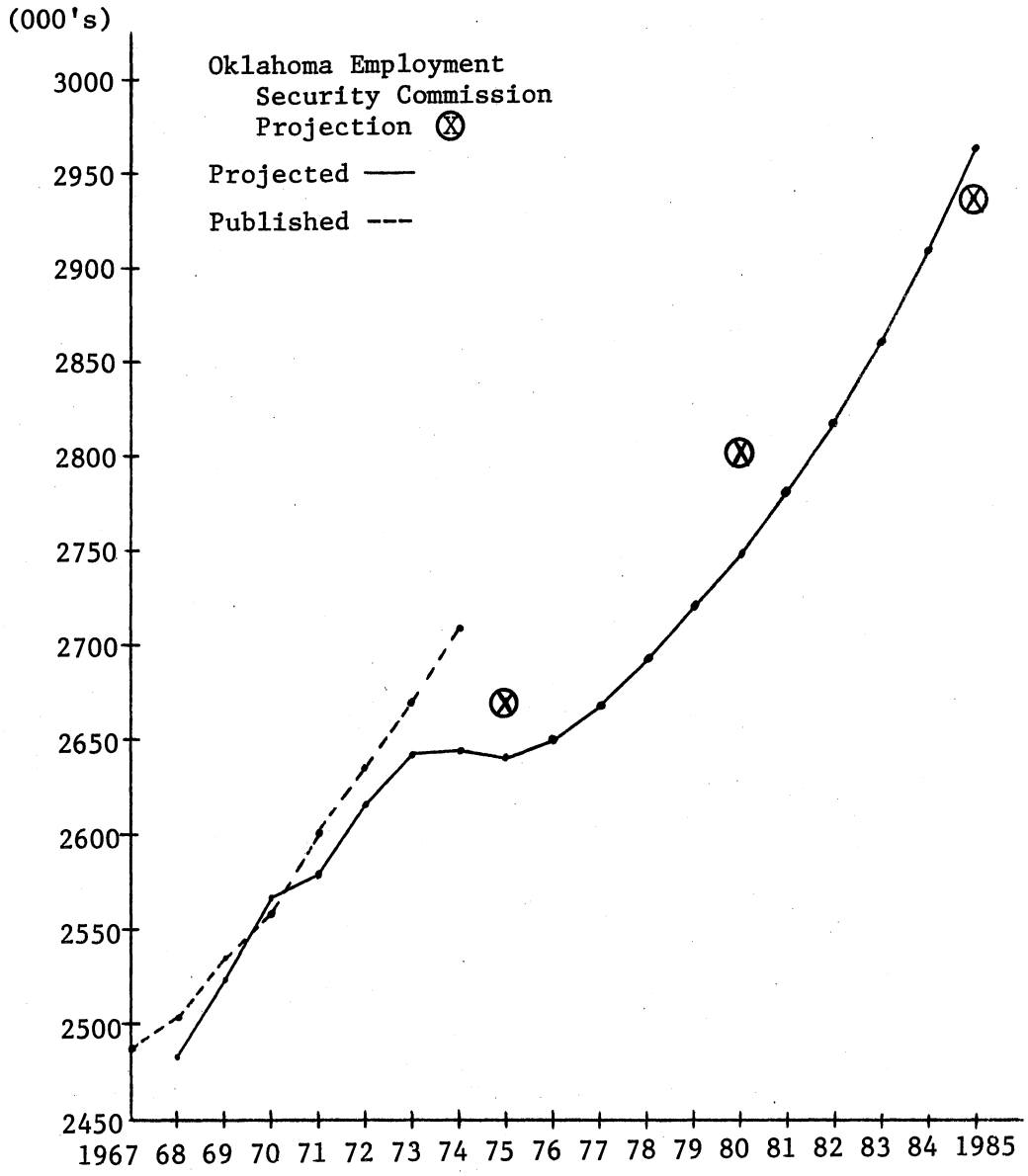

Figure 6. Population Projections, Oklahoma

D. Income Projections

Table XXXI presents estimates of total personal income, wage and salary payments, other labor income, proprietor income, property income, and transfer payments from 1967 through 1985. Published data which are obtained from the U. S. Department of Commerce, Bureau of the Census publications [78], [79], [80], and [81] are also included in the table. Total personal income is expected to increase from $6,664,000,000 in 1967 to $13,726,867,000 in 1985 in 1967 prices. Projected and published figures are similar until 1973, where projected figures are slightly below the published figures.

Wage and salary payments are estimated as total wage and salary payments and wage and salary payments by sector. Total wage and salary payments in Oklahoma are expected to increase from $4,057,000,000 in 1967 to $8,093,948,000 in 1985 in constant 1967 prices. Published data figures are very similar to the simulation projections in total wage and salary payments in each sector.

Proprietor income is estimated as agricultural and non-agricultural. Total proprietor income is expected to decrease from $863,000,000 in 1967 to $782,900,000 in 1985 in constant 1967 prices. Proprietor income is difficult to estimate. It fluctuates very much from one year to another. Published and projected figures in proprietor income are close until 1973, where they differ considerably. This is due to the fact that some sectors' products experienced unusually high prices--such as agricultural sectors and the mining sector--in 1973. Proprietor income in agriculture is expected to increase from $292,000,000 in 1967 to $336,434,000 in 1985 in constant 1967 prices. Non-agricultural

TABLE XXXI

PERSONAL INCOME, WAGE AND SALARY INCOME, AND OTHER INCOME PROJECTIONS IN CONSTANT PRICES (1967 = 100), OKLAHOMA, 1967-1985

		1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
										(Thousands of Dollars)										
Total Personal Income	P[a]		6,834,927	7,119,167	7,423,697	7,683,436	8,017,136	8,338,295	8,613,023	8,894,259	9,217,415	9,584,900	9,984,965	10,410,750	10,864,553	11,352,595	11,880,009	12,449,818	13,064,407	13,726,867
Total Personal Income	A[b]	6,664,000	6,918,426	7,128,415	7,409,286	7,509,481	7,976,856	8,683,694												
Wage & Salary Payments	P		4,153,900	4,334,100	4,533,952	4,687,582	4,911,085	5,109,099	5,256,200	5,400,143	5,574,401	5,780,457	6,006,266	6,244,446	6,496,384	6,767,179	7,060,763	7,378,945	7,722,789	8,093,948
Wage & Salary Payments	A	4,057,000	4,279,271	4,437,158	4,576,956	4,654,575	4,924,980	5,120,210												
Agricultural (Sectors 1 + 2)	P		31,746	33,817	35,825	37,846	39,986	42,211	44,521	46,942	49,504	52,240	55,167	58,291	61,620	65,169	68,957	73,007	77,340	81,974
Agricultural (Sectors 1 + 2)	A	30,000	27,831	29,144	34,394	33,000	30,004	46,582												
Mining (Sector 3)	P		308,289	307,675	307,699	306,907	306,963	307,745	307,270	306,897	307,421	308,866	310,910	313,351	316,216	319,626	323,672	328,386	333,781	339,887
Mining (Sector 3)	A	311,000	321,497	326,958	304,385	294,312	308,061													
Construction (Sector 4)	P		178,159	192,364	214,739	232,431	744,739	274,467	289,756	305,050	327,140	355,827	387,796	421,173	456,457	495,068	538,002	585,603	638,017	695,588
Construction (Sector 4)	A	197,000	215,931	234,062	247,635	268,755	272,945													
Food & Kindred Prod. (Sector 5)	P		98,672	101,715	103,492	104,705	105,553	106,505	107,451	108,311	109,159	110,109	111,207	112,434	113,764	115,190	116,720	118,367	120,139	122,038
Food & Kindred Prod. (Sector 5)	A	96,978	101,489	99,838	102,663	103,140	106,766													
Petroleum Refining (Sector 6)	P		49,508	49,327	49,235	49,003	48,939	49,112	49,133	49,209	49,508	50,039	50,746	51,585	52,557	53,679	54,969	56,430	58,064	59,876
Petroleum Refining (Sector 6)	A	50,378	52,046	50,873	51,013	49,660	50,128													
Lumber & Wood (Sector 7)	P		24,122	23,977	24,430	23,981	35,295	34,701	33,510	32,177	31,162	30,404	29,725	29,037	28,354	27,713	27,130	26,602	26,116	25,669
Lumber & Wood (Sector 7)	A	28,967	29,276	27,980	28,057	30,560	34,503													
Apparel & Others (Sector 8)	P		49,622	54,433	58,971	63,420	68,388	73,407	78,659	84,191	90,151	96,670	103,810	111,594	120,056	129,261	139,295	150,252	162,227	175,321
Apparel & Others (Sector 8)	A	45,970	50,094	59,140	61,215	63,030	72,913													
Printing & Publishing (Sector 9)	P		48,274	51,223	53,558	55,492	57,360	59,457	61,193	62,928	64,813	66,930	69,253	71,741	74,386	77,213	80,249	83,516	87,030	90,805
Printing & Publishing (Sector 9)	A	46,600	50,094	50,873	52,926	52,843	57,289													
Machinery & Elec. Mach. (Sector 10)	P		172,656	175,403	188,844	194,493	229,671	244,101	243,712	242,269	245,953	253,820	262,511	270,425	277,946	285,999	295,037	305,012	315,759	327,237
Machinery & Elec. Mach. (Sector 10)	A	151,134	163,944	186,321	205,326	196,730	214,182													
Transportation Equip. (Sector 11)	P		68,129	70,505	75,367	76,731	77,579	79,790	82,128	83,094	84,889	87,496	90,408	93,298	96,173	99,178	102,410	105,880	109,565	113,456
Transportation Equip. (Sector 11)	A	68,640	81,322	96,022	85,446	67,487	74,215													
Primary & Fabricated (Sector 12)	P		118,503	119,130	127,065	129,055	132,317	139,556	138,721	136,711	137,805	141,343	145,326	148,776	151,903	155,234	159,023	163,232	167,748	172,532
Primary & Fabricated (Sector 12)	A	119,018	124,910	124,002	127,532	123,513	132,806													
Other Manufacturing (Sector 13)	P		126,951	130,131	134,598	135,836	170,296	172,305	171,385	169,874	169,554	170,288	171,391	172,483	173,605	174,936	176,577	178,525	180,751	183,245
Other Manufacturing (Sector 13)	A	125,315	138,572	130,998	139,648	148,981	168,611													
Trans., Com., & Pub. Util. (Sector 14)	P		354,961	377,288	397,972	414,253	430,985	449,768	465,853	481,442	499,046	519,257	541,506	565,286	590,616	617,829	647,260	679,129	713,594	750,838
Trans., Com., & Pub. Util. (Sector 14)	A	340,000	358,925	377,960	380,911	397,362	426,177													
Wholesale & Retail Trade (Sector 15)	P		694,955	738,180	778,082	807,035	833,604	864,642	894,514	921,740	951,972	986,234	1,023,730	1,063,572	1,105,677	1,150,519	1,198,608	1,250,265	1,305,689	1,365,109
Wholesale & Retail Trade (Sector 15)	A	668,000	690,979	714,026	741,187	773,289	831,604													
Finance, Ins., & Real Est. (Sector 16)	P		184,136	200,514	214,468	227,166	239,059	253,334	266,129	279,643	294,332	310,729	328,876	348,694	370,240	393,727	419,432	447,631	478,586	512,578
Finance, Ins., & Real Est. (Sector 16)	A	173,000	181,382	193,078	201,204	211,047	229,848													
Services (Sector 17)	P		437,195	472,932	505,177	534,331	563,419	597,418	626,374	656,750	690,287	727,891	769,103	813,480	861,166	912,701	968,667	1,029,533	1,095,713	1,167,678
Services (Sector 17)	A	414,000	450,096	480,874	508,169	530,091	565,842													
Government (Sector 18 + 19)	P		1,208,022	1,235,486	1,264,430	1,294,897	1,326,932	1,360,580	1,395,891	1,432,915	1,471,705	1,512,314	1,554,801	1,599,226	1,645,648	1,694,137	1,744,755	1,797,575	1,852,670	1,910,113
Government (Sector 18 + 19)	A	1,182,000	1,230,326	1,244,080	1,292,347	1,295,136	1,327,215	1,381,668												
Other Labor Income	P		213,128	234,143	257,229	282,591	310,455	341,065	374,694	411,639	452,226	496,815	545,801	599,617	658,738	723,690	795,045	873,436	959,556	1,054,167
Other Labor Income	A	194,000	210,173	243,169	269,991	288,541	310,455	332,081												
Proprietor Income	P		848,169	855,209	857,004	850,414	843,578	839,790	828,612	817,008	807,906	801,467	794,478	792,109	788,304	785,312	783,305	782,278	781,726	782,900
Proprietor Income	A	863,000	826,296	807,832	796,217	706,513	824,421	1,252,442												
Agricultural (Sector 1 + 2)	P		294,487	299,006	301,928	304,018	306,162	308,064	309,698	311,245	312,858	314,686	314,753	319,013	321,435	324,024	326,803	329,789	332,997	336,434
Agricultural (Sector 1 + 2)	A	292,000	219,770	275,046	325,881	248,145	316,840	702,479												
Non-Agricultural (Sectors 3-17)	P		553,682	556,203	555,076	546,396	537,416	531,726	518,914	505,763	495,048	486,781	479,725	473,096	466,869	461,288	456,502	452,489	448,729	446,466
Non-Agricultural (Sectors 3-17)	A	570,000	606,526	532,787	470,335	458,368	508,380	549,211												
Property Income	P		1,089,308	1,120,483	1,152,550	1,185,535	1,219,464	1,254,364	1,290,263	1,327,190	1,365,173	1,404,243	1,444,432	1,485,771	1,528,293	1,572,032	1,617,023	1,663,301	1,710,904	1,759,869
Property Income	A	1,059,000	1,072,937	1,104,736	1,154,772	1,196,208	1,219,473	1,183,321												
Transfer Payments	P		746,523	800,712	858,836	921,179	988,047	1,059,769	1,136,697	1,219,209	1,307,711	1,402,637	1,504,454	1,614,662	1,730,797	1,856,435	1,991,193	2,135,733	2,290,765	2,457,051
Transfer Payments	A	696,000	750,480	766,849	841,788	931,575	988,029	1,069,121												

[a]Projected figures.

[b]Published figures.

proprietor income is expected to decrease from $570,000,000 in 1967 to $446,466,000 in 1985 due to a decline in the proprietor income rates. Comparison of the proprietor income figures obtained from published data indicates the big jump which occurred in 1973 was mainly in the agricultural sectors.

Other labor income is expected to increase from $194,000,000 to $1,054,167,000; property income is expected to increase from $1,059,000,000 to $1,759,869,000; and transfer payments are expected to increase from $696,000,000 to $2,457,051,000 from 1967 through 1985, respectively.

E. Projections of Other Economic Variables

State and local government expenditures are estimated in five components: education expenditures, highway expenditures, public welfare, health and hospitals, and other state and local expenditures. These variables are projected through 1985, and presented in Table XXXII. Education expenditures are expected to increase from $433,035,000 in 1968 to $1,006,295,000 in 1985; highway expenditures from $185,375,000 in 1968 to $237,566,000 in 1985; public welfare expenditures from $199,657,000 in 1968 to $374,434,000 in 1985; health and hospital expenditures from $68,132,000 in 1968 to $174,385,000 in 1985; and other state and local expenditures from $249,170,000 in 1968 to $616,436,000 in 1985; where all values are in 1967 prices.

Table XXXIII presents estimates of state and local government revenues from 1968 through 1985. All of the variables in this table are expected to increase from 1968 through 1985 in 1967 prices. The increases are state sales tax from $74,013,000 to $115,504,000;

TABLE XXXII

PROJECTIONS OF STATE AND LOCAL GOVERNMENT EXPENDITURES IN CONSTANT PRICES (1967 = 100), OKLAHOMA, 1968-1985

Year	Education Expenditures	Highway Expenditures	Public Welfare	Health and Hospitals	Other Expenditures
	($000)	($000)	($000)	($000)	($000)
1968	433,035	185,375	199,657	68,132	249,170
1969	472,573	184,736	214,080	75,460	274,500
1970	496,926	186,772	220,258	79,974	290,102
1971	523,017	188,965	226,916	84,810	306,818
1972	545,271	191,577	234,844	88,935	321,075
1973	573,861	194,193	242,785	94,234	339,392
1974	601,377	196,913	251,038	99,334	357,020
1975	624,915	200,062	260,599	103,697	372,100
1976	649,010	203,434	270,831	108,163	387,537
1977	676,697	206,845	281,185	113,294	405,275
1978	708,182	210,273	291,591	119,130	425,446
1979	742,459	213,785	302,252	125,483	447,406
1980	778,938	217,436	313,332	132,245	470,777
1981	817,819	221,230	324,849	139,451	495,686
1982	859,633	225,149	336,743	147,201	522,475
1983	904,820	229,167	348,971	155,576	551,425
1984	953,639	233,314	361,529	164,625	582,701
1985	1,006,295	237,566	374,434	174,385	616,436

TABLE XXXIII

PROJECTIONS OF STATE AND LOCAL GOVERNMENT REVENUES IN CONSTANT PRICES (1967 = 100), OKLAHOMA, 1968-1985

Year	Sales Tax	Gasoline Tax	Income Tax	Other Taxes	Federal Aid	Other Revenues	Total
	($000)	($000)	($000)	($000)	($000)	($000)	($000)
1968	74,013	76,453	70,245	184,158	277,994	245,337	928,200
1969	75,724	77,166	74,958	189,109	307,238	257,587	981,782
1970	77,557	77,934	80,007	194,446	319,766	270,788	1,020,497
1971	79,121	78,848	84,313	200,800	333,267	286,508	1,062,855
1972	81,130	79,763	89,845	207,164	349,343	302,251	1,109,496
1973	83,064	80,715	95,170	213,779	365,444	318,616	1,156,787
1974	84,718	81,818	99,724	221,441	382,180	337,572	1,207,452
1975	86,411	82,998	104,387	229,642	401,565	357,860	1,262,861
1976	88,356	84,192	109,745	237,940	422,314	378,388	1,320,933
1977	90,568	85,392	115,837	246,279	443,308	399,020	1,380,403
1978	92,977	86,621	122,470	254,824	464,408	420,158	1,441,456
1979	95,540	87,899	129,529	263,704	486,025	442,127	1,504,824
1980	98,272	89,227	137,053	272,934	508,493	464,961	1,570,939
1981	101,210	90,598	145,144	282,467	531,845	488,544	1,639,807
1982	104,385	92,008	153,888	292,267	555,963	512,788	1,711,299
1983	107,816	93,457	163,335	302,331	580,757	537,687	1,785,383
1984	111,516	94,945	173,524	312,674	606,221	563,274	1,862,154
1985	115,504	96,474	184,507	323,304	632,389	589,571	1,941,749

gasoline, fuels excise, and special fuels use tax from $76,453,000 to $96,474,000; individual and corporation income tax from $70,245,000 to $184,507,000; other state and local taxes from $184,158,000 to $323,304,000; federal aid to the state and local government from $277,994,000 to $632,389,000; and other state and local revenues from $245,337,000 to $589,571,000. Total state and local government revenues are expected to increase from $928,200,000 in 1968 to $1,941,749,000 in 1985.

Estimates of disposable income, personal income per capita, gross state product, and total federal revenues collected in Oklahoma are presented in Table XXXIV. The expected increases of these variables from 1968 to 1985 in 1967 prices are:disposable income, which is defined as total personal income minus federal personal taxes and state and local personal taxes,from $5,898,017,000 to $11,077, 498,000; personal income per capita, which is defined as total personal income divided by population,from $2,754 to $4,635; gross state product, which is defined as value added for business sectors plus federal government and state and local government wage and salary payments,from $8,700,860,000 to $15,251,511,000; and total federal revenues, which include individual income tax, corporation income tax,and all other federal taxes, from $1,359,185,000 to $2,668,728,000; respectively.

TABLE XXXIV

PROJECTIONS OF OTHER ECONOMIC VARIABLES IN CONSTANT PRICES (1967 = 100), OKLAHOMA, 1968-1985

Year	Disposable Income	Personal Income Per Capita	Gross State Product	Total Federal Revenues
	($000)	($)	($000)	($000)
1968	5,898,017	2,754	8,700,860	1,359,185
1969	6,080,678	2,821	9,045,084	1,413,194
1970	6,280,566	2,893	9,432,011	1,471,058
1971	6,472,098	2,979	9,698,270	1,520,411
1972	6,704,518	3,065	10,145,377	1,583,818
1973	6,934,357	3,155	10,508,664	1,644,841
1974	7,153,919	3,258	10,736,457	1,697,043
1975	7,384,382	3,369	10,947,845	1,750,480
1976	7,639,760	3,481	11,222,656	1,811,884
1977	7,921,513	3,594	11,561,906	1,881,710
1978	8,225,736	3,709	11,934,649	1,957,726
1979	8,550,569	3,829	12,322,117	2,038,630
1980	8,897,857	3,954	12,726,597	2,124,858
1981	9,271,061	4,083	13,158,679	2,217,591
1982	9,673,304	4,215	13,625,717	2,317,805
1983	10,106,921	4,351	14,129,810	2,426,075
1984	10,574,112	4,491	14,671,248	2,542,854
1985	11,077,498	4,635	15,251,511	2,668,728

CHAPTER VII

ECONOMIC IMPACT ANALYSIS BY USING THE SIMULATION MODEL

In this chapter, the impact of a proposed army ammunition plant on the State economy is analyzed. The effects of this plant are measured in terms of new employment and income generated through 1985.

A. The Situation

There is a proposal to construct an army ammunition plant in McAlester, Oklahoma. This plant will produce ordnance materials. For this analysis, the construction of the plant is assumed to start in 1976 and is expected to be completed in five years. The construction cost is expected to be about $450,000,000 in current dollars. It is assumed that the plant will begin producing at full capacity in 1981. Expected production employment is 1200 full-time employees.

The impact of the ammunition plant on the State economy is analyzed in two phases: (1) construction phase, and (2) production phase. Construction cost of the plant is evenly distributed over the construction period. Each year's construction expenditure is entered into the model as additional new investment (see equation 5.1) in the other manufacturing industries sector (sector 13) in 1967 prices. Production in the other manufacturing industries sector is initiated in 1981 with 1200 new employees.

The two phases of the plant have different impacts on the State's

economy. During the first year of construction, only the direct and indirect effects from capital formation occur.[1] During the second through fifth years of construction, the direct and indirect effects from capital formation occur due to new investment; however, another effect which is referred to as the induced capacity effect is created. Induced capacity effect is created because of the increased demand for additional goods and services from all other sectors as a result of this capital formation. Other sectors need to increase their capacity in order to produce the additional goods. The direct and indirect capital effects become zero as soon as the construction is over; however, it takes a period of years for the induced capacity effect to approach zero.

During the first year of the production phase, the direct and indirect effects arise. The direct effect measures the economic activity generated directly in the other manufacturing industries sector due to increased sector production. The indirect effects arise as the other manufacturing industries sector increases production demands additional goods and services from all other sectors. These sectors, in turn, increase their demands for goods and services from other industries. The reverberations continue until the economy is completely adjusted. The indirect effects include all reverberations of the increased production.

During each year (starting from the second year of production), another impact arises. This is referred to as induced consumption effect. The induced consumption effect arises as consumers have more

---

[1]See Doeksen, Gerald A., and Dean F. Schreiner, "Investments in Agricultural Processing for Rural Development in Oklahoma," [6] for explanation of short, intermediate, and long-run effects of an investment.

money to spend for goods and services, and continues on into the long-run period.

B. The Results

The results of the impact of the proposed army ammunition plant in terms of employment and income are presented in Table XXXV. The first column of this table indicates the change in total employment due to the proposed plant. Change in total employment column presents the total change in employment due to both construction phase and production phase. Since the production does not occur until 1981, years 1976 through 1980 of this column indicate the change in total employment as a result of construction only. Years 1981 through 1985 indicate the change in total employment of both production phase and construction phase. The only impact left over in this period from the construction phase is the induced capacity effect. Only the direct effect and the indirect effects occur from the production phase in 1981. However, change in total employment column for 1982 through 1985 indicates the direct effect, the indirect effects, and the induced consumption effect of the production phase as well as induced capacity effect of the construction phase. For instance, total Oklahoma employment in 1976 is expected to increase by 3,128 as a result of the direct effect which arises from the new capital formation in the other manufacturing industries sector. The change in the State employment is expected to be 5,327 in 1977, 5,644 in 1978, 5,159 in 1979, and 4,945 in 1980. All of these changes in employment figures indicate both the direct capital effect and the induced capacity effect. The expected change in Oklahoma employment in 1981 is 4,041, which indicates the direct effect and the

indirect effects, both due to production, and the induced capacity effect, due to construction. Oklahoma employment is expected to increase by:4,107 in 1982; 4,187 in 1983; 4,275 in 1984; and 4,358 in 1985 as a result of ammunition plants.

TABLE XXXV

CHANGES IN TOTAL EMPLOYMENT AND TOTAL PERSONAL INCOME AS A RESULT OF CONSTRUCTING ARMY AMMUNITION PLANT, OKLAHOMA, 1976-1985

Year	Change in Total Employment	Change in Total Personal Income in Current Prices
	(1)	(2)
1976	3,128	$27,263,000
1977	5,327	46,341,000
1978	5,644	49,112,000
1979	5,159	44,855,000
1980	4,945	43,437,000
1981	4,041	36,759,000
1982	4,107	37,744,000
1983	4,187	38,790,000
1984	4,275	39,930,000
1985	4,358	41,047,000

The employment multiplier which is obtained by dividing the change in total employment by the production employment directly hired by the producing sector is obtained as 3.63 in 1985. This implies that for every production employee hired by the other manufacturing industries sector, the total State employment is increased by 3.63.

The second column of Table XXXV indicates the expected change in total personal income in the State as a result of the ammunition plant

in current prices. The interpretation of this column is very similar to the first column of the same table. For instance, total personal income is expected to increase by $27,263,000 in 1976 as a result of the direct capital effect. The expected increases in total personal income in Oklahoma are: $46,341,000 in 1977; $49,112,000 in 1978; $44,855,000 in 1979; and $43,437,000 in 1980. All of these expected changes in income arise from the total impact of the direct capital effect and the induced capacity effect. The expected increase in income in 1981 is $36,759,000 which indicates the total impact of the direct effect and the indirect effects from the production phase and the induced capacity effect from the construction phase. The expected increases in the State's personal income in 1982 through 1985 are: $37,744,000; $38,790,000; $39,930,000; and $41,047,000 in current prices, respectively. Each of these figures represents the total impact of the induced capacity effect, the direct effect, the indirect effects, and the induced consumption effect on income in Oklahoma.

The income multiplier, defined as change in total personal income in Oklahoma divided by the wage and salary income of the proposed 1,200 production employees in the other manufacturing industries sector, is obtained as 3.11 in 1985. This implies that every dollar spent as wage and salary payments in the other manufacturing industries sector generates $3.11 in total personal income in Oklahoma in 1985.

The impact of the ammunition plant on employment in Oklahoma is further analyzed in terms of manpower needs. Table XXXVI contains data which summarizes the results of this analysis. The occupation of the jobs created directly, indirectly, and induced are exemplified. Not only is total employment given by wage and salary employment and

TABLE XXXVI

NEEDED EMPLOYMENT BY OCCUPATION AS A RESULT OF CONSTRUCTING ARMY AMMUNITION PLANT, OKLAHOMA, 1976-1985

		1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1.	Engineers (02)	46	77	78	67	63	47	48	49	50	51
2.	Scientists (04+06)	5	9	9	8	7	8	8	8	9	8
3.	Technicians (including health) (08+10+12)	63	103	109	100	97	69	72	72	73	75
4.	Computer and other machine specialists (14+16)	9	16	17	15	14	11	10	11	11	11
5.	Economists, planners and teachers (18+20)	15	26	29	28	28	19	21	20	21	22
6.	Miscellaneous artists (22)	13	22	25	23	22	21	21	21	21	22
7.	Other professional and technical workers (24+99)	59	99	106	99	95	84	86	87	88	90
8.	Financial managers (02)	34	61	68	64	61	51	51	52	53	54
9.	Other manaters and administrators (04-99)	139	242	258	236	226	175	176	182	185	188
10.	Sales workers (00)	104	213	241	226	214	205	198	206	213	215
11.	Secretaries (02)	92	156	168	157	151	124	126	127	129	132
12.	Other machine operators (04)	15	26	29	27	25	22	21	21	22	23
13.	Other clerical workers (06-99)	224	396	428	398	380	329	330	335	341	350
14.	Construction traders (02)	310	496	508	458	446	185	201	207	214	220
15.	Foremen (04)	83	137	139	123	115	107	109	113	114	115
16.	Metal workers (06)	91	147	144	123	115	70	72	73	75	75
17.	Mechanics and repairmen (08)	81	145	155	140	132	113	112	116	118	120
18.	Printing trades (10)	6	12	14	13	13	10	10	10	10	11
19.	Electrical workers (12)	25	42	44	39	37	80	81	82	82	84
20.	Other miscellaneous craftsmen (14-00)	71	118	123	111	107	75	77	79	81	82
21.	Metal and machine shop workers (02)	161	258	254	217	202	91	95	97	99	99
22.	Textile machine workers (02)	3	4	4	4	4	31	32	32	32	32
23.	Final processors (06)	45	75	76	66	62	116	118	120	121	123
24.	Miscellaneous operatives (08-00)	419	708	728	643	605	795	803	820	835	847
25.	Janitorial workers (02)	42	71	77	73	71	62	64	64	65	66
26.	Food workers (04)	62	124	142	135	129	100	96	100	103	106
27.	Personnel service workers (06+08+12+20)	91	151	171	169	167	121	126	125	128	133
28.	Public service workers (00)	22	38	42	39	38	41	42	42	43	44
29.	Total wage and salary	173	289	303	274	264	195	199	204	208	212
	Total wage and salary	2503	4261	4489	4075	3890	3357	3405	3475	3544	3610
	Total Proprietorship	625	1066	1155	1084	1055	684	702	712	731	748
	Total employment	3128	5327	5644	5159	4945	4041	4107	4187	4275	4358

proprietor employment, but the occupation of the wage and salary job is given. For instance, in 1985, the expected increase in the number of: engineers (occupation group 1) is 51, scientists (occupation group 2) is 8, technicians (occupation group 3) is 75, etc. Miscellaneous operatives (occupation group 24) indicate the highest number of expected employment increase at 847 in 1985. Total wage and salary employment is expected to increase by 3,610; total proprietorship employment by 748; and total employment by 4,358 in Oklahoma in 1985.

The impact of the ammunition plant on the total federal revenues, state sales taxes, and state income taxes are presented in Table XXXVII. As a result of constructing this army plant, total federal revenues are expected to increase in current dollars by $5,180,000 in 1976; by $8,805,000 in 1977; by $9,333,000 in 1978; etc. Expected increases in total federal revenues through 1985 are given in the first column of Table XXVII. The second column of the same table presents the expected increases in the state sales tax collections as a result of the army plant. For instance, expected increases in the State sales tax in current dollars are $164,000 in 1976; $279,000 in 1977; $295,000 in 1978; etc. The third column of Table XXXVII presents the expected increases in the State income tax collections as a result of constructing the ammunition plant in current dollars from 1976 through 1985. For instance, expected increases in the state income tax collections are $451,000 in 1976; $769,000 in 1977; $815,000 in 1978; etc.

C. Other Evaluation Uses of the Model

Impact analysis of the McAlester army ammunition plant provides only an example of the many evaluation possibilities which can be

analyzed by utilizing the Oklahoma simulation model. One possibility is using the simulation model to analyze the impact of other industrial changes or expansions. The impact of not only bringing a new industry into the economy, but expansion of existing industries can also be analyzed. Derivation of employment and income multipliers for each sector provides a comparison of expected changes in terms of employment and income generated under various investment strategies.

TABLE XXXVII

CHANGES IN TOTAL FEDERAL REVENUES, STATE SALES TAX, AND STATE INCOME TAX AS A RESULT OF CONSTRUCTING ARMY AMMUNITION PLANT, OKLAHOMA, 1976-1985

Year	Changes in Total Federal Revenues	Changes in State Sales Tax	Changes in State Income Tax
	(1)	(2)	(3)
1976	$5,180,000	$164,000	$451,000
1977	8,805,000	279,000	769,000
1978	9,333,000	295,000	815,000
1979	8,553,000	272,000	746,000
1980	8,253,000	262,000	719,000
1981	7,000,000	221,000	610,000
1982	7,173,000	229,000	626,000
1983	7,371,000	233,000	643,000
1984	7,586,000	240,000	662,000
1985	7,808,000	248,000	681,000

Another evaluation possibility which can be analyzed through this model is measuring the impact of alternative government programs in

the State. The impact of increased or decreased federal expenditures or revenues can be measured in terms of created new jobs and income. Implementation of various state and local government programs have different impacts on the economy. The Oklahoma simulation model can also be used to compare the impact of these programs.

CHAPTER VIII

SUMMARY, IMPLICATION AND LIMITATIONS

A. Summary

The main purpose of the study is to provide a dynamic analysis that will provide economic projections and will be useful in evaluating development strategies. Agricultural and industrial businesses can find the study useful in planning their operations and investments. Government administrators can find it useful in evaluating the impact of governmental policies. The major objective of this study is to develop a social accounting system for Oklahoma for 1967 and to utilize this information to develop an economic model for purposes of projecting economic variables and evaluating planning strategies. The social accounting system is constructed by using secondary data. State economic activities are aggregated into 17 endogenous and five exogenous sectors. The endogenous sectors include two agricultural sectors, one mining sector, nine manufacturing sectors, and five service-type sectors.

The social accounting system for Oklahoma for 1967 is presented in four major accounts: (1) the interindustry account, (2) the capital account, (3) the human resource account, and (4) the government account. The interindustry account is the core of the entire study. The capital account, the human resource account, and the government account are connected to the interindustry account.

The interindustry account of the Oklahoma social accounting system consists of three basic parts: a transaction or flow table, a direct coefficients table, and a direct and indirect coefficients table. The transaction table forms the base of the interindustry account and other tables are derived directly from it. The transaction table represents a double entry accounting system as sales and purchases of each sector are included in the table. The direct coefficients reveal the direct dependence of each sector on all other sectors, since they indicate input requirements per dollar of output. The direct and indirect coefficients indicate the total change which includes direct and indirect effects in input requirements as a result of a one-dollar change in final demand.

The capital account includes six basic parts: a capital coefficient matrix, capacity levels, capital-output ratios, a capital stock matrix, a capital unit matrix, and depreciation coefficients. The capital coefficient matrix forms the core of this account. The capital coefficients indicate the amount of capital goods required from each row sector for every dollar's worth of capital expenditures made by each column sector. Capacity operating levels for 1967 in each sector are estimated by using employment data. Capital-output ratios are defined as the ratio of the total cost of plant and equipment to output at capacity. The total values of capital goods and compositions are given in the capital stock matrix. Capital unit matrix indicates the amount of capital goods required from every sector to produce one unit of output capacity in each sector. Depreciation coefficients are estimated as the ratio of depreciation to depreciable assets.

The human resource account is an important part of a social

accounting system. This section is constructed in three major parts: (1) employment, (2) population, and (3) income. The employment section contains five main parts: (1) a labor coefficient matrix, (2) output-employment ratios, (3) a sector employment matrix, (4) a labor stock matrix, and (5) a total Oklahoma employment by occupation matrix. Labor coefficients indicate change in labor requirements in each occupation group as a result of one unit change in the total employment in that column sector. Output-employment ratios indicate the value of output produced by each employee in each sector. Sector employment matrix presents the total employment (wage and salary employment plus proprietor employment) in each sector. Labor stock matrix gives the occupational mix of employment by sector. Total Oklahoma employment by occupation matrix indicates the total number of employees in each occupation group.

Oklahoma population analysis is based on total employment in Oklahoma. Assuming perfect mobility of labor and full employment, population is estimated by assuming that a specific portion of the population is employed. Income section includes sector wage and salary rates, and proprietor income rates, sector wage and salary incomes and proprietor incomes, total personal income, and disposable income. Sector wage and salary rates and proprietor income rates indicate the wage and salary payments and proprietor income per employee, respectively, in each sector. Sector wage and salary income and proprietor income presents the total wage and salary payments and proprietor income, respectively, in each sector. Total personal income is determined by summation of sector wage and salary incomes, sector proprietor incomes, property income, other labor income, and transfer payments and subtraction of personal contributions to social insurance. Disposable income is estimated by

subtracting personal taxes from total personal income.

Government account is constructed around two groups of activities: (1) federal government, and (2) state and local government. Each government sector is analyzed in two basic parts: (1) revenues, and (2) expenditures. Federal government revenues are estimated by a regression approach. Federal government expenditures are estimated from previous year's expenditures. State and local government revenues are estimated by regression approach in six components: (1) state sales tax, (2) gasoline and fuels excise tax, (3) income tax, (4) all other state and local taxes, (5) federal aid to state and local governments, and (6) all other state and local revenues. State and local government expenditures are analyzed in a similar way to the state and local revenues. The components of state and local expenditures include: (1) education expenditures, (2) highway expenditures, (3) public welfare, (4) health and hospitals, and (5) all other state and local expenditures.

The simulation model is formulated around the basic Leontief input-output model. The model is constructed in a recursive sequence and consists of 62 major equations. Most of the major equations are disaggregated into sub-equations; for example, one sub-equation for each endogenous sector. Each major equation in the employment section is disaggregated into sub-equations to estimate the employment by occupation for each sector. Thus, the entire system includes over 1,500 equations. The model is formulated in Fortran and is run on the computer at a relatively low cost, since it requires only slightly more than two minutes of central processing unit (CPU) time. Researchers can experiment with the model by changing variables and measuring their impact since the computer program is relatively inexpensive.

B. Implication

Employment and income are projected by sector. Total employment is expected to increase by 53.4 percent from 1967 to 1985. Wage and salary employment is expected to increase by 57.2 percent, whereas proprietor employment is expected to increase by 40.6 percent. The slow rate of growth in proprietor employment is due basically to the decline in the number of proprietors in agriculture.

Wage and salary employment is expected to increase in all endogenous sectors except in agriculture (sectors 1 + 2), mining (sector 3), and lumber and wood products (sector 7). The rate of decrease is 26.3 percent in mining, 19.5 percent in agriculture, and 21.3 percent in lumber and wood products from 1967 to 1985. The expected rate of increase is greatest in the apparel and other products sector (sector 8) by 238.5 percent; next greatest is the construction sector (sector 4) by 154.2 percent in the same period. The rates of increase in wage and salary employment of the other manufacturing sectors are: food and kindred products (sector 5) by 11.6 percent; petroleum refining (sector 6) by 5.5 percent; printing and publishing (sector 9) by 72.8 percent; machinery and electrical machinery (sector 10) by 92.1 percent; transportation equipment (sector 11) by 46.7 percent; primary and fabricated metal products (sector 12) by 28.6 percent; and other manufacturing industries (sector 13) by 29.7 percent from 1967 to 1985. Expected rates of increase in wage and salary employment of the other service-type sectors are: transportation, communication, and public utilities (sector 14) by 28.7 percent; wholesale and retail trade (sector 15) by 68.9 percent; finance, insurance, and real estate (sector 16) by 104.3

percent; and services (sector 17) by 105.9 percent in the simulation period of 1967 to 1985. In the same period, wage and salary employment in the federal government sector (sector 18) is expected to decrease by 19.6 percent, while in state and local government sector (sector 19) is expected to increase by 56.0 percent. Total wage and salary employment in service-type sectors is expected to increase by 84.1 percent, whereas for manufacturing sectors the expected rate of increase is 53.7 percent from 1967 to 1985.

Wage and salary employment in all occupation groups are expected to increase from 1967 to 1985. The expected rates of increase are: engineers (occupation group 1) by 24.0 percent; scientists (occupation group 2) by 7.4 percent; technicians (occupation group 3) by 63.1 percent; computer and other machine specialists (occupation group 4) by 27.1 percent; economists, planners, and teachers (occupation group 5) by 83.2 percent; miscellaneous artists (occupation group 6) by 63.9 percent; other professional and technical workers (occupation group 7) by 51.5 percent; financial managers (occupation group 8) by 67.3 percent; other managers and administrators (occupation group 9) by 57.6 percent; sales workers (occupation group 10) by 71.5 percent; secretaries (occupation group 11) by 56.8 percent; other machine operators (occupation group 12) by 47.9 percent; other clerical workers (occupation group 13) by 49.6 percent; construction traders (occupation group 14) by 103.9 percent; foremen (occupation group 15) by 42.7 percent; metal workers (occupation group 16) by 48.7 percent; mechanics and repairmen (occupation group 17) by 41.5 percent; printing trades (occupation group 18) by 63.9 percent; electrical workers (occupation group 19) by 36.4 percent; other miscellaneous craftsmen (occupation group 20) by 49.5 percent; metal and

machine shop workers (occupation group 21) by 52.4 percent; textile machine workers (occupation group 22) by 29.5 percent; final processors (occupation group 23) by 55.4 percent; miscellaneous operatives (occupation group 24) by 50.5 percent; janitorial workers (occupation group 25) by 70.8 percent; food workers (occupation group 26) by 78.4 percent; personnel service workers (occupation group 27) by 102.1 percent; public service workers (occupation group 28) by 58.2 percent; and laborers (occupation group 29) by 36.6 percent.

Among income projections from 1967 to 1985, total personal income is expected to increase by 106.0 percent, wage and salary payments by 99.5 percent, other labor income by 443.4 percent, property income by 66.2 percent, and transfer payments by 253.0 percent. Sectors' wage and salary payments follow patterns which are similar to employment projections. Proprietor income is expected to decline from 1967 to 1985 by 9.3 percent.

Oklahoma population is projected to increase by 19 percent from 1967 to 1985 with an annual average rate of increase of approximately .98 percent.

Federal government revenues are expected to increase by 94.5 percent, whereas governmental (federal government and state and local government) wage and salary payments are to increase by 61.6 percent in the same 18-year period. Total state and local government revenues from 1967 to 1985 are expected to increase by 116.2 percent while rates of increase for individual components of state and local revenues are: state sales taxes by 60.1 percent, gasoline fuels excise and special fuels use tax by 23.8 percent, individual and corporation income tax by 199.9 percent, other state and local taxes by 85.2 percent, federal aid

to state and local governments by 122.2 percent, and other state and local revenues by 159.4 percent. Total state and local government expenditures are expected to increase from 1967 to 1985 by 107.4 percent, whereas the rates of increase for individual components of expenditures are: education expenditures by 114.6 percent, highway expenditures by 33.4 percent, public welfare expenditures by 79.9 percent, health and hospital expenditures by 167.5 percent, and other state and local expenditures by 155.5 percent.

The Oklahoma simulation model can be used as a tool to measure the impact of various development strategies. This study analyzes only one of these possibilities as an example.

The impact analysis consists of measuring the effects on the State's income and employment of the proposed army ammunition plant in McAlester, Oklahoma. New employment which is expected to be generated by this plant is around 5,000 each year during the construction period and around 4,000 during the production period. Employment multiplier is found to be 3.63; this implies that every additional production worker hired by this plant increases the total employment in the State by 3.63 in 1985. New income generated from this plant is expected to be $41,047,000 in 1985 in current prices. Income multiplier is found to be 3.11, which implies that every additional dollar of wage and salary payment made for the production workers of this plant is expected to generate $3.11 in total personal income (in constant 1967 dollars) in the State in 1985. Because of this plant, total wage and salary employment is expected to increase by 3,610; total proprietorship employment by 748; and total employment by 4,358 in 1985. The largest expect- increase is in miscellaneous operatives (occupation group 24), where

847 additional employees are expected to be hired in 1985. It is followed by other clerical workers (occupation group 13) with 350 employees, construction traders (occupation group 12) with 220, sales workers (occupation group 10) with 215, and laborers (occupation group 29) with 212.

C. Limitations

Limitations for the study area arise from (1) data limitations and (2) model assumptions. Data limitations occur since a vast amount of data is required and time and funds prohibit the collection of primary data. With primary data, the model could have been developed in greater detail, permitting greater analysis. For instance, exports and imports are computed as net exports and imports in the present model. With primary data, exports and imports could be analyzed as gross elements. In addition, data limitations faced the aggregation of economic activity into 17 sectors and 29 occupations. The empirical results apply to these sectors and occupations groups and not to specific industries and occupations. Again, the problem of "tradeoff" is faced in deciding how much time and money is available for collection of primary data versus using secondary data and having less model refinement.

Model assumptions also limit the study. A major model limitation is that the simulation model is built around the input-output model and thus has basic input-output assumptions. The most serious input-output assumption is that the technical coefficients are fixed which implies no input substitution and technology is constant. For short-run projections, fixed coefficient assumption is not a major limitation. However, for long-run purposes, if the economy is experiencing rapid

changes, the assumption can limit usefulness of results. To provide for some adjustment in technology, capital-output ratios and labor-output ratios change annually to reflect improved technology.

Most of the future research needs are exemplified directly from the data limitations and model assumptions. Additional research is needed to estimate the technical coefficients with projected changes in prices of inputs and outputs. In this way, a new interindustry flow table needs to be constructed with every set of price projections which may be estimated exogenously. Thus, not only the model will become more dynamic and realistic, but also the area where this model can be utilized to measure the impact of various governmental decisions will be enlarged. Such an analysis will also allow the researcher to project economic variables under the substitutability conditions of factors of production. For instance, recent increases in oil prices have affected Oklahoma's economy by:(1) impact on oil production, (2) an impact on consumption. Oil producers have been encouraged to produce more oil, whereas oil consumers have been discouraged. The impact of various government programs under changing oil prices can be analyzed if appropriate adjustments are made with the model.

Additional refinement of the human resource account is also possible. In such an addition, population may be estimated in a demographic sector by components and age coharts. Net migration may be incorporated into the model as a separate component and may be treated as a difference between the two population projections obtained from the demographic sector and from the model endogenously. It is also possible to analyze migration in two components: (1) inmigration and (2) outmigration. Movement of population in different age coharts can be seen clearly in such an analysis.

A SELECTED BIBLIOGRAPHY

[1] Byerlee, Derek and A. N. Halter. "A Macro-Economic Model for Agricultural Sector Analysis." American Journal of Agricultural Economics, Vol. 56, No. 3 (August, 1974): 520-533.

[2] Cagan, Philip. "The Monetary Dynamics of Hyperinflation." Studies in the Quantity Theory of Money, ed. Milton Friedman, Chicago: The University of Chicago Press, 1956, pp. 25-117.

[3] Doeksen, Gerald A. "Application of Simulation to Regional and Community Planning." Southern Journal of Agricultural Economics, Vol. 4, No. 1 (July, 1972), pp. 35-43.

[4] Doeksen, Gerald A. "A Social Accounting System and Simulation Model Projecting Economic Variables and Analyzing the Structure of the Oklahoma Economy." Ph.D. thesis, Oklahoma State University, 1971.

[5] Doeksen, Gerald A. and Dean F. Schreiner. An Analysis of the Capital Structure by Private Sectors in Oklahoma. Oklahoma State University Agricultural Experiment Station Bulletin B-694, July 1971.

[6] Doeksen, Gerald A. and Dean F. Schreiner. "Investments in Agricultural Processing for Rural Development in Oklahoma." American Journal of Agricultural Economics. Vol. 54, No. 3 (August, 1972): 513-519.

[7] Doeksen, Gerald A. and Dean F. Schreiner. A Simulation Model for Oklahoma with Economic Projections from 1963 to 1980. Oklahoma State University Agricultural Experiment Station Bulletin B-693, May, 1971.

[8] Doeksen, Gerald A. and James Rathwell. "Impacts of a New Agricultural Processing Plant on Rural Development." Southern Journal of Agricultural Economics. Vol. 4, No. 1 (July, 1972), pp. 73-77.

[9] Ekholm, Arthur L., Jr. "Regional Economic Adjustment to the Depletion of Groundwater and Petroleum: High Plains of Oklahoma and Texas." Ph.D. thesis, Oklahoma State University, 1975.

[10] Executive Office of the President, Bureau of the Budget. 1967 Standard Industrial Classification Manual. Washington, 1967.

[11] Ferber, Robert. "Research on Household Behavior." American Economic Review. Vol. 52, No. 1 (March, 1962), pp. 19-63.

[12] Friedman, Milton. A Theory of the Consumption Function. Princeton: Princeton University Press, 1957.

[13] A Generalized Simulation Approach to Agricultural Sector Analysis --With Special Reference to Nigeria. East Lansing: Michigan State University, November 1971.

[14] Hamilton, H. R., S. E. Goldstone, J. W. Milliman, A. L. Pugh, III, E. B. Roberts, and A. Zellner. System Simulation for Regional Analysis: An Application to River-Basin Planning. Cambridge: the MIT Press, 1969.

[15] Herman, Robert S. "State Planning and Development in a Federal System." Regional Accounts for Policy Decisions, ed. Werner Z. Hirsch. Baltimore: Johns Hopkins Press, 1969, pp. 131-152.

[16] Holloway, M. L. "An Economic Simulation Model for Analyzing Natural Resource Policy." Southern Journal of Agricultural Economics. Vol. 6, No. 1 (July, 1974), pp. 171-178.

[17] Klein, Lawrence R. "Some Theoretical Issues in the Measurement of Capacity." Econometrica (April, 1960), pp. 272-286.

[18] Krishnamurty, K. "Industrial Utilization of Capacity." Proceedings of the Business and Economic Statistics Section. Washington: American Statistical Association, 1962, pp. 309-319.

[19] Leontief, Wassily. Input-Output Economics. New York: Oxford University Press, 1966.

[20] Little, Charles H. Economic Changes in Oklahoma. Oklahoma State University Agricultural Experiment Station Bulletin B-652, January 1967.

[21] Little, Charles H. and Gerald A. Doeksen. An Analysis of the Structure of Oklahoma's Economy by Districts. Oklahoma State Agricultural Experiment Station Bulletin B-660, May 1969.

[22] Little, Charles H. and Gerald A. Doeksen. An Input-Output Analysis of Oklahoma. Oklahoma State University Agricultural Experiment Station Bulletin T-124, February 1968.

[23] MacMillan, J. A. "Public Service System in Rural-Urban Development." Ph.D. thesis, Iowa State University, 1968.

[24] Maki, Wilbur R., Richard E. Suttor, and Jerald R. Barnard. Simulation of Regional Product and Income with Emphasis on Iowa, 1954-1974. Iowa State University Agricultural Experiment Station Bulletin 548, September 1966.

[25] Masucci, Robert H. Dollar Volume of Agriculture's Transaction with Industry. USDA AMS Marketing Research Report No. 375, December 1959.

[26] Miernyk, William H. The Elements of Input-Output Analysis. New York: Random House, 1965.

[27] Miernyk, William H. Simulating Regional Economic Development. Lexington: D. C. Heath and Company, 1970.

[28] Mullendore, W. E. "An Economic Simulation Model for Urgan Regional Development Planning." Ph.D. thesis, Iowa State University, 1968.

[29] Mullendore, Walter E. and Aurthur L. Ekholm. Projections of Final Demand for Texas. Austin: Office of the Governor, Office of Information Services, State of Texas, August 1972.

[30] Oklahoma Bureau of Business Research. Oklahoma Statistical Abstract, 1967. Norman: University of Oklahoma, 1968.

[31] Oklahoma Department of Agriculture, Crop and Livestock Reporting Service. Oklahoma Agriculture, 1968. Oklahoma City, 1969.

[32] Oklahoma Department of Agriculture, Crop and Livestock Reporting Service. Oklahoma Agriculture, 1973. Oklahoma City, 1974.

[33] Oklahoma Employment Security Commission, Research and Planning Division. Handbook of Oklahoma Employment Statistics, 1958-1972. Oklahoma City, March 1973.

[34] Oklahoma Employment Security Commission, Research and Planning Division. Handbook of Oklahoma Employment Statistics, 1973. Oklahoma City, June 1974.

[35] Oklahoma Employment Security Commission, Research and Planning Division. "Industry-Occupation Matrices for Oklahoma, 1970." (Unpublished.)

[36] Oklahoma Employment Security Commission, Research and Planning Division. Oklahoma Population Estimates. Oklahoma City, April 1975.

[37] Oklahoma Employment Security Commission, Research and Planning Division. "Oklahoma Population Projections." Mimeographed. Oklahoma City, November 1974.

[38] Oklahoma Tax Commission, Division of Research and Statistics. Annual Report, Fiscal Year 1974. Oklahoma City, 1974.

[39] Oklahoma Tax Commission, Division of Research and Statistics. Report of the Motor Vehicle Division of the Oklahoma Tax Commission for the Calendar Year 1967. Oklahoma City, 1968.

[40] Perloff, Harvey S. and Charles L. Leven. "Toward an Integrated System of Regional Accounts: Stocks, Flows, and the Analysis of the Public Sector." Elements of Regional Account, ed. Werner Z. Hirsh, Baltimore: The Johns Hopkins Press, 1964, pp. 175-210.

[41] Phillips, Almarin. "Industrial Capacity, An Appraisal of Measure of Capacity." American Economic Review. Vol. 53, Part I (May, 1963), pp. 275-308.

[42] Polenske, Karen R. State Estimates of the Gross National Product, 1947, 1958, 1963. Lexington: D. C. Heath and Company, 1972.

[43] Polenske, Karen R. State Projections of the Gross National Product, 1970, 1980. Lexington: D. C. Heath and Company, 1972.

[44] Richardson, Harry W. Input-Output and Regional Economics. London: Weidenfeld and Nicolson, 1972.

[45] Tung, Fu-Lai, James A. MacMillan and Charles F. Framingham. "A Dynamic Regional Model for Evaluating Resource Development Programs." Mimeographed. Winnepeg, Canada: University of Manitoba, 1974.

[46] U. S. Bureau of the Census, Census of Business. Selected Services, 1967, Vol. V, Area Statistics, Part 3, North Dakota-Wyoming, Guam and Virgin Islands. Washington, 1966.

[47] U. S. Congress. The Public Works and Economic Development Act of 1965. Senate Report No. 193, 89th Congress, May 14, 1965.

[48] U. S. Congress Joint Economic Committee, Council of Economic Advisors. Economic Indicators. Washington, September 1975.

[49] U. S. Department of Agriculture. Agricultural Prices. SRS CRB, October 1967.

[50] U. S. Department of Agriculture. Agricultural Prices, SRS, CRB, December 1967.

[51] U. S. Department of Agriculture. Farm Income Situation, ERS FIS-220, July 1972.

[52] U. S. Department of Agriculture. Farm Income State Estimates 1959-1972, Supplement to August 1973 Farm Income Situation. ERS FIS 222, August 1973.

[53] U. S. Department of Agriculture. Field and Seed Crop Production, Farm Use, Sales, Value by States, 1967-1968. SRS CRB, May 1969.

[54] U. S. Department of Commerce, Bureau of Economic Analysis. Survey of Current Business. Washington, December 1969.

[55] U. S. Department of Commerce, Bureau of Economic Analysis. Survey of Current Business. Washington, August 1970.

[56] U. S. Department of Commerce, Bureau of Economic Analysis. Survey of Current Business. Washington, February 1974.

[57] U. S. Department of Commerce. Bureau of the Census. Annual Survey of Manufacturers, 1966. Washington, June 1969.

[58] U. S. Department of Commerce, Bureau of the Census. Annual Survey of Manufacturers, 1968-1969. Washington, November 1973.

[59] U. S. Department of Commerce, Bureau of the Census. Annual Survey of Manufacturers, 1970-1971. Washington, September 1973.

[60] U. S. Department of Commerce, Bureau of the Census. 1969 Census of Agriculture. Vol. II, Ch. 4. Washington, July 1973.

[61] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Governments, State Reports No. 36, Oklahoma. Washington, 1968.

[62] U. S. Department of Commerce, Bureau of the Census. 1970 Census of Housing, Detailed Housing Characteristics. Washington, 1973.

[63] U. S. Department of Commerce, Bureau of the Census. 1970 Census of Housing, Vol. V, Residential Finance. Washington, March 1973.

[64] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Manufacturers, Vol. I, Summary and Subject Statistics. Washington, 1970.

[65] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Manufacturers, Vol. II, Industry Statistics, Part I, Major Group 20 to 28. Washington, 1970.

[66] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Manufacturers, Vol. II, Industry Statistics, Part II, Major Group 29 to 40. Washington, 1970.

[67] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Manufacturers, Vol. III, Area Statistics, Part II. Washington, 1970.

[68] U. S. Department of Commerce, Bureau of the Census. 1967 Census of Mineral Industries, Vol. II, Area Statistics. Washington, 1971.

[69] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1966-1967, Washington, 1968.

[70] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1967-1968. Washington, 1969.

[71] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1968-1969. Washington, 1970.

[72] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1969-1970. Washington, 1971.

[73] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1970-1971. Washington, 1972.

[74] U. S. Department of Commerce, Bureau of the Census. Governmental Finances in 1971-1972. Washington, 1973.

[75] U. S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States, 1968. Washington, 1968.

[76] U. S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States, 1973. Washington, 1973.

[77] U. S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States, 1974. Washington, 1974.

[78] U. S. Department of Commerce, Bureau of the Census. Survey of Current Business. Washington, August 1970.

[79] U. S. Department of Commerce, Bureau of the Census. Survey of Current Business. Washington, August 1971.

[80] U. S. Department of Commerce, Bureau of the Census. Survey of Current Business. Washington, August 1972.

[81] U. S. Department of Commerce, Bureau of the Census. Survey of Current Business. Washington, August 1973.

[82] U. S. Department of Commerce, Bureau of the Census. Survey of Current Business. Washington, August 1974.

[83] U. S. Department of Commerce, Bureau of the Census. 1969 United States Census of Agriculture, Vol. 1, Area Reports, Part 36, Oklahoma, Section 1, Summary Data. Washington, June 1972.

[84] U. S. Department of Commerce, National Technical Information Service. Federal Outlays in Oklahoma in 1968. Published by Office of Economic Opportunities, Washington, 1973.

[85] U. S. Department of Labor, Bureau of Labor Statistics. Consumer Expenditures and Income, Cross Classification of Family Characteristics, Urban Place in the Southern Region, 1960-1961. Washington, 1963.

[86] U. S. Department of Labor, Bureau of Labor Statistics. Consumer Expenditures and Income, Detail of Expenditures and Income, Total Southern Region, Urban and Rural, 1960-1961. Washington, 1963.

[87] U. S. Department of Labor, Bureau of Labor Statistics. Employment and Earnings, States and Areas, 1939-1971. Washington, 1972.

[88] U. S. Department of the Interior, Bureau of Mines. Mineral Yearbook, 1967, Vol. III, Area Statistics, Domestic. Washington, 1968.

[89] U. S. Department of the Treasury, Internal Revenue Service. 1962 Annual Report. Washington, 1962.

[90] U. S. Department of the Treasury, Internal Revenue Service. 1963 Annual Report. Washington, 1963.

[91] U. S. Department of Treasury, Internal Revenue Service. 1964 Annual Report. Washington, 1964.

[92] U. S. Department of Treasury, Internal Revenue Service. 1965 Annual Report. Washington, 1965.

[93] U. S. Department of Treasury, Internal Revenue Service. 1966 Annual Report. Washington, 1966.

[94] U. S. Department of Treasury, Internal Revenue Service. 1967 Annual Report. Washington, 1968.

[95] U. S. Department of Treasury, Internal Revenue Service. 1968 Annual Report. Washington, 1968.

[96] U. S. Department of Treasury, Internal Revenue Service. 1969 Annual Report. Washington, 1969.

[97] U. S. Department of Treasury, Internal Revenue Service. 1970 Annual Report. Washington, 1970.

[98] U. S. Department of Treasury, Internal Revenue Service. 1971 Annual Report. Washington, 1971.

[99] U. S. Department of Treasury, Internal Revenue Service. 1972 Annual Report. Washington, 1972.

[100] U. S. Department of Treasury, Internal Revenue Service. 1973 Annual Report. Washington, 1973.

[101] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1967 Business Income Tax Returns. Washington, 1970.

[102] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1967 Corporation Income Tax Returns. Washington, 1971.

[103] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1964 Individual Income Tax Returns. Washington, January 1967.

[104] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1965 Individual Income Tax Returns. Washington, June 1967.

[105] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1966 Individual Income Tax Returns. Washington, July 1968.

[106] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1967 Individual Income Tax Returns. Washington, August 1969.

[107] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1968 Individual Income Tax Returns. Washington, September 1970.

[108] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1969 Individual Income Tax Returns. Washington, September 1971.

[109] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1970 Individual Income Tax Returns. Washington, October 1972.

[110] U. S. Department of Treasury, Internal Revenue Service. Statistics of Income: 1971 Individual Income Tax Returns. Washington, December 1973.

[111] Warner, Larkin. The Oklahoma Economy: Sources of Recent Growth. Oklahoma State University, College of Business Extension Service, Business Paper No. 8. Stillwater, September 1969.

APPENDIX A

METHODS AND DATA USED FOR CONSTRUCTION OF THE INTERINDUSTRY FLOW TABLE

The Oklahoma Model has 17 endogenous and five exogenous sectors. Sectors are defined according to the classification used by the Bureau of Labor Statistics. Classification of endogenous sectors is summarized in Appendix Table XXXVIII. All data are in 1967 prices.

I. Definitions, Methodologies, and Sources Used in Deriving the Endogenous Sectors

Sectors 1 and 2: Livestock and Livestock Products and Crops

Output is defined as the value of all agricultural commodities produced on the farm in 1967 plus the value of government payments and the rental value received. Estimated values are as follows:

Livestock and livestock products	$467,823,000
Crops	417,412,000
Government payments	112,344,000
Farm rental received	36,400,000
Total	$1,033,979,000

Detailed information for the value of agricultural commodities grown on Oklahoma farms in 1967 is given in [31] and is as follows:

Livestock and livestock products

Cattle and calves	$345,721,000
Sheep and wool	1,956,000
Hogs	25,956,000
Milk, cream, milkfat	67,491,000
Poultry	13,561,000
Eggs	12,576,000
Honey and beeswax	562,000
Total	$467,823,000

TABLE XXXVIII

CLASSIFICATION OF ENDOGENOUS SECTORS, OKLAHOMA MODEL

Oklahoma Model	Included in the Sector
1. Livestock and livestock products (SIC 0132, pt. 014, 0133, 0134, pt. 014; 0135, 0136 0139, pt. 014, 0193, pt. 0729)	(a) cattle and calves (b) dairy products (c) hogs (d) poultry products (e) sheep and lambs (f) wool (g) other livestock products
2. Crops (SIC 1000 except the ones given in section 1)	(a) wheat (b) cotton and lint (c) hay (d) peanuts (e) cottonseed (f) sorghum (g) broomcorn (h) oats (i) alfalfa seed (j) corn (k) barley (l) watermelons (m) spinach (n) soybeans (o) rye (p) fruits and nuts (q) other crop products (r) forestry and fishery products (s) agricultural, forestry, and fishery services
3. Mining (SIC 2000)	(a) crude petroleum and natural gas (b) metal mining (c) bituminous coal and lignite mining (d) non-metallic minerals, except fuels
4. Construction (SIC 3000)	(a) maintenance and repair construction (b) new construction
5. Food and kindred products (SIC 4120)	(a) meat products (b) dairy products (c) canned and frozen food (d) grain mill products (e) bakery products

Table XXXVIII (Continued)

Oklahoma Model	Included in the Sector
	(f) confectionery and related products (g) beverage industries (h) miscellaneous food preparation (i) prepared feed for animals
6. Petroleum refining and related industries (SIC 4129)	(a) petroleum refining (b) paving and roofing materials (c) petroleum products, N.E.C.
7. Lumber and wood, furniture and fixtures, and paper and allied prod. (SIC 4124, 4125, 4126)	(a) lumber and wood products (b) furniture and fixtures (c) paper and allied products
8. Apparel and other finished products made from fabrics and similar materials (SIC 4123)	(a) clothing and fabricated products produced by sewing purchased fabrics and related materials
9. Printing and publishing (SIC 4127)	(a) printing by one or more of the common processes (b) services for the printing trade (c) publishing newspapers, books, and periodicals
10. Machinery and electrical machinery (SIC 4135, 4136)	(a) farm machinery and equipment (b) construction and like equipment (c) metal working machinery (d) electrical household appliances (e) other machinery which utilizes electrical energy, transmission and transformation
11. Transportation equipment (SIC 4137)	(a) motor vehicles (b) aircrafts (c) ships and boats (d) railroad equipment (e) miscellaneous transportation equipment
12. Primary and fabricated metal products (SIC 4133, 4134)	(a) primary metal industries (b) fabricated metal products
13. Other manufacturing (SIC 4119, 4121, 4122, 4128, 4130, 4131, 4132, 4138, 4139)	(a) ordnance and accessories (b) tobacco manufacturers (c) chemicals and allied products (d) rubber and plastic products (e) leather and leather products

Table XXXVIII (Continued)

Oklahoma Model	Included in the Sector
	(f) stone, clay, and glass products
	(g) instruments and related products
	(h) miscellaneous manufacturing
14. Transportation, communication, and public utilities (SIC 5000)	(a) local passenger transportation
	(b) trucking and warehousing
	(c) pipeline transportation
	(d) transportation services
	(e) communication
	(f) electric, gas, and sanitary services
15. Wholesale and retail trade (SIC 6000)	(a) motor vehicles and automotive equipment
	(b) drugs, chemicals, and allied products
	(c) dry goods and apparel
	(d) groceries and related products
	(e) farm products
	(f) electrical goods
	(g) hardware, plumbing, and heating equipment
	(h) machinery equipment and supplies
	(i) miscellaneous wholesalers
	(j) building materials and farm equipment
	(k) general merchandise
	(l) food
	(m) automotive dealers and service stations
	(n) apparel and accessories
	(o) furniture and home furnishings
	(p) eating and drinking places
	(q) miscellaneous retail stores
	(r) retail stores, N.E.C.
16. Finance, insurance, and real estate (SIC 7000)	(a) banking
	(b) credit agencies and other loan banks
	(c) insurance carriers
	(d) insurance agents, brokers, and services
17. Services (SIC 8000)	(a) hotels and other lodging places
	(b) personal services
	(c) miscellaneous business services
	(d) auto repair and services
	(e) motion pictures
	(f) amusements, recreation services
	(g) medical services
	(h) other professional services

Crops

Wheat	$130,373,000
Oats	3,317,000
Barley	4,845,000
Rye	565,000
Corn for grain	1,524,000
Sorghum for grain	25,802,000
Sorghum for forage	7,704,000
Sorghum for silage	8,100,000
Cotton lint	19,633,000
Cottonseed	4,771,000
Soybeans for beans	8,940,000
Peanuts for nuts	22,374,000
Alfalfa seed	1,032,000
All others	178,432,000
Total	$417,412,000

Government payments to farmers and farm rental income are also available in [31] and [51]. All government payments are for crops, except $111,000 which is received by farmers for wool [31] and [52]. Farm rental received is allocated by assuming each sector's share in proportion to output of the livestock and crops sectors.

	Livestock Sector	Crops Sector
Livestock and livestock products	$467,823,000	
Crops		$417,412,000
Government payments	111,000	112,233,000
Farm rental received	19,236,000	17,164,000
Total	$487,170,000	$546,809,000

Publications from the Oklahoma Department of Agriculture and the United States Department of Agriculture are the primary sources for input data which is much more difficult to obtain.

Purchased Input	Paid by Farmer $ million	Marketing Margin %	Marketing Margin $	Paid to Producer $
Feed				
Non-commercial	81.1	2.7	2,189,700	78,910,300
Commercial	42.1	17.8	7,493,800	34,606,200
Livestock	102.7	3.7	3,799,900	98,900,100
Seed	10.7	2.7	289,500	10,410,500
Seed (commercial	9.9	26.9	2,663,100	7,236,900
Fertilizer and lime	33.2	20.3	6,739,600	26,460,400
Fuels, rep. and maintenance	103.5	29.1	30,118,500	73,381,500
Miscellaneous	83.6	-	-	83,600,000
Hired labor	31.3	-	-	31,300,000
Total	498.1		$53,294,100	$444,805,900

The amount paid by farmers for inputs is given in [31] and [51]. The information in [52] supports this. The marketing margin percentages are given in [25]. The distribution of feed into commercial and non-commercial groups is made by using the information given in the Census of Agriculture [83].

The allocation of purchased or home-grown crops used on Oklahoma farms during 1967 is made by information available in [53] and is as follows:

	Livestock	Crops
Seed (purchased)		7,236,900
Seed (home-grown)		10,410,500
Fed to livestock (purchased)	78,910,300	
Fed to livestock (home-grown)	60,982,700	
Total	$139,893,000	$17,647,400

Fuels, repairs, and maintenance expenses are considered as operating expenses. Source [83] gives estimates of purchased fuel. Data[1] in [56]

[1]Use of data given in [56] needs to be clarified. This information used to determine the input structure before imports are considered. After distributing inputs, residuals are computed. In case of negative residual--which implies sector is importing--every entry in each row is adjusted by this residual. Data in Table II presents these adjusted input entries. The calculation of exports and imports is explained in more detail in the last section of this appendix.

are used for estimating the amount of agricultural inputs from the construction sector as repair and maintenance. The remaining amount of operation expenses is allocated to the machinery sector.

Total Operating Expenses	$73,381,500
Less petroleum expenses	41,274,800
Less repair and maintenance	9,398,600
Amount allocated to machinery sector	$22,708,100

Information in [56] is used to allocate petroleum, machinery, and construction inputs between the two agricultural sectors.

The remaining agricultural inputs reported in [51] are allocated into the livestock and crops sectors as follows:

	Livestock	Crops	Total
Fuels, rep. and maintenance	$4,376,100	$25,742,400	$30,118,500
Fertilizer		6,739,600	6,739,600
Feed grains	2,189,700		2,189,700
Feed (commercial)	7,493,800		7,493,800
Livestock	3,799,900		3,799,900
Seed		289,500	289,500
Seed (commercial)		2,663,100	2,663,100
	$17,859,500	$35,434,600	$53,294,100

Transportation and taxes, as reported in [25] are included in these margin totals. Wholesale and retail trade costs may be estimated by subtracting transportation costs and taxes from these margin totals [56]. The results are as follows:

	Livestock	Crops	Total
Margin Total	$17,859,500	$35,434,600	$53,294,100
Less transportation	5,086,200	10,091,300	15,177,500
Less taxes	2,303,900	4,571,100	6,875,000
Wholesale and retail trade	$10,469,400	$20,772,200	$31,241,600

Expenditures for communication and public utilities are added to the above estimated transportation costs, in order to estimate the

purchases of livestock and crops sectors from the transportation, communication, and public utilities sector.

	Livestock	Crops	Total
Transportation charges	$5,086,200	$10,091,300	$15,177,500
Electricity charges	7,134,124	6,387,718	13,521,842
Telephone charges	2,260,935	2,024,385	4,285,320
Total	$14,481,259	$18,503,403	$32,984,662

Average monthly electrical charges are obtained from [50] and the number of farms is obtained from [31]. Average monthly phone bill paid by farmers by regions and the estimated number of farms with phones in Oklahoma are obtained from [49]. The distribution of totals is made by relative share of output of livestock and crops sectors.

Information in [56] is utilized for estimates of the purchases of the agricultural sectors from finance, insurance, and real estate; mining; and services sectors. Depreciation for the livestock and the crops sectors is estimated by using depreciation rates which are ratio of depreciation to depreciable assets during 1967. These ratios are obtained from [102]. Multiplying these ratios by sectors capital stock, which is obtained as a product of sector output and capital output ratio from [101], yields the value of depreciation for each sector. Estimated value of depreciation is $42,330,000 for livestock and $72,098,000 for the crops sector.

The estimation of purchases by livestock and crops sectors from federal government are obtained from [94], [55], and [39]. For computation procedures, purchases are divided into five subsectors: (1) corporation income tax, (2) individual income and employment tax, (3) estate tax, (4) gift tax, and (5) excise tax. For state and local government purchases, sources [31], [55], [39], and [61] are utilized.

State and local purchases are divided into: (1) property tax, (2) federal government payments to state and local governments, (3) charges and miscellaneous, (4) utility revenue, (5) insurance trust revenue, and (6) other state and local government taxes. Other state and local taxes include sales and gross receipts, insurance trust revenue, motor vehicle licenses, and other miscellaneous taxes.

The estimation of purchases by the agricultural sectors from households are obtained from [31], [52], and [55]. Household purchases are divided into two major components: wage and salaries, and other income. The four subcomponents of other income include: other labor income, proprietor income, property income, and transfer payments. For the purchases of imports, the procedure which is explained in export section at the end of this appendix is used. The values of imports are $6,743,000 for livestock sector, and $26,713,000 for the crops sector. Agricultural sectors' purchases from federal government, state and local government, and households are given in Table XXXIX.

Sector 3: Mining

Output of the mining sector is defined as the value of receipts plus the value of minerals used in the mining industry. Data concerning value of production are available in [68] and [88]. Output is obtained as follows:

Production

Oil and gas	1,192,500,000
Metal mining	6,200,000
Bituminous coal and lignite	5,000,000
Non-metal minerals, except mining fuel	19,400,000
Value of production	$1,233,100,000

TABLE XXXIX

PURCHASES OF THE LIVESTOCK AND THE CROPS SECTORS FROM FEDERAL GOVERNMENT, STATE AND LOCAL GOVERNMENT, AND HOUSEHOLDS, OKLAHOMA, 1967

	Purchases of Livestock Sector	Purchases of Crop Sector
From Federal Government		
Individual income tax	$ 711,000	$ 799,000
Excise tax	3,818,000	17,523,000
Total	$4,529,000	$18,322,000
From State and Local Government		
Property tax	$15,454,000	$17,346,000
Utility revenue, charges and miscellaneous	4,679,000	5,252,000
Other state and local taxes	10,773,000	10,172,000
Total	$30,906,000	$32,770,000
From Households		
Wages and salaries	$ 13,422,000	$ 15,065,000
Other income	101,908,000	226,492,000
Total	$115,330,000	$241,557,000

Output

Value of production	1,223,100,000
Less mining included in manufacturing	7,100,000
Value of output	$1,216,000,000

The distribution of this output into endogenous sectors is made by using the information available in [56]. Purchases of mining sector from federal government are estimated from [101], [94], [55], and [39]; from state and local government are obtained from [55], [39], [61], [31], [62], and [63]; from households are determined from [101], [55], [68], [33], and [87]. Mining sector's purchases from federal government, state and local government, and households are given in Table XL. The value of imports by mining sector is estimated as $133,359,000. The value of depreciation is estimated by utilizing the information given in [101] and [102] at $77,657,000.

Sector 4: Construction

Output of construction sector is defined as the value of receipts of the industries in this sector. No other source indicates this sector's output in Oklahoma; therefore, it needs to be estimated from national data. It is assumed that the ratio of output in Oklahoma to output in the United States is the same as the ratio of employment in Oklahoma to employment in the United States. By using this method and the information from [56], [87], and [34], the construction sector's output is estimated as $1,028,358,000.

Purchases of the construction sector from federal government, state and local government, and household sectors are given in Table XL. They are determined by using various sources: [101], [94], [55], and

TABLE XL

PURCHASES OF THE MINING AND THE CONSTRUCTION SECTORS FROM FEDERAL GOVERNMENT, STATE AND LOCAL GOVERNMENT, AND HOUSEHOLDS, OKLAHOMA, 1967

	Purchases of Mining Sector	Purchases of Construction Sector
From Federal Government		
Corporation income tax	$ 3,968,000	$ 8,326,000
Individual income tax	15,667,000	9,935,000
Excise tax	11,696,000	10,230,000
Total	$31,331,000	$28,491,000
From State and Local Government		
Property tax	$ 3,497,000	$ 2,957,000
Utility revenue, charges and miscellaneous	11,679,000	9,877,000
Other state and local taxes	19,262,000	15,761,000
Total	$34,438,000	$28,595,000
From Households		
Wages and salaries	$295,340,000	$187,080,000
Other income	115,731,000	150,154,000
Total	$411,071,000	$337,234,000

[39] for federal government; [55], [39], [31], [68], [62], [61], and [63] for state and local government; and [101], [55], [33], [61], [87], [63], [76], and [68] for households. The value of imports by construction sector is estimated at $202,144,000 and the value of depreciation, which is estimated by using data given in [102] and [101] is estimated at $18,211,000.

Sectors 5 through 13: Manufacturing

Manufacturing activities are classified into nine sectors. The descriptions of these sectors are outlined in Table XXXVIII. Because of the similarities of the techniques used to estimate outputs and inputs, these sectors are discussed jointly.

Output of each of these sectors is defined as the value of production of the industries in that sector. Each sector's output is estimated by adding the value of shipments and the value of inventory change. Output estimates of manufacturing sectors are given in Table XLI. Estimates of output and some of the inputs are obtained by using the information found in the four columns of the United States Census of Manufacturing [64], [65], [66], and [67].

The amount spent for services from the government sectors is assumed to be equal to taxes paid. Data which are used to estimate federal government taxes are found in [101], [94], [55], and [39]. State and local government taxes are estimated from [55], [31], [68], [62], [39], [61], and [63]. Payments of the manufacturing sectors to households are estimated by using information available in [101], [63], [55], [33], [61], [76], [68], and [87]. Table XLII displays these estimates.

TABLE XLI

ESTIMATED OUTPUT FOR MANUFACTURING SECTORS, OKLAHOMA, 1967

	Sector	Value of Shipment	Inventory Change	Output
5	Food and kindred products	$609,000,000	$275,000	$609,275,000
6	Petroleum refining and related industries	779,300,000	445,000	779,745,000
7	Lumber and wood, furniture and fixtures, paper and allied products	95,700,000	25,000	95,725,000
8	Apparel and other finished products made from fabrics and similar materials	79,700,000	22,000	79,722,000
9	Printing and publishing and allied industries	113,700,000	75,000	113,775,000
10	Machinery, electrical machinery equipment and supplies	552,000,000	637,000	552,637,000
11	Transportation equipment	245,000,000	625,000	245,625,000
12	Primary and fabricated metal products industries except ordnance, machinery and transportation equipment	438,500,000	253,000	438,753,000
13	Miscellaneous and all other manufacturing equipment	379,400,000	143,000	379,543,000

TABLE XLII

PURCHASES OF MANUFACTURING SECTORS FROM THE FEDERAL GOVERNMENT, STATE AND LOCAL GOVERNMENT, AND HOUSEHOLDS, OKLAHOMA, 1967

Purchases By / Purchases From	Food & Kindred Products (Sector 5)	Petroleum Refining & Related Industries (Sector 6)	Lumber & Wood & Related Industries (Sector 7)	Apparel & Others (Sector 8)	Printing & Publishing (Sector 9)	Machinery, Electrical Machinery (Sector 10)	Transportation Equipment (Sector 11)	Primary & Fabrication Metal Products (Sector 12)	Other Manufacturing Industries (Sector 13)
Federal Government									
Individual Income Tax	$6,828,000	$8,738,000	$ 1,073,000	$ 893,000	$ 1,275,000	$ 6,193,000	$ 2,753,000	$ 4,917,000	$ 4,254,000
Corporation Income Tax	12,325,000	63,197,000	2,076,000	1,621,000	3,466,000	16,224,000	6,186,000	10,770,000	12,294,000
Excise Tax	5,006,000	6,339,000	992,000	867,000	1,133,000	4,563,000	2,163,000	3,673,000	3,210,000
Total	$24,159,000	$78,274,000	$ 4,141,000	$ 3,381,000	$ 5,874,000	$26,980,000	$ 11,102,000	$ 19,360,000	$ 19,758,000
State & Local Government									
Property Tax	$ 1,752,000	$2,242,000	$ 275,000	$ 229,000	$ 327,000	$ 1,589,000	$ 706,000	$ 1,261,000	$ 1,092,000
Utility Revenue, Charges & Misc.	5,852,000	7,490,000	919,000	766,000	1,093,000	5,308,000	2,359,000	4,215,000	3,646,000
Other State & Local Government Taxes	9,490,000	12,145,000	1,490,000	1,243,000	1,772,000	8,607,000	3,827,000	6,835,000	5,912,000
Total	$17,094,000	$21,877,000	$ 2,684,000	$ 2,238,000	$ 3,192,000	$15,504,000	$ 6,892,000	$ 12,311,000	$ 10,650,000
Households									
Wages & Salaries	$65,819,000	$49,204,000	$27,808,000	$30,112,000	$38,339,000	$154,846,000	$100,539,000	$127,532,000	$101,861,000
Other Income	59,040,000	71,561,000	13,682,000	10,185,000	16,940,000	60,695,000	28,494,000	47,609,000	45,647,000
Total	$124,859,000	$120,765,000	$41,490,000	$40,297,000	$55,279,000	$215,541,000	$129,033,000	$175,141,000	$147,508,000

The value of depreciation for each sector is estimated by using that sector's depreciation rate, capital-output ratio, and output from [101] and [102].

The values of depreciation and the values of imports for the manufacturing sectors are given in Table XLIII.

Sectors 14 through 17: Services

The discussions of these sectors are given jointly because similar techniques are used to estimate each sector's output and inputs. This section includes the discussion of transportation, communication, and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services sectors.

Output for the transportation, communication, and public utilities sector is defined as the value of receipts received. No source indicates the output directly; therefore, it needs to be estimated from national data. For this estimate, it is assumed that the ratio of output between Oklahoma and the United States is the same as the ratio of employment between Oklahoma and the United States. Employment statistics are available in [87] and [75]. Sector output for the United States is given in [56]. By this method, output is estimated at $1,306,821,000.

Output for the wholesale and retail sector is defined as the value of services performed in handling goods. To estimate the output for this sector, the same procedure which is used for transportation sector is applied. By using the information given in [56], [75], and [87], output estimate is obtained as $1,862,361,000.

The output of finance, insurance,and real estate sector is defined

TABLE XLIII

THE VALUES OF DEPRECIATION AND IMPORTS FOR THE MANUFACTURING SECTORS, OKLAHOMA, 1967

	Sector	Value of Imports	Value of Depreciation
5	Food and kindred products	$81,622,000	$11,419,000
6	Petroleum refining and related industries	30,803,000	30,359,000
7	Lumber and wood, furniture and fixtures, paper and allied products	21,617,000	3,311,000
8	Apparel and other finished products made from fabrics and similar materials	19,785,000	644,000
9	Printing, publishing, and allied industries	20,852,000	2,864,000
10	Machinery, electrical machinery equipment and supplies	92,154,000	17,420,000
11	Transportation equipment	38,949,000	6,348,000
12	Primary and fabricated metal products industries except ordnance, machinery, and transportation equipment	59,609,000	12,547,000
13	Miscellaneous and all other manufacturing industries	74,878,000	15,343,000

as the value of receipts received for services of this sector. A similar procedure to the earlier two sectors is applied. Since property income is included in the household row sector, the output of finance, insurance, and real estate sector needs to be adjusted. A similar adjustment is also needed for the row sector of finance, insurance, and real estate sector. By using the information available in [56], [87], [75] and [55], the output of this sector is estimated at $1,028,369,000.

Services sector's output is defined as the amount paid to the industries of this sector for their services. By using the employment ratio and statistics given in [56], [75], and [87], the output of services sector is estimated at $1,471,529,000.

Input data for these sectors are much more difficult to obtain. National coefficients are used for most of these inputs' estimates. These sectors purchases from primary inputs sectors are estimated individually. Taxes paid by these sectors are assumed equal to the value of services received. Data in [101], [94], [55], and [39] yield federal taxes paid by these sectors, while data in [31], [68], [62], [55], [39], [61], and [63] yield the estimates of state and local taxes of the same sectors. Data on payments to households are available in [101], [55], [33], [87], [61], [63], [76], and [68]. Purchases of these sectors from government and household sectors are given in Table XLIV. Depreciation of transportation, communication, and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services sectors are estimated by using the data in [101] and [102] at: $132,735,000; $69,523,000; $25,614,000; and $96,615,000; respectively. The values of imports of the sectors are estimated at: $60,763,000; $114,790,000; $90,011,000; and 133,062,000, respectively.

TABLE XLIV

PURCHASES OF THE SERVICES SECTORS FROM THE FEDERAL GOVERNMENT, STATE AND LOCAL GOVERNMENT, AND HOUSEHOLDS, OKLAHOMA, 1967

Purchases From / Purchases By	Transportation, Communication, and Public Utilities (Sector 14)	Wholesale and Retail (Sector 15)	Finance, Insurance and Real Estate (Sector 16)	Services (Sector 17)
Federal Government				
Individual Income Tax	$17,136,000	$33,660,000	$ 8,711,000	$20,910,000
Corporation Income Tax	30,361,000	65,633,000	27,058,000	14,015,000
Excise Tax	12,407,000	16,748,000	10,230,000	13,693,000
Total	$59,904,000	$116,041,000	$45,999,000	$48,618,000
State and Local Government				
Property Tax	3,758,000	$ 5,355,000	$ 2,957,000	$ 4,232,000
Utility Revenue, Charges and Miscellaneous	12,552,000	17,889,000	9,879,000	14,136,000
Other State and Local Government Taxes	20,749,000	31,037,000	15,567,000	23,622,000
Total	$37,059,000	$54,281,000	$28,403,000	$41,990,000
Households				
Wages and Salaries	$322,870,000	$634,340,000	$164,298,000	$394,095,000
Other Income	157,530,000	401,680,000	171,653,000	378,494,000
Total	$480,480,000	$1,036,020,000	$335,951,000	$772,589,000

II. Definitions, Methodologies, and Sources Used in Deriving the Exogenous Sectors

Federal Government Sector

Total federal government outlays in Oklahoma are assumed to be equal to the output of the federal government sector. Since there is not any source indicating the total federal outlays in Oklahoma in 1967, they are estimated by using the information in [84]. This estimate is obtained as $2,280,885,000. For exogenous sectors, total output does not need to be equal to total inputs. This requires individual estimation of expenditures. Exogenous sectors purchases from federal government, state and local government, and households are estimated individually as they are in endogenous sectors. The sources which are used to estimate the purchases from federal government are [94], [55], and [39]; from state and local government are [31], [68], [62], [55], [39], [61], and [63]; and from households are [34], [55], and [54]. These estimates are given in Table XLV. Estimates of purchases by federal government from endogenous sectors are obtained by using Polenske study [42]. Federal government purchases of imports are estimated at $200,669,000.

State and Local Government Sector

Governments of state, county, municipal, special districts, and school districts are included in this sector. Output for this sector is defined as the sum of the expenditures of included government units in Oklahoma. Sector output is obtained by using the information in [56], [75], and [34] as $1,157,000,000. Estimates of purchases by

TABLE XLV

PURCHASES OF FEDERAL GOVERNMENT AND STATE AND LOCAL GOVERNMENT FROM FEDERAL GOVERNMENT, STATE AND LOCAL GOVERNMENT, AND HOUSEHOLDS, OKLAHOMA, 1967

	Purchases of Federal Government	Purchases of State and Local Government
From Federal Government		
Individual income tax	$34,557,000	$24,990,000
Excise tax	2,099,000	3,101,000
Total	$36,656,000	$28,091,000
From State and Local Government		
Property tax	6,559,000	2,763,000
Utility revenue, charges and miscellaneous	21,910,000	9,228,000
Other state and local taxes	30,189,000	14,774,000
Federal government payments to state and local governments	284,550,000	-
Total	$343,208,000	$26,765,000
From Households		
Wages and Salaries	651,430,000	471,000,000
Other income	458,098,000	138,542,000
Total	$1,109,528,000	$609,542,000

state and local government sector from federal government are obtained from [94], [55], and [39]; from state and local government are obtained from [31], [68], [62], [55], [39], [61], and [63]; and from households are obtained from [55], [52], [54], and [61]. These estimates are also given in Table XLV. Purchases by state and local government from endogenous sectors are estimated by using the information available in the Polenske study [42]. The value of imports purchased by state and local government is estimated at $97,705,000.

Private Capital Formation Sector

The total amount of capital invested by the private sectors are included in this sector's output. This output consists of new capital formation, capital replacement needs, and residential housing construction. Since new capital formation figures are not available, they must be estimated. This estimation is made by using capital-output ratios and the change of output in respective sectors. Multiplication of these estimates yields the total capital need by each sector. Each sector's total capital need is distributed into producing sectors by using that sector's column vector of capital coefficient matrix. A row-wise addition of this new matrix results in a column vector of new capital formation. Similarly, capital coefficient matrix is used to distribute the estimates of capital replacement needs for each sector. The column vector which is obtained by totaling all individual columns of this matrix indicates the replacement capital purchases from respective sectors. Residential housing construction estimates are obtained from [75]. Summation of new capital formation column, capital replacement column, and addition of the value of residential housing construction

to the construction sector represents the total value of the purchases made by private capital formation sector from each producing sector. The total output of this sector is estimated as $1,142,208,000. This final column provides the base for the column vector in Table II. The column vector of private capital formation in Table II is obtained after adjustments made for imports.

Household Sector

Individuals' expenditures for goods and services constitute the purchases of the household sector. Household income includes wages and salaries, proprietor income, other labor income, property income, and transfer payments. Household expenditures are estimated in two groups. In the first group, purchases of households; from federal government--by using the sources [94], [55], and [39]; from state and local government--by using the sources [55], [39], [62], and [63]; and from households--by using the sources [55], [62], and [76]--are obtained. In the second group, household expenditres on endogenous sectors are estimated. For these estimates, the ratio of population between Oklahoma and the United States is used as proxy. Sources [56] and [75] are used for expenditures on endogenous sectors. Sector expenditures total $7,060,166,000.

Household payments of federal government taxes are as follows:

Individual income tax	$362,693,000
Social security	204,000,000
Other federal taxes	194,215,000
Total	$760,908,000

Other federal taxes include estate tax, gift tax, and excise tax.

Household payments as state and local government taxes are as

follows:

Property tax	$132,395,000
Utility revenue charges and miscellaneous	135,317,000
Other state and local government taxes	215,223,000
Total	$482,935,000

Households property income within themselves are estimated from [62] and [76] at $44,521,000. The value of imports is estimated at $1,443,997,000.

Export Sector

Exports and imports are computed as residuals. First, and inter-industry table is completed using the entries whose derivation is discussed in this appendix. The demand for the product is obtained by adding the row entries. Then this sum is subtracted from the estimate of sector output. If the residual is positive, it implies a surplus; whereas a negative residual implies a shortage. Surplus values are assumed to be equal to sector exports, while shortages indicate the sector imports. Export and import figures obtained in this way indicate only the "net" values. Export figures are given in column 22 of Table II for livestock (sector 1), crops (sector 2), mining (sector 3), and petroleum refining (sector 6) sectors.

The "net" import figures are distributed to the various sectors by assuming each sector's imports are equal to the percentage it requires from the total demand for the products of that sector. The amount of imports for each sector is then subtracted from the amount that the purchases sectors purchased from that producing sector. Total value of sector imports is obtained by totaling the values of imports for every column and entered as row 20 of Table II. In this way, a new inter-industry table is constructed and presented in Table II.

APPENDIX B

CLASSIFICATION OF OCCUPATION GROUPS, OKLAHOMA MODEL

TABLE XLVI

CLASSIFICATION OF OCCUPATION GROUPS, OKLAHOMA MODEL

Occupation Group	Occupations Included in Occupation Groups
1. Engineers (CODE 1002)	(a) aero-astronautic (b) chemical (c) civil (d) electrical (e) industrial (f) mechanical (g) metallurgical (h) mining (i) petroleum (j) sales (k) other
2. Scientists (CODES 1004 + 1006)	(a) agricultural (b) atmospheric, space (c) biological (d) chemists (e) geologists (f) marine (g) physicists and astronomers (h) life, physical; N.E.C. (i) actuaries (j) mathematicians (k) statisticians
3. Technicians (CODES 1008 + 1010 + 1012)	(a) agricultural, biological, excluding health (b) chemical (c) draftsmen (d) electrical, electronic (e) industrial engineering (f) mathematical (g) mechanical engineering (h) surveyors (i) engineering, science; N.E.C. (j) chiropractors (k) dentists (l) dietitians (m) optometrists (n) pharmacists (o) physicians, M. D. osteopaths (p) podiatrists (q) registered nurses (r) therapists (s) veterinarians (t) clinical lab technology

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(u) dental hygienists
	(v) health record technology
	(w) radiologic technology
	(x) therapy assistants
	(y) other health technology
4. Computer and other machine specialists (CODES 1014 + 1016)	(a) airplane pilots
	(b) air traffic controllers
	(c) embalmers
	(d) flight engineers
	(e) radio operators
	(f) tool programers, numerical
	(g) other technicians excluding health
	(h) computer programers
	(i) computer systems analysts
	(j) other computer specialists
5. Economists and planners and teachers (CODES 1018 + 1020)	(a) economists
	(b) political scientists
	(c) psychologists
	(d) urban and regional planners
	(e) other social scientists
	(f) adult education teachers
	(g) agriculture teachers
	(h) art, drama, music teachers
	(i) atmospheric, earth, marine
	(j) biology teachers
	(k) business, commerce teachers
	(l) chemistry teachers
	(m) coaches, phys. ed. teachers
	(n) economic teachers
	(o) education teachers
	(p) elementary school teachers
	(q) engineering teachers
	(r) English teachers
	(s) foreign language teachers
	(t) health specialties teachers
	(u) history teachers
	(v) home economics teachers
	(w) law teachers
	(x) mathematics teachers
	(y) physics teachers
	(z) preschool, kindergarten
	(aa) psychology teachers
	(bb) secondary school teachers
	(cc) sociology teachers
	(dd) social science teachers; N.E.C.
	(ee) misc. college and university
	(ff) college, university; N.E.C.
	(gg) theology teachers
	(hh) trade, industrial teachers

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occuptation Groups
	(ii) teachers; N.E.C., excluding college, university
6. Miscellaneous artists (CODE 1022)	(a) actors (b) athletes and kindred workers (c) authors (d) dancers (e) designers (f) editors and reporters (g) musicians and composers (h) painters and sculptors (i) photographers (j) public relations men, writers (k) radio, TV announcers (l) writers, artists, entertain; N.E.C.
7. Other professional and technical workers (CODES 1024-1999)	(a) accountants (b) architects (c) archivists and curators (d) clergymen (e) religious, excluding clergymen (f) farm management advisors (g) foresters, conservationists (h) home management advisors (i) judges (j) lawyers (k) librarians (l) operations, systems research (m) personnel labor relations (n) research workers; N.E.C. (o) recreation workers (p) social workers (q) vocational, ed counselors (r) professional, technical, kindred workers
8. Financial managers (CODE 2002)	(a) bank, financial managers (b) creditmen (c) buyers, shippers, farm producers (d) buyers, wholesale, retail (e) purchasing agents, buyers; N.E.C. (f) sales manager, retail trade (g) sales manager, excluding retail trade
9. Other managers and administrators (CODES 2004-2999)	(a) assess, control, local public administrator (b) construction inspector, public (c) health administrators (d) inspectors, excluding construct public

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(e) officials, administrators, public
	(f) postmasters and mail supervisors
	(g) school administrators, college
	(h) school administrators, elementary, secondary
	(i) funeral directors
	(j) managers, superintendents, building
	(k) office managers; N.E.C.
	(l) officers, pilots, pursers, ship
	(m) officials of lodges, unions
	(n) railroad conductors
	(o) restaurant, cafe, bar managers
	(p) other managers, administrators
	(q) managers, administration excluding farm
10. Sales workers (CODES 3000-3999)	(a) advertising agents, salesmen
	(b) auctioneers
	(c) demonstrators
	(d) hucksters and peddlers
	(e) insurance agents, brokers, etc.
	(f) newsboys
	(g) real estate agents, brokers
	(h) stock and bond salesmen
	(i) sales representatives, manufacturing
	(j) sales representatives, wholesale trade
	(k) sales clerks, retail trade
	(l) salesmen, service and construction
	(m) salesworkers
11. Secretaries (CODE 4002)	(a) legal
	(b) medical
	(c) other
	(d) stenographers
	(e) typists
12. Other machine operators (CODE 4004)	(a) bookkeeping, billing operators
	(b) calculating
	(c) computer, peripheral equipment
	(d) duplicating
	(e) keypunch
	(f) tabulating
	(g) other office
13. Other clerical workers (CODES 4006-4999)	(a) bank tellers
	(b) billing clerks
	(c) bookkeepers

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(d) cashiers
	(e) clerical assistants, social welfare
	(f) clerical supervisors; N.E.C.
	(g) collectors, bill and account
	(h) counter clerks, excluding food
	(i) dispatcher, starter, vehicle
	(j) enumerators and interviewers
	(k) estimators, investigators; N.E.C.
	(l) expeditors, product controllers
	(m) file clerks
	(n) insurance adjusters, exam
	(o) library attendants, assistant
	(p) mail carriers, post office
	(q) mail handler, excluding post office
	(r) messengers and office boys
	(s) meter readers, utilities
	(t) payroll, time keeping clerks
	(u) postal clerks
	(v) proofreaders
	(w) real estate appraisers
	(x) receptionists
	(y) shipping, receiving clerks
	(z) statistical clerks
	(aa) stock clerks, store keepers
	(bb) teachers aides, excluding monitors
	(cc) telegraph messengers
	(dd) telegraph operators
	(ee) telephone operators
	(ff) ticket station, express agents
	(gg) weighers
	(hh) misc. clerical workers; N.E.C.
	(ii) clerical workers, not specialist
	(jj) clerical, kindred workers
14. Construction traders (CODE 5002)	(a) carpenters
	(b) carpenters apprentices
	(c) brickmasons and stonemasons
	(d) brick, stonemason apprentices
	(e) bulldozer operators
	(f) cement and concrete finishers
	(g) electricians
	(h) electricians apprentices
	(i) excavating, grading, machine operator
	(j) floor layers, excluding tile setters
	(k) painters, construction, maintenance

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(l) painter apprentices
	(m) paperhangers
	(n) plasterers
	(o) plumbers and pipefitters
	(p) plumbers, pipefitters apprentices
	(q) roofer and slaters
	(r) structural metal craft
	(s) tilesetters
15. Foremen (CODE 5004)	(a) foremen, N.E.C.
16. Metal workers (CODE 5006)	(a) blacksmiths
	(b) boilermakers
	(c) heat treaters, annealers, etc.
	(d) forgemen and hammermen
	(e) job and die setters, metal
	(f) machinists
	(g) machinists apprentices
	(h) millwrights
	(i) molders, metal
	(j) pattern and model makers
	(k) rollers and finishers, metal
	(l) sheet metal workers, tinsmiths
	(m) sheet metal apprentices
	(n) tool, diemakers
	(o) tool, diemarker apprentices
17. Mechanics and repairmen (CODE 5008)	(a) air conditioners, heating, refrigeration
	(b) aircrafts
	(c) auto accessories installers
	(d) auto body
	(e) auto mechanics
	(f) auto mechanics apprentices
	(g) data processing machine
	(h) farm implement
	(i) heavy equipment mechanics, including Diesel
	(j) household appliances
	(k) office machine
	(l) radio, television
	(m) railroad, car shop
	(n) mechanics, excluding auto apprentices
	(o) other mechanics and repairmen
	(p) mechanics, repairmen, not specialists
(18) Printing trades (CODE 5010)	(a) bookbinders
	(b) compositors and typesetters

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(c) electrotypers, stereotypers
	(d) engravers excluding photo-engravers
	(e) photoengravers, lithographers
	(f) pressmen and plate printers
	(g) pressmen apprentices
	(h) printing apprentices, excluding press
19. Electrical workers (CODE 5012)	(a) electric power linemen, cablemen
	(b) locomotive engineers
	(c) locomotive firemen
	(d) power station operators
	(e) telephone installers, repairmen
	(f) telephone linemen, splicers
20. Other miscellaneous craftsmen (CODES 5014-5999)	(a) bakers
	(b) cabinetmakers
	(c) carpet installers
	(d) cranemen, derrickmen, hoistmen
	(e) decorators, window dressers
	(f) dental laboratory technicians
	(g) furniture and wood finishers
	(h) furriers
	(i) glaziers
	(j) inspectors, log and lumber
	(k) inspectors, other
	(l) jewelers and watchmakers
	(m) millers, grain, flour, feed
	(n) motion picture projectionists
	(o) opticians, lens grinder, polisher
	(p) piano, organ tuners, repairmen
	(q) shipfitters
	(r) shoe repairmen
	(s) sign painters and letters
	(t) stationary engineers
	(u) stone cutters, stone carvers
	(v) tailors
	(w) upholsterers
	(x) craftsmen, kindred workers; N.E.C.
	(y) craft apprentices; N.E.C.
	(z) apprentices, not specialists
	(aa) craftsmen, kindred workers
21. Metal and machine shop workers (CODE 6102)	(a) drill press operatives
	(b) furnacemen, smeltermen, pourers
	(c) grinding machine operatives
	(d) heaters, metal
	(e) lathe, milling machine operatives

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(f) metal platers
	(g) other precision machine operators
	(h) punch stamping press operators
	(i) solderers
	(j) welders and flame cutters
22. Textile machine workers (CODE 6104)	(a) carding, lapping, combing
	(b) knitters, loopers, and toppers
	(c) spinners, twisters, winders
	(d) weavers
	(e) other textile operatives
23. Final processors (CODE 6106)	(a) checkers, examiners, etc., manufacturing
	(b) graders and sorters, manufacturing
	(c) meat wrappers, retail trade
	(d) packer, wrapper, excluding meat produce
	(e) product grader, packer, exluding factory, farm
24. Miscellaneous operatives (CODES 6108-6200)	(a) asbestos, insulation workers
	(b) assemblers
	(c) blasters and powdermen
	(d) bottling, canning operatives
	(e) chainmen, rodmen, axemen surveying
	(f) clothing ironers and pressers
	(g) cutting operatives; N.E.C.
	(h) dressmaker, seamstress, excluding factory
	(i) drillers, earth
	(j) dry wall installers, lathes
	(k) dyers
	(l) filer, polisher, sander, buffer
	(m) garage workers, gas station attendant
	(n) laundry, dry clean operator; N.E.C.
	(o) meat cutters, butchers, excluding manufacturers
	(p) meat cutters, butchers
	(q) milleners
	(r) mine operatives; N.E.C.
	(s) mixing operatives
	(t) oilers, greasers, excluding auto
	(u) painters, manufacturing articles
	(v) photographic process workers

TABLE XLVI (Continued)

Occupation Group	Occupations Included in Occupation Groups
	(w) riveters and fasteners
	(x) sailors and deckhands
	(y) sawyers
	(z) sewers and stitchers
	(aa) shoemaking machine operator
	(bb) stationary firemen
	(cc) winding operatives; N.E.C.
	(dd) miscellaneous machine operatives
	(ee) operatives; N.E.C.
	(ff) machine operatives, not specialists
	(gg) operatives excluding tansportation
	(hh) boatmen and canalmen
	(ii) bus drivers
	(jj) conductors, motormen, urban rail
	(kk) delivery and routemen
	(ll) fork lift, tow motor operator
	(mm) motormen, mine, factory, logging
	(nn) parking attendants
	(oo) railroad brakemen
	(pp) railroad switchmen
	(qq) taxicab drivers, chauffeurs
	(rr) truck drivers
	(ss) transport equipment operators
25. Janitorial workers (CODE 7002)	(a) chambermaid, maid, excluding private
	(b) cleaners and charwomen
	(c) janitors and sextons
26. Food workers (CODE 7004)	(a) bartenders
	(b) busboys
	(c) dooks, excluding private
	(d) dishwashers
	(e) food counter, fountain workers
	(f) waiters
	(g) food workers; N.E.C., exluding private
27. Personnel service workers (CODES 7006 + 7008 + 7012 + 7020)	(a) dental assistants
	(b) health aides, excluding nursing
	(c) health trainees
	(d) lay midwives
	(e) nurses aides, orderlies
	(f) practical nurses
	(g) airline stewardesses
	(h) attendant, recreation, amusement
	(i) attendant, personal service; N.E.C.
	(j) baggage porters and bellhops

TABLE XLVI (Continued

Occupation Group	Occupations Included in Occupation Groups
	(k) barbers
	(l) boarding, lodging housekeepers
	(m) bootblacks
	(n) child care workers, excluding private
	(o) elevator operators
	(p) hairdressers, cosmetologists
	(q) housekeepers, excluding private
	(r) personal service apprentices
	(s) school monitors
	(t) ushers, recreation, amusement
	(u) welfare service aides
	(v) child care workers
	(w) cooks, private
	(x) housekeepers, private
	(y) laundresses, private
	(z) maids, servants, private
	(aa) private household workers
28. Public service workers (CODE 7010)	(a) crossing guard, bridgetenders
	(b) firemen, fire protection
	(c) guards and watchmen
	(d) marshals and constables
	(e) policemen and detectives
	(f) sheriffs and bailiffs
	(g) service worker, excluding private house
29. Laborers (CODES 8000-9049)	(a) animal caretakers, excluding farm
	(b) carpenters, helpers
	(c) construction laborer, excluding carpenter help
	(d) fishermen and oystermen
	(e) freight, material handlers
	(f) garbage collectors
	(g) gardeners, groundkeeper, excluding farm
	(h) longshoremen and stevedores
	(i) lumbermen, raftsmen, woodchoppers
	(j) stock handlers
	(k) teamsters
	(l) vehicle washer, equipment cleaners
	(m) warehousemen, N.E.C.
	(n) other laborers
	(o) laborers, not specialists
	(p) laborers, excluding farm
	(q) farmers (owners and tenants)
	(r) farm managers
	(s) farmers, farm managers
	(t) farm foremen
	(u) farm laborers, wage workers
	(v) farm laborers, unpaid family
	(w) farm laborers, self-employed
	(x) farm laborers, foreman

APPENDIX C

VECTORS AND SCALARS WHICH WERE NOT PRESENTED IN THE SOCIAL ACCOUNTS

TABLE XLVII

VECTORS AND SCALARS WHICH WERE NOT PRESENTED IN THE SOCIAL ACCOUNTS

Matrix \ Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A_2	1.00041	1.00041	1.00055	1.00078	1.00108	1.00028	1.01031	1.00275	1.00574	1.02044	1.00111	1.00000	1.00022	1.00031	1.00081	1.00011	1.00050
A_4				1.04910													
A_6	.25744	.65234	.49080		.61959	.58585	1.15058	.68034	.86603	1.63283	.67744	.94849	1.19840	1.18841	.87403	1.34606	1.13723
A_7	1.01366	1.01737	.97500			.92000											
A_9	.00025	.00117	.00020	.22059	.00516	.01154	.00191	.00068	.00516	.00727	.00495	.00049	.00826	.03687	.00209	.00806	.02665
A_{11}	1.08526	1.08526	1.02439	1.14462	1.05195	1.00000	1.22727	1.10959	1.04054	1.09441	1.25688	1.00000	1.00000	1.03636	1.03181	1.01183	1.03316
A_{12}	.98927	.98927	.97268	1.04529	1.01274	.99369	1.02199	1.07914	1.02911	1.06521	.99305	1.00655	1.03712	1.01482	1.02747	1.03241	1.04620
A_{14}	1.01121	.95367	.97682	.88885	1.02642	.98130	1.11722	.97229	1.03656	1.01352	1.00502	.98784	1.03742	.98225	.96981	.99549	.95983
A_{17}	.96750	.96750	.98990	1.02200	.98050	1.00000	.94342	1.04000	.99227	.98492	.98988	.97887	.96706	.97550	.99500	.99600	1.00000
A_{19}	1.07023	1.07023	1.02214	1.01843	1.00667	1.00667	1.00667	1.00667	1.00667	1.00667	1.00667	1.00667	1.00667	1.03047	1.01066	1.02088	1.01765
A_{21}	1.02010	1.02010	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008	.95008
A_{22}	.40339	.70404	.53987	.59121	.38619	.35565	.76108	.81622	.75902	.66178	.78720	.63957	.70538	.57821	.73019	.46906	.72751

a_4	1.04580	a_8	.98600	a_{15}	1.02862
a_5	1.02500	a_{10}	1.01101	a_{16}	1.09860
a_6	.98797	a_{12}	1.05058	a_{17}	.05028
a_7	2.63637	a_{13}	.97319	a_{18}	1.03465
		a_{14}	1.07259		

APPENDIX D

TOTAL EMPLOYMENT BY OCCUPATION BY SECTOR, OKLAHOMA, 1967-1985

TABLE XLVIII

TOTAL EMPLOYMENT BY OCCUPATION, LIVESTOCK AND LIVESTOCK PRODUCTS SECTOR (SECTOR 1), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	13	13	13	13	12	12	12	12	12	12	11	11	11	11	11	11	10	10	10
2. Scientists (04+06)	15	15	15	14	14	14	14	14	14	13	13	13	13	12	12	12	12	12	12
3. Technicians (including health) (08+10+12)	61	60	60	59	58	58	57	56	55	54	53	52	52	51	50	50	49	49	48
4. Computer & Other Machine Specialists (14+16)	30	30	29	29	29	28	28	27	27	27	26	26	25	25	25	25	24	24	24
5. Economists, Planners & Teachers (18+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Misc. Artists (22)	42	42	41	41	40	40	39	38	38	37	37	36	36	35	35	34	34	34	33
7. Other Professional & Technical Workers (24+99)	44	43	43	43	42	42	41	40	40	39	38	38	37	37	36	36	36	35	35
8. Financial Managers (02)	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
9. Other Managers & Administrators (04-99)	143	141	140	139	137	135	133	131	129	127	125	123	122	120	118	117	116	114	113
10. Sales Workers (00)	92	91	90	89	88	87	86	84	83	82	80	79	78	77	76	75	74	74	73
11. Secretaries (02)	73	72	72	71	70	69	68	67	66	65	64	63	62	61	60	60	59	58	58
12. Other Machine Operators (04)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. Other Clerical Workers (06-99)	272	269	268	264	261	257	253	249	245	240	238	235	231	228	226	222	220	217	215
14. Construction Traders (02)	105	104	103	102	101	99	98	96	95	93	92	90	89	88	87	86	85	84	83
15. Foremen (04)	82	81	80	80	78	77	76	75	74	73	72	71	70	69	68	67	66	66	65
16. Metal Workers (06)	12	12	12	12	12	11	11	11	11	11	10	10	10	10	10	10	10	10	9
17. Mechanics & Repairmen (08)	37	36	36	36	35	35	34	34	33	33	32	32	31	31	31	30	30	30	29
18. Printing Trades (10)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19. Electrical Workers (12)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. Other Misc. Craftsmen (14-00)	51	50	50	50	49	48	47	47	46	45	44	44	43	43	42	42	41	41	40
21. Metal & Machine Shop Workers (02)	38	38	37	37	36	36	35	35	34	34	33	33	32	32	31	31	31	30	30
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	15	15	15	14	14	14	14	14	13	13	13	13	13	12	12	12	12	12	12
24. Misc. Operatives (08-00)	445	440	438	432	427	420	414	407	400	394	390	384	379	374	369	364	360	356	352
25. Janitorial Workers (02)	55	54	54	53	53	52	51	50	50	49	48	47	47	46	46	45	44	44	43
26. Food Workers (04)	10	10	10	10	10	9	9	9	9	9	9	9	8	8	8	8	8	8	8
27. Personnel Service Workers (06+08+12+20)	39	38	38	38	37	37	36	36	35	35	34	34	33	33	32	32	32	31	31
28. Public Service Workers (10)	19	19	19	18	18	18	18	17	17	17	17	16	16	16	16	16	15	15	15
29. Laborers (00)	9,078	8,973	8,926	8,826	8,704	8,567	8,441	8,313	8,182	8,055	7,936	7,823	7,717	7,615	7,518	7,425	7,340	7,257	7,182
Total Wage & Salary	10,774	10,649	10,592	10,473	10,328	10,168	10,018	9,865	9,711	9,560	9,418	9,284	9,157	9,036	8,921	8,812	8,710	8,613	8,522
Total Proprietorship	57,726	57,048	56,740	56,104	55,327	54,468	53,664	52,844	52,021	51,215	50,449	49,731	49,052	48,406	47,791	47,207	46,656	46,139	45,654
Total Employment	68,500	67,697	67,332	66,577	65,655	64,636	63,682	62,709	61,732	60,775	59,867	59,015	58,209	57,442	56,712	56,019	45,366	54,752	54,176

TABLE XLIX

TOTAL EMPLOYMENT BY OCCUPATION, CROPS SECTOR (SECTOR 2), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	10	10	10	10	10	10	9	9	9	9	9	9	9	9	8	8	8	8	8
2. Scientists (04+06)	12	12	12	12	12	11	11	11	11	11	11	11	10	10	10	10	10	10	10
3. Technicians (including health) (08+10+12)	47	46	46	46	45	45	44	44	43	43	42	42	41	41	40	40	39	39	39
4. Computer & Other Machine Specialists (14+16)	23	23	23	22	22	22	22	21	21	21	20	20	20	20	20	19	19	19	19
5. Economists, Planners & Teachers (18+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Misc. Artists (22)	32	32	32	31	31	31	30	30	29	29	29	28	28	28	27	27	27	26	26
7. Other Professional & Technical Workers (24+99)	34	34	34	33	33	32	32	32	31	31	30	30	30	29	29	29	28	28	28
8. Financial Managers (02)	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2
9. Other Managers & Administrators (04-99)	109	108	107	106	105	104	103	102	100	99	98	96	95	94	93	92	91	90	90
10. Sales Workers (00)	70	69	69	68	68	67	66	65	64	63	63	62	61	60	60	59	59	58	58
11. Secretaries (02)	56	55	55	55	54	54	53	52	51	51	50	50	49	48	48	47	47	46	46
12. Other Machine Operators (04)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13. Other Clerical Workers (06-99)	207	205	204	202	200	198	196	193	190	188	185	183	181	179	177	176	175	173	171
14. Construction Traders (02)	80	79	79	78	77	76	76	74	74	72	72	71	70	69	68	68	67	67	66
15. Foremen (04)	62	61	61	60	60	59	58	58	57	56	56	55	54	54	53	52	52	52	51
16. Metal Workers (06)	9	9	9	9	9	9	8	8	8	8	8	8	8	8	8	8	8	7	7
17. Mechanics & Repairmen (08)	28	28	28	27	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23
18. Printing Trades (10)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19. Electrical Workers (12)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. Other Misc. Craftsmen (14-00)	39	38	38	38	38	37	37	36	36	35	35	34	34	34	33	33	33	32	32
21. Metal & Machine Shop Workers (02)	29	29	28	28	28	28	27	27	27	26	26	26	25	25	25	24	24	24	24
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10	9	9	9	9
24. Misc. Operatives (08-00)	339	335	334	330	327	324	321	317	312	307	303	300	296	293	290	288	285	283	280
25. Janitorial Workers (02)	42	42	41	41	40	40	40	39	39	38	38	37	37	36	36	36	35	35	35
26. Food Workers (04)	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7	6
27. Personnel Service Workers (06+08+12+20)	30	30	30	29	29	29	28	28	28	27	27	26	26	26	26	25	25	25	25
28. Public Service Workers (10)	15	15	15	15	14	14	14	14	14	14	13	13	13	13	13	13	12	12	12
29. Laborers (00)	6,931	6,855	6,830	6,770	6,697	6,631	6,551	6,462	6,372	6,287	6,205	6,131	6,062	5,994	5,931	5,870	5,814	5,762	5,713
Total Wage & Salary	8,226	8,137	8,107	8,036	7,942	7,869	7,773	7,668	7,562	7,460	7,365	7,277	7,193	7,113	7,037	6,966	6,899	6,837	6,780
Total Proprietorship	44,074	43,597	43,435	43,057	42,554	42,160	41,649	41,087	40,518	39,972	39,463	38,988	38,539	38,112	37,706	37,324	36,966	36,633	36,324
Total Employment	52,300	51,734	51,542	51,093	50,496	50,029	49,422	48,755	48,080	47,432	46,828	46,265	45,732	45,225	44,743	44,290	43,865	43,470	43,104

TABLE L

TOTAL EMPLOYMENT BY OCCUPATION, MINING SECTOR (SECTOR 3), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	2,304	2,234	2,182	2,135	2,083	2,038	1,999	1,953	1,908	1,870	1,838	1,810	1,785	1,762	1,743	1,726	1,714	1,704	1,698
2. Scientists (04+06)	1,337	1,297	1,266	1,239	1,209	1,183	1,160	1,133	1,107	1,085	1,067	1,050	1,036	1,023	1,011	1,002	994	989	985
3. Technicians (including health) (08+10+12)	1,251	1,213	1,184	1,159	1,131	1,107	1,085	1,060	1,036	1,015	998	983	969	957	946	937	930	925	922
4. Computer & Other Machine Specialists (14+16)	714	692	676	662	646	632	620	605	591	580	570	561	553	546	540	535	531	528	526
5. Economists, Planners & Teachers (18+20)	90	87	85	83	81	80	78	76	74	73	72	71	70	69	68	67	67	66	66
6. Misc. Artists (22)	132	128	125	122	119	117	114	112	109	107	105	104	102	101	100	99	98	98	97
7. Other Professional & Technical Workers (24+99)	2,654	2,574	2,513	2,459	2,399	2,348	2,303	2,250	2,198	2,154	2,117	2,085	2,056	2,030	2,007	1,989	1,975	1,963	1,956
8. Financial Managers (02)	724	702	686	671	654	640	628	614	600	588	578	569	561	554	548	542	538	536	533
9. Other Managers & Administrators (04-99)	2,125	2,061	2,012	1,969	1,921	1,880	1,844	1,801	1,760	1,725	1,695	1,670	1,646	1,625	1,607	1,592	1,580	1,572	1,566
10. Sales Workers (00)	454	440	430	421	410	402	394	385	376	368	362	357	352	347	343	340	338	336	334
11. Secretaries (02)	2,883	2,796	2,730	2,671	2,606	2,550	2,502	2,444	2,388	2,340	2,300	2,265	2,234	2,205	2,181	2,160	2,145	2,132	2,124
12. Other Machine Operators (04)	702	681	665	650	635	621	609	595	581	570	560	552	544	537	531	526	522	519	517
13. Other Clerical Workers (06-99)	3,810	3,696	3,608	3,530	3,445	3,371	3,306	3,229	3,157	3,092	3,041	2,994	2,952	2,915	2,883	2,856	2,835	2,819	2,807
14. Construction Traders (02)	837	812	792	775	757	740	726	709	693	679	668	658	648	640	633	627	622	619	617
15. Foremen (04)	2,397	2,325	2,270	2,221	2,167	2,120	2,080	2,032	1,985	1,946	1,912	1,883	1,857	1,833	1,813	1,796	1,783	1,773	1,766
16. Metal Workers (06)	327	317	310	303	296	289	284	277	271	265	261	257	253	250	247	245	243	241	241
17. Mechanics & Repairmen (08)	1,189	1,153	1,126	1,102	1,075	1,052	1,032	1,008	985	965	949	934	921	909	899	891	884	879	876
18. Printing Trades (10)	28	27	26	26	25	25	24	24	23	23	22	22	22	21	21	21	20	20	20
19. Electrical Workers (12)	9	9	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7	7
20. Other Misc. Craftsmen (14-00)	3,308	3,208	3,132	3,065	2,991	2,926	2,870	2,804	2,741	2,685	2,639	2,599	2,563	2,530	2,502	2,480	2,461	2,447	2,438
21. Metal & Machine Shop Workers (02)	552	535	523	511	499	488	479	468	457	448	440	434	428	422	418	414	410	408	407
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	27	26	26	25	24	24	23	23	22	22	22	21	21	21	20	20	20	20	20
24. Misc. Operatives (08-00)	11,884	11,526	11,253	11,010	10,745	10,514	10,313	10,072	9,844	9,647	9,482	9,337	9,206	9,091	8,990	8,906	8,840	8,791	8,758
25. Janitorial Workers (02)	324	314	307	300	293	287	281	275	268	263	258	254	251	248	245	243	241	240	239
26. Food Workers (04)	32	31	30	30	29	28	28	27	26	26	26	25	25	24	24	24	24	24	24
27. Personnel Service Workers (06+08+12+20)	23	22	22	21	21	20	20	19	19	19	18	18	18	18	17	17	17	17	17
28. Public Service Workers (10)	137	133	130	127	124	121	119	116	113	111	109	108	106	105	104	103	102	101	101
29. Laborers (00)	746	723	707	691	674	660	647	632	618	606	595	586	578	570	564	559	555	552	550
Total Wage & Salary	41,000	39,762	38,824	37,986	37,067	36,271	35,576	34,751	33,957	33,279	32,711	32,214	31,764	31,360	31,012	30,724	30,496	30,326	30,212
Total Proprietorship	2,175	2,109	2,060	2,015	1,966	1,924	1,887	1,844	1,801	1,765	1,735	1,709	1,685	1,664	1,645	1,630	1,618	1,609	1,603
Total Employment	43,175	41,871	40,884	40,001	39,033	38,195	37,463	36,595	35,758	35,044	34,446	33,923	33,449	33,024	32,657	32,354	32,114	31,935	31,815

TABLE LI

TOTAL EMPLOYMENT BY OCCUPATION, CONSTRUCTION SECTOR (SECTOR 4), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	299	266	281	308	328	339	373	387	400	421	450	481	513	546	582	621	664	710	760
2. Scientists (04+06)	11	10	10	11	12	12	14	14	17	15	16	18	19	20	21	23	24	26	28
3. Technicians (including health) (08+10+12)	204	181	192	210	224	231	255	264	273	287	307	328	350	373	397	424	453	484	518
4. Computer & Other Machine Specialists (14+16)	44	39	41	45	48	50	55	57	59	62	66	71	76	80	86	91	98	104	112
5. Economists, Planners & Teachers (18+20)	13	12	12	13	14	15	16	17	17	18	20	21	22	24	25	27	29	31	33
6. Misc. Artists (22)	30	27	28	31	33	34	37	39	40	42	45	48	52	55	58	62	66	71	76
7. Other Professional & Technical Workers (24+99)	233	207	219	240	256	264	291	302	312	328	351	375	400	426	453	484	517	553	592
8. Financial Managers (02)	129	114	121	133	141	146	161	167	173	182	194	208	222	236	251	268	286	306	328
9. Other Managers & Administrators (04-99)	2,361	2,096	2,224	2,437	2,589	2,677	2,948	3,056	3,159	3,327	3,553	3,802	4,054	4,314	4,596	4,903	5,240	5,606	6,001
10. Sales Workers (00)	248	220	233	256	272	281	310	321	332	349	373	399	426	453	483	515	550	589	630
11. Secretaries (02)	667	592	628	688	732	756	833	863	892	940	1,004	1,074	1,145	1,219	1,298	1,385	1,480	1,584	1,695
12. Other Machine Operators (04)	23	20	22	24	25	26	29	30	31	32	35	37	39	42	45	48	51	55	58
13. Other Clerical Workers (06-99)	1,357	1,205	1,278	1,401	1,488	1,539	1,694	1,756	1,816	1,912	2,042	2,185	2,330	2,480	2,641	2,818	3,012	3,222	3,449
14. Construction Traders (02)	13,797	12,253	12,990	14,239	15,131	15,646	17,229	17,858	18,461	19,440	20,761	22,218	23,693	25,213	26,851	28,651	30,622	32,759	35,069
15. Foremen (04)	1,107	983	1,042	1,142	1,214	1,255	1,382	1,433	1,481	1,560	1,666	1,782	1,901	2,023	2,154	2,299	2,457	2,628	2,814
16. Metal Workers (06)	421	374	396	434	462	477	526	545	563	593	633	678	723	769	819	874	934	1,000	1,070
17. Mechanics & Repairmen (08)	848	753	798	875	930	962	1,059	1,098	1,135	1,195	1,276	1,366	1,456	1,550	1,650	1,761	1,882	2,013	2,155
18. Printing Trades (10)	7	6	6	7	8	8	9	9	9	10	10	11	12	13	14	14	16	17	17
19. Electrical Workers (12)	160	142	151	165	175	181	200	207	214	225	241	258	275	292	311	332	355	380	407
20. Other Misc. Craftsmen (14-00)	1,914	1,700	1,802	1,976	2,099	2,170	2,390	2,477	2,561	2,697	2,880	3,082	3,287	3,498	3,725	3,975	4,248	4,544	4,865
21. Metal & Machine Shop Workers (02)	785	697	739	810	861	890	980	1,016	1,050	1,106	1,181	1,264	1,348	1,434	1,528	1,630	1,742	1,864	1,995
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	10	9	9	10	11	11	12	13	13	14	15	16	17	18	19	21	22	24	25
24. Misc. Operatives (08-00)	2,313	2,054	2,179	2,388	2,537	2,623	2,888	2,994	3,095	3,259	3,480	3,724	3,972	4,227	4,501	4,803	5,134	5,492	5,879
25. Janitorial Workers (02)	107	95	101	110	117	121	134	138	143	151	161	172	184	196	208	222	237	254	272
26. Food Workers (04)	27	24	25	28	30	31	34	35	36	38	41	43	46	49	52	56	60	64	69
27. Personnel Service Workers (06+08+12+20)	16	14	15	16	18	18	20	21	21	22	24	26	27	29	31	33	36	38	41
28. Public Service Workers (10)	132	117	124	136	145	150	165	171	177	186	199	212	227	241	257	274	293	313	336
29. Laborers (00)	5,237	4,650	4,931	5,405	5,744	5,939	6,539	6,778	7,007	7,379	7,880	8,434	8,993	9,570	10,192	10,875	11,623	12,434	13,312
Total Wage & Salary	32,500	28,860	30,597	33,538	35,644	36,852	40,581	42,066	43,485	45,790	48,904	52,333	55,809	59,390	63,248	67,489	72,131	77,165	82,606
Total Proprietorship	17,121	15,203	16,118	17,668	18,777	19,414	21,378	22,160	22,908	24,122	25,763	27,569	29,400	31,286	33,319	35,553	37,999	40,651	43,517
Total Employment	49,621	44,063	46,715	51,206	54,421	56,266	61,959	64,226	66,393	69,912	74,667	79,902	35,209	90,676	96,567	103,042	110,130	117,816	126,123

TABLE LII

TOTAL EMPLOYMENT BY OCCUPATION, FOOD AND KINDRED PRODUCTS SECTOR (SECTOR 5), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	69	70	71	72	72	73	73	73	73	73	73	74	74	74	75	75	76	76	77
2. Scientists (04+06)	18	18	19	19	19	19	19	19	19	19	19	19	19	19	19	20	20	20	20
3. Technicians (including health) (08+10+12)	55	56	57	58	58	58	58	58	58	58	58	59	59	59	60	60	60	61	61
4. Computer & Other Machine Specialists (14+16)	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11	11
5. Economists, Planners & Teachers (18+20)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6. Misc. Artists (22)	21	21	22	22	22	22	22	22	22	22	22	22	22	22	23	23	23	23	23
7. Other Professional & Technical Workers (24+99)	195	197	202	204	205	205	206	206	206	207	207	208	209	210	211	212	214	216	218
8. Financial Managers (02)	317	320	328	332	333	334	334	335	336	336	337	338	339	341	343	345	348	351	354
9. Other Managers & Administrators (04-99)	753	761	779	788	792	793	795	796	797	798	800	803	806	810	815	820	826	833	841
10. Sales Workers (00)	947	957	980	991	996	997	999	1,002	1,003	1,004	1,006	1,009	1,014	1,019	1,025	1,032	1,039	1,048	1,057
11. Secretaries (02)	261	264	270	273	274	275	275	276	276	277	277	278	279	281	282	284	286	288	291
12. Other Machine Operators (04)	125	126	129	131	131	132	132	132	132	132	133	133	134	134	135	136	137	138	140
13. Other Clerical Workers (06-99)	1,031	1,042	1,067	1,078	1,084	1,086	1,088	1,091	1,092	1,093	1,095	1,099	1,104	1,109	1,116	1,123	1,131	1,141	1,151
14. Construction Traders (02)	80	81	83	84	84	84	84	85	85	85	85	85	86	86	86	87	88	88	89
15. Foremen (04)	695	702	719	727	731	732	733	735	736	737	738	741	744	748	752	757	763	769	776
16. Metal Workers (06)	122	123	126	128	128	128	129	129	129	129	130	130	131	131	132	133	134	135	136
17. Mechanics & Repairmen (08)	372	376	385	389	391	392	392	393	394	394	395	396	398	400	403	405	408	412	415
18. Printing Trades (10)	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10
19. Electrical Workers (12)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. Other Misc. Craftsmen (14-00)	577	583	597	604	607	608	609	610	611	612	613	615	618	621	624	628	633	638	644
21. Metal & Machine Shop Workers (02)	87	88	90	91	91	92	92	92	92	92	92	93	93	94	94	95	95	96	97
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	1,555	1,573	1,609	1,627	1,636	1,637	1,642	1,646	1,648	1,649	1,653	1,657	1,665	1,674	1,684	1,694	1,707	1,721	1,737
24. Misc. Operatives (08-00)	6,214	6,282	6,433	6,500	6,534	6,541	6,559	6,573	6,582	6,589	6,602	6,623	6,651	6,687	6,726	6,769	6,820	6,877	6,939
25. Janitorial Workers (02)	196	198	203	205	206	206	207	207	208	208	208	209	210	211	212	214	215	217	219
26. Food Workers (04)	109	110	113	114	114	115	115	115	115	116	116	116	117	117	118	119	120	121	122
27. Personnel Service Workers (06+08+12+20)	18	18	19	19	19	19	19	19	19	19	19	19	19	19	19	20	20	20	20
28. Public Service Workers (10)	75	76	78	78	79	79	79	79	79	80	80	80	80	81	81	82	82	83	84
29. Laborers (00)	1,485	1,501	1,537	1,553	1,562	1,564	1,568	1,571	1,573	1,574	1,578	1,583	1,590	1,598	1,607	1,618	1,630	1,643	1,658
Total Wage & Salary	15,400	15,566	15,939	16,110	16,191	16,214	16,252	16,288	16,309	16,328	16,361	16,414	16,486	16,570	16,667	16,776	16,900	17,040	17,194
Total Proprietorship	360	364	373	377	378	379	380	381	381	382	382	384	385	387	390	392	395	398	402
Total Employment	15,760	15,930	16,312	16,487	16,569	16,593	16,632	16,669	16,690	16,710	16,743	16,798	16,871	16,957	17,057	17,168	17,295	17,438	17,596

TABLE LIII

TOTAL EMPLOYMENT BY OCCUPATION, PETROLEUM REFINING SECTOR (SECTOR 6), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	629	614	608	603	596	591	589	586	583	582	585	589	595	602	611	621	634	648	664
2. Scientists (04+06)	307	300	297	294	291	289	288	286	284	284	285	288	290	294	298	303	309	316	324
3. Technicians (including health) (08+10+12)	609	595	589	584	577	572	571	567	564	564	566	570	576	583	591	602	614	627	642
4. Computer & Other Machine Specialists (14+16)	187	183	181	179	177	176	175	174	173	173	174	175	177	179	182	185	188	192	197
5. Economists, Planners & Teachers (18+20)	60	58	58	58	57	56	56	56	56	56	56	56	57	57	58	59	60	62	63
6. Misc. Artists (22)	48	47	46	46	45	45	45	45	44	44	45	45	45	46	47	47	48	49	51
7. Other Professional & Technical Workers (24+99)	887	866	857	850	841	834	831	826	822	821	825	831	840	849	861	876	894	917	936
8. Financial Managers (02)	170	166	164	163	161	160	159	158	158	157	158	159	161	163	165	168	171	175	179
9. Other Managers & Administrators (04-99)	304	297	294	291	288	286	285	283	282	282	283	285	288	291	295	300	306	313	320
10. Sales Workers (00)	55	54	53	53	52	52	52	51	51	51	51	52	52	53	53	54	55	57	58
11. Secretaries (02)	678	662	655	650	643	637	635	631	628	628	630	635	641	649	658	670	683	698	715
12. Other Machine Operators (04)	279	272	270	267	264	262	261	260	258	258	259	261	264	267	271	276	281	287	294
13. Other Clerical Workers (06-99)	1,019	996	985	977	967	958	956	949	944	944	947	955	965	975	991	1,007	1,026	1,049	1,076
14. Construction Traders (02)	180	176	174	172	170	169	169	168	167	167	167	169	170	172	175	178	181	185	190
15. Foremen (04)	372	363	360	356	352	350	349	346	345	344	346	348	352	356	361	368	375	383	392
16. Metal Workers (06)	70	68	68	67	66	66	66	65	65	65	65	66	66	67	68	69	70	72	74
17. Mechanics & Repairmen (08)	224	219	216	215	212	210	210	209	208	207	208	210	212	214	218	221	226	231	236
18. Printing Trades (10)	17	17	16	16	16	16	16	16	16	16	16	16	16	16	16	17	17	18	18
19. Electrical Workers (12)	7	7	7	7	7	6	6	6	6	6	6	6	7	7	7	7	7	7	7
20. Other Misc. Craftsmen (14-00)	218	213	211	209	206	205	204	203	202	202	203	204	206	209	212	215	220	224	230
21. Metal & Machine Shop Workers (02)	103	100	100	99	98	97	96	96	95	95	96	96	97	98	100	102	104	106	109
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	111	108	107	106	105	104	104	103	103	103	103	103	104	106	108	110	112	114	117
24. Misc. Operatives (08-00)	1,027	1,004	992	983	974	966	963	956	951	951	956	963	972	984	998	1,015	1,036	1,059	1,084
25. Janitorial Workers (02)	122	119	118	117	116	115	114	114	113	113	113	114	115	117	118	120	123	126	129
26. Food Workers (04)	29	28	28	28	27	27	27	27	27	27	27	27	27	28	28	29	30	30	30
27. Personnel Service Workers (06+08+12+20)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
28. Public Service Workers (10)	32	31	31	31	30	30	30	30	30	30	30	30	30	31	31	32	32	33	34
29. Laborers (00)	250	244	242	240	237	235	234	233	232	232	232	234	236	239	243	247	252	257	264
Total Wage & Salary	8,000	7,813	7,733	7,667	7,581	7,520	7,497	7,450	7,413	7,408	7,438	7,493	7,567	7,658	7,770	7,904	8,060	8,239	8,439
Total Proprietorship	84	82	81	80	80	79	79	78	78	78	78	79	79	80	82	83	85	87	89
Total Employment	8,084	7,895	7,814	7,747	7,661	7,599	7,576	7,528	7,491	7,486	7,516	7,572	7,646	7,738	7,852	7,987	8,145	8,326	8,528

TABLE LIV

TOTAL EMPLOYMENT BY OCCUPATION, LUMBER AND WOOD PRODUCTS SECTOR (SECTOR 7), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	19	18	18	18	18	26	25	24	23	22	21	21	20	20	19	18	18	18	17
2. Scientists (04+06)	3	3	3	3	3	4	4	4	4	3	3	3	3	3	3	3	3	3	3
3. Technicians (including health) (08+10+12)	16	15	15	15	15	22	21	20	19	19	18	18	17	16	16	16	15	15	14
4. Computer & Other Machine Specialists (14+16)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Economists, Planners & Teachers (18+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Misc. Artists (22)	8	8	8	8	7	11	10	10	10	9	9	9	8	8	8	8	8	7	7
7. Other Professional & Technical Workers (24+99)	40	38	38	38	37	54	53	51	48	47	45	44	42	41	40	39	38	37	36
8. Financial Managers (02)	30	28	28	28	28	41	40	38	36	35	34	33	32	31	30	29	28	28	27
9. Other Managers & Administrators (04-99)	191	182	179	182	177	259	253	243	231	223	216	210	204	197	192	186	181	177	173
10. Sales Workers (00)	120	114	113	114	111	163	159	152	145	140	136	132	128	124	120	117	114	111	108
11. Secretaries (02)	109	104	102	104	101	148	144	138	132	127	123	120	116	112	109	106	104	101	98
12. Other Machine Operators (04)	14	13	13	13	13	19	18	18	17	16	16	15	15	14	14	14	13	13	13
13. Other Clerical Workers (06-99)	224	213	210	213	208	304	297	284	271	261	253	246	239	231	225	218	213	208	203
14. Construction Traders (02)	282	268	265	268	262	382	373	358	342	329	319	309	301	292	283	275	268	261	255
15. Foremen (04)	219	208	206	208	203	297	290	278	265	255	247	240	233	226	220	214	208	203	198
16. Metal Workers (06)	57	54	54	54	53	77	75	72	69	66	64	62	60	59	57	56	54	53	52
17. Mechanics & Repairmen (08)	84	80	79	80	78	114	111	107	102	98	95	92	89	87	84	82	80	78	76
18. Printing Trades (10)	37	35	35	35	34	50	49	47	45	43	42	41	39	38	37	36	35	34	33
19. Electrical Workers (12)	4	4	4	4	4	5	5	5	5	5	4	4	4	4	4	4	4	4	4
20. Other Misc. Craftsmen (14-00)	361	344	339	343	335	490	479	460	437	421	409	396	385	374	362	352	343	334	326
21. Metal & Machine Shop Workers (02)	101	96	95	96	94	137	134	128	122	118	114	111	108	104	101	98	96	94	91
22. Textile Machine Workers (02)	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2
23. Final Processors (06)	132	126	124	126	122	179	175	168	160	154	149	145	140	136	132	129	125	122	119
24. Misc. Operatives (08-00)	1,773	1,117	1,101	1,117	1,087	1,590	1,555	1,491	1,423	1,368	1,326	1,288	1,250	1,213	1,177	1,145	1,115	1,087	1,062
25. Janitorial Workers (02)	75	71	70	71	70	102	99	95	91	87	85	82	80	77	75	73	71	69	68
26. Food Workers (04)	4	4	4	4	4	5	5	5	5	5	4	4	4	4	4	4	4	4	4
27. Personnel Service Workers (06+08+12+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28. Public Service Workers (10)	23	22	22	22	21	31	30	29	28	27	26	25	24	24	23	22	22	21	21
29. Laborers (00)	672	640	632	639	623	911	891	855	815	783	760	738	717	695	675	655	638	622	608
Total Wage & Salary	4,600	3,807	3,759	3,805	3,710	5,424	5,298	5,082	4,847	4,663	4,520	4,390	4,260	4,132	4,012	3,901	3,800	3,706	3,618
Total Proprietorship	736	700	692	700	683	998	975	935	892	858	832	808	784	760	738	718	699	682	666
Total Employment	5,336	4,507	4,451	4,505	4,393	6,422	6,273	6,017	5,739	5,521	5,352	5,198	5,044	4,892	4,750	4,619	4,499	4,388	4,284

TABLE LV

TOTAL EMPLOYMENT BY OCCUPATION, APPAREL AND OTHER PRODUCTS SECTOR (SECTOR 8), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	4	4	5	5	5	6	6	6	7	7	8	8	9	10	10	11	12	13	14
2. Scientists (04+06)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Technicians (including health) (08+10+12)	4	4	5	5	5	6	6	6	7	7	8	8	9	10	10	11	12	13	14
4. Computer & Other Machine Specialists (14+16)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Economists, Planners & Teachers (18+20)	10	11	12	12	13	14	15	16	17	18	20	21	22	24	26	27	29	32	34
6. Misc. Artists (22)	10	11	12	12	13	14	15	16	17	18	20	21	22	24	26	27	29	32	34
7. Other Professional & Technical Workers (24+99)	13	14	15	16	17	19	20	21	22	24	26	27	29	31	33	36	38	41	44
8. Financial Managers (02)	9	10	10	11	12	13	14	15	16	17	18	19	20	22	23	25	26	28	30
9. Other Managers & Administrators (04-99)	103	110	120	130	138	148	158	168	179	190	203	216	231	247	264	282	303	325	349
10. Sales Workers (00)	140	150	164	176	188	202	215	229	243	259	276	294	314	335	359	384	412	441	474
11. Secretaries (02)	81	87	95	102	109	116	124	132	141	150	159	170	182	194	208	222	238	255	274
12. Other Machine Operators (04)	9	10	10	11	12	13	14	15	16	17	18	19	20	22	23	25	26	28	30
13. Other Clerical Workers (06-99)	243	261	284	306	327	350	373	397	422	449	478	510	545	582	623	667	714	766	822
14. Construction Traders (02)	10	11	12	12	13	14	15	16	17	18	20	21	22	24	26	27	29	32	34
15. Foremen (04)	249	267	291	313	335	358	382	407	432	461	489	523	559	596	638	683	732	785	843
16. Metal Workers (06)	11	12	13	14	15	16	17	18	19	20	22	23	25	26	28	30	32	35	37
17. Mechanics & Repairmen (08)	88	94	103	111	118	127	135	144	153	162	173	185	197	211	226	241	259	277	298
18. Printing Trades (10)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19. Electrical Workers (12)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. Other Misc. Craftsmen (14-00)	216	232	252	272	290	311	332	353	375	399	425	453	484	518	554	592	635	681	731
21. Metal & Machine Shop Workers (02)	9	10	10	11	12	13	14	15	16	17	18	19	20	22	23	25	26	28	30
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	572	613	668	719	770	823	878	935	994	1,058	1,125	1,202	1,283	1,371	1,466	1,570	1,682	1,803	1,936
24. Misc. Operatives (08-00)	5,309	5,695	6,206	6,679	7,135	7,641	8,149	8,674	9,223	9,810	10,448	11,147	11,903	12,721	13,606	14,565	15,606	16,738	17,969
25. Janitorial Workers (02)	45	48	52	57	60	65	69	74	78	83	88	94	101	108	115	123	132	142	152
26. Food Workers (04)	4	4	5	5	5	6	6	6	7	7	8	8	9	10	10	11	12	13	14
27. Personnel Service Workers (06+08+12+20)	6	6	7	8	8	9	9	10	10	11	12	12	13	14	15	16	18	19	20
28. Public Service Workers (10)	19	20	22	24	26	27	29	31	33	35	37	40	42	46	49	52	56	60	64
29. Laborers (00)	136	146	159	171	183	196	209	222	236	251	268	286	305	326	348	373	400	429	460
Total Wage & Salary	7,300	7,830	8,532	9,182	9,809	10,507	11,204	11,926	12,680	13,488	14,367	15,326	16,366	17,490	18,707	20,025	21,458	23,014	24,707
Total Proprietorship	280	300	327	352	376	403	430	457	486	517	551	588	628	671	718	768	823	883	948
Total Employment	7,580	8,130	8,859	9,534	10,185	11,000	11,634	12,383	13,166	14,005	14,918	15,914	16,994	18,161	19,425	20,793	22,281	23,897	25,655

TABLE LVI

TOTAL EMPLOYMENT BY OCCUPATION, PRINTING AND PUBLISHING SECTOR (SECTOR 9), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6	7	7
2. Scientists (04+06)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Technicians (including health) (08+10+12)	9	9	10	10	10	11	11	11	12	12	12	12	13	13	14	14	14	15	16
4. Computer & Other Machine Specialists (14+16)	12	12	13	14	14	14	15	15	15	16	16	16	17	18	18	19	19	20	21
5. Economists, Planners & Teachers (18+20)	5	5	5	6	6	6	6	6	6	6	7	7	7	7	8	8	8	8	9
6. Misc. Artists (22)	1,003	1,032	1,088	1,130	1,162	1,194	1,229	1,257	1,284	1,313	1,348	1,385	1,426	1,468	1,514	1,563	1,617	1,672	1,733
7. Other Professional & Technical Workers (24+99)	73	75	79	82	85	87	89	91	93	96	98	101	104	107	110	114	118	122	126
8. Financial Managers (02)	221	227	240	249	256	263	271	277	283	289	297	305	314	323	334	344	356	368	382
9. Other Managers & Administrators (04-99)	459	472	498	517	532	546	562	575	587	601	616	634	652	672	693	715	739	765	793
10. Sales Workers (00)	964	992	1,045	1,086	1,117	1,147	1,181	1,208	1,234	1,262	1,295	1,331	1,370	1,411	1,455	1,502	1,553	1,607	1,666
11. Secretaries (02)	458	471	496	516	531	545	561	574	586	600	615	632	651	670	691	714	738	764	791
12. Other Machine Operators (04)	72	74	78	81	83	86	88	90	92	94	97	99	102	105	109	112	116	120	124
13. Other Clerical Workers (06-99)	1,175	1,210	1,274	1,323	1,362	1,398	1,441	1,473	1,505	1,540	1,579	1,622	1,671	1,720	1,774	1,831	1,893	1,959	2,030
14. Construction Traders (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15. Foremen (04)	168	173	182	189	195	200	206	210	215	220	226	232	239	246	254	262	270	280	290
16. Metal Workers (06)	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6	7	7
17. Mechanics & Repairmen (08)	40	41	43	45	46	48	49	50	51	52	54	55	57	58	60	62	64	67	69
18. Printing Trades (10)	1,898	1,953	2,059	2,138	2,200	2,260	2,327	2,379	2,430	2,486	2,551	2,622	2,698	2,778	2,865	2,958	3,058	3,165	3,281
19. Electrical Workers (12)	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6	7	7
20. Other Misc. Craftsmen (14-00)	31	32	34	35	36	37	38	39	40	40	42	43	44	45	47	48	50	52	54
21. Metal & Machine Shop Workers (02)	18	18	20	20	21	21	22	22	23	24	24	25	26	26	27	28	29	30	31
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	54	56	58	61	62	64	66	68	69	71	72	74	77	79	81	84	87	90	93
24. Misc. Operatives (08-00)	571	587	619	643	662	680	700	715	731	748	767	788	811	836	862	890	920	952	987
25. Janitorial Workers (02)	71	73	77	80	82	84	87	89	91	93	95	98	101	104	107	111	114	118	123
26. Food Workers (04)	14	14	15	16	16	17	17	18	18	18	19	19	20	20	21	22	22	23	24
27. Personnel Service Workers (06+08+12+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28. Public Service Workers (10)	10	10	11	11	12	12	12	12	13	13	13	14	14	15	15	16	16	17	17
29. Laborers (00)	62	64	67	70	72	74	76	78	79	81	83	86	88	91	94	96	100	103	107
Total Wage & Salary	7,400	7,612	8,023	8,334	8,577	8,807	9,069	9,272	9,472	9,690	9,941	10,218	10,514	10,830	11,167	11,529	11,919	12,338	12,788
Total Proprietorship	947	974	1,027	1,066	1,098	1,127	1,160	1,186	1,212	1,240	1,272	1,308	1,346	1,386	1,429	1,475	1,525	1,579	1,636
Total Employment	8,347	8,586	9,050	9,400	9,675	9,934	10,229	10,458	10,684	10,930	11,213	11,526	11,860	12,216	12,596	13,004	13,444	13,917	14,424

TABLE LVII

TOTAL EMPLOYMENT BY OCCUPATION, MACHINERY AND ELECTRICAL MACHINERY SECTOR (SECTOR 10), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	1,015	1,152	1,162	1,243	1,272	1,492	1,575	1,562	1,543	1,556	1,595	1,638	1,677	1,712	1,750	1,793	1,842	1,894	1,950
2. Scientists (04+06)	39	44	45	48	49	57	60	60	59	60	61	63	64	66	67	69	71	73	75
3. Technicians (including health) (08+10+12)	766	869	877	938	960	1,126	1,189	1,179	1,164	1,174	1,204	1,236	1,265	1,292	1,321	1,353	1,390	1,429	1,471
4. Computer & Other Machine Specialists (14+16)	147	167	168	180	184	216	228	226	223	225	231	237	243	248	253	260	267	274	282
5. Economists, Planners & Teachers (18+20)	66	75	76	81	83	97	102	102	100	101	104	106	109	111	114	117	120	123	127
6. Misc. Artists (22)	108	122	124	132	135	159	168	166	164	166	170	174	178	182	186	191	196	202	207
7. Other Professional & Technical Workers (24+99)	519	589	594	636	650	763	805	799	789	796	816	838	857	875	895	917	942	968	997
8. Financial Managers (02)	324	368	371	397	406	476	503	499	492	497	509	523	535	546	558	572	588	604	622
9. Other Managers & Administrators (04-99)	886	1,005	1,015	1,085	1,110	1,302	1,375	1,364	1,347	1,358	1,392	1,430	1,464	1,494	1,528	1,565	1,608	1,653	1,702
10. Sales Workers (00)	535	607	613	655	670	786	830	823	813	820	841	864	884	902	922	945	971	998	1,028
11. Secretaries (02)	778	883	891	953	975	1,144	1,207	1,197	1,182	1,192	1,222	1,256	1,285	1,312	1,341	1,374	1,412	1,452	1,494
12. Other Machine Operators (04)	182	206	208	223	228	268	282	280	277	279	286	294	301	307	314	322	330	340	350
13. Other Clerical Workers (06-99)	1,848	2,098	2,116	2,263	2,316	2,716	2,868	2,844	2,809	2,832	2,904	2,983	3,053	3,117	3,186	3,265	3,353	3,448	3,550
14. Construction Traders (02)	471	534	539	577	590	692	731	725	716	722	740	760	778	794	812	832	854	879	905
15. Foremen (04)	1,189	1,349	1,362	1,456	1,490	1,748	1,845	1,830	1,807	1,822	1,868	1,919	1,964	2,005	2,050	2,101	2,157	2,218	2,284
16. Metal Workers (06)	2,281	2,589	2,612	2,794	2,858	3,353	3,541	3,511	3,467	3,497	3,584	3,683	3,768	3,848	3,932	4,030	4,139	4,256	4,382
17. Mechanics & Repairmen (08)	689	782	789	844	863	1,013	1,069	1,060	1,047	1,056	1,083	1,112	1,138	1,162	1,188	1,217	1,250	1,286	1,324
18. Printing Trades (10)	30	34	34	37	38	44	46	46	46	46	47	48	50	51	52	53	54	56	58
19. Electrical Workers (12)	337	382	386	413	422	495	523	519	512	516	530	544	557	568	581	595	611	629	647
20. Other Misc. Craftsmen (14-00)	223	253	255	273	279	328	346	343	339	342	350	360	368	376	384	394	405	416	428
21. Metal & Machine Shop Workers (02)	3,008	3,414	3,445	3,684	3,770	4,421	4,669	4,630	4,572	4,611	4,725	4,857	4,969	5,075	5,187	5,315	5,457	5,613	5,778
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	1,099	1,247	1,258	1,346	1,377	1,615	1,705	1,692	1,670	1,684	1,727	1,774	1,816	1,854	1,895	1,942	1,994	2,050	2,111
24. Misc. Operatives (08-00)	6,527	7,407	7,475	7,994	8,179	9,595	10,130	10,047	9,921	10,005	10,255	10,538	10,783	11,010	11,254	11,533	11,841	12,179	12,539
25. Janitorial Workers (02)	281	319	322	344	352	413	436	432	427	431	442	454	464	474	484	496	510	524	540
26. Food Workers (04)	32	36	37	39	40	47	50	49	49	49	50	52	53	54	55	56	58	60	61
27. Personnel Service Workers (06+08+12+20)	3	3	3	4	4	4	5	5	4	4	5	5	5	5	5	5	5	6	6
28. Public Service Workers (10)	136	154	156	166	170	200	211	209	207	208	214	220	225	229	234	240	247	254	261
29. Laborers (00)	481	546	551	589	603	707	746	740	731	737	756	776	795	811	829	850	873	897	924
Total Wage & Salary	24,000	27,234	27,484	29,394	30,073	35,277	37,245	36,939	36,477	36,786	37,711	38,744	39,648	40,480	41,377	42,402	43,545	44,781	46,101
Total Proprietorship	594	674	680	728	744	873	922	914	903	910	933	959	981	1,002	1,024	1,049	1,078	1,108	1,141
Total Employment	24,594	27,908	28,164	30,122	30,817	36,150	38,167	37,853	37,380	37,696	38,644	39,703	40,629	41,482	42,401	43,451	44,623	45,889	47,242

TABLE LVIII

TOTAL EMPLOYMENT BY OCCUPATION, TRANSPORTATION EQUIPMENT SECTOR (SECTOR 11), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	604	596	612	650	658	661	675	690	694	704	721	740	758	776	796	816	838	861	886
2. Scientists (04+06)	20	20	20	22	22	22	22	23	23	23	24	24	25	26	26	27	28	28	29
3. Technicians (including health) (08+10+12)	242	239	245	260	264	265	270	276	278	282	289	296	304	311	319	327	336	345	355
4. Computer & Other Machine Specialists (14+16)	112	110	114	121	122	122	125	128	129	130	134	137	141	144	148	151	155	160	164
5. Economists, Planners & Teachers (18+20)	21	21	21	23	23	23	23	24	24	24	25	26	26	27	28	28	29	30	31
6. Misc. Artists (22)	63	62	64	68	69	69	70	72	72	73	75	77	79	81	83	85	87	90	92
7. Other Professional & Technical Workers (24+99)	294	290	298	316	320	322	328	336	338	343	351	360	369	378	387	397	408	419	431
8. Financial Managers (02)	162	160	164	174	176	177	181	185	186	189	193	198	203	208	213	219	225	231	238
9. Other Managers & Administrators (04-99)	475	468	482	511	517	520	531	543	545	554	567	582	596	611	626	642	659	677	697
10. Sales Workers (00)	85	84	86	92	92	93	95	97	98	99	101	104	107	109	112	115	118	121	125
11. Secretaries (02)	284	280	288	306	309	311	317	324	326	331	339	348	356	365	374	384	394	405	417
12. Other Machine Operators (04)	98	97	99	106	107	107	110	112	112	114	117	120	123	126	129	132	136	140	144
13. Other Clerical Workers (06-99)	787	776	798	847	857	861	879	899	904	917	939	964	988	1,012	1,036	1,063	1,092	1,122	1,155
14. Construction Traders (02)	516	509	523	556	562	564	577	590	592	601	616	632	648	663	680	697	716	736	757
15. Foremen (04)	541	534	549	582	589	592	604	618	621	630	646	663	679	696	712	731	751	772	794
16. Metal Workers (06)	832	821	844	896	906	910	930	951	956	970	993	1,019	1,045	1,070	1,096	1,124	1,154	1,188	1,221
17. Mechanics & Repairmen (08)	1,209	1,193	1,226	1,302	1,317	1,323	1,352	1,381	1,389	1,409	1,442	1,481	1,519	1,554	1,592	1,634	1,678	1,725	1,774
18. Printing Trades (10)	16	16	16	17	17	18	18	18	18	19	19	20	20	20	21	22	22	23	23
19. Electrical Workers (12)	8	8	8	9	9	9	9	9	9	9	10	10	10	10	10	11	11	11	12
20. Other Misc. Craftsmen (14-00)	185	182	188	199	201	202	207	211	212	216	221	226	232	238	244	250	257	264	271
21. Metal & Machine Shop Workers (02)	1,063	1,048	1,078	1,145	1,158	1,164	1,189	1,215	1,222	1,239	1,267	1,302	1,336	1,367	1,400	1,436	1,475	1,517	1,560
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	370	365	375	398	403	405	413	423	425	431	442	453	464	476	487	500	513	528	543
24. Misc. Operatives (08-00)	2,523	2,489	2,559	2,718	2,747	2,761	2,820	2,883	2,898	2,941	3,010	3,090	3,169	3,244	3,324	3,409	3,501	3,599	3,701
25. Janitorial Workers (02)	83	82	84	89	90	91	93	95	95	97	99	102	104	107	109	112	115	118	122
26. Food Workers (04)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27. Personnel Service Workers (06+08+12+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28. Public Service Workers (10)	41	40	42	44	45	45	46	47	47	48	49	50	51	53	54	55	57	58	60
29. Laborers (00)	266	262	270	286	290	291	297	304	305	310	317	326	334	342	350	359	369	379	390
Total Wage & Salary	10,900	10,752	11,053	11,737	11,870	11,922	12,181	12,454	12,518	12,703	13,006	13,350	13,686	14,014	14,356	14,726	15,124	15,547	15,992
Total Proprietorship	178	176	180	192	194	195	199	203	204	207	212	218	223	229	234	240	247	254	261
Total Employment	11,078	10,928	11,233	11,929	12,064	12,117	12,380	12,657	12,722	12,910	13,218	13,568	13,909	14,243	14,590	14,966	15,371	15,801	16,253

TABLE LIX

TOTAL EMPLOYMENT BY OCCUPATION, PRIMARY AND FABRICATED METAL PRODUCTS SECTOR (SECTOR 12), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	349	345	345	365	368	375	393	388	380	380	388	396	403	408	415	422	430	439	449
2. Scientists (04+06)	35	35	34	37	37	38	39	39	38	38	39	40	40	41	42	42	43	44	45
3. Technicians (including health) (08+10+12)	514	508	508	538	543	553	579	572	560	560	571	583	593	602	611	621	634	647	661
4. Computer & Other Machine Specialists (14+16)	46	45	45	48	48	49	52	51	50	50	51	52	53	54	55	56	58	58	59
5. Economists, Planners & Teachers (18+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Misc. Artists (22)	10	10	10	10	10	11	11	11	11	11	11	11	12	12	12	12	12	12	13
7. Other Professional & Technical Workers (24+99)	348	344	344	364	367	374	392	387	379	379	387	395	402	407	413	421	429	438	447
8. Financial Managers (02)	207	205	204	216	218	222	233	230	225	226	230	235	239	242	246	250	255	260	266
9. Other Managers & Administrators (04-99)	684	676	675	716	722	735	770	761	745	746	760	776	789	800	813	827	843	861	880
10. Sales Workers (00)	358	354	354	374	378	385	403	398	390	390	398	406	413	419	425	433	441	450	460
11. Secretaries (02)	524	518	517	548	553	563	590	583	571	571	582	595	605	613	623	634	646	660	674
12. Other Machine Operators (04)	103	102	102	108	109	111	116	114	112	112	114	117	119	120	122	124	127	130	132
13. Other Clerical Workers (06-99)	1,201	1,188	1,186	1,257	1,269	1,291	1,353	1,336	1,308	1,310	1,334	1,363	1,386	1,407	1,427	1,452	1,481	1,512	1,544
14. Construction Traders (02)	726	718	717	760	766	781	818	808	790	792	806	824	838	850	863	878	895	914	934
15. Foremen (04)	925	915	913	968	976	994	1,042	1,029	1,007	1,009	1,028	1,050	1,067	1,083	1,099	1,118	1,140	1,164	1,189
16. Metal Workers (06)	1,451	1,435	1,433	1,518	1,533	1,560	1,635	1,614	1,580	1,582	1,612	1,646	1,674	1,699	1,724	1,753	1,789	1,827	1,866
17. Mechanics & Repairmen (08)	359	355	354	376	379	386	404	399	391	391	399	407	414	420	426	434	443	452	462
18. Printing Trades (10)	67	66	66	70	71	72	75	74	73	73	74	76	77	78	80	81	83	84	86
19. Electrical Workers (12)	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	9	9	9
20. Other Misc. Craftsmen (14-00)	423	418	418	443	446	455	476	470	461	461	470	480	488	495	502	511	522	532	544
21. Metal & Machine Shop Workers (02)	4,139	4,093	4,088	4,331	4,371	4,451	4,664	4,604	4,507	4,513	4,599	4,697	4,776	4,845	4,918	5,003	5,103	5,210	5,323
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	407	402	402	426	430	438	458	453	443	444	452	462	470	476	484	492	502	512	523
24. Misc. Operatives (08-00)	4,642	4,591	4,585	4,858	4,901	4,992	5,230	5,165	5,056	5,063	5,158	5,266	5,357	5,434	5,515	5,612	5,724	5,843	5,970
25. Janitorial Workers (02)	220	218	217	230	232	236	248	245	240	240	244	250	254	257	261	266	271	277	283
26. Food Workers (04)	44	44	43	46	46	47	50	49	48	48	49	50	51	51	52	53	54	55	56
27. Personnel Service Workers (06+08+12+20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28. Public Service Workers (10)	73	72	72	76	77	78	82	81	79	80	81	83	84	85	87	88	90	92	94
29. Laborers (00)	1,038	1,026	1,025	1,086	1,096	1,116	1,169	1,155	1,130	1,132	1,153	1,178	1,198	1,215	1,233	1,255	1,280	1,306	1,335
Total Wage & Salary	18,900	18,690	18,664	19,776	19,953	20,321	21,291	21,024	20,582	20,609	20,998	21,446	21,810	22,121	22,456	22,852	23,302	23,788	24,304
Total Proprietorship	297	294	293	311	314	319	334	330	323	324	330	337	343	348	353	359	366	374	382
Total Employment	19,197	18,984	18,957	20,087	20,267	20,640	21,625	21,354	20,905	20,933	21,328	21,783	22,153	22,469	22,809	23,211	23,668	24,162	24,686

TABLE LX

TOTAL EMPLOYMENT BY OCCUPATION, OTHER MANUFACTURING INDUSTRIES SECTOR (SECTOR 13), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	276	278	283	290	291	363	364	360	355	352	351	351	351	351	351	352	353	355	358
2. Scientists (04+06)	46	46	47	48	48	60	61	60	59	59	58	58	58	58	58	59	59	59	60
3. Technicians (including health) (08+10+12)	197	198	202	207	208	259	260	257	253	251	250	250	250	250	250	251	252	254	256
4. Computer & Other Machine Specialists (14+16)	35	35	36	37	37	46	46	46	45	44	44	44	44	44	44	45	45	45	45
5. Economists, Planners & Teachers (18+20)	10	10	10	10	10	13	13	13	13	13	13	13	13	13	13	13	13	13	13
6. Misc. Artists (22)	94	96	98	101	101	126	127	125	123	122	122	122	122	122	122	122	123	124	124
7. Other Professional & Technical Workers (24+99)	406	408	416	427	428	534	536	530	522	517	516	516	516	516	516	518	520	523	527
8. Financial Managers (02)	203	204	208	214	214	267	268	265	261	259	258	258	258	258	258	259	260	261	263
9. Other Managers & Administrators (04-99)	766	771	785	806	808	1,007	1,012	1,000	984	976	974	974	973	973	974	977	981	986	994
10. Sales Workers (00)	869	874	890	915	917	1,142	1,148	1,134	1,117	1,107	1,105	1,104	1,104	1,104	1,105	1,108	1,113	1,119	1,127
11. Secretaries (02)	526	529	539	554	555	691	695	686	676	670	669	668	668	668	669	671	674	677	682
12. Other Machine Operators (04)	85	86	87	89	90	112	112	111	109	108	108	108	108	108	108	108	109	109	110
13. Other Clerical Workers (06-99)	1,428	1,437	1,464	1,504	1,507	1,877	1,886	1,864	1,836	1,821	1,815	1,815	1,814	1,814	1,817	1,821	1,829	1,839	1,852
14. Construction Traders (02)	361	363	370	380	381	474	477	471	464	460	459	459	459	459	459	460	462	465	468
15. Foremen (04)	881	886	902	927	930	1,158	1,164	1,150	1,132	1,122	1,120	1,120	1,119	1,119	1,120	1,123	1,128	1,135	1,143
16. Metal Workers (06)	390	392	400	410	412	512	515	509	501	497	496	496	496	495	496	497	499	502	506
17. Mechanics & Repairmen (08)	532	535	545	560	561	699	703	694	684	678	676	676	676	676	676	678	681	685	690
18. Printing Trades (10)	30	30	31	31	32	39	40	39	38	38	38	38	38	38	38	38	38	39	39
19. Electrical Workers (12)	994	1,000	1,018	1,046	1,049	1,306	1,313	1,297	1,277	1,266	1,264	1,263	1,263	1,263	1,264	1,267	1,273	1,280	1,289
20. Other Misc. Craftsmen (14-00)	347	349	355	365	366	456	458	453	446	442	441	441	441	441	441	442	444	447	450
21. Metal & Machine Shop Workers (02)	131	132	134	138	138	172	173	171	168	167	166	166	166	166	166	167	168	169	170
22. Textile Machine Workers (02)	489	492	501	515	516	643	646	638	628	623	622	621	621	621	622	623	626	630	634
23. Final Processors (05)	1,438	1,448	1,474	1,515	1,518	1,890	1,900	1,877	1,849	1,833	1,828	1,829	1,828	1,828	1,830	1,834	1,841	1,852	1,865
24. Misc. Operatives (08-00)	7,694	7,742	7,883	8,100	8,120	10,113	10,164	10,043	9,888	9,804	9,782	9,780	9,777	9,775	9,785	9,810	9,853	9,911	9,981
25. Janitorial Workers (02)	268	270	274	282	283	352	354	350	344	341	341	341	340	340	341	342	343	345	348
26. Food Workers (04)	15	15	15	16	16	20	20	20	19	19	19	19	19	19	19	19	19	19	19
27. Personnel Service Workers (06+08+12+20)	20	20	20	21	21	26	26	26	26	25	25	25	25	25	25	26	26	26	26
28. Public Service Workers (10)	285	287	292	300	301	374	376	372	366	363	362	362	362	362	362	363	365	367	370
29. Laborers (00)	1,082	1,089	1,108	1,139	1,142	1,422	1,429	1,412	1,390	1,379	1,375	1,375	1,375	1,374	1,376	1,380	1,386	1,394	1,403
Total Wage & Salary	19,900	20,022	20,387	20,947	21,000	26,153	26,286	25,973	25,573	25,356	25,297	25,292	25,284	25,280	25,305	25,373	25,483	25,630	25,812
Total Proprietorship	1,272	1,280	1,303	1,339	1,342	1,672	1,680	1,660	1,635	1,621	1,617	1,617	1,616	1,616	1,618	1,622	1,629	1,638	1,650
Total Employment	21,172	21,302	21,690	22,286	22,342	27,825	27,966	27,633	27,208	26,977	26,914	26,909	26,902	26,896	26,923	26,995	27,112	27,268	27,462

TABLE LXI

TOTAL EMPLOYMENT BY OCCUPATION, TRANSPORTATION, COMMUNICATION, AND PUBLIC UTILITIES SECTOR (SECTOR 14), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	1,018	1,031	1,064	1,089	1,100	1,110	1,125	1,130	1,134	1,140	1,152	1,165	1,181	1,197	1,215	1,235	1,258	1,283	1,310
2. Scientists (04+06)	175	177	183	187	189	191	193	194	195	196	198	200	203	206	209	212	216	220	225
3. Technicians (including health) (08+10+12)	340	344	355	364	367	371	376	378	379	381	385	389	394	400	406	413	420	428	437
4. Computer & Other Machine Specialists (14+16)	505	512	528	540	546	551	558	561	562	566	571	578	586	594	603	613	624	636	650
5. Economists, Planners & Teachers (18+20)	90	91	94	96	97	98	99	100	100	101	102	103	104	106	107	109	111	113	116
6. Misc. Artists (22)	533	540	557	570	576	581	589	592	594	597	603	610	618	627	636	647	659	672	686
7. Other Professional & Technical Workers (24+99)	1,123	1,138	1,174	1,201	1,213	1,225	1,241	1,247	1,251	1,258	1,270	1,286	1,302	1,320	1,340	1,363	1,388	1,415	1,445
8. Financial Managers (02)	287	291	300	307	310	313	317	319	320	322	325	328	333	337	342	348	355	362	369
9. Other Managers & Administrators (04-99)	3,037	3,077	3,174	3,249	3,282	3,314	3,355	3,373	3,382	3,402	3,436	3,477	3,522	3,571	3,625	3,686	3,753	3,827	3,907
10. Sales Workers (00)	665	674	695	711	718	725	735	738	741	745	752	761	771	782	794	807	822	838	856
11. Secretaries (02)	1,708	1,730	1,785	1,827	1,846	1,864	1,887	1,897	1,902	1,914	1,932	1,955	1,981	2,008	2,039	2,073	2,110	2,152	2,197
12. Other Machine Operators (04)	443	449	463	474	479	483	489	492	493	496	501	507	514	521	529	538	547	558	570
13. Other Clerical Workers (06-99)	9,949	10,080	10,397	10,643	10,751	10,855	10,992	11,048	11,080	11,147	11,256	11,390	11,539	11,699	11,877	12,074	12,295	12,536	12,800
14. Construction Traders (02)	839	850	877	897	906	915	927	932	934	940	949	960	973	986	1,002	1,018	1,037	1,057	1.079
15. Foremen (04)	1,573	1,594	1,644	1,683	1,700	1,716	1,738	1,747	1,752	1,762	1,779	1,801	1,824	1,850	1,878	1,909	1,944	1,982	2,024
16. Metal Workers (06)	343	348	358	367	371	374	379	381	382	384	388	393	398	403	409	416	424	432	441
17. Mechanics & Repairmen (08)	5,354	5,424	5,595	5,728	5,785	5,842	5,915	5,946	5,963	5,999	6,056	6,129	6,209	6,296	6,391	6,498	6,616	6,746	6,888
18. Printing Trades (10)	27	27	28	29	29	29	30	30	30	30	30	31	31	32	32	33	33	34	35
19. Electrical Workers (12)	3,863	3,914	4,037	4,132	4,174	4,215	4,268	4,290	4,302	4,328	4,370	4,422	4,480	4,542	4,611	4,688	4,773	4,867	4,970
20. Other Misc. Craftsmen (14-00)	1,192	1,208	1,246	1,275	1,288	1,300	1,317	1,324	1,328	1,335	1,348	1,365	1,382	1,402	1,423	1,446	1,473	1,502	1,534
21. Metal & Machine Shop Workers (02)	468	474	489	501	506	510	517	520	521	524	529	536	543	550	559	568	578	590	602
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	193	196	202	206	208	210	213	214	215	216	218	221	224	227	230	234	238	243	248
24. Misc. Operatives (08-00)	11,920	12,076	12,455	12,752	12,881	13,005	13,171	13,237	13,277	13,355	13,485	13,647	13,825	14,018	14,230	14,466	14,730	15,020	15,336
25. Janitorial Workers (02)	634	642	662	678	685	692	700	704	706	710	717	726	735	746	757	769	783	799	816
26. Food Workers (04)	94	95	98	100	102	102	104	104	105	105	106	108	109	110	112	114	116	118	121
27. Personnel Service Workers (06+08+12+20)	104	105	109	111	112	113	115	115	116	116	118	119	121	122	124	126	128	131	134
28. Public Service Workers (10)	214	217	224	229	231	233	236	238	238	240	242	245	248	252	255	260	264	270	275
29. Laborers (00)	2,809	2,846	2,935	3,005	3,035	3,065	3,103	3,119	3,128	3,147	3,178	3,216	3,258	3,303	3,353	3,409	3,471	3,539	3,614
Total Wage & Salary	49,500	50,150	51,728	52,951	53,487	54,002	54,689	54,970	55,130	55,456	55,996	56,668	57,408	58,207	59,088	60,072	61,166	62,370	63,635
Total Proprietorship	4,063	4,116	4,246	4,346	4,390	4,432	4,489	4,512	4,525	4,552	4,596	4,651	4,712	4,778	4,850	4,931	5,021	5,119	5,227
Total Employment	53,563	54,266	55,974	57,297	57,877	58,434	59,178	59,482	59,655	60,008	60,592	61,319	62,120	62,985	63,938	65,003	66,187	67,489	68,912

TABLE LXII

TOTAL EMPLOYMENT BY OCCUPATION, WHOLESALE AND RETAIL TRADE SECTOR (SECTOR 15), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	561	577	607	633	650	664	681	697	711	727	745	765	786	809	833	859	886	916	947
2. Scientists (04+06)	50	51	54	56	58	59	61	62	63	65	66	68	70	72	74	76	79	82	84
3. Technicians (including health) (08+10+12)	1,316	1,355	1,424	1,485	1,524	1,557	1,598	1,636	1,668	1,705	1,747	1,795	1,845	1,898	1,954	2,014	2,079	2,148	2,222
4. Computer & Other Machine Specialists (14+16)	220	226	238	248	255	260	267	274	279	285	292	300	308	317	327	337	348	359	371
5. Economists, Planners & Teachers (18+20)	179	184	194	202	207	212	217	222	227	232	238	244	251	258	266	274	283	292	302
6. Misc. Artists (22)	426	438	461	481	493	504	517	530	540	552	566	581	597	614	632	652	673	695	719
7. Other Professional & Technical Workers (24+99)	1,368	1,408	1,480	1,544	1,584	1,619	1,662	1,701	1,734	1,772	1,816	1,866	1,918	1,973	2,031	2,094	2,161	2,233	2,310
8. Financial Managers (02)	4,670	4,807	5,052	5,269	5,408	5,527	5,672	5,806	5,920	6,050	6,201	6,369	6,547	6,734	6,934	7,147	7,377	7,622	7,885
9. Other Managers & Administrators (04-99)	14,631	15,061	15,829	16,509	16,942	17,316	17,771	18,191	18,547	18,953	19,428	19,954	20,512	21,099	21,723	22,393	23,111	23,881	24,705
10. Sales Workers (00)	37,733	38,843	40,823	42,575	43,694	44,657	45,830	46,914	47,831	48,881	50,106	51,460	52,901	54,415	56,025	57,751	59,603	61,589	63,714
11. Secretaries (02)	3,553	3,657	3,844	4,009	4,114	4,205	4,315	4,417	4,504	4,602	4,718	4,846	4,981	5,124	5,275	5,438	5,612	5,799	5,999
12. Other Machine Operators (04)	923	950	998	1,041	1,069	1,092	1,121	1,148	1,170	1,196	1,226	1,259	1,294	1,331	1,370	1,413	1,458	1,506	1,558
13. Other Clerical Workers (06-99)	23,105	23,785	24,997	26,070	26,755	27,344	28,063	28,727	29,289	29,931	30,681	31,511	32,393	33,320	34,306	35,362	36,497	37,713	39,014
14. Construction Traders (02)	1,075	1,106	1,163	1,213	1,245	1,272	1,306	1,336	1,363	1,392	1,427	1,466	1,507	1,550	1,596	1,645	1,698	1,755	1,815
15. Foremen (04)	1,857	1,912	2,009	2,095	2,150	2,198	2,256	2,309	2,354	2,406	2,466	2,533	2,603	2,678	2,757	2,842	2,933	3,031	3,136
16. Metal Workers (06)	360	370	389	406	417	426	437	448	456	466	478	491	505	519	534	551	569	588	608
17. Mechanics & Repairmen (08)	7,695	7,921	8,325	8,682	8,911	9,107	9,346	9,567	9,754	9,968	10,218	10,495	10,788	11,097	11,425	11,777	12,155	12,560	12,993
18. Printing Trades (10)	110	113	119	124	127	130	134	137	139	142	146	150	154	159	163	168	174	180	186
19. Electrical Workers (12)	8	8	9	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	14
20. Other Misc. Craftsmen (14-00)	2,916	3,002	3,155	3,290	3,377	3,451	3,542	3,625	3,696	3,777	3,872	3,977	4,088	4,205	4,330	4,463	4,606	4,760	4,924
21. Metal & Machine Shop Workers (02)	567	584	613	640	656	671	689	705	719	734	753	773	795	818	842	868	896	925	957
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	1,464	1,507	1,584	1,652	1,695	1,733	1,778	1,820	1,856	1,896	1,944	1,997	2,052	2,111	2,174	2,241	2,312	2,390	2,472
24. Misc. Operatives (08-00)	18,894	19,449	20,441	21,319	21,879	22,361	22,949	23,491	23,951	24,475	25,089	25,768	26,489	27,247	28,053	28,917	29,845	30,840	31,903
25. Janitorial Workers (02)	1,511	1,555	1,635	1,705	1,750	1,788	1,835	1,879	1,915	1,957	2,006	2,061	2,118	2,179	2,243	2,312	2,387	2,466	2,551
26. Food Workers (04)	20,758	21,369	22,458	23,422	24,037	24,567	25,213	25,809	26,314	26,891	27,564	28,310	29,103	29,935	30,820	31,770	32,790	33,882	35,051
27. Personnel Service Workers (06+08+12+20)	413	425	447	466	478	489	502	513	524	535	548	563	579	596	613	632	652	674	697
28. Public Service Workers (10)	2,133	2,196	2,308	2,407	2,470	2,524	2,591	2,652	2,704	2,763	2,832	2,909	2,990	3,076	3,167	3,264	3,369	3,482	3,602
29. Laborers (00)	8,704	8,960	9,417	9,821	10,079	10,301	10,572	10,822	11,034	11,275	11,558	11,871	12,203	12,552	12,923	13,321	13,749	14,207	14,697
Total Wage & Salary	157,200	161,819	170,071	177,373	182,033	186,043	190,935	195,448	199,272	203,638	208,742	214,393	220,388	226,696	233,402	240,593	248,315	256,588	265,436
Total Proprietorship	39,723	40,890	42,975	44,821	45,998	47,011	48,248	49,388	50,354	51,458	52,747	54,175	55,690	57,284	58,979	60,796	62,747	64,838	67,073
Total Employment	196,923	202,709	213,046	222,194	228,031	233,054	239,183	244,836	249,626	255,096	261,489	268,568	276,078	283,980	292,381	301,389	311,062	321,426	332,509

TABLE LXIII

TOTAL EMPLOYMENT BY OCCUPATION, FINANCE, INSURANCE, AND REAL ESTATE SECTOR (SECTOR 16), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	76	79	84	88	92	95	98	101	104	107	111	115	120	124	130	135	141	148	155
2. Scientists (04+06)	18	19	20	21	22	22	23	24	25	25	26	27	28	29	31	32	33	35	37
3. Technicians (including health) (08+10+12)	46	48	51	54	56	57	60	61	63	65	67	70	72	75	78	82	86	90	94
4. Computer & Other Machine Specialists (14+16)	195	203	217	227	236	243	252	260	267	275	285	295	307	319	332	347	362	380	398
5. Economists, Planners & Teachers (18+20)	12	12	13	14	14	15	16	16	16	17	18	18	19	20	20	21	22	23	24
6. Misc. Artists (22)	87	91	97	101	105	108	112	116	119	123	127	132	137	142	148	155	162	169	178
7. Other Professional & Technical Workers (24+99)	836	872	930	974	1,011	1,042	1,081	1,113	1,145	1,181	1,221	1,266	1,315	1,368	1,425	1,487	1,554	1,628	1,708
8. Financial Managers (02)	3,649	3,805	4,058	4,252	4,411	4,547	4,720	4,857	5,000	5,154	5,330	5,527	5,740	5,970	6,218	6,489	6,784	7,104	7,453
9. Other Managers & Administrators (04-99)	2,512	2,619	2,794	2,927	3,037	3,130	3,250	3,344	3,442	3,548	3,670	3,804	3,951	4,110	4,281	4,467	4,670	4,891	5,131
10. Sales Workers (00)	6,929	7,225	7,706	8,074	8,377	8,636	8,964	9,224	9,494	9,789	10,123	10,495	10,899	11,335	11,808	12,322	12,882	13,490	14,154
11. Secretaries (02)	5,243	5,467	5,831	6,109	6,338	6,534	6,783	6,979	7,184	7,407	7,660	7,940	8,247	8,577	8,935	9,323	9,747	10,208	10,710
12. Other Machine Operators (04)	1,044	1,088	1,161	1,216	1,262	1,301	1,350	1,390	1,430	1,475	1,525	1,581	1,642	1,708	1,779	1,856	1,941	2,032	2,132
13. Other Clerical Workers (06-99)	10,597	11,049	11,786	12,348	12,810	13,207	13,709	14,107	14,519	14,970	15,481	16,050	16,667	17,336	18,060	18,845	19,701	20,632	21,646
14. Construction Traders (02)	218	227	242	254	264	272	282	290	299	308	318	330	343	357	372	388	405	424	445
15. Foremen (04)	94	98	104	110	114	117	122	125	129	133	137	142	148	154	160	167	175	183	192
16. Metal Workers (06)	6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	11	11	12	12
17. Mechanics & Repairmen (08)	61	64	68	71	74	76	79	81	84	86	89	92	96	100	104	108	113	119	124
18. Printing Trades (10)	35	36	39	41	42	44	45	46	48	49	51	53	55	57	60	62	65	68	71
19. Electrical Workers (12)	6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	11	11	12	12
20. Other Misc. Craftsmen (14-00)	218	227	242	254	264	272	282	290	299	308	318	330	343	357	372	388	405	424	445
21. Metal & Machine Shop Workers (02)	5	5	6	6	6	6	6	7	7	7	7	8	8	8	8	9	9	10	10
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	7	7	8	8
24. Misc. Operatives (08-00)	167	174	186	194	202	208	216	222	229	236	244	253	263	273	284	297	310	325	341
25. Janitorial Workers (02)	1,040	1,084	1,157	1,212	1,257	1,296	1,345	1,384	1,425	1,469	1,519	1,575	1,636	1,701	1,772	1,849	1,933	2,025	2,124
26. Food Workers (04)	66	69	73	77	80	82	85	88	90	93	96	100	104	108	112	117	123	128	135
27. Personnel Service Workers (06+08+12+20)	135	141	150	157	163	168	175	180	185	191	197	204	212	221	230	240	251	263	276
28. Public Service Workers (10)	220	229	245	256	266	274	284	293	301	311	321	333	346	360	375	391	409	428	449
29. Laborers (00)	281	293	312	327	340	350	364	374	385	397	410	426	442	460	479	500	522	547	574
Total Wage & Salary	33,800	35,240	37,590	39,383	40,862	42,121	43,724	44,993	46,310	47,746	49,375	51,190	53,164	55,295	57,600	60,106	62,834	65,806	69,038
Total Proprietorship	6,471	6,747	7,196	7,540	7,823	8,064	8,371	8,614	8,866	9,141	9,453	9,800	10,178	10,586	11,027	11,507	12,030	12,598	13,217
Total Employment	40,271	41,987	44,786	46,923	48,685	50,185	52,095	53,607	55,176	56,887	58,828	60,990	63,342	65,881	68,627	71,613	74,864	78,404	82,255

TABLE LXIV

TOTAL EMPLOYMENT BY OCCUPATION, SERVICES SECTOR (SECTOR 17), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	549	570	606	636	661	684	713	735	757	782	810	841	874	910	947	988	1,032	1,079	1,130
2. Scientists (04+06)	155	161	171	179	186	193	201	207	214	221	229	238	247	257	267	279	291	305	319
3. Technicians (including health) (08+10+12)	7,361	7,639	8,120	8,523	8,858	9,179	9,564	9,853	10,152	10,485	10,865	11,281	11,725	12,197	12,702	13,248	13,836	14,470	15,153
4. Computer & Other Machine Specialists (14+16)	270	280	298	313	325	337	351	361	372	385	399	414	430	447	466	486	507	531	556
5. Economists, Planners & Teachers (18+20)	3,724	3,864	4,108	4,312	4,482	4,644	4,838	4,985	5,136	5,305	5,496	5,707	5,932	6,170	6,426	6,702	7,000	7,320	7,666
6. Misc. Artists (22)	1,344	1,395	1,482	1,556	1,617	1,676	1,746	1,799	1,854	1,914	1,984	2,060	2,141	2,227	2,319	2,419	2,526	2,642	2,767
7. Other Professional & Technical Workers (24+99)	6,474	6,718	7,141	7,496	7,791	8,073	8,411	8,666	8,929	9,222	9,556	9,922	10,312	10,727	11,172	11,651	12,163	12,726	13,327
8. Financial Managers (02)	293	304	323	339	353	365	381	392	404	417	432	449	467	485	506	527	551	576	603
9. Other Managers & Administrators (04-99)	4,791	4,972	5,285	5,547	5,766	5,974	6,225	6,413	6,608	6,824	7,071	7,342	7,631	7,938	8,268	8,622	9,005	9,418	9,862
10. Sales Workers (00)	1,214	1,260	1,339	1,406	1,461	1,514	1,577	1,625	1,674	1,729	1,792	1,860	1,934	2,012	2,095	2,185	2,282	2,386	2,499
11. Secretaries (02)	5,779	5,997	6,375	6,691	6,954	7,206	7,508	7,736	7,970	8,232	8,530	8,856	9,205	9,576	9,972	10,400	10,862	11,360	11,896
12. Other Machine Operators (04)	531	551	586	615	639	662	690	711	732	756	784	814	846	880	916	956	998	1,044	1,093
13. Other Clerical Workers (06-99)	9,693	10,058	10,692	11,223	11,664	12,086	12,594	12,975	13,369	13,808	14,307	14,855	15,440	16,062	16,728	17,444	13,200	19,054	19,953
14. Construction Traders (02)	697	723	769	807	839	869	906	933	961	993	1,029	1,068	1,110	1,155	1,203	1,254	1,310	1,370	1,435
15. Foremen (04)	357	370	394	413	430	445	464	478	492	508	527	547	569	592	616	642	671	702	735
16. Metal Workers (06)	159	165	175	184	191	198	206	213	219	226	235	244	253	263	274	286	299	312	327
17. Mechanics & Repairmen (08)	3,687	3,826	4,067	4,269	4,437	4,597	4,790	4,935	5,085	5,252	5,442	5,650	5,873	6,109	6,362	6,636	6,930	7,248	7,590
18. Printing Trades (10)	72	75	79	83	87	90	94	96	99	102	106	110	115	119	124	130	135	142	148
19. Electrical Workers (12)	25	26	28	29	30	31	32	33	34	36	37	38	40	41	43	45	47	49	51
20. Other Misc. Craftsmen (14-99)	1,364	1,415	1,504	1,579	1,641	1,701	1,772	1,826	1,881	1,943	2,013	2,090	2,173	2,260	2,354	2,455	2,564	2,681	2,808
21. Metal & Machine Shop Workers (02)	480	498	529	556	578	598	624	642	662	684	708	736	764	795	828	864	902	944	988
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	40	42	44	46	48	50	52	54	55	57	59	61	64	66	69	72	75	79	82
24. Misc. Operatives (08-00)	5,327	5,528	5,876	6,168	6,411	6,642	6,921	7,131	7,347	7,588	7,863	8,164	8,485	8,826	9,912	9,587	10,013	10,472	10,966
25. Janitorial Workers (02)	5,910	6,133	6,519	6,843	7,112	7,369	7,678	7,911	8,151	8,418	8,723	9,057	9,414	9,792	10,199	10,636	11,108	11,618	12,166
26. Food Workers (04)	9,276	9,626	10,232	10,740	11,163	11,566	12,052	12,417	12,793	13,214	13,691	14,216	14,776	15,370	16,007	16,694	17,435	18,234	19,095
27. Personnel Service Workers (06+08+12+20)	25,467	26,427	28,092	29,487	30,647	31,757	33,088	34,091	35,124	36,277	37,589	39,029	40,566	42,199	43,948	45,833	47,869	50,061	52,424
28. Public Service Workers (10)	2,648	2,748	2,921	3,066	3,187	3,302	3,440	3,544	3,652	3,772	3,908	4,058	4,218	4,388	4,570	4,766	4,977	5,205	5,451
29. Laborers	1,813	1,881	2,000	2,099	2,182	2,261	2,356	2,427	2,500	2,582	2,676	2,778	2,888	3,004	3,129	3,263	3,408	3,564	3,732
Total Wage & Salary	99,500	103,252	109,755	115,205	119,740	124,069	129,274	133,189	137,226	141,732	146,861	152,485	158,486	164,867	171,702	179,070	187,002	195,592	204,822
Total Proprietorship	42,699	44,309	47,100	49,439	51,385	53,242	55,476	57,156	58,889	60,822	63,023	65,437	68,012	70,750	73,684	76,846	80,258	83,935	87,897
Total Employment	142,199	147,561	156,855	164,644	171,125	177,311	184,750	190,345	196,115	202,554	209,884	217,922	226,498	235,617	245,386	255,916	267,280	279,527	292,719

TABLE LXV

TOTAL EMPLOYMENT BY OCCUPATION, FEDERAL GOVERNMENT SECTOR (SECTOR 18), OKLAHOMA, 1967-1985)

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	2,323	2,295	2,267	2,240	2,213	2,186	2,160	2,134	2,108	2,083	2,058	2,033	2,009	1,985	1,961	1,937	1,914	1,891	1,868
2. Scientists (04+06)	447	443	438	433	427	422	417	412	407	402	397	393	388	383	379	374	370	365	361
3. Technicians (including health) (08+10+12)	1,850	1,828	1,806	1,784	1,762	1,741	1,720	1,700	1,679	1,659	1,639	1,619	1,600	1,580	1,562	1,543	1,524	1,506	1,488
4. Computer & Other Machine Specialists (14+16)	1,734	1,713	1,692	1,672	1,652	1,632	1,612	1,593	1,574	1,555	1,536	1,518	1,499	1,481	1,464	1,446	1,428	1,411	1,394
5. Economists, Planners & Teachers (18+20)	459	454	448	443	438	432	427	422	417	412	407	402	397	392	388	383	378	374	369
6. Misc. Artists (22)	358	354	350	345	341	337	333	329	325	321	317	314	310	306	302	299	295	292	288
7. Other Professional & Technical Workers (24+99)	2,825	2,791	2,757	2,724	2,692	2,659	2,627	2,596	2,564	2,534	2,503	2,473	2,443	2,414	2,385	2,356	2,328	2,300	2,272
8. Financial Managers (02)	481	476	470	464	459	453	448	442	437	432	426	421	416	411	406	401	397	392	387
9. Other Managers & Administrators (04-99)	4,846	4,788	4,731	4,673	4,617	4,562	4,507	4,453	4,399	4,347	4,295	4,242	4,191	4,141	4,091	4,042	3,993	3,945	3,898
10. Sales Workers (00)	126	124	122	121	120	118	117	115	114	112	111	110	108	107	106	105	103	102	101
11. Secretaries (02)	3,871	3,824	3,778	3,733	3,688	3,644	3,600	3,557	3,514	3,472	3,430	3,388	3,348	3,307	3,268	3,228	3,190	3,151	3,113
12. Other Machine Operators (04)	788	778	769	760	750	742	733	724	715	706	698	690	681	673	665	657	649	641	634
13. Other Clerical Workers (06-99)	18,556	18,331	18,112	17,894	17,679	17,467	17,255	17,047	16,844	16,641	16,441	16,243	16,048	15,855	15,663	15,475	15,289	15,104	14,924
14. Construction Traders (02)	1,497	1,479	1,461	1,444	1,426	1,409	1,392	1,375	1,359	1,342	1,326	1,310	1,295	1,279	1,264	1,248	1,233	1,219	1,204
15. Foremen (04)	902	891	880	870	859	849	839	829	819	809	799	790	780	771	761	752	743	734	725
16. Metal Workers (06)	1,175	1,160	1,146	1,133	1,119	1,106	1,092	1,079	1,066	1,053	1,041	1,028	1,016	1,004	991	980	968	956	945
17. Mechanics & Repairmen (08)	7,395	7,306	7,219	7,132	7,045	6,960	6,877	6,794	6,713	6,632	6,553	6,473	6,396	6,318	6,242	6,168	6,094	6,020	5,947
18. Printing Trades (10)	139	138	136	134	133	131	129	128	126	125	123	122	120	119	118	116	115	113	112
19. Electrical Workers (12)	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	72	71
20. Other Misc. Craftsmen (14-00)	757	748	739	730	722	713	704	696	688	679	671	663	655	647	639	632	624	616	609
21. Metal & Machine Shop Workers (02)	768	758	749	740	731	722	714	705	697	688	680	672	664	656	648	640	632	625	617
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	356	352	347	343	339	335	331	327	323	319	315	311	308	304	300	297	293	290	286
24. Misc. Operatives (08-00)	3,480	3,438	3,397	3,355	3,315	3,275	3,236	3,197	3,158	3,120	3,083	3,046	3,009	2,973	2,937	2,902	2,867	2,832	2,798
25. Janitorial Workers (02)	1,024	1,012	1,000	987	976	964	952	941	929	918	907	896	886	875	864	854	844	834	824
26. Food Workers (04)	265	262	259	256	253	250	247	244	241	238	235	232	229	227	224	221	219	216	213
27. Personnel Service Workers (06+08+12+20)	180	178	175	173	171	169	167	165	163	161	159	157	155	154	152	150	148	146	144
28. Public Service Workers (10)	776	766	757	748	739	730	722	713	704	696	687	679	671	663	655	647	639	632	624
29. Laborers (00)	2,034	2,010	1,986	1,962	1,938	1,915	1,892	1,869	1,846	1,824	1,802	1,781	1,759	1,738	1,717	1,696	1,676	1,656	1,636
Total Wage & Salary	59,500	58,784	58,077	57,378	56,688	56,006	55,332	54,667	54,009	53,359	52,717	52,083	51,457	50,838	50,226	49,622	49,025	48,436	47,852

TABLE LXVI

TOTAL EMPLOYMENT BY OCCUPATION, STATE AND LOCAL GOVERNMENT SECTOR (SECTOR 19), OKLAHOMA, 1967-1985

Occupation Group	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Engineers (02)	773	792	812	832	853	874	896	918	941	965	989	1,014	1,039	1,065	1,092	1,119	1,147	1,176	1,205
2. Scientists (04+06)	555	569	583	598	613	628	644	660	676	693	711	728	747	765	784	804	824	845	866
3. Technicians (including health) (08+10+12)	1,769	1,813	1,858	1,905	1,952	2,001	2,051	2,102	2,155	2,209	2,264	2,321	2,379	2,438	2,499	2,562	2,626	2,691	2,758
4. Computer & Other Machine Specialists (14+16)	2,128	2,181	2,235	2,291	2,348	2,407	2,467	2,529	2,592	2,657	2,723	2,792	2,861	2,933	3,006	3,081	3,158	3,237	3,318
5. Economists, Planners & Teachers (18+20)	625	641	657	674	690	708	725	743	762	781	800	820	841	862	884	906	928	952	975
6. Misc. Artists (22)	332	340	349	358	366	376	385	395	404	415	425	436	446	458	469	481	493	505	518
7. Other Professional & Technical Workers (24+99)	8,964	9,188	9,418	9,653	9,894	10,142	10,395	10,656	10,922	11,195	11,474	11,761	12,055	12,357	12,666	12,982	13,307	13,639	13,980
8. Financial Managers (02)	447	458	469	481	493	505	518	531	544	558	572	586	600	616	631	647	663	679	696
9. Other Managers & Administrators (04-99)	16,751	17,170	17,601	18,040	18,492	18,953	19,428	19,913	20,410	20,920	21,444	21,980	22,528	23,092	23,670	24,261	24,868	25,490	26,127
10. Sales Workers (00)	283	290	297	305	312	320	328	336	345	353	362	371	380	390	400	410	420	430	441
11. Secretaries (02)	10,961	11,234	11,515	11,803	12,099	12,401	12,711	13,028	13,354	13,688	14,030	14,381	14,740	15,109	15,487	15,874	16,271	16,678	17,094
12. Other Machine Operators (04)	1,431	1,467	1,503	1,541	1,579	1,619	1,659	1,701	1,743	1,787	1,832	1,877	1,924	1,972	2,022	2,072	2,124	2,177	2,232
13. Other Clerical Workers (06-99)	16,653	17,070	17,497	17,934	18,383	18,842	19,313	19,797	20,291	20,798	21,318	21,851	22,396	22,957	23,531	24,119	24,722	25,340	25,974
14. Construction Traders (02)	2,209	2,265	2,321	2,379	2,439	2,500	2,562	2,626	2,692	2,759	2,828	2,899	2,971	3,046	3,122	3,200	3,280	3,362	3,446
15. Foremen (04)	664	680	698	715	733	751	770	789	809	829	850	871	893	915	938	962	986	1,010	1,036
16. Metal Workers (06)	22	23	23	24	24	25	26	26	27	28	28	29	30	31	31	32	33	34	35
17. Mechanics & Repairmen (08)	2,220	2,275	2,332	2,391	2,450	2,512	2,574	2,639	2,705	2,772	2,842	2,913	2,986	3,060	3,137	3,215	3,295	3,378	3,462
18. Printing Trades (10)	55	56	58	59	61	62	64	65	67	69	70	72	74	76	78	80	82	84	86
19. Electrical Workers (12)	115	117	120	123	126	130	133	136	140	143	147	150	154	158	162	166	170	174	179
20. Other Misc. Craftsmen (14-00)	931	954	978	1,002	1,027	1,053	1,079	1,106	1,134	1,162	1,191	1,221	1,251	1,283	1,315	1,348	1,381	1,416	1,451
21. Metal & Machine Shop Workers (02)	201	206	211	216	222	227	233	239	245	251	257	264	270	277	284	291	298	306	314
22. Textile Machine Workers (02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23. Final Processors (06)	22	23	23	24	24	25	26	26	27	28	28	29	30	31	31	32	33	34	35
24. Misc. Operatives (08-00)	3,548	3,637	3,728	3,821	3,916	4,014	4,114	4,217	4,323	4,431	4,542	4,655	4,772	4,891	5,013	5,138	5,267	5,398	5,533
25. Janitorial Workers (02)	3,619	3,710	3,802	3,898	3,995	4,095	4,197	4,302	4,410	4,520	4,633	4,749	4,867	4,989	5,114	5,242	5,373	5,507	5,645
26. Food Workers (04)	533	546	560	574	588	603	618	634	649	666	683	699	717	735	753	772	791	811	831
27. Personnel Service Workers (06+08+12+20)	855	876	898	920	943	967	991	1,016	1,041	1,067	1,094	1,121	1,149	1,178	1,207	1,238	1,268	1,300	1,333
28. Public Service Workers (10)	36,467	37,380	38,315	39,271	40,255	41,260	42,293	43,350	44,434	45,543	46,683	47,850	49,044	50,271	51,527	52,815	54,138	55,491	56,878
29. Laborers (00)	3,767	3,861	3,957	4,056	4,158	4,261	4,368	4,477	4,589	4,704	4,821	4,942	5,066	5,192	5,322	5,455	5,591	5,731	5,874
Total Wage & Salary	116,900	119,822	122,818	125,888	129,035	132,261	135,568	138,957	142,431	145,991	149,641	153,382	157,216	161,147	165,175	169,304	173,537	177,875	182,322

VITA

A. Unal Sarigedik

Candidate for the Degree of

Doctor of Philosophy

Thesis: A SIMULATION MODEL FOR ANALYZING ALTERNATIVE CHANGES OF THE OKLAHOMA ECONOMY AND PROJECTING ECONOMIC VARIABLES FROM 1967 TO 1985

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Ankara, Turkey, May 15, 1943, the son of Mr. and Mrs. M. Seyfeddin Sarigedik.

Education: Graduated from Gazi Lisesi, Ankara, Turkey, in 1960; received Agriculture Engineer degree in Agricultural Economics from the University of Ankara in 1964; received Master of Science degree in Agricultural Economics from Oklahoma State University in 1972; completed requirements for the Doctor of Philosophy degree at Oklahoma State University in December, 1975.

Professional Experience: Planner and Economic Analyst, Turkish Ministry of Agriculture, 1964-1969; U.S.A.I.D. participant, the Department of Agricultural Economics, Oklahoma State University, 1970-1971; Graduate Research Assistant, Department of Agricultural Economics, Oklahoma State University, 1972-1975.