THE IMPACT OF AGRICULTURAL RESOURCE ADJUSTMENTS ON THE ECONOMY OF SOUTHWESTERN OKLAHOMA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Problems of Agricultural Adjustment

Agricultural regions face a multitude of economic and social problems arising from resource adjustments. The resource adjustments are, in part, made by farm operators to meet changes in the markets they face and changes in the technology they use. The magnitude and importance of past agricultural adjustments are shown by the reduction in farm numbers and the declining nature of many communities in agricultural regions. The nature and magnitude of future adjustments need to be estimated to guide decisions in all sectors of the area's economy.

The need for resource adjustments in the agricultural sector stems from changing technologies used by agriculture and the economic environment of agriculture as a whole. Agriculture is generally characterized as a high fixed cost, declining average cost industry. As prices received by farmers decline relative to the prices paid by farmers, the individual operator strives to either produce more with the same total cost of production or to produce the same output with lower total costs. In both instances the operator is attempting to lower the average cost per unit of output. Attempting to produce more at the same total cost tends to aggravate the problem of excess supply, and the prices received by farmers may be forced down even more.

Historically agriculture has increased supply in the face of falling farm prices. The introduction of cost reducing and/or output increasing technologies can account for this phenomenon. The adoption of cost reducing and/or output increasing technologies is the correct decision for the individual but is the wrong action in so far as the industry is concerned, as it increases the total quantity supplied as prices fall.

The development of new agricultural technologies has enabled individual farm operators to increase total output and output per acre and to reduce cost per unit of output. Changes in mechanical technology have enabled anindividual to farm more land and have created pressures for farm enlargement. The use of the tractor on the farm reduced--or more realistically eliminated--the need for horses and mules as power sources. The replacement has allowed land formerly used to support this workstock to be used to produce salable agricultural commodities, thus increasing the total supply of products available.

Another area of supply increasing adjustments has been the increased use of commercial fertilizers, pesticides, higher yielding crop varieties and improved cropping practices. These technologies enable the individual farm operator to increase output per unit of land and per unit of machinery. Thus, with labor-saving machinery and cost-reducing and/or output increasing technologies, the individual farm operator has been able to survive as an economic unit by expanding farm size both extensively and intensively as prices received decline.

Extensive expansion has increased the demand for land and land prices have increased. The increased cost of the land resource requires a higher return in terms of dollars per acre to make the investment profitable.

To obtain higher dollar returns per acre the farmer must either increase output per acre at approximately the same cost or reduce cost per acre with approximately the same output. Since the individual farmer will attempt to increase output in response to falling prices and the increased output will drive prices down even more, returns become less than costs for many operators and they are "forced" out of agriculture. The process of adjustment of the human resource out of agriculture has been continuing since the 1930's and current prospects are that it will continue for some time in the future.

The outlook for the individual resource owner may appear to be a bit dismal. However, when one looks at individual farms, many appear to be quite profitable in terms of total net income. These farms are able to obtain an "opportunity cost" return on fixed resources, including operator's labor and management, by having low variable costs of production and by having optimum combinations of inputs and outputs for the market situations they face.

Study Objectives

The overall objective of the study is to determine the effects of future resource adjustments in agriculture on the other sectors of the economy in Southwestern Oklahoma. Specific objectives are to determine the effect of the agricultural resource adjustments upon:

1) Population in the area.
2) Employment in the nonagricultural sector.
3) Personal incomes in the area.
4) Total volume of trade in retail, wholesale and service firms in the area.

The information obtained will provide an indication of the needed economic development in other industries to maintain the total economic activity of the area. The results also will provide vital information to businessmen in making locational and investment decisions. It will provide guides to communities in assessing their future and in planning for social-governmental services such as schools, roads, public power and water supply. Perhaps one of the most important factors is that it will show the need for opportunities for the displaced human resources in the region. With guides provided, more orderly development of the region's total economy, with respect to its resources, can be accomplished.

Study Area

Description of the Study Area

Southwestern Oklahoma is included in the region generally considered the Great Plains. The Great Plains is delineated by special characteristics, mainly rainfall, topography, and vegetation. The actual study area involved includes Beckham, Caddo, Comanche, Cotton, Grady, Greer, Harmon, Kiowa, Jackson, Tillman, and Washita counties (see Figure 1). Many of the problems of resource adjustments in the Great Plains region are present in the study area. The problems are a general lack of nonfarm employment opportunities for displaced farm labor; high risk with respect to weather conditions for a given time period; great distances to central markets, although there are many market outlets in the area; and few crop alternatives because of the climatic conditions of the area. Another factor involved in the choice of the 11 county area is the recent study done on estimating future

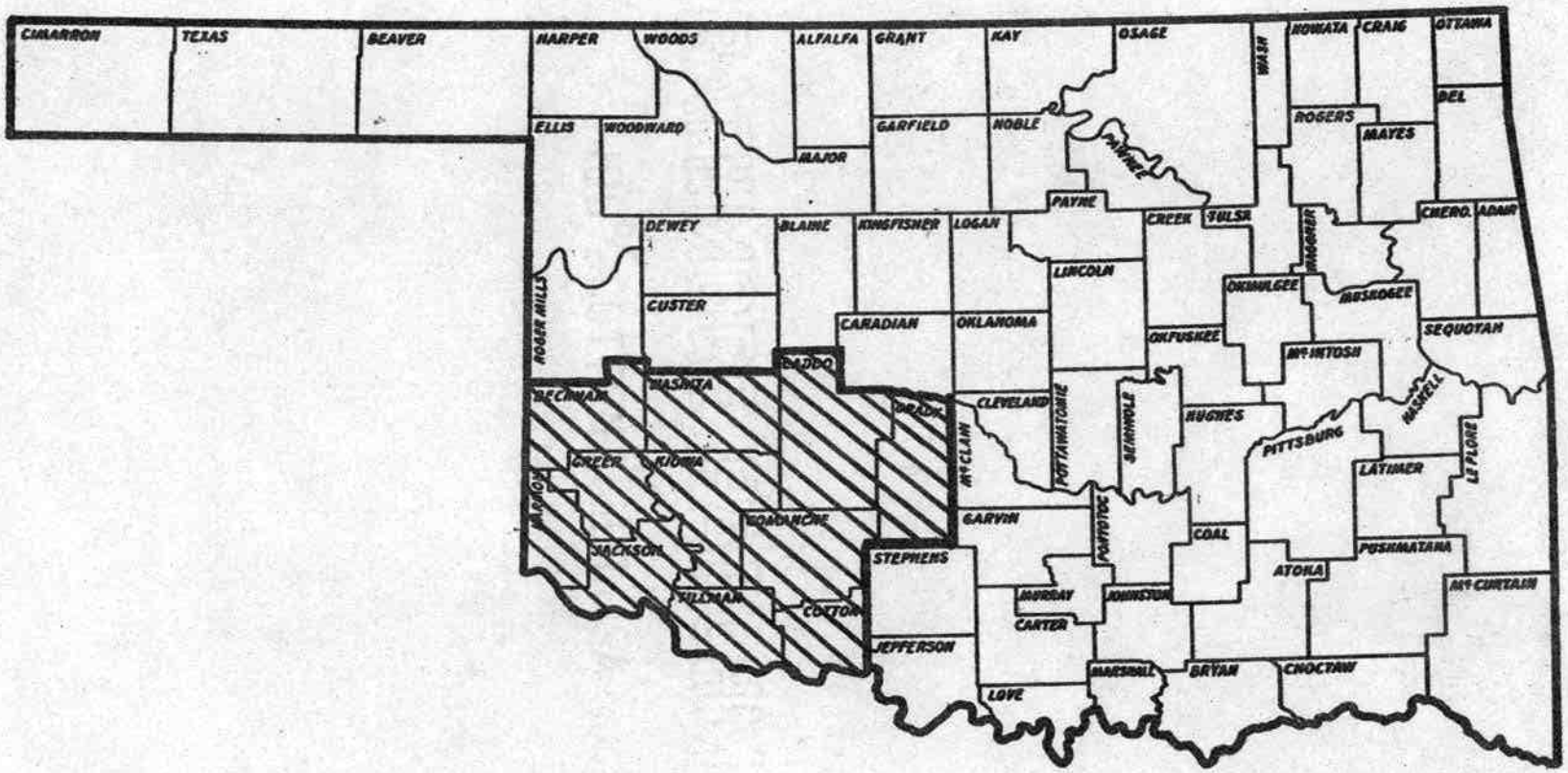

Figure 1. Study Area in Southwestern Oklahoma

agricultural adjustments.[1]

Development of the Study Area

The Great Plains region was developed in a manner somewhat different from many other regions in the United States in that it was settled under the Homestead Laws, the first of which was enacted in 1862. These laws provided that a person could acquire 160 acres of land at $1.25 per acre if he lived on the land and farmed it for five years. Payment was spread over time. Later laws provided for free land upon "proving up" and provided for larger parcels of land--up to 640 acres under the Desert Land Act.[2]

Oklahoma is different from other states in the Great Plains region as it was originally set aside as Indian Territory.[3] It was not until the late 1870's and the 1880's that a great deal of pressure was brought to bear upon the Federal government to open Oklahoma, or Indian Territory, as it was called, for homesteading and settlement by the non-Indians. Before Indian Territory could be opened for settlement, the United States government had to obtain the land from the Indians. This was done by giving (or rather forcing) allotments of lands held by tribes as communal lands to individual tribal members. The remaining land (after allotment) was purchased from the tribes by the Federal government for

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[1] P. L. Strickland, Jr., J. S. Plaxico, and W. F. Lagrone, Minimum Land Requirements and Adjustments for Specified Income Levels, South-Western Oklahoma (Bulletin B-608, Stillwater, 1963).

[2] Roland R. Renne, Land Economics (New York, 1958), p. 498.

[3] Victor E. Harlow, Oklahoma, Its Origins and Development (Oklahoma City, 1949).

the purpose of homesteading.[4]

The actual homesteading of Oklahoma was done through several "land rushes". The first rush was in 1889 in Central Oklahoma on land that had not been assigned to any particular Indian tribe. The land in this area was laid out in 160-acre tracts for homesteads. The settler rushed for the parcel of land that he wanted at a signal given at noon on the 22nd of April, 1889. Within one day the entire region was homesteaded.[5]

Southwestern Oklahoma was opened for settlement at three different times. The first opening was a land rush on April 19, 1892 for 160-acre homesteads on land that was formerly the Cheyenne-Arapahoe Reservation. From this land opening, part of Beckham County and all of Washita County was settled, along with several other counties just to the north of the study area. However, Beckham County was not formed until later.[6]

The second opening was the assignment of the region called Greer County to the Oklahoma Territory in 1896. Greer County was included in Texas until this time, but boundary verification indicated that it should be included in Oklahoma Territory, as the Territory had been defined by Congress.[7] From the original Greer County, present day Greer, Harmon, Jackson, and the southern part of Beckham county were formed.

The third and last opening involved in the settlement of Southwestern Oklahoma was the Kiowa-Comanche-Washita Opening in the summer of 1901. This land opening was carried out by lottery for 13,000 tracts of

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[4]Ibid., Chapters 38 and 39.

[5]Ibid., Chapter 39.

[6]Ibid., p. 266.

[7]Ibid., p. 268.

160 acres each. In order to file a claim, an individual had to be eligible for a homestead under the Homestead Act.[8] The present day counties of Caddo, Comanche, Cotton, Kiowa, Tillman, and part of Grady were formed from the Kiowa-Comanche-Washita Opening. The remaining part of Grady county was formed from the Chickasaw reservation at the time of statehood in 1907.

Southwestern Oklahoma was settled, for the most part, by homesteaders on 160-acre tracts obtained in the land rushes. Being settled in this manner, numerous smaller towns were created to serve the needs of the many farm families in the area. This large number of relatively small farms of 160 acres lasted until the 1930's, when the economic conditions forced many farmers into bankruptcy and the consolidation of farms began. Technological innovations, which have appeared since the late 1920's, enabled the farm consolidation to take place with relative ease. As farm consolidation took place, the farm population declined, reducing the need for the many small communities in the area.

Nature and Magnitude of Past Area Adjustments

In Southwestern Oklahoma many changes have taken place within the agricultural sector of the region's economy. The most noticeable change has been the reduction in farm numbers. In 1930 there were 36,971 farms in this 11 county region.[9] This number had been reduced to 15,061, in

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[8] Ibid., pp. 268-270.

[9] United States Department of Commerce, Bureau of the Census, U. S. Census of Agriculture 1930, Vol. II, Part 2, (Washington, 1932).

1960, a total decrease of 21,910 farms.[10] During this same period the rural population decreased from 254,924 to 127,071, a reduction of 127,853 persons.[11] These changes represent a 60 percent reduction in the number of farms and a 50 percent reduction in rural population. With the reduction in farm numbers and a slight increase in acres farmed, the average farm size has gone from 155.1 acres in 1930 to 386.5 acres in 1960, or more than doubled.

Adjustments have also been taking place in the nonagricultural sector of the economy in Southwestern Oklahoma. The number of firms engaged in the sale of consumer goods and services has declined from approximately 5,324 in 1929[12] to 4,335 in 1962.[13] While the number of firms selling consumer goods and services has been declining the volume of business done by the firms has increased from $326,913,000 to $470,817,000 (adjusted with 1957-59 = 100 base). The increase in sales and decrease in the number of firms indicates that there are economies of size in the sale of consumer goods and that the management of these firms have taken advantage

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[10] United States Department of Commerce, Bureau of the Census, U. S. Census of Agriculture for Oklahoma 1959, Vol. 1, Part 36, (Washington, 1961).

[11] W. N. Peach, R. W. Poole, and J. D. Tarver, County Building Block Data for Regional Analysis, Oklahoma (Stillwater, 1965).

[12] United States Department of Commerce, Bureau of the Census, U. S. Census of Manufactures, 1929, Vol. III (Washington, 1933). U. S. Census of Distribution, 1930, Vol. I, Part 3, and Vol. II (Washington, 1934). The estimate of number of service firms in 1929 is based upon the U. S. Census of Business, Service Establishments, 1935, Vol. II (Washington 1937).

[13] United States Department of Commerce, Bureau of the Census, U. S. Census of Business, 1963, Nos. BC 63-SH38, BC 63-WA38, and BC 63-RA38 (Washington, 1965).

of the economies of size. Part of the gain in economic activity can be attributed to the growth and opening of three military bases in this area and part must be attributed to increased demand for services. These two factors have increased the total volume of trade more than trade has been reduced by the agricultural adjustments during the same period. The increased demand for services appears in many ways. Consumers want more services incorporated into the items they purchase. For example, they want ready-to-wear clothing rather than cloth to make their own, and foods processed to facilitate home preparation rather than doing their own processing. Along with the demand for increased services incorporated into consumer goods, new technologies have enabled the development of many new consumer items. Television is a prime example of this. All these factors have led to the increase in economic activity.

From 1930 to present the total population in Southwestern Oklahoma has declined. Between 1930 and 1950 the population of the area went from 323,648 to 250,848, a decline of 72,800. From 1950 to 1960 there was an increase of 16,044 to 266,892.[14] The recent increase can be attributed to increasing the military personnel in the area. Without the three bases the downward trend in population, no doubt, would have continued.

Another important point with respect to population has been the increasing number of persons over the age 65. In 1930 there were 12,147 persons over 65 in the area, while in 1960 there were 26,885.[15] This group, generally considered the retired population, has increased while the total population has decreased.

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[14] Peach, Poole and Tarver.

[15] Ibid.

Thus Southwestern Oklahoma is a changing area, both in terms of total economic characteristics and in terms of the economic characteristics of the agricultural and nonagricultural sectors. The area is one with a declining population, particularly when the military installations are excluded from the data. Firms, both farm and nonfarm, are experiencing some type of economies of size as firm numbers are decreasing and volume of business per firm is increasing. Another important fact is the growing percentage of total population that is over 65 years of age. This indicates that the younger people are leaving the area in large numbers and that the productive members of the area are declining, both number-wise and percentage-wise.

CHAPTER II

ANALYTICAL FRAMEWORK

The first phase in estimating the effect of agricultural adjustment on total economic activity in an area is to obtain an estimate or a projection of the adjustments. Given the estimate of the future structure of farming, changes in the demand for productive inputs can be determined. Also, changes in consumption expenditures by farm families can be estimated. The change in the demand for agricultural productive inputs and consumption expenditures by farm families is considered the triggering mechanism leading to other adjustments of interest in this study.

The second phase in the analysis is to determine the impact of the changes in farm sector purchases of productive inputs and consumer goods and services on the nonfarm sector of the economy. It is suspected that the impact will be most severe on retail sales and service establishments of the region. In estimating the change, multiplier analysis, including population, employment, and expenditure multipliers, is used. It is assumed that manufacturing and mining activities will be maintained at their 1960 level unless otherwise stated.

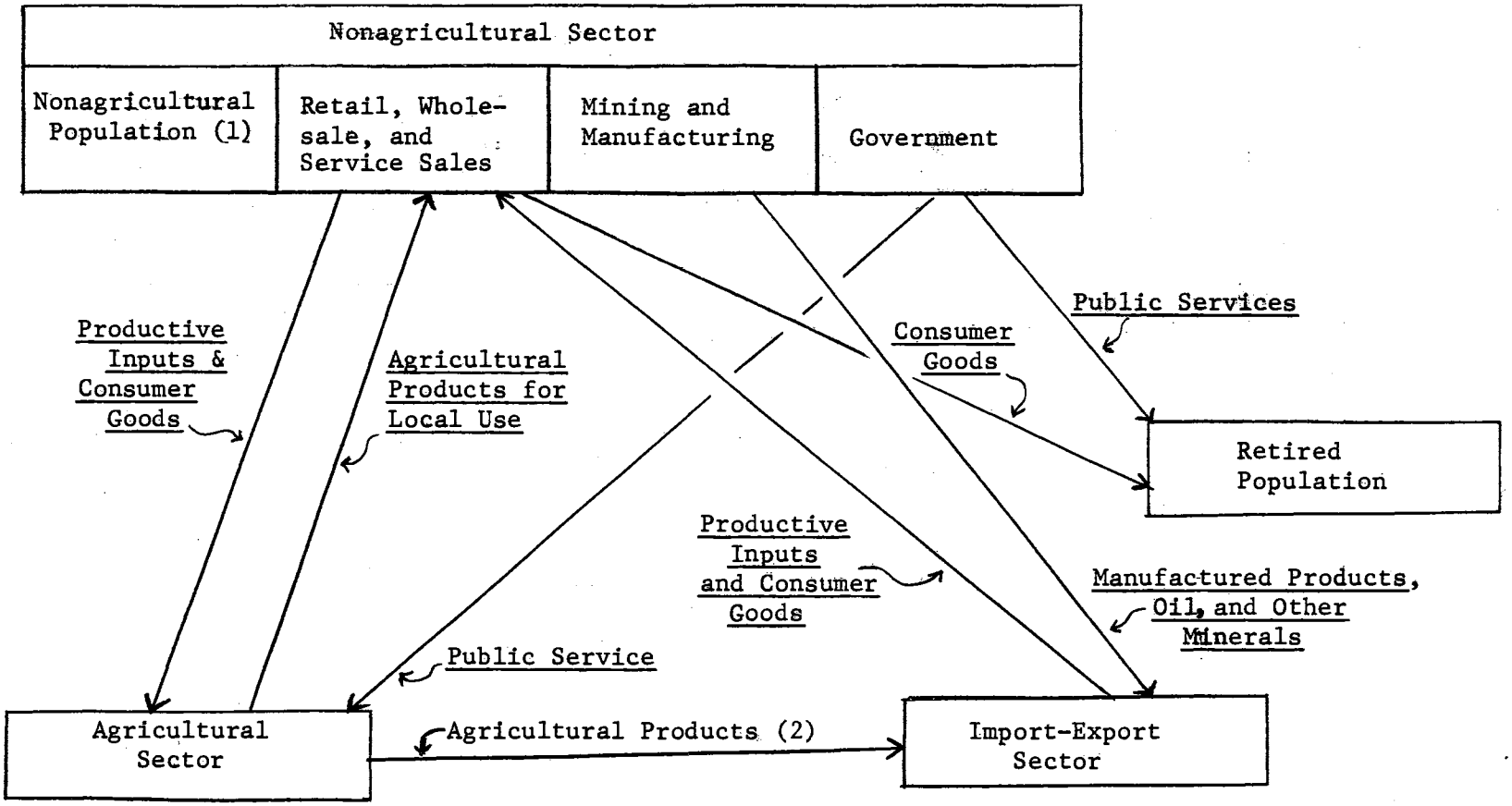
The results are used to estimate the needed increase in economic activity in the area to: 1) maintain the present level of economic activity and 2) provide for economic development. The results also measure the need for labor migration, other resource transfers, and inter- and intra-area nonfarm firm adjustments.

Theorized Economic Linkage in Southwestern Oklahoma

Clearly, strong interdependence between the agricultural and the nonagricultural sectors of the economy in Southwestern Oklahoma is assumed. It is the magnitude of the interdependence that is of primary concern. In attempting to determine quantitatively the interdependence between the major sectors, the economic linkage between all sectors and subsectors must be traced. The economic linkage model for Southwestern Oklahoma includes three major sectors: agriculture, nonagriculture and import-export. Figure 2 shows the intersector flows of goods and services within the study area indicating the theorized economic linkage.

The agricultural sector supplies agricultural products, demands agricultural productive inputs and services directly related to agricultural production, and demands consumer goods and services for farm families. Many of the products for export originate from the agricultural sector of the area. The demand for goods and services, both for the agricultural productive inputs and consumer goods and services, is met by the nonagricultural sector.

The nonagricultural sector is divided into four subsectors: retail, wholesale and service sales; mining and manufacturing; governmental services; and retired population. The nonagricultural sector and each subsector include supply and demand activities. With the exception of the manufactured products, oil, and minerals supplied by the mining and manufacturing subsector, all items supplied by the nonagricultural sector are assumed to be demanded from within the study area by either the nonagricultural sector or the agricultural sector. The demands of the nonagricultural sector are supplied from within the sector, with the exception



(1) Nonagricultural population supplies labor to the retail, wholesale and service sales; mining and manufacturing; and government subsectors and demands public services and consumer goods.

(2) The products go through marketing firms in the retail, wholesale, and service sales subsector.

Figure 2, Theorized Intersector Economic Flows in Southwestern Oklahoma.

of finished consumer goods and productive inputs sold by the retail, wholesale, and service sales subsector. A small amount of agricultural products for processing into productive inputs is also demanded by the retail, wholesale, and service sales subsector. Thus the nonagricultural sector provides manufactured products, oil, and other minerals for export from the area, and imports finished consumer goods and productive inputs for sale within the area. The nonagricultural sector provides the agricultural sector with purchased productive inputs and consumer goods and services. It also provides a limited market for some agricultural products.

The import-export sector provides the linkage of Southwestern Oklahoma's economy with the economic activity of the United States as a whole. It is through the import-export sector that all items produced but not consumed or consumed but not produced within the study area must flow.

The division of the economy of Southwestern Oklahoma into the three sectors and four subsectors is used to show how changes in one sector--agriculture--affect the other sectors. The reason for the division of the nonagricultural sector into four subsectors is that it isolates the subsector of the economy that will be most affected by changes in agricultural resource uses, retail, wholesale, and service sales. The division also isolates the mining and manufacturing subsector, which is considered unaffected by agricultural adjustments but which might provide possibilities for economic development of the area.

Theoretical Economic Interdependence Model

The economic model used for estimating the total impact of agricultural resource adjustments describes the linkages or interdependence of

the various sectors and subsectors of the economy in a primarily rural area such as Southwestern Oklahoma. The model is designed to show how a change in employment, expenditures, or personal incomes in any one sector or subsector of a rural area economy will affect the other sectors and subsectors in terms of employment, volume of trade, and personal income.

The model consists of five basic equations. Included in the basic equations are one functional relationship, indicating how nonagricultural employment is influenced by changes in agricultural employment, and four identity statements which describe the composition of: 1) total population, 2) total employment, 3) total personal income, and 4) total volume of trade in the retail, wholesale, and service sales subsector. Within each of the four basic identity statements, changes in one or two key variables are expressed as functional relationships. In total there are eight coefficients in the five equation model. Of the eight coefficients, six are essentially multipliers of various types. The other two coefficients are the per capita consumption expenditures for the agricultural population and the nonagricultural population. The five basic equations and their estimating forms are:

1.0 $\Delta L_2 = b_1 \Delta L_1$

2.0 $P = P_1 + P_2 + P_3$

2.1 $\hat{P} = P_1 + \hat{P}_2 + P_3$

2.2 $\hat{P} = P_1 + (P_2 + b_2 \Delta L_2) + P_3$

3.0 $L = L_1 + L_2$

3.1 $L = L_1 + L_3 + L_4 + L_5$

3.2 $\hat{L} = L_1 + \hat{L}_3 + L_4 + \hat{L}_5$

3.3 $\hat{L} = L_1 + (L_3 + b_3 \Delta C) + L_4 + (L_5 + b_4 \Delta P)$

4.0 $Y_p = Y_{p_1} + Y_{p_2}$

4.1 $Y_p = Y_{p_1} + Y_{p_3} + Y_{p_4} + Y_{p_5} + Y_{p_6}$

4.2 $\hat{Y}_p = Y_{p_1} + \hat{Y}_{p_3} + Y_{p_4} + \hat{Y}_{p_5} + Y_{p_6}$

4.3 $\hat{Y}_p = Y_{p_1} + (Y_{p_3} + b_5 \Delta C) + Y_{p_4} + (Y_{p_5} + b_6 \Delta P) + Y_{p_6}$

5.0 $C = C_1 + C_2 + C_3$

5.1 $\hat{C} = C_1 + \hat{C}_2 + \hat{C}_3$

5.2 $\hat{C} = C_1 + b_7 P_1 + b_8(\hat{P}_2 + P_3)$

Where:

L = Total Employment

L_1 = Agricultural Employment

L_2 = Nonagricultural Employment ($L_3 + L_4 + L_5$)

L_3 = Retail, Wholesale, and Service Sales Employment

L_4 = Mining and Manufacturing Employment

L_5 = Government Employment

P = Total Population

P_1 = Agricultural Population

P_2 = Nonagricultural Population

P_3 = Retired Population (persons over 60)

Y_p = Total Personal Income

Y_{p1} = Personal Income to Agriculture

Y_{p_2} = Personal Income to Nonagriculture ($P_3 + P_4 + P_5 + P_6$)

Y_{p_3} = Personal Income to Retail, Wholesale, and Service Sales

Y_{p4} = Personal Income to Mining and Manufacturing

Y_{p_5} = Personal Income to Government

Y_{p_6} = Personal Income to Retired Population

C = Total Volume of Trade in Retail, Wholesale, and Service Sales Subsector ($C_1 + C_2 + C_3$)

C_1 = Demand for Productive Inputs and Services by Agriculture

C_2 = Demand for Consumer Goods and Services by Agriculture

C_3 = Demand for Consumer Goods and Services by Nonagriculture

b_1 = "Basic - Derivative" Employment Multiplier

b_2 = "Nonagricultural Employment - Population" Multiplier

b_3 = "Expenditure - Employment" Multiplier

b_4 = "Population - Government Employment" Multiplier

b_5 = "Expenditure - Personal Income" Multiplier

b_6 = "Population - Governmental Personal Income" Multiplier

b_7 = Agricultural Per Capita Consumption

b_8 = Nonagricultural Per Capita Consumption

Equation 1.0 ($\Delta L_2 = b_1 \Delta L_1$) describes the relationship of a change in the nonagricultural labor force to a change in the agricultural labor force. The coefficient b_1 is a "basic-derivative" employment multiplier.[16] This particular multiplier indicates how a change in agricultural employment (ΔL_1), considered to be in the basic employment, affects nonagricultural employment (ΔL_2), considered to be in the derivative or service employment. It is through equation 1.0 and a predetermined estimate of the change in agricultural employment that the analysis of the impact of agricultural resource use adjustments on the nonagricultural sector of the economy is initiated. Equation 1.0 gives an estimate of the change in nonagricultural employment, (ΔL_2).

Equation 2.0 ($P = P_1 + P_2 + P_3$) is the identity statement describing the composition of the population in the study area. The change in total

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[16] See pages 30-36 for a discussion of the "basic derivative" employment concept.

population depends upon changes in the level of employment in both the agricultural and the nonagricultural sectors of the economy. Since all changes are assumed to originate in the agricultural sector, the projected agricultural population (P_1) is a predetermined variable obtained from the estimate of agricultural employment. The retired population (P_3) is assumed to remain at its present level in the analysis. The change in the nonagricultural population is assumed to be dependent upon changes in the nonagricultural employment, that is $\Delta P_2 = b_2 \hat{\Delta L}_2$, where ΔL_2 is estimated in equation 1.0. Equation 2.2 ($\hat{P} = P_1 + [P_2 + b_2 \hat{\Delta L}_2] + P_3$) is used to project the total population of the study area. In essence, the projected population is the sum of the predetermined agricultural population (P_1), the assumed unchanging retired population (P_3), and the present nonagricultural population (P_2) plus the change in nonagricultural population (ΔP_2). The coefficient b_2, appearing in equation 2.2, can be considered the "nonagricultural employment-population" multiplier as it indicates how P_2 changes with L_2.

Equations 3.0 ($L = L_1 + L_2$) and 3.1 ($L = L_1 + L_3 + L_4 + L_5$) are the identity statements which describe the levels of employment in the major sectors and the subsectors of the economy of the study area. Equation 3.2 ($\hat{L} = L_1 + \hat{L}_3 + L_4 + \hat{L}_5$) is the general form of the equation used in predicting future employment levels. Two variables in equation 3.2 are estimated within the model: $\hat{L}_3$, projected employment in the retail, wholesale, and service sales sector; and $\hat{L}_5$, projected government employment. The predetermined variables in both equation 3.2 and 3.3 are L_1, the projected level of agricultural employment, and L_4, employment in the mining and manufacturing subsector, which is

assumed to be unchanging for the purposes of this study.

The change in L_3 is assumed to be related to the change in the total volume of trade in the retail, wholesale, and service sales subsector; that is, $\Delta L_3 = b_3 \Delta C$. The change in L_5, governmental employment, is assumed to be related to changes in total population; that is, $\Delta L_5 = b_4 \Delta P$. The projected total employment by sectors and subsectors of the study area can be estimated with equation 3.3 if the change in the volume of trade in the retail, wholesale, and service sales subsector and the change in total population are known.

In this study an estimate of the change in population is obtained from equations 2.0 and 2.2, enabling $\hat{L}_5$ to be determined. The change in the total labor force essentially is estimated when $\hat{\Delta L}_2$ is determined in equation 1.0. Knowing $\hat{L}$ and $\hat{L}_5$, equation 3.3 ($\hat{L} = L_1 + [L_3 + b_3 \Delta C] + L_4 + [L_5 + b_4 \hat{\Delta P}]$) is solved for the change in the total volume of trade in the retail, wholesale, and service sales subsector, ΔC. Given $\hat{\Delta C}$, $\hat{L}_3$ is obtained from the relationship $\hat{L}_3 + L_3 = b_3 \Delta C$. Thus, in this particular study, equation 3.3 is used to determine first $\hat{L}_5$, then ΔC, and finally $\hat{L}_3$. If an estimate of the total change in C and P were available, then $\hat{L}_3$, $\hat{L}_5$, and $\hat{L}$ could be estimated directly.

The coefficient b_3 can be considered an "expenditure-employment" multiplier which relates changes in the employment in the retail, wholesale, and service sales subsector to changes in the volume of trade in the same subsector. The coefficient b_4 is essentially a "population-government employment' multiplier relating changes in government employment to changes in total

population.

Equations 4.0 ($Y_p = Y_{p_1} + Y_{p_2}$) and 4.1 ($Y_p = Y_{p_1} + Y_{p_3} + Y_{p_4} + Y_{p_5} + Y_{p_6}$) identify the source of total personal income in the area by sectors and subsectors respectively. The general equation used for projecting personal income is 4.2 ($\hat{Y}_p = Y_{p_1} + \hat{Y}_{p_3} + Y_{p_4} + \hat{Y}_{p_5} + Y_{p_6}$). Personal income to the agricultural sector (Y_{p_1}), and the mining and manufacturing (Y_{p_4}), and retired population (Y_{p_6}) subsectors of the nonagricultural sector are assumed to be unchanging in this study. The remaining two variables in equation 4.2, personal income to the retail, wholesale, and service sales subsector ($\hat{Y}_{p_3}$) and to the governmental subsector ($\hat{Y}_{p_5}$) are estimated within the model.

Equation 4.3 ($\hat{Y}_p = Y_{p_1} + [Y_{p_3} + b_5\Delta C] + Y_{p_4} + [Y_{p_5} + b_6\Delta P] + Y_{p_6}$) includes the functional relationships used in estimating the changes in personal income to retail wholesale, and service firms ($\Delta Y_{p_3} = b_5\Delta C$) and the government ($\Delta Y_{p_5} = b_6\Delta P$) subsectors. $\hat{\Delta C}$ is obtained from equation 3.3 and $\hat{\Delta P}$ is obtained from equations 2.0 and 2.2. Thus the projected personal incomes to the retail, wholesale, and service firms subsector ($\hat{Y}_{p_3} = Y_{p_3} + b_5\Delta C_3$) and to the government subsector ($\hat{Y}_{p_5} = Y_{p_5} + b_6\Delta P$) are obtained and the projected total personal income in the study area ($\hat{Y}_p$) is determined.

Coefficient b_5 is a "consumption expenditure-personal income" multiplier as it indicates how personal income in the retail, wholesale, and service sale subsector is affected by a change in consumption expenditures of all types. The coefficient b_6 is a "population-governmental personal income" multiplier which indicates how personal incomes of governmental employees are affected by changes in total population.

Equation 5.0 ($C = C_1 + C_2 + C_3$) is the identity statement that delineates the sources of trade and the volume from each source in the retail, wholesale, and service firms subsectors. The three sources of trade are: 1) the demand for productive inputs and services by agriculture (C_1), 2) the demand for consumer goods and services by the agricultural population (C_2), and 3) the demand for consumer goods and services by the nonagricultural and retired populations (C_3). To obtain the projected volume of trade, C, equation 5.2 ($C = C_1 + b_7P_1 + b_8 (\hat{P}_2 + P_3)$ is used. The demand for productive inputs and services by agriculture is a predetermined variable. The demand for consumer goods and services by the agricultural and nonagricultural populations is assumed to be different, that is, they have different per capita consumption expenditures. Thus, $C_2 = b_7P_1$, where b_7 is the per capita consumption expenditure level for the agricultural population and $C_3 = b_8 (\hat{P}_2 + P_3)$, where b_8 is the nonagricultural per capita consumption expenditure level.

The interdependence model described above stresses the influence of a change in agricultural resource use on the total economic activity within the study area. The equations and functional or causal relationships used in this model are thought to be representative of economic and demographic relationships as they exist within Southwestern Oklahoma, and in other predominently rural areas in the Great Plains region.

Two major ideas or techniques are involved in using the interdependence model. The first technique used is one that will give a realistic estimate of potential agricultural resource use adjustments. The results of a minimum resource study of farm adjustments will be

utilized to obtain the projected values of L_1, P_1, C_1, C_2, and Y_{p_1}. The second major technique to be utilized is multiplier analysis. As indicated above, six of the parameters in the interdependence model are essentially multipliers. In the next two sections of this chapter, the use of minimum resource models in resource use adjustment estimation and the concept of the multiplier and multiplier analysis are discussed.

Use of Minimum Resource Models in Adjustment Research

The estimate of adjusted agricultural resource use was obtained from previous research for Southwestern Oklahoma.[17] The Strickland study uses a linear programming technique to determine the minimum set of resources needed to provide a given level of net income to an individual farm unit. The primary objective of the adjustment study was to determine the minimum set of resources (land, labor, and capital) required to provide a specified return to operator's labor and management in Southwestern Oklahoma. The specific objectives of the study were:

1) To determine the minimum resources required (land, labor, and capital) to obtain specified returns to farm operator's labor and management.

2) To determine the combination of farm enterprises consistent with minimum resource use for given income levels.

3) To determine the number of farms in the area consistent with these levels of income.[18]

The adjustment study assumed that agriculture would adjust to its

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[17] Strickland, et. al.

[18] Ibid., pp. 6 & 7.

most efficient organization, given a set of assumptions or restrictions concerning technology, prices, and availability of the factors of production.[19] It is assumed that the technology and management used by the individual farms are the optimum available at the time of the study (1962). The prices used in the program are the estimates of the 1961 prices received by farmers including the 1961 price support levels for crops that have supported prices. The land price used is based upon 1961 land transactions in the area. An interest charge of six percent is used for the cost of working capital and five percent for fixed capital. Hired labor is assumed to receive $1.00 per hour.

In the adjustment study, results were obtained for three income levels: $3,000, $5,000, and $7,000. These different income levels were selected to represent three levels of opportunity cost of farming and to represent the efficiency criterion of equating the returns to labor in alternative uses; i.e., labor used in agricultural jobs and in nonagricultural jobs. For the purposes of the present study, the results for the $3,000 returns to operator's labor and management are used.

There are several reasons for choosing this level of returns rather than a higher level. First, $3,000 is the residual after all other costs are paid. It can be called the returns to operator's labor and management when the particular operator owns no other resources. In this area at least a 50 percent equity in land, building, machinery, and other equipment is common. With this assumption, the farm organization has an opportunity cost charge of $2,917 for

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[19] Ibid., pp. 11-18.

the use of capital.[20] Thus, the farm family that has 50 percent equity has a net income of $5,917 a year, which is consistent with incomes received in nonfarm employment. Second, the farmer receives a somewhat lower annual cash income, but he is building an estate valued at approximately $100,000 through the acquisition of land and capital gains on land investments, while the nonfarm worker does very little in the way of accumulating such a sizeable estate for retirement. A third argument in favor of using the $3,000 return is that the farm family traditionally has been willing to give up some cash income to be able to live on the farm.

Using the adjustment projection based upon the $3,000 return gives a conservative estimate of the potential change in farm numbers. By using the conservative projection, the likelihood of such a change occurring is increased, thus increasing the validity of the estimate of the impact of agricultural resource adjustment on total economic activity in the study area.

Along with estimating the minimum decrease in the number of farms for the three income goals, the adjustment study determines the optimum combination of crops and livestock to be produced on a typical farm and the optimum combination of inputs to use in the production of the crops and livestock. Farm organizations were developed for the four predominent soil types in Southwestern Oklahoma and for different combinations of land and labor prices, assuming current factor and product

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[20] In the adjustment study a 5 percent opportunity cost was used for capital. Table 13 of the Strickland study gives an average of $116,697 capital investment for adjusted agriculture. The $2,917 is obtained by multiplying $116,697 by 2.5 percent.

prices. Variations in labor cost changed the organizations very little. However, different levels of land price altered the estimated farm sizes considerably. For example, the programmed farm size for the clay soils farm is 701 acres with the current land price. With a 50 percent increase in land price the programmed solution calls for an average farm size of 1896 acres, an increase of 170 percent. [21]

The farm plans used in this study are based on current labor and land prices used. These plans, along with activity budgets, are the main source of information for estimates of the future demand for productive inputs. The adjustment study gives an estimate of the change in farm numbers, and a basis for estimating demand for productive inputs and demand for consumer goods and services by the farm population.

Multiplier Analysis

Aggregate Multipliers

Given the projected changes in the demand for productive inputs and consumer goods and services by the agricultural sector of the economy, how will the nonagricultural sector be affected? Isard suggests the use of multiplier analysis in dealing with questions of this nature. This technique stresses the interrelations of sectors within a regional economy and the spread of changes in economic activity originating in any one sector to all other sectors, either directly or indirectly.[22]

The concept of a multiplier effect in economics was developed by

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[21] Strickland, Appendix B.

[22] Walter Isard, Methods of Regional Analysis: An Introduction to Regional Science (New York, 1960), p. 189.

R. F. Kahn in 1931.[23] The basis of Kahn's analysis is that, given the propensity to consume, it is possible to estimate the quantitative relationship between primary employment and total employment. He demonstrated this by showing how secondary employment would be increased through an increase in public works employment. He stated that an increase in construction employment and in goods and services entering the construction sector would increase the demand for consumer goods and thus cause an increase in secondary employment. Kahn emphasized that leakages in the economic system could keep the process of employment creation from bringing about full employment, thus a static general equilibrium at less than full employment is possible. The leakage results from the portion of the income arising from the increase in primary employment that is not spent (i.e., saved), and is lost to the income stream.

Using the concepts formulated by Kahn, Keynes developed what he called the investment multiplier.[24] Keynes placed the emphasis on the relationship between added investment and added income. He referred to Kahn's multiplier as an employment multiplier, as Kahn dealt with the relationship between basic employment and total employment and the income induced by these two types of employment. Keynes points out that the two multipliers, investment and employment, do not have to be of the same magnitude. However, he stated that

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[23] R. F. Kahn, "The Relation of Home Investment to Unemployment" The Economic Journal, Vol. 41. June, 1931, pp. 179-98.

[24] John Maynard Keynes, The General Theory of Employment, Interest and Money (London, 1960), p. 115.

there would be no great harm done to the facts if it is assumed that the employment multiplier is equal to the investment multiplier.[25]

The basic assumptions of the Keynesian multiplier analysis are: 1) real consumption expenditures are a stable function of real income and 2) the marginal propensity to consume is greater than zero but less than one.[26] These assumptions, in essence, say that when real income increases (or decreases) real consumption will increase (or decrease) but less than income. If the marginal propensity to consume were equal to one, then income and consumption would increase (or decrease) by the same amount. Keynes' investment multiplier is defined as the reciprocal of one minus the marginal propensity to consume.

Boulding developed what he calls the payments multiplier based upon the concept of an increase in total payments that will result from an increase in payments from a single source.[27] This multiplier concept is developed from his Theory of Payments.[28] He developed the payments multiplier using the idea of marginal propensity to spend. The latter concept is somewhat similar to the marginal propensity to consume of Keynes but it takes into account all transactions in the payments system, not just expenditures from income earned from employment.

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[25]Ibid., pp. 115-16.

[26]Gardner Ackley, Macroeconomic Theory (New York, 1961), p. 219.

[27]Kenneth E. Boulding, A Reconstruction of Economics (New York, 1950), pp. 226-28.

[28]Ibid., Chapter 12.

Boulding is critical of the payments multiplier on three counts.[29] The first is that it does not differentiate between payments that are independent of the volume of receipts and those that are dependent upon the volume of receipts. His second criticism is that it does not take into account changes in velocity of money, which is most important in determining total economic activity under the neo-classical quantity theory of money.[30] The third criticism that Boulding has is that the payments multiplier does not take into account effects of the redistribution of the money stock and changes this might have on the marginal propensity to spend. While he is critical of this multiplier for these reasons, he concedes that useful estimates of increases (or decreases) in total economic activity resulting from an increase (or decrease) in expenditures in one sector or a single source can be made.

The main difference between the Boulding payments multiplier and the Keynesian investment multiplier or the Kahn employment multiplier is that Boulding uses gross payments associated with the transfer of assets among sectors in the economy while Keynes and Kahn use only value added by the transfer of assets among sectors.

The Keynesian and Boulding multipliers both show how changes in investment or employment in one sector of the economy will affect total activity of all sectors of an economy. The multiplier enables estimates of a final equilibrium level to be obtained quickly and with a reasonable degree of accuracy. Embodied in multiplier analysis is the

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[29] Ibid., pp. 115-16.

[30] Irving Fisher, The Purchasing Power of Money (New York, 1932).

interdependence of the various sectors of an economy.

Local and Regional Multipliers

Recognition of the concept of the multiplier effect in economics has led to the development of the economic base study and the concept of local or regional multipliers. The concept of an economic base and the resulting multipliers has been widely used in dealing with urban economic problems, particularly with the problem of economic growth and development. A series of 14 articles by Andrews reviews much of the previous work in the area of urban economic base analysis.[31] Andrews discusses the problems associated with measurement, definitions, and uses of the concept in analytical work. In his articles there is no mention of application of the concept to an agricultural region, with agriculture being considered the economic base.

An economic base study done by Palmer, et. al., was made in 12 cities in the Great Plains States.[32] In this particular study, agriculture was assumed to be the largest employer among the basic industries. The purpose of this study was not to trace the impact of changes in one sector of the economy to all other sectors, but rather to observe and compare the multiplier coefficients of the 12 cities. However, agriculture was considered to be a basic industry in the study communities.

Regional or local multiplier studies can be designed to handle any number of variables. The most comprehensive regional multiplier analysis

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[31] Richard Andrews, "Mechanics of the Urban Economic Base," Land Economics, Vol. 29 to Vol. 31. May 1953 - Feb. 1956.

[32] Edgar Palmer, The Community Economic Base and Multiplier. Business Research Bulletin No. 63, (Univ. of Nebraska, Lincoln, Neb., 1958.)

is input-output analysis, which involves division of the regional economy into many sectors, tracing the flows between the sectors and determining the interdependence among these sectors. The simplest regional multiplier analysis is that associated with economic base type studies.[33]

The model developed earlier in this chapter combines features of both economic base analysis and input-output analysis. The multiplier analysis derived from the economic base study is used to introduce changes in the four identity statements in the model. The four identity statements describe the economic interdependence, in aggregate terms, of the various sectors and subsectors of the study area's economy.

The economic base type of analysis is dependent upon the idea that some industries in a region are basic (primary) and some industries are derivative or service (non-basic or residential) industries. The basic industries are those that produce goods and services locally for sale outside the region. The basic industries, by exporting their porducts, provide means of payment for raw materials, food, and manufactured products which are "imported" into the regions. They also support the service or derivative industries which produce goods and services for use within the region.[34]

The multiplier coefficient used in regional multiplier analysis is derived from the ratio of some quantifying measure of the service industries to the basic industries. The unit of measure used in many studies has been employment. Other units of measure that could be used are dollar flow, payrolls, and value added. However, Palmer

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[33] Isard, p. 189.

[34] Ibid., p. 190.

suggests use of employment because changes in employment are closely related to changes in other units of measurement. Also, reliable employment data are generally easier to obtain than reliable data on the other units of measurement.[35] The multiplier coefficient obtained using employment as the unit of measure is the basic-derivative employment multiplier. This multiplier indicates the approximate number of jobs in the derivative industries or firms that one job in the basic industry supports.

The economic base study technique can be used in forecasting future economic activity of a region or city. Andrews[36] lists four basic steps in such a study. The first step is to define and measure the total basic employment in the area. Along with the estimate of basic employment, the total service or derivative employment in the study area is determined. The second step is the calculation of the proportion of basic to derivative employment. The resulting ratio is called the basic-derivative employment multiplier. The third step in using an economic base study for predictive purposes is the estimation of the future trend in each sector of the economic base. The final step is estimation of future employment in the service or derivative industries and estimation of the future population of the region, based upon the future trend in basic employment.

A simple illustration of the above four steps may clarify the use of the concept in prediction. Assume that the total present employment in a region is 2,000. Of the total, 800 persons are employed in the

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[35] Palmer, pp. 47-51.

[36] Andrews, Vol. 29, p. 163.

basic industry of the region, agriculture for example. The remaining persons, 1,200, are employed in service or derivative industries. (The difference between a basic industry and a service industry has been explained previously.) In this same region the total population is 5,000 persons. With the information given, a series of ratios can be established:

		Ratio to Basic as Unity
Basic Employment	800	1.0
Service Employment	1,200	1.5
Total Employment	2,000	2.5
Total Population	5,000	6.25

The ratio of service or derivative employment to basic employment is the basic-derivative employment multiplier. This multiplier indicates how a change in employment in the basic sector of the economy affects employment in the service or derivative sector. The second ratio that is obtained from the data is the ratio of total employment to basic employment. This ratio is the basic-total employment multiplier, which is always one unit larger than the basic-derivative employment multiplier. The two employment ratios, or multipliers, are based on the assumption that there is a constant relationship between employment in basic industries and employment in service industries. In the example, the basic-derivative employment multiplier for present economic activity is 1.5 and the future basic-derivative ratio is assumed to be 1.5 unless something happens to change the basic economic structure of the region.

A third ratio, total population to basic employment, is based upon the assumption that there is a constant relationship between the size of the labor force and population.[37] In the example, the total population - basic employment ratio is 6.25. Another ratio, not presented in the table, is the total population - total employment ratio. In the example this ratio is 2.5, which indicates that each job holder, regardless of which sector he is employed in, supports 2.5 persons including himself.

The above discussion has carried the hypothetical illustration through the first two steps of the four steps in the use of economic base analysis in prediction. The level of employment in the basic industries and the service industries has been estimated. The employment and population multipliers or ratios have been computed based upon current economic conditions, which are assumed normal.

The third step in the analysis is to project the future trend in basic employment. Since the basic employment in the study area in this hypothetical example is agriculture, a 25 percent reduction in farm employment is assumed. This assumption is based upon the extension of past trends in farm employment. Given the initial reduction of 200 jobs in agriculture, the short-run ratios are as follows:

		Ratio to Basic as Unity
Basic Employment	600	1.0
Service Employment	1,200	2.0
Total Employment	1,800	3.0
Total Population	5,000	8.33

[37]Andrews, Vol. 30, p. 48.

Thus the ratios have temporarily increased. The temporary change in the ratios is caused by adjustment lags in the service industries to changes in the basic industry . However, as the service industries adjust to changes in the demand for their products by persons employed in the basic industries--a decrease in the example--employment in the service industries will be reduced. The adjustment in the service industries will continue until the normal ratios are re-established. The re-establishment of the normal ratios is based upon the assumption that, with optimum employment ratios existing, the economy was operating in the most efficient manner before the change in the basic industries took place. Clearly, the level of future ratios could be the subject of intensive research. For example, economies of size for future economic and technological environments can change the "normal" ratio.

The fourth step in the economic base analysis is application of the estimated normal equilibrium ratios to the projected future level of employment in the basic industries to obtain estimates of the future level of employment in the service industries and future population. In the hypothetical illustration the future employment and population estimates are:

		Ratio to Basic as Unity
Basic Employment	600	1.0
Service Employment	900	1.5
Total Employment	1,500	2.5
Total Population	3,750	6.25

The preceeding analysis shows in aggregate terms how a change in employment in one sector of the regional economy affects employment in other sectors and total economic activity in the region.

Use of Multipliers in Interdependence Model

As stated earlier, six of the coefficients in the interdependence model developed in this study are essentially "multipliers." Of the six, b_1 is to be obtained from an economic base analysis. The other five, b_2 to b_6, are to be estimated statistically using data from the study area.

The economic-base multiplier is used to obtain an estimate of the potential change in nonagricultural employment caused by the projected change in agricultural employment. The change in agricultural employment is the initial change in the interdependence model with all other changes in economic activity stemming directly or indirectly from it.

The five statistically determined multipliers appear in equations 2.2, 3.3, and 4.3. The five multipliers are used to determine the affect of the initial change obtained from equation 1.0 on the various sectors of the economy and to project the total impact of agricultural resource adjustment.

The use of multipliers gives estimates of the total change in a variable but does not explain the adjustment path. In this study the total change in economic activity as measured by several variables is of concern, and multipliers give the type of answers desired.

Sources of Data

From the nature of the model developed for this study, it is apparent that a great deal of information regarding personal and gross

income, employment, population, consumption expenditures, and particular types of businesses is needed. The primary source of data for the nonagricultural sectors is County Building Block Data for Regional Analysis: Oklahoma.[38] This material is supplemented with U. S. Census reports for population, retail sales, wholesale sales, selected services, and manufacturing. Also used are the annual Oklahoma sales tax reports of the Oklahoma Tax Commission.[39]

The source of data for the agricultural sector comes from U. S. Census of Agriculture, County Building Block Data for Regional Analysis: Oklahoma and the agricultural adjustment study in the 11 county area done by Strickland.

To obtain information on volume of business needed for survival, a survey of a sample of nonfarm firms was taken in 11 communities in Southwestern Oklahoma (see Figure 3). The towns in which interviews were conducted were selected from a list grouping towns by size. Three towns were selected from each of the four size groups except the largest size, from which two towns were selected. The businesses interviewed were selected from lists of firms obtained from local Chambers of Commerce. The firms were placed in one of eight categories and samples were drawn from each category for each town. The results of these interviews are used to show the adjustment gap in the nonagricultural sector caused by adjustments in the agricultural sector.

The nonagricultural adjustment gap indicates the need for and potential magnitude of resource adjustments in the nonagricultural

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[38] Peach, Poole and Tarver.

[39] Oklahoma Tax Commission. Oklahoma Sales Tax and Use Tax, Annual Reports (Oklahoma City, 1946-47 thru 1963-64.)

sector of the economy in Southwestern Oklahoma.

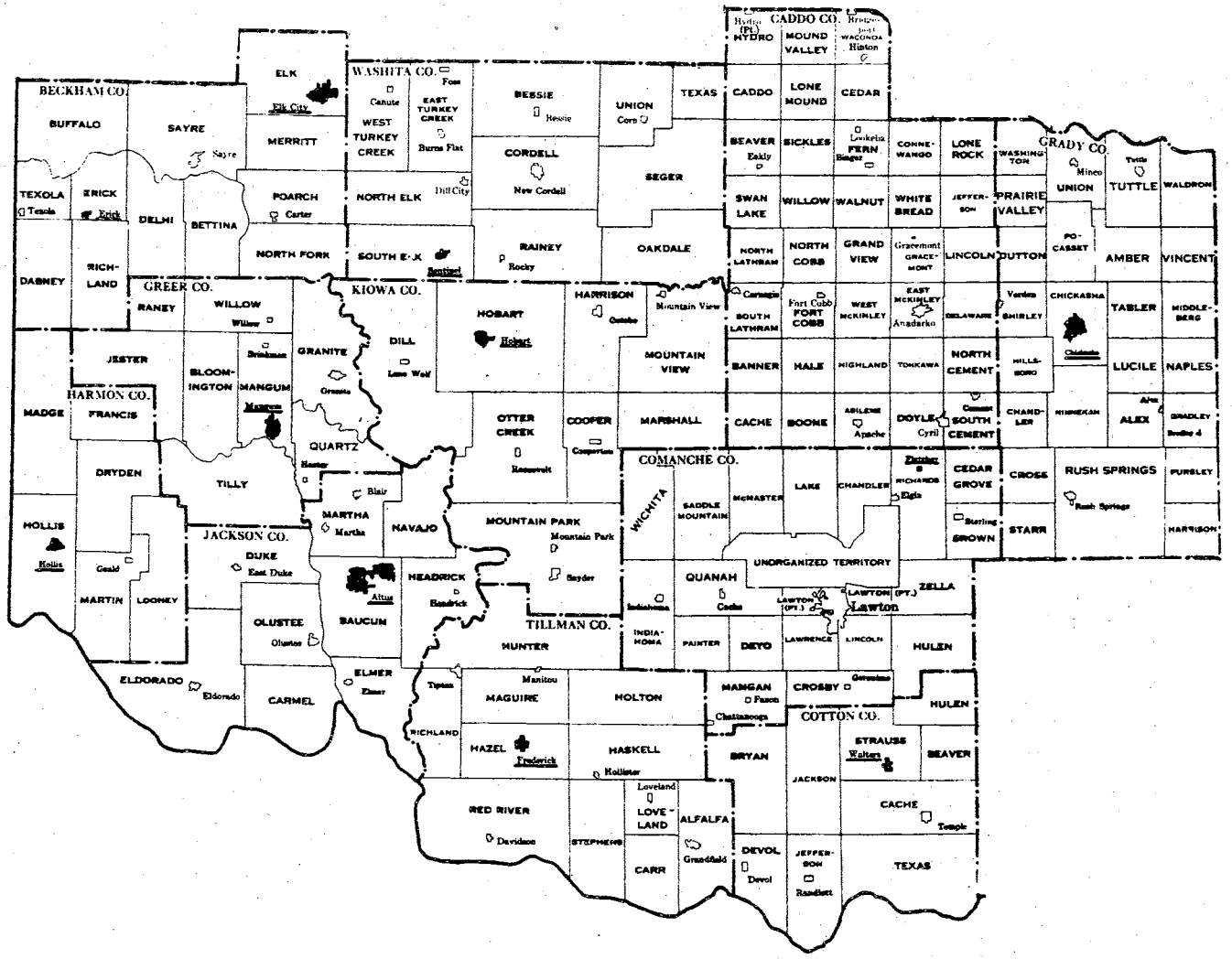

Figure 3. Locations of Interviewed Firms in Southwestern Oklahoma.

CHAPTER III

POTENTIAL CHANGES IN AGRICULTURAL RESOURCE USE

The Nature of Agricultural Adjustment

As stated earlier, the first step in determining the total impact of agricultural adjustments is to examine the magnitude of the projected adjustment in terms of change from the present situation. The present situation in this study refers to 1960-61. This time period is used as the base period from which changes in the agricultural and nonagricultural sectors are measured. There are two reasons for using this base period. First, the agricultural adjustment study was done using 1960-61 as the base period. Second, data on the all variables in the interdependence model are available for 1960. The procedure for estimating the agricultural adjustments was discussed earlier.

By using the results of the Strickland study, an estimate of the future demand for productive inputs can be obtained. It must be emphasized that only one estimate of adjustments that might take place is used. Other estimates can be obtained by changing the income target or other assumptions used in projecting potential adjustments. The estimate of future demand is based on the assumption that the adjustment needed to achieve the $3,000 return to operator's labor and management will take place as hypothesized. Other assumptions are

that farmers will adopt the practices assumed in the adjustment study and that prices and institutions will stay the same.

Only a part of the farms and ranches in Southwestern Oklahoma were included in the Strickland study because the study was limited to the land resources that are capable of producing cash crops without irrigation. The included land resources comprise 72 percent of all the cropland and 58 percent of the farms in the study area (see Table I).

TABLE I

NUMBER OF FARMS AND LAND USE: TOTAL, AND SUBJECT TO ADJUSTMENT: SOUTHWESTERN OKLAHOMA, 1960.

	Total	Subject to Adjustment
Number of Farms	16,060	9,263
Total land	5,347,080	3,204,800
Cropland	3,196,482	2,288,672

Source: Strickland, Table I, p. 12.

Exclusion of ranches is not considered a serious limitation because the land utilized by ranches has few alternative uses in agriculture. Another group of farms excluded from adjusting farms are irrigated farms. These also can be said to be directly tied to a specific land use and the land will continue to be used in this specific manner because of the high cost of land and land preparation. Although much of the land is suitable for irrigation, water for expanded irrigation is a severely limiting factor. For these reasons irrigated farms are assumed to be fixed at their present number and size.

In some cases the farming operation is orientated toward a particular market, such as dairying. The resources used by these farms are expected to remain fairly constant over time in this particular agricultural region, as markets for milk and milk products are rather limited. There are also farms operated by part-time and semi-retired operators. Because of their very nature the number of these farms and the resources used by them are expected to remain fairly constant over time. It is this last group, essentially noncommerical farms, that will be affected least by the adjustment in agriculture.

It is recognized that the number of farms in the four groups above are changing. What is important is that their number is not expected to change because of the adjustment of farm size to attain a given level of returns to operator's labor and management. The farms included in the adjustment study are those not limited to a specific land use or market.

Strickland estimates the number of farms in the area to be 16,060 in 1960. These farms include 5,347,080 acres, of which 3,196,482 acres are cropland. Of this total number of farms, Strickland estimates that 9,263 are of such a nature that they are subject to adjustment of resources and farm organization to attain a $3,000 return to operator's labor and management. The group of farms subject to adjustment include 3,204,800 acres (59 percent of the total acreage in the area) and 2,288,672 acres of cropland. The farms subject to adjustment are 58 percent of the total number of farms and include 72 percent of the cropland (see Table I).

Demand for Productive Inputs

Present Demand

Aggregate demand estimates presented here are made for a "before" and "after" type situation. The classes of inputs given in the budgets of the adjusted agricultural resource use dictate, to a certain extent, the classes of inputs for the before adjustment demand estimate. The basic classes of inputs included in the budgets for the adjusted agriculture are:

1) Fertilizer Materials
2) Feed
3) Seed
4) Machinery
5) Fuel and Lubricants
6) Custom Work
7) Contract Work
8) Labor

The Census of Agriculture, 1959[40] provides data on class 1), 2), 3), 5), and 8) for the eleven counties in the region. The figures for these input classes are given in Table II. The figure for present demand for machinery was synthesized because no specific data could be found for the input class. In estimating the present demand for machinery it was assumed that:

a) The annual depreciation for a basic set of machinery represents the average annual demand for machinery on a given farm.

b) All nonadjusting farms (6,797) use two-row machinery.

c) One-third of the adjusting farms (3,088) use two-row machinery.

d) Two-thirds of the adjusting farms (6,175) use four-row machinery.

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[40] U. S. Department of Commerce, Bureau of the Census, United States Census of Agriculture, 1959 (Washington, 1961).

TABLE II

PRESENT (1960) DEMAND FOR PRODUCTIVE INPUTS AND SERVICES, BY FARMS SUBJECT AND NOT SUBJECT TO ADJUSTMENT, SOUTHWESTERN OKLHOMA.

	Total	Subject to Adjustment	Not Subject to Adjustment
Fertilizer Materials	$2,293,080	$1,651,018	$ 642,062
Lime	4,795	3,452	1,343
Feed	8,594,672	6,188,164	2,406,508
Seed	2,341,135	1,685,617	655,518
Machinery	12,325,364	8,874,262	3,451,102
Fuel	7,124,858	5,129,898	1,994,960
Custom Work	9,206,816	6,628,908	2,577,908
Contract Work	1,145,294	824,612	320,682
Labor Hire	7,831,346	5,638,569	2,192,777
Total	50,867,360	36,624,500	14,242,860

Appendix A, Table I, gives the machinery included in the basic set of machinery, the new cost of both two-row and four-row machines, the useful life of the machine, and the annual depreciation. Multiplying farm numbers by the appropriate annual depreciation and summing gives an estimate of annual expenditure or demand for machinery.

A figure for present demand for contract work is obtained from a paper by Tweeten and Walker.[41]

Since the present demand is based on the total number of farms in the region, and because not all farms are subject to adjustment, the demand figures are reduced by the proportion of cropland adjusting (72 percent of the total). The total demand for productive inputs before adjustment is $48,574,280 (see Table II). The demand for productive inputs by the adjusting farms is $34,973,482.

Future Demand

The estimate of future demand for productive inputs is based on the projected needs of the adjusted agricultural economy. As stated above, the income target for the adjustment is a $3,000 return to operator's labor and management. The method of estimating future demand is lengthy but not particularly difficult, given optimum farm organizations and input requirements for the various enterprises.

Strickland gives optimum farm plans for various returns to operator's labor and management, levels of land price, and levels of hourly labor cost.[42] For this study, plans for the four soil-type farms are

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[41] Luther G. Tweeten and Odell Walker, "Estimating Socioeconomic Effects of a Declining Farm Population in a Sparse Area", Regional Development Analysis. Oklahoma State University (Stillwater, 1963).

[42] Strickland, et. al., Appendix B.

selected using the $3,000 return to operator's labor and management, current land prices,and labor cost at one dollar per hour. In looking at the different farm organizations, varying labor cost by 50 percent will not change the results of the analysis very much. However, changes in land price would affect the result, because farms would be larger and the resource mix would be different to attain the $3,000 return.

Enterprise requirements for farms on the four basic soil types are given in Oklahoma State University Experiment Station Processed Series P-357[43], P-368[44], and P-369[45]. By multiplying the enterprise requirements by the acres in that enterprise for each soil type, multiplying this product by the number of adjusted farms on the soil type, then summing over soil types, an estimate of the demand for various productive inputs for adjusted agriculture is obtained. The results of this computation are shown in Table III. To these figures the demand from nonadjusting farms, which is assumed unchanging for this study, is added to give the total demand for productive inputs after adjustment.

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[43]John W. Goodwin, James S. Plaxico, and William F. Lagrone, Resource Requirements, Costs and Expected Returns: Alternative Crop and Livestock Enterprises: Clay Soils of the Rolling Plains of Southwest Oklahoma (Processed Series P-357, Oklahoma State University [Stillwater, September , 1960]).

[44]Larry J. Connor, William F. Lagrone,and James S. Plaxico, Resource Requirements, Costs and Expected Returns: Alternative Crop and Livestock Enterprises: Loam Soils of the Rolling Plains of Southwest Oklahoma (Processed Series P-368, Oklahoma State University [Stillwater, February 1961]).

[45]William F. Lagrone, Percy L. Strickland, Jr., and James S. Plaxico, Resource Requirements, Crops and Expected Returns: Alternative Crop and Livestock Enterprises: Sandy Soils of the Rolling Plains of Southwest Oklahoma, (Processed Series P-369, Oklahoma State University [Stillwater, February 1961]).

TABLE III

PROJECTED DEMAND FOR PRODUCTIVE INPUTS AND SERVICES BY ADJUSTING AND NONADJUSTING FARMS: SOUTHWESTERN OKLAHOMA.

	By Adjusting Farms	By Nonadjusting Farms	Total Projected Demand
Fertilizer and Lime Materials	$ 3,139,081	$ 643,405	$ 3,781,143
Feed	6,540,269	2,406,508	8,946,777
Seed	3,342,393	655,518	3,997,911
Machinery	4,671,708	3,451,102	8,122,810
Fuel	5,797,238	1,994,960	7,792,198
Custom Work	20,112,000	2,578,000	22,690,000
Contract Work	1,027,842	320,682	1,348,524
Labor Hire	1,117,856	2,192,777	3,310,633
Total	45,748,000	14,243,000	59,991,000

The projected demand for productive inputs by adjusting farms is $45,748,000 and the total demand after adjustment is $59,991,000 (see Table III).

Implications

The results of these estimates of the demand for productive inputs show a net increase in expenditures of about $9 million. In only two of the eight input classes is there a decrease in demand. These two classes, machinery and hired labor, have a combined decrease of $8.7

million. All other input classes show an increase in demand of $17.8 million. The increase in demand for most classes of inputs is to be expected as more intensive farming practices are assumed used in the future. Some of the changes in demand warrant further explanation.

Demand for Machinery

The demand for machinery, as shown in Table II and III, projects a 34 percent reduction in dollars spent. This is due, in part, to the reduction in number of farms and the assumption that all adjusted farms use four-row equipment to approximately full capacity. Four-row equipment costs more per unit, but the individual farm operation will use fewer units. Another source of the reduction is the assumption in the adjustment study that all harvesting is done by custom operators. Thus, the purchase of harvesting machinery does not enter into the projected demand for machinery as shown in Tables II and III, but is included in the demand for custom work.

It is possible to estimate the annual demand for machinery along with demand for fuel that is embodied in the total demand for custom work. Having the total demand for custom work divided in this manner gives more meaningful estimates of the total demand for machinery and fuel under the conditions of adjusted agriculture. Table IV shows the total demand for machinery and fuel from both individual farm operators and from custom operators. The method of obtaining estimates of machinery and fuel demand from the total value of custom work is given in Appendix B. The total decrease in the demand for machinery is $1.6 million when the demand from custom operators is included in the estimate. This is a decline of 11 percent from the present demand.

TABLE IV

TOTAL DEMAND FOR MACHINERY AND FUEL; PRESENT (1960) AND PROJECTED, SOUTHWESTERN OKLAHOMA.

	Present	Projected	Change
Machinery			
Direct	$12,325,000	$8,123,000	$-4,202,000 (-34 o/o)
From Custom Work (Includes trucking)	2,762,000	4,359,000	+1,597,000 (71 o/o)
Total	14,087,000	12,482,000	-1,605,000 (-11 o/o)
Fuel			
Direct	7,125,000	7,792,000	+667,000 (9 o/o)
From Custom Work (Includes trucking)	617,000	967,000	+350,000 (57 o/o)
Total	7,742,000	8,759,000	+1,017,000 (13 o/o)

Demand for Fuel

The projected demand for fuel by farm operators is estimated to increase by nine percent from the present demand. When the demand for fuel by custom operators is added to that of the individual farm operators, the total increase in fuel use is 13 percent more than the present demand. This increase can be attributed to the increased use of mechanical harvesting techniques assumed in the adjustment study.

Demand for Hired Labor

The demand for hired labor is estimated to decrease by 58 percent. The large reduction is due to the fact that the adjustment study calls for mechanical harvesting of cotton, whereas under present conditions

much of the cotton harvest is done by hired labor.

Demand for Custom Work

The projected decrease in the demand for hired labor is somewhat misleading, in that labor is hired by the custom operator to run the machines. The labor hired by custom operators is not included with the hired labor data. Because of the restriction that all harvesting is done by custom operators, the projected demand for custom work shows an increase of 146 percent above the current demand.

Demand for Contract Work

The projected demand for contract work shows an increase of about 18 percent above the present demand. Contract work is essentially hired labor that is paid on a per acre basis rather than on a per-hour, per-day, per-week or per-month basis. Table V shows the demand for labor stemming from custom work, contract work, and hired labor for the present and projected situation. The demand is given in terms of hours of labor needed. See Appendix B for the method of estimating the hours of labor in custom work. The hours needed is converted to full-time man-units assuming a hired man works 2,500 hours.

Total Demand for Hired Labor

Table V indicates that under the present situation 5,363 full-time man-units of hired labor are demanded while under the projected situation 4,818 full-time man-units are demanded. This is a reduction of 545 full-time man-units, or a 10 percent reduction in the total demand for hired labor.

The estimated decrease in the demand for hired labor is a minimum reduction. It is assumed that all labor that cannot be provided by the operator is hired. Table VI shows the seasonal demand for labor by the

four basic soil-type farms of the adjustment study and the total full-time men needed to fill these seasonal demands. The table shows a need for 54 full-time men between January 1 and April 30 and 1,504 between May 1 and July 31, with no additional labor needed at other times during the year. Since the heavy demand for additional labor comes in the early summer, it is not unrealistic to assume that part of it can be met with other family labor; i.e., children home from school.

TABLE V

HIRED AGRICULTURAL LABOR, PRESENT (1960) AND PROJECTED, SOUTHWESTERN OKLAHOMA.

	Present		Projected	
	Hours	*FTE	Hours	*FTE
Custom	1,681,588	673	4,144,238	1658
Hired	7,831,346	3132	3,310,633	1324
Contract	894,000	1558	4,590,320	1836
Totals	13,406,934	5363	12,045,191	4818

*FTE = full-time equivalents.

If it is assumed that part of the additional labor requirement is met with family labor, the estimate of the demand for hired labor can be reduced by another 700 or 800 men. (Here it is assumed that one-half of the required labor is supplied by family labor.) Thus the total decrease in demand for hired labor could very easily be 1,350 full-time men.

TABLE VI

PROJECTED HIRED AGRICULTURAL LABOR BY SEASONS, SOUTHWESTERN OKLAHOMA.

	Jan.-April (Hours)	May-July (Hours)	Aug.-Sept. (Hours)	Oct.-Dec. (Hours)	No. Farms
Sandy	----	129,000	----	----	1382
Clay	----	353,000	----	----	1209
Level Loam	----	70,335	----	----	1387
Rolling Loam	83,562	446,444	----	----	529
Total Hours[1]	44,436	938,079			
	54 FTE[2]	1504 FTE[2]			

[1]Requirement times number of farms.

[2]Full time equivalents.

Demand for Seed

The estimate for future demand for seed is $1.66 million greater than the present demand. This increase is due partly to the assumption that under adjusted agriculture all seed is purchased, while under present conditions some operators grow their own seed. However, through wider use of hybrids and improved varieties, the demand for purchased seed will no doubt increase.

Demand for Fertilizer

The projected demand for fertilizer is estimated to be $1.48 million greater than the present demand. The increase in the quantity of fertilizer used is to be expected as farm operators attempt to increase

productivity.

Summary

The productive inputs can be grouped as those sold and not sold at retail outlets. Included in the inputs sold at retail are feed, seed, fertilizer, machinery, and fuel. Productive inputs not sold at retail are hired labor, contract work,and custom work. With this type of breakdown a more meaningful indication of changes in demand is obtained. Table VII gives this grouping of the eight input classes that have been dealt with to this point.

TABLE VII

PRESENT (1960) AND PROJECTED DEMAND FOR AGRICULTURAL PRODUCTIVE INPUTS AND SERVICES FROM RETAIL FIRMS AND OTHER SUPPLIERS, SOUTHWESTERN OKLAHOMA.

	Present	Projected	Change
INPUTS SOLD AT RETAIL			
Feed	$ 8,595,000	$ 8,947,000	$ + 352,000
Seed	2,341,000	3,998,000	+1,657,000
Fertilizer	2,298,000	3,781,000	+1,483,000
Machinery	14,087,000	12,482,000	-1,605,000
Fuel	7,747,000	8,759,000	+1,017,000
Totals	35,068,000	37,967,000	+2,899,000 (8.3 %)
INPUTS NOT SOLD AT RETAIL			
Hired Labor	7,831,000	3,311,000	-4,520,000
Contract Work	1,145,000	1,349,000	+ 204,000
Custom Work[1]	6,828,000	17,364,000	+10,541,000
Totals	15,799,000	22,024,000	+ 6,225,000 (39%)

[1]Value of machinery and fuel taken out.

The total demand for inputs sold at retail shows an increase of $2.9 million or 8.3 percent of the present demand for these items. This is a small increase in terms of the total volume of retail, wholesale, and service firms who make such sales. The present volume of business in retail and wholesale sales and services is $423,952,000. The increase in demand for productive inputs sold at retail is only 0.7 percent of the total volume of trade.

The projected demand for productive inputs not sold at retail shows an increase of $6.2 million, a 39 percent increase from the present demand for these inputs. The demand for custom services is estimated to increase by $10.5 million. Labor is the main input not sold at retail. The change in the total demand for hired labor, which includes custom and contract workers as well as hired men, is about 1,350 full-time men (a decrease from 5,360 to 4,010).

In summary, the direct effects of the projected agricultural adjustments are 1) an increase in demand for productive inputs sold at retail of $2.9 million with 2) an increase of $6.2 million on inputs not sold at retail for a total increase in demand of $9.1 million. The demand for hired labor decreased by 1,350 men. This decrease, along with the reduction in farm numbers of 4,760, implies a reduction in agricultural employment of 6,110 persons. The projected total demand for productive inputs, agricultural employment, and agricultural population are used as the predetermined variables in Chapter V. The reduction in agricultural employment led to a decline in the agricultural population of 19,400 (3.19[average family size] times- 6110).

CHAPTER IV

ESTIMATION OF INTERDEPENDENCE COEFFICIENTS AND MODEL

In this chapter the interdependence and multiplier coefficients of the model developed in Chapter II are determined. In the system of equations, eight coefficients are to be estimated. The eight coefficients are estimated independently, but the results of one equation are used in the solution of subsequent equations.

Estimating Techniques

Three techniques are used in estimating the coefficients in the model. Least-squares regression is used to estimate five of the coefficients.[46] Simple averages are used for two coefficients. The eighth coefficient is estimated using the basic-derivative multiplier concept. It would be preferable to use least-squares regression estimates for all coefficients so that levels of statistical significance can be given, but suitable data are not available.

Both time series and cross sectional data are used in the regression estimates. The cross sectional data are observations across counties for a given year. The time series data are observations from each county for a series of years. Cross sectional and time series data are

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[46] For a complete discussion of regression techniques in economics, see Chapter I of Econometric Methods by J. Johnston, McGraw-Hill Book Company, Inc., 1960.

available for all variables in the model except for the division of consumption expenditures into farm and nonfarm consumption. The inability to obtain reliable data on farm family and nonfarm family consumption expenditures led to the use of simple averages in estimating the per capita consumption expenditures of these two groups.

Coefficient Estimation

Least-squares Regression Estimates

The five interdependence coefficients obtained by least-squares regression were estimated in three ways: 1) using data from all eleven counties, 2) using data from all counties except Comanche, which includes a very large military base, and 3) using data from the eight counties with the highest percent of the population classified as rural. The three estimates of each coefficient were made to see if: 1) a large military base influences the coefficients, and 2) if more urbanization influences the coefficients. The data used in the regression estimates are presented in Appendix D.

Table VIII gives the estimates of the five coefficients obtained by least-squares regression. The results indicate that the interdependence coefficients are influenced by the presence of the large military base. The elimination of more urbanized counties (eight county estimate) from the estimate does not appear to change the estimates a great deal from the ten county estimates. The ten county estimates have lower R^2 values than the eleven county estimates, indicating that a smaller proportion of the variation in the dependent variables is accounted for by variation in the independent variables. However, the ten county estimates appear to give a more realistic picture of the economic interdependence

TABLE VIII

ESTIMATES OF FIVE INTERDEPENDENCE COEFFICIENTS USING THREE ALTERNATIVE COUNTY GROUPINGS FOR SOUTHWESTERN OKLAHOMA[1]

Equation[2]	11 Counties	10 Counties[3]	8 Counties[4]
(A) $L_5 = a_4 + b_4 P$	$\hat{L}_5 = 946.23 + 0.051 P$ $m = 22 \quad t = 18.42$ $R^2 = .944$	$\hat{L}_5 = 34.07 + 0.034 P$ $m = 20 \quad t = 7.73$ $R^2 = .768$	$\hat{L}_5 = 86.63 + 0.030 P$ $m = 16 \quad t = 5.95$ $R^2 = .717$
(B) $L_3 = a_3 + b_3 C$	$\hat{L}_3 = -54.28 + .100 C$ $m = 22 \quad t = 26.30$ $R^2 = .972$	$\hat{L}_3 = -6.24 + .098 C$ $m = 20 \quad t = 11.47$ $R^2 = .880$	$\hat{L}_3 = 8.45 + .092 C$ $m = 16 \quad t = 11.99$ $R^2 = .911$
(C) $P_2 = a_2 + b_2 L_2$	$\hat{P}_2 = 20,347 + 4.654 L_2$ $m = 11 \quad t = 15.48$ $R^2 = .964$	$\hat{P}_2 = 820 + 3.192 L_2$ $m = 10 \quad t = 7.15$ $R^2 = .965$	$\hat{P}_2 = 120 + 3.317 L_2$ $m = 8 \quad t = 8.71$ $R^2 = .927$
(D) $Y_5 = a_6 + b_6 P$	$\hat{Y}_5 = -17.224 + 1.160 P$ $m = 22 \quad t = 9.921$ $R^2 = .831$	$\hat{Y}_5 = -743 + 0.214 P$ $m = 30 \quad t = 1.94$ $R^2 = .172$	$\hat{Y}_5 = -31 + 0.106 P$ $m = 16 \quad t = 4.20$ $R^2 = .558$
(E) $Y_3 = a_5 + b_5 C$	$\hat{Y}_3 = 9402 + 0.152 C$ $m = 22 \quad t = 9.17$ $R^2 = .807$	$\hat{Y}_3 = 2045 + 0.203 C$ $m = 20 \quad t = 7.51$ $R^2 = .758$	$\hat{Y}_3 = 951 + 0.254 C$ $m = 16 \quad t = 7.20$ $R^2 = .787$

[1]See Appendix D for sources of data for each parameter estimated.

[2]Equation notation is explained on page 17.

[3]Excludes Comanche County.

[4]Excludes Comanche, Jackson and Grady Counties for equations (A), (B), (C), and (E) and excludes Comanche, Jackson and Washita Counties in equation (D).

of the agricultural and nonagricultural sectors of the study region with one exception. In estimating the relationship between total population and personal incomes to governmental employees, the eight county estimate is used. This is done to eliminate the influence of military payrolls on the coefficient, b_6.

Comanche County is excluded from the estimates of the interdependence coefficients because Fort Sill and the activity associated with the installation is the major source of economic activity in the county. Approximately 25,000 men are stationed at Fort Sill, which comprises over 25 percent of the population and 50 percent of the total labor force in the County. With such a large part of the labor force and population dependent upon the activities of Fort Sill, inclusion of Comanche County in the estimation of coefficients will give results that do not reflect the typical economic flows within the remainder of the study area.

Two other counties in the study area, Jackson and Washita, also have military installations. However, these bases are considerably smaller than Fort Sill and over 20 percent of the population in both counties is considered rural. The economic activity of these two counties is not as dependent upon the military bases as is economic activity in Comanche County, and the basic industry in both counties is agriculture.

Population-Government Employment Multiplier

The first coefficient estimated (b_4) shows how government employment and population changes are related (Equation A, Table VIII). Government employment refers to persons employed by all levels of government, such as school teachers, police and fire protection, public service workers, public administrators at all levels and highway

department workers.

In the model, the functional relationship between government employment and total population is

$$(A) \quad L_5 = a_4 + b_4 P \ .$$

The estimated values for a_4 and b_4 are 34.070 and 0.034 respectively. Thus, the functional relationship becomes

$$\hat{L}_5 = 34.070 + \underset{(7.73**)}{.034}\ P \ . \qquad R^2 = .768$$

The number in parentheses is the t-value. One asterisk indicates that the estimated value is significantly different from zero at the 95% confidence level and two asterisks indicate that the estimated value is significantly different from zero at the 99% confidence level. This notation will be used with all coefficients estimated by least-squares regression. The R^2 following the equation is the coefficient of determination.

The estimate of b_4 ($\hat{b}_4 = .034$) indicates that for every change of 1,000 in total population, the number of governmental employees changes by 34 in the same direction. Because the need of so many governmental employees, such as school teachers and public service workers, is related to population this decline is to be expected. Government employment in the study area is approximately 11 percent of total nonfarm employment.

The functional relationship between population and government employment was estimated using only post World War II data from ten of the study counties. There are 20 observations included in the estimate, ten from 1950 and ten from 1960. During the post World War II period, governmental agencies have undertaken many activities that previously

were not considered within their scope. Including data for the pre-war years would have introduced into the estimate of the coefficient philosophies of government that are not presently practiced. Projections with such a coefficient would give misleading guides as to future levels of economic activity in the region in so far as governmental action is concerned.

Expenditure-Employment Multiplier

The second coefficient estimated (b_3) is the relationship between employment in retail, wholesale, and service firms and the volume of sales of these types of firms in the area (Equation B, Table VIII). The relationship gives an estimate of the number of employees needed per dollar of sales and indicates how employment varies with changes in the volume of consumption expenditures.

In the model the relationship between employment and volume of sales in retail, wholesale, and service firms is

$$(B) \quad L_3 = a_3 + b_3 C \text{ .}$$

The estimated values for a_3 and b_3 are $\hat{a}_3 = -6.24$ and $\hat{b}_3 = 0.098$. Thus the estimating form of the relationship becomes

$$\hat{L}_3 = -6.24 + \underset{(11.47^{**})}{0.098C} \text{ .} \qquad R^2 = .880$$

The results of the estimate indicate that for every change of $1,000,000 in consumption expenditures, employment in retail, wholesale, and service firms will change by approximately 98 persons in the same direction.

Twenty observations were used in computing $\hat{b}_3$. The years included are 1950 and 1960. Observations were made on L_3 and C in each of the ten counties for both years.

Nonagricultural Employment - Population Multiplier

The third coefficient (b_2) estimated by least squares regression is the relationship between the nonfarm labor force and the nonfarm population (Equation C, Table VIII). The coefficient, essentially family size of nonfarm families, indicates the number of people in the nonfarm population each worker in the nonagricultural sector supports. Included in the nonfarm population that the nonfarm labor force supports are retired persons as well as the workers' own families.

The relationship between nonfarm employment and nonfarm population appears in equation 2.2 of the model. The relationship is

$$(C) \quad P_2 = a_2 + b_2 L_2 .$$

In this equation $\hat{a}_2$ is 820.024 and $\hat{b}_2$ is 3.192. The estimating equation for the relationship is

$$\hat{P}_2 = 820.02 + \underset{(7.15**)}{3.192}\, L_2 . \qquad = \qquad R^2 \quad .965$$

The estimate for b_2 indicates that for every change of 100 in the nonfarm labor force, the nonfarm population will change by approximately 319 persons in the same direction.

In estimating b_2 observations were taken on the ten counties for only one year because the percent of the population over 60 years old has been increasing in the past 20 years and a time series estimate of the coefficient would be misleading.[47] Using only the cross sectional data, the problem of the increasing percent of the population past 60 is reduced.

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[47] See Appendix D, Table 3.

Population Governmental-Personal Income Multiplier

The fourth coefficient estimated relates governmental income to total population (Equation D, Table VIII). The estimated coefficient (b_6) shows the marginal governmental personal income per capita. Governmental personal income, as used in this study, includes all wages and salaries paid to governmental employees, for all levels of government.

The relationship between governmental income and population appears in equation 4.3 of the model:

$$(D) \quad Y_{p_5} = a_6 + b_6 P.$$

The estimated values for a_6 and b_6 are -31 and 0.106 respectively. Thus, the estimating equation is

$$\hat{Y}_{p_5} = -31 + \underset{(4.20**)}{0.106\ P}. \qquad R^2 = .558$$

The estimate $\hat{b}_6 = 0.106$ indicates that for every unit change in population, governmental personal income will change by approximately $106 in the same direction.

In estimating b_6 only post World War II data were used as was done for the estimate of b_4 in equation 3.2. Using data from 1950 and 1960 allows $\hat{b}_6$ to show how governmental personal income has been changing with population in the post war period.

Expenditure - Personal Income Multiplier

The last coefficient estimated by least-squares regression is the relationship between personal income received by employees and proprietors and total volume of sales in the retail, wholesale, and service firms (Equation E, Table VIII). The coefficient estimated (b_5) shows the percent of gross sales that is personal income for firms selling consumption goods and services.

The relationship between personal income and total volume of sales in retail, wholesale, and service firms is

$$(E) \quad Y_{p_3} = a_5 + b_5 C \text{ .}$$

The estimated values for a_5 and b_5 are 2045 and 0.203 respectively. The estimating equation for the relationship becomes

$$Y_{p_3} = 2045 + \underset{(7.51^{**})}{0.203\ C} \text{ .} \qquad R^2 = .758$$

The results of the estimate ($\hat{b}_5 = 0.203$) indicate that, at the margin, 20.3 cents of each dollar spent on consumption goods and services goes to personal income of people working in retail, wholesale, and service firms. There are 20 observations in the estimate, one for each of the 10 counties for 1950 and 1960. Post war years were used in order that $\hat{b}_5$ might reflect newer sales methods which have been adopted in recent years.

Per Capita Consumption Expenditures

Two of the interdependence coefficients are averages based upon one year. The coefficients estimated in this manner are b_7 and b_8, appearing in equation 5.2 of the model. The coefficients b_7 and b_8 represent the per capita expenditures on consumer goods and services by agricultural and nonagricultural consumers respectively.[48] Equation 5.0 of the interdependence model includes three sources of expenditures: 1) expenditures on agricultural productive inputs and services (C_1); 2) expenditures on consumer goods and services by agricultural families (C_2); and 3) expenditures on consumer goods and services by nonagricultural families (C_3). Available time series and cross sectional data on

[48] Consumer items include food; shelter; household operations, furnishings, and equipment; personal and medical care; recreation; reading; education; miscellaneous personal items; and transportation.

consumption do not differentiate between the three sources. Thus, it is necessary to allocate the total consumption expenditure among the three sources and determine the two per capita consumption levels on the basis of the allocation. For the purpose of this study, consumption expenditures on productive inputs by agriculture enters the interdependence model as a predetermined variable. The present and projected demand for productive inputs was estimated in Chapter III.

The Bureau of Labor Statistics gives data on nonfarm consumption expenditures in this general region.[49] The per capita consumption expenditures for nonagricultural families (b_8) is calculated to be $1290 with total consumption expenditures being approximately $285,528,000.[50] Personal income of the nonfarm population is given as $361,429,000.

Consumption expenditures by farm families is estimated in a manner similar to that used in estimating nonfarm family consumption. The Bureau of Labor Statistics data are used as the basis of the estimate but they are adjusted where farm consumption expenditures are suspected to be different than nonfarm consumption.[51] The farm per capita

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[49] United States Department of Labor, Bureau of Labor Statistics, Consumer Expenditures and Income, Small Cities in the Southern Region B.L.S. Report No. 237-75 (Washington, April 1965).

[50] See Appendix E for the method of calculating the per captia consumption expenditures for this region.

[51] Farm consumption expenditures are expected to be less on food, housing, and transportation. In estimating farm family consumption expenditures the Bureau of Labor Statistics data are adjusted in the following manner:

Food expenditures reduced approximately $150.
Housing expenditures reduced approximately $100.
Transportation expenditures reduced approximately $100.

consumption expenditure (b_7) is estimated to be \$1180.[52] The personal income of farm families is given as \$53,769,000.

With the estimates $\hat{b}_7$ and $\hat{b}_8$ equation 5.2 can be written as follows:

$$\hat{C} = C_1 + \$1180P_1 + \$1290\ (\hat{P}_2 + P_3) \ .$$

Basic-Derivative Ratio Estimate

The employment multiplier (b_1) in equation 1.0 is derived from an economic base analysis of the study area. The technique of estimating a basic-derivative ratio or a basic employment multiplier from an economic base study was discussed in Chapter II.

The first step in determining the basic employment multiplier to be used in equation 1.0 was to delineate the basic and service industries. Three industries in the study area can be considered basic.[53] They are agriculture, mining, and manufacturing. The local demand for the final product of these three industries is negligible; thus, their products must be exported from the region. All other industries in the study area are considered service industries because their products are consumed within the region. The industries included in the service sector of the economy are retail, wholesale, and service firms and the various governmental agencies, excluding defense.

In the estimation of the basic employment multiplier, employment data from the Census of Population for nine of the eleven counties of the study area were used. The nine counties included in the estimate have the highest percentage of total population classified as rural. In the

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[52]See Appendix E for method of obtaining the per capita consumption expenditures for farm families.

[53]A basic industry has been previously defined as one that "exports" its product to provide a means for payment for raw materials and manufactured products which are imported and support the local service activities.

two excluded counties, Comanche and Jackson, there are large military bases. The service industries in these two counties receive a large volume of trade from personnel of the bases. Having a larger portion of trade originating from a source such as a military installation tends to give a basic employment multiplier that is higher than the ratio for the entire area. By excluding these two counties, an economic force which is not typical of the area as a whole is eliminated from the estimate of the multiplier. This is not to say that the two military installations are not important sources of economic activity within the region. The procedure simply excludes their influence from the coefficients that are used in estimating potential changes in economic activity. The future of the military bases is not dependent upon survival in an economic sense, but is controlled by decisions pertaining to national defense. The installations can be closed partially or completely by the stroke of a pen, as was done in 1965 to a base in Southwestern Oklahoma.

The 1960 employment data for the eleven counties in the study area are given in Table IX. Also presented are basic-derivative and basic-total employment ratios for the eleven counties. The ratios are obtained by dividing derivative and total employment by basic employment. The ratio of interest for use in equation 1.0 is the basic-derivative employment ratio or multiplier.

The basic-derivative ratio based on employment data for nine counties, excluding Comanche and Jackson from the total of eleven, is 1.82. The ratio indicates that, in 1960, each 100 jobs in basic industries in the study area supported 182 jobs in the service industries. This implies that if the ratio of basic to service or derivative

TABLE IX

TOTAL, BASIC, AND DERIVATIVE EMPLOYMENT[1] AND RATIOS BY COUNTY, SOUTHWESTERN OKLAHOMA, 1960.

County	Total Employment	Basic[2] Employment	Derivative[3] Employment	Derivative Basic	Total Basic
Beckham	6,159	1,822	4,337	2.38	3.38
Caddo	8,734	3,285	5,449	1.66	2.66
Cotton	2,487	929	1,558	1.68	2.68
Grady	10,048	3,232	6,816	2.11	3.11
Greer	2,995	956	2,039	2.13	3.13
Harmon	2,004	840	1,164	1.39	2.39
Kiowa	4,875	1,672	3,203	1.92	2.92
Tillman	4,670	1,818	2,852	1.57	2.57
Washita	4,616	1,971	2,645	1.34	2.34
Nine County Total	46,588	16,525	30,063	1.82	2.82
Comanche	19,733	2,318	17,415	7.51	8.51
Jackson	7,378	1,720	5,658	3.29	4.29
Two County Total	27,111	4,038	23,073	5.71	6.71
Eleven County Total	73,699	20,563	53,136	2.58	3.58

[1]U. S. Department of Commerce, Bureau of the Census, Census of Population, 1960, Vol. 1, Part 38, Oklahoma (Washington, 1961).

[2]Includes employment in agriculture, mining, and manufacturing.

[3]Includes all other employment, except for military personnel.

employment remains the same in the future a reduction of 100 jobs in agriculture will eventually reduce the number of jobs in the nonagricultural sector by 182.

The basic-derivative employment ratio was also estimated for 1950. Table X gives the total, basic, and derivative employment for the same nine counties used in estimating the 1960 ratio.

TABLE X

BASIC, DERIVATIVE, AND TOTAL EMPLOYMENT[1] AND RATIOS, NINE COUNTIES,[2] SOUTHWESTERN OKLAHOMA, 1950.

	Number	Ratio With Basic as Base
Basic Employment	26,612	1.00
Derivative Employment	29,034	1.09
Total Employment	55,646	2.09

[1]U. S. Department of Commerce, Bureau of the Census, Census of Population, 1950, Vol. I, Part 36 (Washington, 1952).

[2]Beckham, Caddo, Cotton, Grady, Greer, Harmon, Kiowa, Tillman and Washita.

In 1950 the basic-derivative employment ratio was 1.09, 0.73 less than the same ratio in 1960. Andrews lists several factors that can cause changes in the basic employment multipliers in urban areas.[54] Applying his concepts to an agricultural region, there are six possible sources of changes in the basic employment multiplier in Southwestern

[54]Andrews, Vol. 31, pp. 144-155, 245-236 and 361-371.

Oklahoma. They are:

1) Substitution of capital or purchased inputs for labor in agriculture.

2) Demand for additional services embodied in consumer goods.

3) Changes in tastes and preferences of consumers.

4) Slowness in adjustment by retail firms to changes in volume of trade in the short run.

5) Increases in retired population.

6) Increasing number of people living in the study area having jobs outside the study area.

While not any single reason may explain the change completely, the combined effect could be the increase from 1.09 in 1950 to 1.82 in 1960.

The employment data presented in Table IX and X indicate that total employment in the nine counties included in the basic-derivative employment ratio has declined by approximately 9,000 between 1950 and 1960, while derivative employment has increased by 1,000 jobs. Thus, agricultural or basic employment has declined by 10,000 jobs in the ten year period. The reduction in agricultural employment may have been caused by the substitution of capital for labor in the production process. The substitution enables one farmer to handle more acres, which increases farm size and reduces the number of farms. As the individual farm operator uses more purchased inputs per acre he creates additional demand for the purchased factors of production. The increased demand for the purchased inputs and services causes the firms selling the items to hire additional personnel to meet the additional trade. The result of the above actions tends to increase derivative employment as the basic employment declines.

The increased use of capital inputs with labor makes each unit of labor more productive. The increase in productivity of agricultural labor is what Andrews calls a qualitative change in basic employment.[55] A qualitative change in basic employment can cause a permanent change in the economic base, "permanently" altering the basic-derivative employment multiplier. In Southwestern Oklahoma, the substitution of capital for labor could have caused the increase in employment in the derivative industries while employment in agriculture, a basic industry, declines. Thus, the ratio of derivative to basic employment increases.

A second factor that tends to increase the basic employment multiplier is the increasing demand by all consumers for additional services with the items they purchase. A change in tastes and preferences and an increased demand for services comes about, in part, with higher personal incomes. As personal income increases, consumers purchase more services with each item and purchase goods that they previously could not afford. The increased use of capital inputs by agriculture is a result of attempts to increase personal incomes by farm operators. The farm family then spends the additional income on items that involve the additional services mentioned above. Also, the increased use or purchased or capital inputs by agriculture tends to increase the personal incomes of those involved with the sales and services of the items. The result tends to be higher employment in the derivative industries, which causes an increase in the basic-employment multiplier.

A third factor that changes the employment multiplier is the

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[55]Andrews, Vol. 31, p. 145.

slowness of retail firms to adjust to declining sales. The slowness of adjustment could be attributed to lack of knowledge or "the American optimism" about the future. The result of such optimism is that firms tend to maintain their sales people at higher levels than is economically rational, and derivative employment remains high as basic employment declines.

Other causes of changes in the basic employment multiplier have a similar effect. Increasing numbers of retired people in the area will cause the basic employment multiplier to increase. Retired people leave the labor force but continue to make purchases from the derivative industries. The net effect of the increase in the retired population is that derivative employment may remain approximately the same as people retire although basic employment may decline. A final factor that might cause a change in the basic employment multiplier is persons living and making purchases in the area supporting employment in the derivative industries, but having a job in another area.

The above factors are potential sources of change in the basic employment multiplier. The presence of such forces indicates that the multiplier is not a stable relationship, but is constantly changing. In Chapter II it was demonstrated that, given a stable ratio in the long run, the ratio will be variable in the short run.

The basic employment multiplier derived using employment data for 1960 will be used in lieu of the 1950 data. The main reason for the choice is that the 1960 data are the most recent available employment data, thus, current employment conditions are reflected in the multiplier. Thus, b_1 in equation 1.0 of the interdependence model is

estimated to be 1.82.[56] Clearly, other ratios could be considered to obtain a range of adjustment estimates.

Estimating Model

At this point, the interdependence model can be written in its estimated form as the eight interdependence coefficients have been estimated. The estimating forms (including values for the b_i in estimating equations) are

$$(1.0)\quad \hat{\Delta L}_2 = 1.82\Delta L_1,$$

$$(2.2)\quad \hat{P} = P_1 + (P_2 + 3.19\ \Delta L_2) + P_3,$$

$$(3.3)\quad \hat{L} = L_1 + (L_3 + .098\,\Delta C) + L_4 + (L_5 + .034\,\Delta P),$$

$$(4.3)\quad \hat{Y}_p = Y_{p_1} + (Y_{p_3} + .203\,\Delta C) + Y_{p_4} + (Y_{p_5} + .106\,\Delta P) + Y_{p_6} \text{ and}$$

$$(5.2)\quad \hat{C} = C_1 + 1180P_1 + 1290\,(\hat{P}_2 + P_3).$$

In the estimated form, the intercept coefficients estimated by regression have not been included. They are omitted because the model is concerned with only a small portion of the total relationship between variables. The five coefficients that have intercepts associated with them were all determined by linear regression. The R^2 values in all but one estimate indicate that between .75 and .85 percent of the change in the dependent variable is explained by the independent variable for the range that was dealt with (see Table VIII). It is quite possible

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[56] In an unpublished study by Charles H. Little at Oklahoma State University in 1966, a basic employment multiplier for Western Oklahoma is estimated to be 1.84, supporting the employment multiplier of 1.82 used in this study. Little's estimate is made using simple linear regression, forcing the regression line through the origin. While the technique is different, his classification of employment into basic and service industries is essentially the same.

that for the entire range of values none of the relationships estimated are linear, but may be of some other form. However, for the purpose of this study, and because only a small segment of the entire range is being considered, the linear regression estimate of the five coefficients is used. The intercept terms are not included in the estimated form of the model for the above reasons.

The next step in the analysis is to determine the initial changes in the exogenous variables, and relate the initial changes to the endogenous variables through the estimated form of the interdependence model. In the next chapter this will be done. Results in the following chapter indicate the total impact of agricultural adjustments on the nonfarm economy.

CHAPTER V

POTENTIAL CHANGES IN TOTAL ECONOMIC ACTIVITY

This study is attempting to determine what effect agricultural resource adjustments will have on total economic activity in a rural area. The exact magnitude of future economic activity and the length of time required to reach the projected level are dependent upon the speed of the agricultural adjustments and their magnitude. No attempt is made to specify timing of the projected adjustments.

It must be emphasized that the projection of future demand for productive inputs and consumer goods by the agricultural sector is based upon a study that measures the adjustment gap in agriculture. The projected demand by agriculture is based upon agriculture adjusting to the situation described by Strickland's results for the $3,000 returns to operator's labor and management. If the adjustments occur as indicated in Strickland's study, then the demand for productive inputs and consumer goods by agriculture will be at various specified levels. The estimate, or projection, of the magnitude of the impact of agricultural adjustments on the nonagricultural sector is dependent upon the validity of the adjustment estimate and how well the interdependence model approximates the economic relationships in the study area.

In this chapter the impact of projected agricultural adjustments on the total economy of Southwestern Oklahoma is estimated. All projections

are based upon the estimated agricultural adjustments required to attain the goal of a $3,000 return to operator's labor and management. The magnitude of the agricultural labor force and changes in the demand for productive inputs used by agriculture was estimated in Chapter III. Chapter IV dealt with the estimation of the interdependence model for the study area. The problem now is to determine how the projected changes in the agricultural sector of the economy will affect economic activity in the nonfarm sector of the economy for the eleven county study area. The total economic effect of the change in agricultural resource use is estimated with the interdependence model.

Economic Base Multipliers and Total Changes In Economic Activity

One possible method of determining the total effect of agricultural resource use adjustments on economic activity in the study area is to use the multipliers derived from the economic base analysis of the area. This method is an alternative to the interdependence model. The difference between the two estimating methods is that the multipliers used in the economic base analysis are developed from simple employment and population ratios, while the multipliers in the interdependence model are functional relationships between economic variables. The two methods give the same projected total change in the economic variable being considered, either directly or indirectly. However, the interdependence model indicates the change in the variables for each sector and subsector. The economic base analysis gives only the total change.

Again, the underlying assumption of economic base studies is that there are sympathetic movements in derivative employment and total

population to changes in basic employment. The ratios, or multipliers, obtained from the economic base analysis indicate the magnitude of sympathetic adjustments to changes in the base.

The two basic multipliers needed to determine the total economic impact of agricultural resource use adjustments are the basic-derivative employment multiplier and the basic employment-total population multiplier. The basic-derivative employment multiplier indicates how derivative employment changes in response to changes in basic employment. The basic employment-total population multiplier gives estimates of changes in total population in the area in response to changes in basic employment. Another multiplier that is easily obtained is the basic-total employment multiplier, which is always one greater than the basic-derivative employment multiplier.

Table XI shows the three multipliers just discussed. The table also indicates basic, derivative, and total employment and the total population in the nine counties included in the estimate of the basic-employment multiplier used, b_1 in equation 1.0 of the interdependence model.

With the three multipliers obtained from the economic base analysis, it is possible to estimate directly the total change in nonfarm employment, total employment, and total population, given the estimated change in farm employment. It is also possible to estimate indirectly changes in total expenditures for consumer goods and services.

Agricultural employment was estimated to decrease 6,110 full-time workers. Applying the derivative employment multiplier (1.82) to the change in basic employment (-6110), derivative employment is estimated to decrease by 11,120. The change in total employment is estimated to

TABLE XI

BASIC, DERIVATIVE, AND TOTAL EMPLOYMENT: TOTAL POPULATION AND RATIOS, BASED ON NINE COUNTIES IN SOUTHWESTERN OKLAHOMA, 1960[1]

	Total	Ratio to Basic
Basic Employment[2]	16,525	1.00
Derivative Employment[2]	30,063	1.82
Total Employment	46,588	2.82
Total Population[3]	146,363	8.85

[1]Includes Beckham, Caddo, Cotton, Grady, Greer, Harmon, Kiowa, Tillman, and Washita Counties.

[2]See Table IX.

[3]See Appendix D, Table 2.

be a reduction of 17,231 jobs. With the decrease of 6,110 in basic employment, the change in total population (found by applying the total population multiplier, 8.85) is estimated to be a decrease of 54,073 persons.

The change in expenditures for consumer goods and services can be estimated by multiplying the change in total population by per capita consumption expenditures for the study area. Per capita consumption expenditures for the area are estimated to be $1260.[57] Thus, the estimated decrease in expenditures for consumer goods is $68,120,000 (54,073 x 1260). The demand for agricultural productive inputs was estimated to increase by $9,124,000. The total volume of business in the

[57]See Appendix E.

retail, wholesale, and service firms subsector as the subsector has been defined for this study, has a net decrease of $58,996,000.

The above are estimates of the total changes in the nonfarm labor force, total employment, and consumption expenditures. The impact of the agricultural resource adjustments on the various subsectors of the nonfarm economy can be estimated by introducing a change caused by agricultural adjustments into the interdependence model.

Interdependence Model Estimates of the Total Change in Economic Activity

The initial change in the economic flows in the study area, as described by the interdependence model, is introduced in equation 1.0 of the model. Equation 1.0 relates changes in agricultural employment to changes in nonagricultural employment, using the basic-derivative employment multiplier concept. In Chapter III the change in agricultural employment was estimated to be -6,110 workers. Using the basic employment multiplier (b_1), estimated to be 1.82 in Chapter IV, the change in nonagricultural employment is projected to be -11,122, a 19 percent decrease from the present level. This is essentially the same procedure as the first step in using the economic base technique.

$$(1.0)\quad \Delta\hat{L}_2 = b_1 \Delta L_1$$
$$= (1.82)\ (-6,110)$$
$$= -11,122$$
$$\hat{L}_2 = 58,928 - 11,122$$
$$= 47,806$$

With the change in the nonagricultural labor force estimated, it is possible to estimate changes in population, the various components

of nonagricultural employment, personal incomes to various classes of employment, and changes in consumer expenditures.

Changes in Population

Equation 2.2 of the flow model is used in estimating changes in population. In the equation, the total population, P, is divided into three groups; farm population (P_1), nonfarm population (P_2), and the retired population (P_3). The retired population includes all persons over age 60, whether they live in town or on farms. It is recognized that many persons over 60 are still gainfully employed; however, other persons less than 60 are retired. By using 60 years of age as the dividing point, the actual number of persons retired can be approximated.

$$(2.1) \quad \hat{P} = P_1 + \hat{P}_2 + P_3$$

$$(2.2) \quad \hat{P} = P_1 + (P_2 + 3.19\Delta\hat{L}_2) + P_3$$

In equation 2.1, retired population (P_3) is assumed fixed, farm population (P_1) is predetermined, and nonfarm population ($\hat{P}_2$) is dependent upon changes in the model.

The change in the nonfarm population is given as a function of the change in nonfarm employment. The coefficient b_2 of the relationship was estimated to be 3.19 in Chapter IV. The change in the nonfarm employment was estimated to be -11,122 persons using the basic-derivative employment ratio analysis. The change in the nonfarm population is estimated to be a decrease of 35,479 persons,[58] which is 19 percent

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[58] $\Delta\hat{P}_2 = (3.19) \quad (\Delta L_2)$

$= (3.19) \quad (-11,122)$

$= -35,479$

less than the present nonfarm population.

The projected farm population is found by subtracting the estimated decrease in agricultural employment times the number of persons per farm family from the present farm population. The value for P_1 is estimated to be 23,523.[59] This is a 43 percent decrease from the present farm population.

With the number of retired persons remaining approximately the same (36,596) and the population decreasing in number, the percentage of the population retired will increase. The possibility of the retired segment of the population in the study area increasing as a percent of the total population is in line with what has happened in the past. In 1940 the retired population was 9 percent of the total population. By 1960 the retired population had increased to 14 percent of the total population. Under the projected conditions the retired population will be approximately 19 percent of the future total population.

The total population after agricultural resource adjustment, using equation 2.2, is estimated to be 211,871 persons. The farm population estimate is 23,523. The estimate of the nonfarm population is 151,752 persons. The retired population, assumed to unchanging in numbers, is 36,596. This is a 22 percent reduction in the total population, with farm population reduced by 45 percent and nonfarm population reduced by 19 percent (see Table XII).

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[59] Projected farm population = (present farm population) - (decrease in agricultural employment) (average family size)

$$P_1 = 43{,}075 - (3.20)(6{,}110) = 43{,}075 - 19{,}552 = 23{,}523$$

TABLE XII

PRESENT AND PROJECTED LEVELS OF POPULATION BY GROUPS IN SOUTHWESTERN OKLAHOMA.

	Present[1]	Projected	Change	Change as % of Present
Total Population	266,902	211,871	-55,031	-21.50
Farm	43,075	23,523	-19,552	-45.39
Nonfarm	187,231	151,752	-35,479	-18.95
Retired	36,596	36,596	0	---

[1]See Appendix D, Table 2.

Changes in Employment

Changes in employment in the nonfarm labor force caused by the projected agricultural resource adjustments are estimated with equation 3.3 of the flow model. In equation 3.3 the nonfarm labor force (L_2) is divided into three subsectors: employment in retail, wholesale, and service firms (L_3); employment in mining and manufacturing (L_4); and government employment in all levels of government (L_5). Employment in the mining and manufacturing sector is assumed to remain constant.

$$(3.0) \quad L = L_1 + L_2$$

$$(3.2) \quad \hat{L} = L_1 + \hat{L}_3 + L_4 + \hat{L}_5$$

$$(3.3) \quad \hat{L} = L_1 + (L_3 + b_3\Delta C) + L_4 + (L_5 + b_4\Delta P)$$

$$= L_1 + (L_3 + 0.098\Delta C) + L_4 + (L_5 + 0.034\Delta P)$$

In equation 3.3, L_1 is a predetermined variable estimated to be 8,661 in Chapter III. L_4 is assumed fixed at 5,799. The remaining two variables, $\hat{L}_3$ and $\hat{L}_5$, are given as functional relationships; $\hat{L}_3 = L_3 + 0.098\Delta C$ and $\hat{L}_5 = L_5 + 0.034\Delta P$. Equation 3.3 is used to estimate three variables; ΔL_5, ΔL_3, and ΔC. ΔL_5 is estimated to be -1,871, using the value of ΔP obtained in estimating $\hat{P}$ in equations 2.0 and 2.2. The value for ΔL_3 is estimated to be -9,251. Given ΔL_3, ΔC (an estimate of the total change in both retail and wholesale trade in the study area) is - $94,398,000.[60]

Total nonagricultural employment in the study area is estimated to decline by 11,122 persons, 19 percent below the present level. Employment in the trade and service subsector is estimated to decrease by 9,249, a decrease of 23 percent from the present employment in the subsector. Government employment is estimated to decrease by 1,971 jobs, 15 percent below the present level.

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[60] (3.3) $\hat{L} = \hat{L}_1 + (L_3 + b_3\Delta C) + L_4 + (L_5 + b_4\Delta P)$

$= 8,661 + (40,643 + .098\ \Delta C) + 5,799 + \{12,486 + (.234)(-55,031)\}$

$= 8,661 + 40,643 + .098\ \Delta C + 5,799 + 12,486 - 1,871$

$= 65,718 + .098\ \Delta C$

$\hat{L} = \hat{L}_1 + \hat{L}_2 = 8,661 + 47,806 = 56,467$

$56,467 = 65,718 + .098\ \Delta C$

$.098\Delta C = -9,251$

$\Delta L_3 = -9,251$

$\Delta C = -\$94,398,000$

$\Delta L_5 = -1,871$

The estimated changes in employment in the various sectors and subsectors of the economy in the study area are summarized in Table XIII. The estimates indicate that a 42 percent reduction in agricultural employment caused a 19 percent reduction in total nonagricultural employment.

TABLE XIII

1960 AND PROJECTED LEVELS OF EMPLOYMENT AND CHANGES IN EMPLOYMENT RESULTING FROM AGRICULTURAL RESOURCE ADJUSTMENTS IN SOUTHWESTERN OKLAHOMA.

	1960[1] Employment	Projected Employment	Change in Employment	% Change Based on Present
Agriculture	14,771	8,661	-6,110[2]	-11.51
Nonagriculture	58,928	47,806	-11,122	-18.87
Retail, Wholesale and Service Sales	40,643	31,392	-9,251	-22.76
Mining and Manufacturing	5,799	5,799	0	0
Government	12,486	10,615	-1,871	-14.98
Area Total	73,699	56,467	-17,232	-23.52

[1]See Appendix D, Table 2.

[2]Obtained from Chapter III.

Changes in Personal Income

Personal income is the money that consumers have to spend for goods and services. Changes in the volume of business done by firms selling consumption goods and services comes from changes in personal income and in the number of consumers along with the change in the demand for

production inputs. The change in personal income in the study area can be estimated using equation 4.3 of the model.

Equation 4.3 gives total personal income of the area as the sum of personal income in the various sectors of the economy.

$$(4.0)\quad Y_p = Y_{p_1} + Y_{p_2}$$

$$(4.2)\quad \hat{Y}_p = Y_{p_1} + \hat{Y}_{p_3} + Y_{p_4} + \hat{Y}_{p_5} + Y_{p_6}$$

$$(4.3)\quad \hat{Y}_p = Y_{p_1} + (Y_{p_3} + b_5\Delta C) + Y_{p_4} + (Y_{p_5} + b_6\Delta P) + Y_{p_6}$$

In equation 4.3, the personal income is predetermined for persons working in agriculture (Y_{p_1}), mining and manufacturing (Y_{p_4}), and retired persons (Y_{p_6}). Previously it was explained that employment in the mining and manufacturing sector is assumed constant at its present level, thus personal income is assumed constant. The retired population is also assumed unchanging in numbers, and the personal income received by this group is assumed to remain at the present level.

The personal income received by the agricultural sector is assumed to remain at the present level. An earlier assumption in this study is that resource adjustments are taking place to enable a higher return to operator's labor and management. At first these two assumptions may appear to be inconsistent. The projected resource adjustments are increased farm size with a reduction in agricultural employment. Thus, with the same total personal income to the agricultural sector of the economy and fewer human resources requiring returns, the personal income per family in agriculture can increase.

The personal income of two subsectors of the nonfarm economy--retail, wholesale, and service sales (Y_{p_3}); and government (Y_{p_5}) --

is given as a functional relationship of the total volume of trade in the retail, wholesale, and service firms subsector and population respectively. In estimating personal income to the retail, wholesale, and service firms, the change in the volume of sales is used from equation 3.3. The estimated change in total population is obtained from equations 2.0 and 2.2. Given these two estimates, the total change in personal income can be estimated as well as the change in the two subsectors in the nonagricultural sector, using equation 4.3.[61]

The change in personal income to the retail, wholesale, and service firms subsector is estimated to be -$19,163,000 (14 percent below the present level). The change in personal income to persons employed by the various governmental units and agencies is estimated to be -$5,833,000 (7 percent less than present). The total personal income in the study area is estimated to decrease by $24,996,000, reducing total personal income, after adjustments, available for the purchase of consumer goods and services to $325,573,000. This is a 7 percent reduction from the present level of personal income in the area. Table XIV summarizes the changes in personal income for the sectors and subsectors of the study area's economy.

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[61] $\hat{Y}_p = Y_{p_1} + (Y_{p_3} + b_5 \Delta C) + Y_{p_4} + (Y_{p_5} + b_6 \Delta P) + Y_{p_6}$

$= 64,957 + \{145,143,000 + (0.203)(-94,398,000)\} + 23,498,000$

$+ \{80,847,000 + (0.106)(-55,031)\} + 36,133,000$

$= \$325,573,000$

$\Delta Y_{p_3} = -19,163,000$

$\Delta Y_{p_5} = -5,833,000$

TABLE XIV

PRESENT AND PROJECTED LEVELS OF PERSONAL INCOME, AND CHANGES RESULTING FROM AGRICULTURAL RESOURCE ADJUSTMENTS IN SOUTHWESTERN OKLAHOMA.

	Present[1]	Change	Projected	% Change Based Upon Present
Agriculture	$64,957,000	0	$ 64,957,000	-
Nonagriculture[2]	285,612,000	-$24,996,000	260,616,000	-8.75
Sales & Services	139,771,000	-19,163,000	120,608,000	-13.71
Mining & Mfg.	26,761,000	0	26,761,000	-
Government[2]	82,947,000	- 5,833,000	77,114,000	-7.03
Retired	36,133,000	0	36,133,000	0
Total	350,569,000	-24,996,000	325,573,000	-7.13

[1]See Appendix D, Table 2.

[2]Excludes incomes to military personnel at Fort Sill ($77,500,000).

Changes in Consumption Expenditures

Consumption expenditures, as the term has been used throughout the study, includes two major types of purchases. The first is the purchase of goods and services for personal consumption. The second major type of purchases included in consumption expenditures are the productive inputs used by agriculture. The changes in purchases or demand for productive inputs by agriculture were estimated in Chapter III.

Equation 5.2 in the model breaks total consumption expenditures into three classes--demand for productive inputs by agriculture (C_1), demand for consumer goods and services by farm families (C_2), and

demand for consumer goods and services by nonfarm families (C_3).

$$(5.2)\quad \hat{C} = C_1 + b_7P_1 + b_8(\hat{P}_2 + P_3)$$
$$= C_1 + 1180P_1 + 1290(\hat{P}_2 + P_3)$$

The change in total consumption expenditures is the sum of changes in demand for agricultural productive inputs and in personal consumption by farm and nonfarm families. The demand for productive inputs was estimated in Chapter III to increase by $9,124,000. The changes in personal consumption expenditures by nonfarm and farm families are estimated by multipliying the projected population of the farm and nonfarm sectors, P_1 and P_2, by their respective per capita consumption expenditures. The total change in personal consumption expenditures is estimated to -$68,840,000,[62] a 20 percent reduction from the present level. The total volume of trade in the sales and service subsector is estimated, using equation 5.2 to be $330,717,000, 15 percent below the present volume.[63] Table XV summarizes the changes in consumption

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[62] In footnote 60 ΔC was estimated to be -$94,398,000. Included in that estimate is the change in the volume of wholesale trade in the study area, as well as retail and service sales. In the estimate here consumption expenditure declines by $68,840,000. Only expenditures at retail outlets and service firms are included. In equation 3.3 changes in employment by various sectors and subsectors are being estimated and employment in the retail, wholesale, and service firm subsector is assumed related to the total volume of trade in the subsector. Thus wholesale trade is included in the estimate of ΔC used in equation 3.3. The same ΔC (-$94,398,000) is also used in equation 4.3 for essentially the same reason.

In equation 5.2 changes in retail and service trade are estimated for use in Chapter VI. Since only retail and service trade are being considered, all wholesale trade has been excluded from the estimate of the change the volume of trade.

[63] $\hat{C} = C_1 + b_7P_1 + b_8(\hat{P}_2 + P_3)$

$= 59,991,000 + (1180)(23,523) + (1290)(151,752 + 36,596)$
$= 59,991,000 + 27,757,000 + 242,969,000$
$= 330,717,000$
$\hat{C}_2 + \hat{C}_1 = 270,726,000$

expenditures by the various sectors of the economy in the study area.

TABLE XV

PRESENT AND PROJECTED LEVELS OF CONSUMPTION AND CHANGES RESULTING FROM AGRICULTURAL RESOURCE ADJUSTMENTS IN SOUTHWESTERN OKLAHOMA.

	Present	Projected	Change	% Change Based on Present
Demand for Agricultural Productive Inputs	$ 50,867,000[1]	$ 59,991,000	$+ 9,124,000	+17.94
Personal Consumption	339,566,000	270,726,000	-68,840,000	-20.27
Farm	50,829,000[2]	27,757,000	-23,072,000	-45,39
Nonfarm	288,737,000[3]	242,969,000	-45,768,000	-15.85
Total Volume of Trade in Sales and Services	390,433,000	330,717,000	-59,716,000	-15.29

[1] See Chapter III.

[2] ($1180)(43,075).

[3] ($1290)(223,827).

The two methods that can be used in estimating the impact of agricultural resource use adjustments on total economic activity give essentially the same projection of total change. The results using the economic base method of analysis give projections of changes in total population and in total nonagricultural employment only. The use of the interdependence model (which admittedly utilizes the concept of,

and a multiplier derived from, an economic base analysis) gives not only the total changes in the four economic measures, but it also indicates how various sectors and subsectors change. Having estimates of changes within each sector and subsector as well as the total change in economic activity enables more detailed and meaningful projections of future economic activity to be made. The more detailed projection, in turn, will guide individuals in specific subsectors in adjusting to meet the future needs of the area.

Summary of Changes in the Nonfarm Economy

The impact of the projected agricultural resource use adjustments on the nonfarm economy has been estimated in terms of changes in personal incomes, employment, consumption, and total population. These changes are summarized in Table XVI.

The results of the analysis indicate that attainment of a $3,000 return to operator's labor and management, assuming the minimum resource adjustment criterion, will reduce agricultural employment (including farm operators) by 42 percent from the present level. The reduction in employment means that farm population will also decrease. The farm population is estimated to decrease by 45 percent from its present number. As the farm population decreases, total personal consumption by farm families will decline. The decrease in personal consumption by the farm sector is estimated to be 42 percent.

The agricultural sector adjustment is expected to require additional purchased inputs of 18 percent. The increase in use of purchased inputs is due, in part, to the substitution of capital for labor.

TABLE XVI

SUMMARY OF PRESENT AND PROJECTED LEVELS OF POPULATION, EMPLOYMENT, PERSONAL INCOMES, AND CONSUMPTION; AND CHANGES RESULTING FROM AGRICULTURAL RESOURCE ADJUSTMENTS IN SOUTHWESTERN OKLAHOMA.

		1960	Projected	Change	Percent Change Based Upon Present
Total Population[1]	P	$266,902	211,871	-55,031	- 21.50
Farm	P_1	43,075	23,523	-19,552	- 45.38
Nonfarm	P_2^1	187,231	151,752	-35,479	- 18.95
Retired	P_3^2	36,596	36,596	0	0
Total Employment[2]	L	73,699	56,467	-17,232	- 23.52
Agricultural	L_1	14,771	8,661	- 6,110	- 41.51
Nonagricultural	L_2^1	58,928	47,806	-11,122	- 18.87
R. W. & S.	L_3^2	40,643	31,393	- 9,251	- 22.76
Mining & Mfg.	L_4^3	5,799	5,799	0	0
Government	L_5^4	12,486	10,615	- 1,871	- 14.98
Total Personal Income[3] (000)	Yp	$350,569	$325,573	$-24,996	- 7.13
Agricultural	Yp_1	64,957	64,957	0	0
Nonagricultural	Yp_2^1	285,612	260,616	-24,996	- 8.75
R. W. & S.	Yp_3^2	139,711	120,608	-19,163	- 13.70
Mining & Mfg.	Yp_4^3	26,761	23,489	0	0
Government	Yp_5^4	82,947	77,114	- 5,833	- 7.03
Retired	Yp_6^5	36,133	36,133	0	0
Total Vol. Retail Trade (000)	C	$390,433	$330,717	$-59,716	- 15.29
Agr. Prod. Inputs	C_1	50,867	59,991	+ 9,124	+ 17.94
Agr. Per. Consum.	C_2^1	50,829	27,757	-23,072	- 45.39
Nonagr. Per. Con.	C_3^2	288,737	242,969	-45,768	- 15.85
Total Per. Consum.[4]		339,566	270,726	-68,840	- 20.27

[1] See table XII.

[2] See table XIII.

[3] See table XIV.

[4] See table XV.

The nonfarm sector of the economy faces a total reduction in sales to the agricultural sector of approximately $11,017,000, and a reduction of 19,552 potential consumers of goods and services. The flow model developed to determine the impact of agricultural adjustments on the nonfarm sector of the economy estimates that projected changes in the agricultural sector will reduce nonfarm employment by 19 percent, nonfarm population by 19 percent, and personal incomes in the nonfarm sector by 9 percent. The total volume of trade by the sales and services subsector is estimated to decrease by 15 percent.

The results indicate that changes in the agricultural sector of the economy of a rural area, such as Southwestern Oklahoma, have a large impact on the nonagricultural sector in terms of employment and personal incomes. Employment and personal incomes are both key variables in the maintenance and/or development of economic activity. The next question to be answered is what do the decreases in employment, consumption expenditures, and personal incomes in the area mean to the individual firms selling consumer goods and services. Also to be examined in the next chapter is the potential reduction in nonfarm firms caused by the estimated agricultural adjustments.

CHAPTER VI

POTENTIAL ADJUSTMENTS IN THE NONAGRICULTURAL SECTOR

Estimates of future economic activity in the nonfarm sector of the economy were made in Chapter V. The estimates indicate that there will be a sizeable reduction in the volume of retail trade over time, if the resources in the agricultural sector of the economy adjust as indicated in the farm adjustment study. The question to be answered is how the various types of retail sales and service firms might be affected in terms of volume of trade and number of surviving firms.

Present Situations-Nonfarm Firms

Interviews were conducted in eleven towns and cities in Southwestern Oklahoma to obtain estimates of the present volume of sales by different types of retail firms, and estimates of the volume of sales that the firms need for survival. The communities in which firms were interviewed were selected by a stratified random sample.

The cities and towns of the eleven county study area were stratified into four groups based upon the 1960 population. The four groups are: 1) population 2500 or less; 2) population 2501 to 5000; 3) population 5001 to 10,000;and 4) population greater than 10,000. Communities selected and populations in each of the first three groups are: group 1) Erick, 1300; Sentinel, 1200; and Fletcher, 850; group 2) Mangum, 4000; Hollis, 3000; and Walters, 2800; and group 3) Elk City, 8200;

Frederick, 5900; and Hobart, 5100. There are only three cities with population over 10,000 in the study area. Since the study is concerned primarily with the impact of agricultural adjustment, Lawton was excluded from the sample cities as its retail trade is heavily dependent upon Fort Sill and expenditures by military personnel. Thus, the communities in group 4) are Altus, 21,000 and Chickasha, 14,900. Seven of the eleven communities are county seats.

Sampling of Firms for Interviews

The selection of firms was made by drawing a random sample from lists of firms furnished by the Chambers of Commerce in the eleven study communities. Again, the sample can be called a stratified random sample because the firms were divided into nine categories. The categories are: Ia) grocery stores and super markets; Ib) cafes; II) furniture and appliance stores; III) men's and women's clothing stores, shoe stores, and department stores; IV) variety, drug, and hardware stores; V) auto dealers and service stations; VI) agricultural productive input sale outlets; VII) building materials; and VIII) personal and financial services. One or more firms, with the exception of cafes and building materials, were selected from each of the nine categories in each study community. Table XVII gives the number of firms interviewed by category. More firms were included in the sample from the larger communities to give the individual firms located there about the same chance of being drawn for the sample as firms in the smaller communities. In total, 132 firms were interviewed.

The interviews were conducted with either the owner or manager of each firm in the sample. The questionaire used was designed to obtain

information in four areas (see Appendix F for a sample questionaire). First, questions were asked about the major firm characteristics. Characteristics included were the number of employees, the present volume of business, the amount of capital being used in the firm, the year the firm was established, the year the current management started, and information on the location of the wholesalers with which the firm deals.

TABLE XVII

NUMBER OF FIRMS INTERVIEWED BY FIRM CATEGORIES, SOUTHWESTERN OKLAHOMA.

Category	Ia	Ib	II	III	IV	V	VI	VII	VIII	Total
Number	13	6	11	14	18	15	20	8	27	132

The second area of questions dealt with the firm's trade area. The present number of customers served, percent of customers that are farm families and the size of the trade area were included in trade area information.

The third area of questions dealt with the firm's competition. Questions were asked to determine the number of competitors, how the firm ranked among the total number of competitors, and how the number of competitors has changed in the past 15 years. The purpose was to obtain an idea of the interviewed firm's competitive standing in the trade area, and to obtain information on the past change in firm numbers in the particular trade areas.

The last part of the questionaire was designed to obtain information on the future conditions facing the firms. These questions gave

information on needed volume of trade for present firm size for "satisfactory" profits,[64] and what the individual managers felt the future held in store for them in terms of competition and potential agricultural adjustments. The information from the last section of questions is used to project the future number of firms, assuming the estimated agricultural adjustments do take place.

Present Number of Firms

An estimate of the present number of retail firms in the study area was obtained from sales tax data from the Oklahoma Tax Commission. The Commission publishes an annual report, Oklahoma Sales Tax and Use Tax,[65] which includes sales tax collections and number of returns by county for ten classes of business firms. The ten classes of firms include all firms whose sales are subject to state sales tax. Because sales tax returns are filed quarterly, the number of returns reported divided by four gives an estimate of the total number of firms in a particular class of firms for a particular year. Table XVIII gives the number of firms in the year 1960-61 by business group for the study area.

The estimated number of firms given in Table XVIII includes what can be called "commercial" firms and "quasi-commercial" firms. The difference between the commercial and quasi-commercial firms is

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[64] Satisfactory profits refers to a level of net returns to the firm that pays an "opportunity cost return" to all owned capital and gives the firm owner an income which he feels necessary for his family to live comfortably. This definition will be used throughout this chapter.

[65] Oklahoma Tax Commission.

essentially the same difference as between commercial and noncommercial farms (see page 42). A commercial firm is one that has sufficient resources to provide a "satisfactory" income to the owner or operator of the firm for his labor and management after an opportunity cost return is paid owned capital used by the firm. This definition is essentially the same as the general definition of a commercial farm. The commercial nonfarm firm faces similar problems, in many respects, to the problems of commercial farms. The problems of the established firms are what volume of trade to strive for, what lines of merchandise to carry, and how large a trade area to cover with the resources available to the firm (including capital, labor and managerial abilities). Other problems facing the nonfarm firms are whether to expand their present physical facilities, relocate the firm or to establish a branch store. The individual firm must even decide whether or not to remain in business. For example, the owner of a firm selling hardware must decide if his present location has sufficient potential trade for him to earn a satisfactory living or if an alternative would be better. He must decide if he needs to expand or remodel his present store facility or to continue using the store the way it is. He must decide what lines of merchandise to carry to meet the needs of his customers. Finally, the owner or manager must decide what volume of trade to strive for and the size trade area needed to provide the volume of trade desired. These problems correspond to problems of commercial farms of how much, what, and how to produce. The quasi-commercial nonfarm firms lack sufficient resources to give a "satisfactory" level of returns to the owner or operator for his labor and management, after an opportunity cost return is paid owned capital. The owners or operators of these firms are living on capital in the same

manner as the operators of noncommercial farms do.

TABLE XVIII

PRESENT NUMBER OF RETAIL FIRMS IN SOUTHWESTERN OKLAHOMA, 1960-61[1]

Business Classification	Number of Firms
Food	1176
Apparel	139
General Merchandise	671
Furniture, Fixtures and Equipment	198
Motor Vehicle	880
Lumber and Materials	193
Services	373
Coin Devices and Public Services	74
Miscellaneous	519
Total	4223

[1]Estimated from Oklahoma Sales Tax and Use Tax, Statistical Report for the Fiscal Year Ending June 30, 1961, Oklahoma Tax Commission,(Oklahoma City,).

The quasi-commercial firms can be typified by the rural, crossroads store and many stores in small communities. The estimate of the number of firms given in Table XVIII overstates the number of commercial firms in the study area because of the presence of many small, quasi-commerical business firms.

An attempt to estimate the present number of commercial firms is made using the results of the questionaires and information on consumption expenditures. The estimate to be made classifies the firms somewhat differently than does the State Tax Commission, conforming instead to the classification used in the questionaires described earlier in this chapter. The main difference is that firms selling agricultural productive inputs are included in the General Merchandise group in the sales tax

information, but are considered a separate group for the purposes of this study. Another difference between the classifications is that department stores are included in the General Merchandise class in the sales tax information, but they are included in class III (clothing stores) for the purposes of study. The Food classification of the sales tax information is separated into class Ia, grocery stores and super markets, and class Ib, cafes,in this study.

The estimated 1960 volume of trade in the various types of firms is given in Table XIX. The estimate is made by allocating the total personal consumption expenditures for the eleven county area to the various classes of firms by the percentage of personal income spent on various consumer goods. Table XIX also includes the projected volume of trade in the various classes of firms using the estimated future total personal income of the area after the projected agricultural adjustments have had their total effect. All classes of firms, except those selling primarily agricultural productive inputs, show a decrease in the volume of trade. The total volume of trade for firms selling agricultural productive inputs increases, as was explained in Chapter III.

Estimates of the present volume of trade of the various types of commercial firms were obtained from the interviews with the individual firms. The average present volumes of trade obtained from the samples firms, by class of business, are given in Table XX. It should be emphasized that the firms interviewed are considered commercial (as the term was explained above). An effort was made to exclude the small quasi-commercial type of business operations from the sampled firms. Also given in Table XX is the manager's estimate of volume of trade needed for firm survival given the present method of firm operation.

TABLE XIX

PERCENT OF PERSONAL INCOME SPENT, AND PRESENT AND PROJECTED VOLUME OF TRADE BY CLASS OF RETAIL FIRM, SOUTHWESTERN OKLAHOMA.

Class of Retail Firm	Percent of Personal Income Spent[1]	Present Volume of Trade[2]	Projected Volume of Trade[3]	Change in Volume
Consumer Goods & Services		(1,000)	(1,000)	(1,000)
Class Ia	18.6	$63,159	$50,355	$-12,804
Class Ib	5.7	19,355	15,431	- 3,924
Class II	6.1	20,713	16,514	- 4,199
Class III	9.6	32,598	25,990	- 6,608
Class IV	10.7	36,334	28,968	- 7,366
Class V	19.5	66,217	52,792	-13,425
Class VI	10.2	34,635	27,614	- 7,022
Class VII	6.1	20,713	16,514	- 4,199
Not Included[4]	13.5	45,841	36,548	- 9,293
Total	100.0	339,566	270,726	-68,840
Agricultural Productive Inputs	--	50,867	59,991	+ 9,124
Total		390,433	330,717	-59,716

[1]The percentages used in this column are obtained from Consumer Expenditures and Income, Small Cities in the Southern Region, 1961 , BLS Report 237-75, April, 1964.

[2]Percent of personal income spent x present total personal income.

[3]Percent of personal income spent x projected personal income.

[4]It appears that personal savings is included in this group.

TABLE XX

PRESENT AND NEEDED VOLUME OF TRADE FOR SAMPLED FIRMS IN SOUTHWESTERN OKLAHOMA.

Class of Retail Firm	Present Average Volume	Needed Average Volume	Change in Volume
Consumer Goods			
Class Ia	$300,000	$326,000	$ +26,000
Class Ib	50,000	51,000	+ 1,000
Class II	99,000	106,000	+ 5,000
Class III	126,000	133,000	+ 7,000
Class IV	106,000	107,000	+ 1,000
Class V	327,000	323,000	- 4,000
Class VII	235,000	227,000	- 8,000
Agricultural Productive Inputs	601,000	528,000	-73,000

In two of the seven classes of business firms selling personal consumption goods, the average present volume of sales is greater than the average needed volume of sales. The two are class V, which includes auto dealers and service stations, and class VII, building materials.

When the present and needed average volumes of trade for auto dealers and service stations are considered separately, the auto dealers indicated a present average volume of $605,000 and a needed average volume of $600,000. The service stations interviewed indicated a present average volume of $93,000 and a needed average volume of $99,000, an increase in needed volume of $6,000 per firm. In the case of auto dealers the

present average volume exceeds the needed by $5,000 per firm, which is an indication of fairly rapid adjustment by auto dealers to changes in their volume of trade. Firms selling building materials also appear to have adjusted to changes facing them.

All other classes of firms selling consumer items indicate a need for additional trade. The need ranges from one percent in class IV to over eight percent in class Ia. The estimated increase in the needed average volume of trade in the five classes and by service stations as shown in Table XX, indicate that there are excess firms for the present volume of trade in the area.

Present and Potential Number of Commercial Firms

Using the data from Tables XIX and XX it is possible to estimate both the number of commercial firms needed for the 1960 volume of trade and the potential future number of commercial firms. The estimate of the present number of firms by business class is made by dividing the 1960 volume of trade obtained from Table XIX, by the present average volume, obtained from Table II. The estimated number of firms is given in Table XXI.

The projected number of firms by business class is obtained by dividing the projected volume of trade, obtained from Table XIX by the needed average volume of trade, given in Table XX. These are also given in Table XXI.

The number of firms in Table XXI is an estimate of the commercial firms in the study area before and after agricultural adjustment. In all but one class, the number of firms is estimated to decline. The decline is caused by two factors. One factor is the adjustment of firms in total

number to the present total volume of trade available to each class. The second factor causing the decline in firm numbers is the decrease in projected total volume of trade. The total change in what can be considered commercial firms is a decline of 212. The firms that show an increase in numbers are those selling agricultural productive inputs. The increase in this class of firms is due primarily to the projected increase in demand for purchased inputs (see Chapter III).

TABLE XXI

PRESENT AND PROJECTED NUMBER OF COMMERCIAL FIRMS IN SOUTHWESTERN OKLAHOMA

Class of Firm	Present Number of Firms	Number of Firms Needed	Change
Consumer Goods			
Class Ia	215	188	-27
Class Ib	382	330	-52
Class II	207	170	-37
Class III	257	213	-44
Class IV	341	296	-45
Class V	201	178	-23
Class VII	146	135	-11
Agricultural Productive Inputs	85	112	+27
Total	1834	1622	-212

The estimated changes in firm numbers by class of firms given in Table XXI are net changes in groups of heterogeneous firms. In class III,

for example, the estimated change in firms selling clothing items is -44. Included in class III are men's and women's clothing stores, department stores, and shoe stores. The estimated decline in firm numbers does not mean that the number of each type of store will decline by 11. The estimated change in firm numbers says that there will be potential volume of consumer expenditures on clothing items to support 44 fewer commercial firms selling such items. It is possible for specific type or types of firms within the class to increase in numbers while all others decline. For example, it is possible for the number of specialty clothing stores to increase by 5 and the number of general clothing, shoe, and department stores to decline by 49, giving a net change in class III of -44 firms.

In the case of firms selling agricultural productive inputs, there may be declines in the number of firms selling some types of inputs such as machinery and increases in the number selling other types of inputs such as fertilizers and chemicals.

Potential Magnitudes of Nonfarm Firm Adjustment

There are two potential sources of future adjustments of retail firms in Southwestern Oklahoma. The first are adjustments to more efficient firm size for the present volume of trade in the area. The present number of firms in the study area has been estimated by two different methods. The first method, using sales tax data, indicates that there are presently 4,223 firms selling items subject to sales tax. The second method of estimation, using the commercial firm criteria, indicates that there is enough trade in the study area to support 1,834 retail firms (see Table XXI). If the present number of firms providing services (373) is added to the second estimate, the result is 2,207 commercial firms in

area. The difference, 2,016 firms, is an estimate of the present adjustment gap in the nonagricultural sector.

The second source of potential nonfarm firm adjustments is the projected reduction in the total volume of trade in the area. Table XXI shows that the number of commercial firms in the area is estimated to decline by 212. This is a 12 percent reduction from the estimate of the present number of commercial firms that could economically exist in the study area.

The total potential magnitude of nonfarm firm adjustment is a decline of 2,228 firms--2,016 from the present adjustment gap and 212 from the projected adjustment gap. The question that now arises is whether adjustments of this potential magnitude are likely to occur.

Included in the questions asked of the firm managers was one dealing with past changes in competition and another requesting information on how the manager felt competition would change in the future. In response to the first question, 30.5 percent of the interviewed managers said that the number of their competitors had been decreasing, 38.2 percent said there had been no change, and 31.3 percent said that the number of competitors had been increasing. Many of the managers did say that part of their new competition comes from existing firms taking on new lines of merchandise. These managers indicated that the total number of firms in the area is about the same, but that the trend is for the individual firm to diversify its lines of merchandise. In response to the second question only 8.4 percent of the managers felt that the number of competing firms would increase, 65.4 percent foresaw no change in the number of competitors, and 26.0 felt they would have fewer competitors in the future.

The number of firms estimated from the sales tax data indicates a steady decline for the past 18 years. The decline is particularly high in the counties with the greater rural population. The counties with the greatest percentage of the population urban have actually shown an increase in the number of firms. However, the increase in these few counties is more than offset by the decreases in the other counties. (See Appendix G). Thus, historical evidence supports the hypothesis of a decline in the number of nonfarm firms in the area. Firm managers (to a certain extent) expect the decline to continue.

There are several factors that will limit the magnitude of future nonfarm firm adjustments. The greatest limiting factor is trade area size. It must be remembered that the commercial firm estimates were obtained using only a volume of trade criteria. In order for a firm to obtain a given volume of trade, it must have sufficient potential customers within its more or less established trade area to provide the volume. In response to questions about trade area size, the managers of firms selling consumer goods indicated that 90 to 95 percent of their trade came from within 15 miles of the firm. The managers of firms selling agricultural inputs indicated that 80 percent of their trade came from within 20 miles, a slightly larger trade area than consumer goods firms serve.

The problem of trade area expansion is one of length of time needed for travel to the larger trade centers. A trip of about 30 minutes one way is as far as many people are willing to travel to shop if there are alternative (even though less desirable) shopping facilities located closer. Better roads have enabled more rapid travel to trade centers in the past, thus expanding trade area size. With the present system of

improved roads in the study area, it is doubtful that trade areas can be expanded a great deal through more rapid transportation.

Assuming that the size of the trade area can be expanded, another problem that arises is the number of potential customers. It was estimated in Chapter V that the population in the study area would decrease by 60,000 persons. It will be necessary for most firms to expand the size of their trade areas just to maintain the present number of potential customers.

A third factor that might tend to restrict adjustments of nonfarm firms is the present trade patterns. Many small communities were founded as the area was settled. As better roads and modern methods of transportation have been adopted, the need for these once thriving trade centers has been reduced. But the small towns seem to be able to survive and the small--perhaps quasi-commercial--firms in them continue to operate. Many of the firms in these small towns exist only because they provide convenience by saving the 30 minute trip to the large trade centers for a loaf of bread and a box of crackers. As long as these firms provide a desired service, many of them will be able to survive.

It is because of the three problems just discussed that total adjustments indicated in Table XXI will lag. However, this is not to say that there will not be adjustments of a sizeable magnitude in firms in the retail, wholesale, and service sales subsector. The total adjustment achieved will depend upon how the three factors impeding adjustments are overcome.

The information presented in this chapter can be useful to individual nonfarm firm owners or managers in the study area because it provides aids in formulating expectations of future economic activity. It provides

a guide to the potential volume of trade in nine classes of firms, and gives an estimate of the number of commercial firms (as the term has been defined in this chapter) that might exist in the future. The individual firm manager has an estimate of the projected total volume of trade for particular types of firm and can adopt policies to attain that part of the total volume that he feels will be most profitable to him. The study has also indicated which types of merchandise might be in greatest demand.

It must be emphasized that the projections given in this chapter are based on aggregates and that the changes are net changes of a group of firms with similar characteristics. Any changes in operations that individual firms undertake should be based upon a microeconomic analysis of the firm, using the results of this study to formulate expectations of future economic activity.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Objective

The overall objective of this study has been to determine the impact of potential resource adjustments in agriculture on the other sectors of the economy in Southwestern Oklahoma. Specific objectives have been to determine the effect of the agricultural adjustments upon population in the area; employment in the nonagricultural sector; personal incomes in the area; and total volume of trade in the retail, wholesale, and service firms in the area. The feasibility for the study arises from previous research conducted to determine optimum resource use and allocation in agriculture. The research technique used in the resource adjustment study was linear programming. The objective function specifies a solution such that the minimum set of resources needed to attain a specific level of returns to the farm operator's labor and management is determined. The results of the agricultural adjustment study indicate that a reduction of approximately 6100 farm operators is needed to attain optimum resource use consistent with the specified returns ($3000) to labor and management. The reduction is approximately 42 percent of the present number of farm operators. If the resource adjustments in agriculture do take place as predicted in the adjustment study, the problem becomes one of determining the impact on total economic activity in the area.

Procedure

To determine the total impact of agricultural adjustments on economic activity in Southwestern Oklahoma, an economic model describing the interdependence of the agricultural and nonagricultural sectors of the economy was developed. The interdependence model consists of five equation, of which one is a functional relationship and four are identity statements. The identity statements describe the relationship of various sectors and subsectors to total population, employment, personal income, and consumption expenditures. Within each of the four identity statements there are one or two functional relationships indicating the interdependence of several key variables in the model. The eight parameters or coefficients in the interdependence model are estimated using data from the study area. Five of the coefficients are estimated by least squares regression, two are simple averages and one is estimated from an economic base analysis (an averaging technique) of the study area. The five coefficients estimated by least-squares regression and the one estimated from the economic base analysis can be considered multipliers, because they indicate the total change in a dependent variable caused by change in an independent variable.

The key to the interdependence model is the multiplier derived from the economic base analysis because it indicates how changes in agricultural employment will affect total employment in the area. The multiplier is the ratio of derivative employment to basic employment. It represents the capacity of economic activity in the basic industries to support economic activity in the derivative industries of the study

area when employment is used as a measure of economic activity. Basic industries are those that produce goods and/or services locally for sale outside the study area. Derivative industries are those that produce goods and/or services locally for sale within the study area. In this analysis, employment in agriculture, manufacturing, and mining is considered basic, with all other employment being derivative.

Results

By introducing changes in economic activity caused by the projected agricultural resource adjustments into the model, changes in total economic activity as well as changes in the various subsectors of the nonagricultural sector of the economy are estimated.

The results of this study indicate that if agricultural resource adjustments occur in the magnitude estimated, all the economic variables included in the interdependence model will decline, except one. The one variable that is projected to increase is the demand for productive inputs by agriculture. The estimated 42 percent reduction in agricultural employment results in a 19 percent reduction in employment in the nonagricultural sector. In terms of jobs, a reduction of 6000 in agriculture results in a loss of approximately 11,000 in the nonagricultural sector, of which 9,200 are in the retail, wholesale, service subsector and 1,800 are in the governmental subsector. Along with the reduction in the number of jobs, personal income is reduced by 25 million dollars. Consumption expenditures are estimated to decline by 20 percent, or 68 million dollars. Population in the area is projected to be reduced by 55,031 persons, 22 percent less than the 1960 level. Thus, the projected agricultural adjustments will have an appreciable impact on total economic

activity in Southwestern Oklahoma. The severity of the impact depends upon the speed of the adjustments in agriculture and the action taken by the nonagricultural sector to prepare for, or counteract, the reduction in agricultural employment.

The present number of retail and service firms in the area is estimated to be 4220. The present volume of trade in the area is sufficient to support approximately 2200 commercial firms and service establishments, indicating a present adjustment gap of 2000 firms. This sizeable adjustment gap is an indication of low returns to resources being used in the nonagricultural sector. The impact of agricultural adjustments is a general decline in the volume of retail and service trade in the area resulting in the number of commercial firms in the area being reduced by an additional 200 firms. The total potential decrease in commercial retail and service firms is 2200, 2000 from the present adjustment gap and 200 from the future gap. It is doubtful that the number of firms will be reduced by this full amount because of fixed capital investment and the presence of many convenience stores whose owners are willing to accept low returns on their capital investment.

In terms of different types of firms, only those selling agricultural productive inputs show a potential gain in the volume of trade to expect and in firm numbers.

Implications

The results of the analysis are dependent upon the estimates of the eight coefficients in the interdependence model and the projected agricultural resource adjustments. Of the coefficients, the most crucial is the basic employment multiplier. Also important is the estimate of

changes in agricultural employment. The problem with these two estimates is whether they represent the situation as it exists (in the case of the multiplier) and will exist (in the case of agricultural employment). If, for example, the decline in agricultural employment is only 4500, derivative employment would decline by only 8190 (assuming the basic employment multiplier is 1.82 as given in Table XI) and total population would decline by 39,825 persons. On the other hand if the basic employment multiplier is actually 1.50 instead of 1.82 as estimated in Chapter IV, the 6100 decline in agricultural employment would cause a reduction of 9,150 jobs in the nonagricultural sector. If the basic employment multiplier is higher, for instance 2.25, nonagricultural employment could be expected to decline by 13,750. Correspondingly, a greater decline in agricultural employment would cause greater declines in nonagricultural employment and total economic activity.

The accuracy of the estimation of these two variables in the interdependence model determines the accuracy of the estimate of the total impact of agricultural adjustments on economic activity in Southwestern Oklahoma. The general direction of the impact is a reduction in total economic activity. Thus, the existence of a need for labor and resource migration in the agricultural sector causes a general reduction in total economic activity. The magnitude of the total reduction in economic activity is dependent upon the total reduction in agricultural employment and the substitution of capital for labor by agriculture. It is possible to offset the impact of agricultural adjustments by increasing employment in other sectors of the economy or by adopting labor intensive enterprises in agriculture.

Need for Further Research

This study has shown that agricultural resource use adjustments have an appreciable impact on total economic activity in a rural area. Declines in economic activity in small areas are beneficial to national economic growth and development because of resource transfers to uses yielding higher returns. However, the decline in economic activity is costly to the local area in terms of loss of skilled human resources and declining returns to fixed capital in the area, particularly social capital.

In this study the impact of agricultural resource adjustments on social services, such as schools, hospitals, and churches, has not been investigated except through government employment. Much useful information for local governments and social institutions could be obtained from such a study. The analysis could provide estimates of needed school and hospital facilities, the tax base available to support social services of various types, and changes needed in political structures to achieve desired social services at minimum taxpayer cost.

Another logical study to follow would be one to determine what type or types of industries or technologies could be established in Southwestern Oklahoma to provide employment for the displaced agricultural labor. By keeping the human resources employed within the area, total economic activity could be maintained or increased. It is important that any type of industrialization in the area be on a sound economic basis, not a short term, make work type of venture.

Because the area is predominately agricultural in nature, it appears that industries to process agricultural products might be established

within the area. Another possibility for utilizing part of the displaced labor would be increasing livestock feeding and possibly the establishment of a packing plant to use the fattened livestock. The adjustment study indicates that there will be increasing numbers of stocker cattle being used, thus there would not be a lack of stockers available for feeding.

A technological development which could keep part of the potentially displaced labor in the area is increased adoption of irrigation in farming. The problem here is lack of water at reasonable costs. However, if a supply can be developed to provide water at reasonable costs, irrigated farming could be increased and some potentially displaced agricultural labor would remain employed. Many of the nonfarm firm managers in the area foresee irrigation as a great benefit to the area in terms of economic activity.

The three possibilities for employing the labor displaced by agricultural adjustments would provide for economic development within the area, where economic development is taken to mean increasing total economic activity. The resource adjustments in the agricultural and nonagricultural sectors provide increasing returns to resources. However, the higher returns to resources involves a decline in total economic activity. In order to increase total economic activity the displaced human resources must be be re-employed or new resources brought into the area. Creation of new jobs which employ much of the displaced labor would provide Southwestern Oklahoma with increased economic activity and enable the area to contribute to the total economic growth of the state and nation.

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APPENDIX A

APPENDIX A, TABLE I

BASIC FARM MACHINERY FOR SOUTHWESTERN OKLAHOMA: NEW COST, USE LIFE, AND ANNUAL DEPRECIATION FOR TWO AND FOUR-ROW MACHINERY.

Item	2-Row			4-Row		
	New Cost	Use Life	Annual Depreciation	New Cost	Use Life	Annual Depreciation
	$	yrs.	$	$	yrs.	$
Tractor	4,400	10	440	5,500	10	500
Moldboard plow	320	15	21	460	15	31
One-way plow	575	15	38	1,000	15	67
Spiketooth harrow	330	15	22	600	15	40
Planter	340	15	23	700	15	47
Cultivator	300	15	20	675	15	45
Toolbar	312	15	21	550	15	37
Grain drill	605	15	40	605	15	40
Power mower	342	10	34	342	10	34
Side delivery rake	350	10	35	350	10	35
Total			694			876

APPENDIX B

APPENDIX B, TABLE I

BREAKDOWN OF PROJECTED CUSTOM CHARGES INTO LABOR, FUEL AND LUBRICANTS, REPAIRS DEPRECIATION, INTEREST, AND RETURNS TO MACHINE OWNER'S RISK AND OVERHEAD.

Custom Operation	Total Charges	Labor	Fuel and Lubricants	Repairs	Depre-ciation	Interest	Returns to Machinery Owners Risk & Overhead
Combining	$2,857,061	$476,177[1]	$149,986	$499,954	$623,751	$188,078	$ 919,115
Baling	4,708,816	470,882[2]	357,111	615,727	964,199	366,039	1,764,932
Cotton Stripping	3,814,155	635,693[1]	300,894	322,084	885,731	283,943	1,385,809
Trucking	3,139,639	1,603,685[3]	158,385	118,789	158,385	316,770	783,625
Total	14,519,771	3,186,437	966,992	1,592,554	2,632,066	1,154,830	4,853,481
Percent of Total	100	21.9	6.7	11.0	19.0	8.0	33.4

[1] 1/6 Total Charge.

[2] 1/10 Total Charge.

[3] 51% Total Charge.

APPENDIX B, TABLE II

BREAKDOWN OF PRESENT CUSTOM CHARGES INTO LABOR, FUEL AND LUBRICANTS, REPAIRS, DEPRECIATION, INTEREST AND RETURNS TO MACHINE OWNER'S RISK AND OVERHEAD.

Item	% of Total Charge[1]	Charge
Total Charges	100.0	$9,207,000
Labor	21.9	2,016,333
Fuel & Lubricants	6.7	616.869
Repairs[2] } Depreciation[2]	30.0	2,762,100
Interest	8.0	736,560
Returns to Owner's Risk and Overhead	33.4	3,975,138

[1]Based upon percentages obtained in Appendix B, Table I.

[2]Combined as both items are purchased from machinery dealers and repair shops.

APPENDIX B, PART II

The method used to determine the change in labor required for custom work is as follows:

Ratio of labor cost in custom work to total cost of custom work for projected situation (see Table I of Appendix B).

Custom Labor Cost	$ 3,186,437	= .219
Total Cost Custom Work	$14,519,771	

Ratio of custom labor cost to hours of custom labor. (Assume custom labor receives an average of $1.15 per hour)

Hours of Custom Labor	2,658,852	= .834
Custom Labor Charge	$3,186,437	

To find:

1) Total value of custom work for present situation:[1]

Total value custom work	$9,206,816
Subject to adjustments	6,628,908
Not subject to adjustments	2,577,908

2) Total labor involved with custom work for present situation:

$9,206,816 X 0.219 = 2,016,293

2,016,293 X 0.834 = 1,681,588 hours or 673 full-time men[2]

3) Present labor involved with custom work not subject to adjustments.

$2,577,908 X 0.219 = 564,562

564,562 X 0.834 = 470,845 hours or 188 full-time men[2]

4) Total value of custom work after agricultural adjustments:[3]

Subject to adjustments	$20,112,000
Not subject to adjustments	2,578,000
Total value custom work	22,690,000

5) Total labor involved with custom work after adjustments:

$22,690,000 X 0.219 = 4,969,110

4,969,110 X 0.834 = 4,144,238 hours or 1658 full-time men[2]

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[1] See Table II page 40 of text.

[2] Full-time hired man is assumed to work 2500 hours per year.

[3] See Table III page 43 of text.

APPENDIX C

APPENDIX C, TABLE I

DETERMINING AVERAGE FAMILY SIZE IN SOUTHWESTERN OKLAHOMA, 1960[1].

County	White		Non-White	
	Persons Per Family	Number of Families	Persons Per Family	Number of Families
Beckham	2.86	6168	3.83	127
Caddo	3.15	9022	4.74	820
Comanche	3.40	22,853	4.25	2122
Cotton	3.04	2621	4.68	124
Grady	2.98	9735	3.41	496
Greer	2.78	2945	3.34	107
Harmon	3.01	1910	4.33	107
Jackson	3.26	8729	3.87	501
Kiowa	2.89	5080	4.34	337
Tillman	3.02	4768	3.89	532
Washita	3.20	5335	4.02	57

[1]Data from U. S. Census of Population, 1960.

$$\frac{\text{Total Population}}{\text{Total Number of Families}} = \frac{271,478}{84,496} = 3.21 \text{ average family size}$$

APPENDIX D

APPENDIX D, TABLE I

DATA USED IN REGRESSION ESTIMATES AND SOURCES

County	Year	Population[1] (P)	Government Employment (L_5)	Volume Trade in R.W. & S.[2,3] (C)	Employment in R.W. & S.[1,3] (L_3)
				($1,000)	
Comanche	1960	90,803	4,784	126,793	12,631
Grady	"	29,590	1,466	49,445	5,350
Jackson	"	29,736	1,216	55,987	4,432
Beckham	"	17,782	623	34,555	3,714
Caddo	"	28,621	1,350	42,276	4,099
Cotton	"	8,031	429	15,971	1,129
Kiowa	"	14,825	578	30,720	2,625
Greer	"	8,877	542	15,593	1,490
Harmon	"	5,852	257	11,714	907
Tillman	"	14,654	584	29,360	2,268
Washita	"	18,121	647	16,534	1,998
Comanche	1950	55,165	2,539	88,148	8,841
Grady	"	34,872	1,084	41,122	5,135
Jackson	"	20,082	611	36,085	3,328
Beckham	"	21,627	516	34,957	3,873
Caddo	"	34,913	1,016	36,834	3,900
Cotton	"	10,180	317	13,813	1,163
Kiowa	"	18,926	583	29,639	2,855
Greer	"	11,749	430	12,930	1,440
Harmon	"	8,079	243	11,506	980
Tillman	"	17,598	503	28,400	2,413
Washita	"	17,657	499	16,763	2,200

[1]Source: U. S. Census of Population for 1950 and 1960

[2]Source: Census of Business for 1948, 1954, 1958, and 1963. Vols. dealing with Retail Trade, Wholesale Trade and Selected Services. Indexed using the Consumer Price Index 1957-59 = 100.

[3]Retail, wholesale and service sales subsector.

APPENDIX D, TABLE I (continued)

		Non-Rural Population[1] (P_2)	Total Non-Agricultural Employment[1] (L_2)	Personal Income to Employment in R.W.& S.[2,3] (Y_3)	Personal Income to Government Employees (Y_5)
County	Year			($1,000)	($1,000)
Comanche	1960	87,036	18,695	29,382	106,327
Grady	"	23,387	8,326	15,080	3,604
Jackson	"	26,564	6,070	12,848	18,304
Beckham	"	14,108	4,838	10,100	3,191
Caddo	"	21,858	6,221	14,031	4,974
Cotton	"	6,030	1,826	3,317	873
Kiowa	"	11,146	3,557	7,949	1,596
Greer	"	6,714	2,204	3,880	1,465
Harmon	"	3,837	1,254	3,884	616
Tillman	"	10,861	3,256	8,694	1,735
Washita	"	12,276	2,731	8,897	13,829
Comanche	1950			13,195	49,849
Grady	"			11,230	1,880
Jackson	"			8,942	1,699
Beckham	"			9,267	962
Caddo	"			10,473	4,136
Cotton	"			3,134	643
Kiowa	"			7,859	1,800
Greer	"			4,117	821
Harmon	"			3,922	617
Tillman	"			8,887	1,036
Washita	"			7,755	1,008

[1]Source: U. S. Census of Population for 1950 and 1960.

[2]Source: County Building Block Data for Regional Analysis: Oklahoma.

[3]Retail, wholesale and service sales subsector.

APPENDIX D, TABLE II

DATA AND SOURCES - PRESENT SITUATION (1960)

County	(P) Total[1] Population	(P_1) Farm[1] Population	(P_2) Nonfarm Population[2]	(L) Total[1] Employment	(L) Agri.[1] Employment
Beckham	17,782	3,674	14,108	6,159	1,321
Caddo	28,621	6,763	21,858	8,734	2,517
Comanche	90,803	3,767	87,036	19,733	1,051
Cotton	8,031	2,001	6,030	2,487	665
Grady	29,590	6,203	23,387	10,048	1,730
Greer	8,877	2,163	6,714	2,995	798
Harmon	5,852	2,015	3,837	2,004	750
Jackson	29,736	3,172	26,564	7,378	1,312
Kiowa	14,825	3,679	11,146	4,875	1,323
Tillman	14,654	3,793	10,861	4,670	1,419
Washita	18,131	5,845	12,286	4,616	1,885
TOTAL	266,902	43,075	223,827	73,699	14,771

[1]Source: U. S. Census of Population, 1960.

[2]Includes Retired Population.

APPENDIX D, TABLE II (continued)[3]

(L_2) Nonagri. Employment	(L_3) Consumer[1] Goods & Service Employment	(L_4) Mining[1] & Manufacturing Employment	(L_5) Government[1] Employment	(Y_p) Total[2] Personal Income (1,000)	(Y_{p_1}) Total[2] Personal Income (1,000)
4,848	3,714	501	623	$ 27,026	$ 4,931
6,217	4,099	768	1,350	37,410	10,249
18,682	12,631	1,267	4,784	175,133	3,596
1,822	1,129	264	429	8,941	2,606
8,318	5,350	1,502	1,466	40,029	7,734
2,197	1,490	165	542	10,428	3,144
1,254	907	90	257	8,426	4,165
6,066	4,432	408	1,226	47,687	6,792
3,552	2,625	349	578	20,239	5,393
3,251	2,268	399	584	22,282	7,436
2,731	1,998	86	647	30,470	8,911
58,928	40,643	5,799	12,486	428,071	64,957

[1]Source: U. S. Census of Population, 1960.

[2]Source: County Building Block Data for Regional Analysis: Oklahoma.

[3]Includes data for Beckham, Caddo, Comanche, Cotton, Grady, Greer, Harmon, Jackson, Kiowa, Tillman, and Washita Counties.

APPENDIX D, TABLE II (continuted)[5]

(Y_{p_2}) Nonfarm[1] Personal Income	(Y_{p_3}) Retail, Wholesale[1,2] And Service Firms Personal Income	(Y_{p_4}) Mining and[1,3] Manufacturing Personal Income	(Y_{p_5}) Government[1] Personal Income	(Y_{p_6}) Retired Popu-[1,4] lation Person Income
(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
$ 22,095	$ 12,339	$ 3,048	$ 3,290	$ 3,418
27,161	13,881	3,392	5,128	4,760
171,537	46,849	7,496	109,624	7,568
6,335	3,736	312	900	1,387
32,295	18,092	5,168	3,716	5,319
7,284	3,570	389	1,510	1,815
4,261	2,309	225	635	1,092
40,895	16,450	1,976	18,871	3,598
14,846	8,950	1,460	1,645	2,791
14,846	7,952	2,595	1,789	2,510
21,559	5,643	700	13,341	1,875
363,114	139,771	26,761	160,449	36,133

[1] County Building Block Data for Regional Analysis: Oklahoma.

[2] Sum of wages paid in Wholesale and Retail Trade Services. Finance Insurance and Real Estates, Contract Construction, Public Utilities and 87.5 % or Proprietor and Property Income.

[3] Sum of wages paid in Mining and Manufacturing and 12.5% of Proprietor and Property Income.

[4] Transfer payments.

[5] Includes data for Beckham, Caddo, Comanche, Cotton, Grady, Greer, Harmon, Jackson, Kiowa, Tillman, and Washita Counties.

APPENDIX D, TABLE III

RETIRED POPULATION (OVER 60) SOUTHWESTERN OKLAHOMA, 1940, 1950 AND 1960.

County	1940[1] Retired Population	1940[1] % Total	1950[2] Retired Population	1950[2] % Total	1960[3] Retired Population	1960[3] % Total
Beckham	2,273	10.25	2,969	13.73	3,566	20.05
Caddo	3,899	9.38	4,695	13.45	4,868	17.00
Comanche	3,141	8.06	4,339	7.87	5,937	6.54
Cotton	1,290	10.00	1,472	14.47	1,595	19.86
Grady	4,020	9.78	4,973	14.27	5,747	19.42
Greer	1,436	9.87	1,709	14.55	2,122	23.91
Harmon	884	8.82	987	12.22	1,160	19.83
Jackson	2,128	9.37	2,759	13.74	3,374	11.34
Kiowa	2,323	10.18	2,691	14.22	3,084	20.81
Tillman	1,949	9.39	2,405	13.65	2,726	18.61
Washita	2,181	9.79	2,285	12.95	2,417	13.33
Total	25,524	9.46	31,284	12.47	36,596	13.71

[1]Source; U. S. Census of Population, 1940.

[2]Source; U. S. Census of Population, 1950.

[3]Source; U. S. Census of Population, 1960.

APPENDIX E

APPENDIX E

Procedures for determining the per capita consumption expenditures in Southwestern Oklahoma by:

A. Nonagricultural population

Average family size	3.21[1]
Family expenditures for current consumption[2]	$3,897
Personal insurance expenditures per family	110
Contribution per family	137[3]
Total annual nonagricultural family expenditures	$4,144

Per capita consumption expenditures = total annual family expenditures divided by average family size or

$$\frac{\$4,144}{3.21} = \$1,290$$

B. Agricultural population

Total annual nonagricultural family expenditures	$4,144
Agricultural family expenditure adjustment[4]	350
Total annual agricultural family expenditures	$3,794

$$\text{Agricultural per capita expenditures} = \frac{\$3,974}{3.21} = \$1,180$$

C. Total Population

$$\frac{(43,075)(1180) + (223,827)(1290)}{266,902} = \$1,260$$

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[1] See Appendix C.

[2] Expenditure data are those given for Mangum, Oklahoma in Consumer Expenditures and Incomes, Small Cities in the Southern Region, 1961. Bureau of Labor Statistics Report No. 237-75.

[3] The figure for contributions given by the Bureau of Labor Statistics is reduced by 20 percent to account for contributions that go to agencies outside the study area.

[4] See footnote 51.

APPENDIX F

APPENDIX F, TABLE I

NUMBER OF FIRMS BY CLASS OF TRADE IN COMANCHE, GRADY AND JACKSON COUNTIES, 1946 to 1963[1].

	Food	Apparel	G.M.[2]	F.F. & E.[3]	M.V.[4]	L&M[5]	Service	Misc.	Coin & P.U.	Total
1963-64	534	73	288	111	421	102	168	254	37	1,988
62-63	534	76	283	110	418	103	167	254	39	1,984
61-62	534	77	281	101	407	97	166	242	39	1,944
60-61	535	76	273	98	392	94	158	229	39	1,894
59-60	529	71	265	98	380	85	157	164	34	1,818
58-59	539	69	269	92	367	86	164	169	39	1,794
57-58	523	71	262	85	342	76	160	155	38	1,712
56-57	509	70	261	82	329	78	155	156	32	1,672
55-56	515	69	255	77	318	82	159	161	32	1,668
54-55	527	69	249	75	304	81	158	141	29	1,633
53-54	533	72	249	78	297	78	156	137	27	1,627
52-53	546	69	244	74	300	79	155	138	28	1,633
51-52	561	63	245	71	297	79	151	133	29	1,629
50-51	577	58	243	71	293	77	150	144	28	1,641
49-50	577	57	252	72	286	71	154	152	29	1,650
48-49	583	51	250	74	282	65	153	160	27	1,645
47-48	591	48	253	68	282	69	149	173	26	1,659
46-47	595	48	261	59	290	76	150	208	44	1,731

[1]From annual Oklahoma Sales Tax Report of Oklahoma Tax Commission.

[2]General Merchandise.

[3]Furniture, Fixtures and Equipment.

[4]Motor Vehicle.

[5]Lumber and Materials.

APPENDIX F, TABLE II

NUMBER OF FIRMS BY CLASS OF TRADE IN BECKHAM, CADDO, COTTON, GREER, HARMON, KIOWA TILLMAN AND WASHITA COUNTIES, 1946 TO 1963[1].

	Food	Apparel	G.M.[2]	F.F. & E.[3]	M.V.[4]	L&M[5]	Service	Misc.	Coin & P.U.	Total
1963-64	587	64	384	107	483	102	198	324	30	2,279
62-63	596	63	392	103	487	100	201	312	32	2,286
61-62	629	66	402	102	502	97	210	302	34	2,344
60-61	641	63	398	100	488	99	215	290	35	2,329
59-60	644	58	397	92	486	92	202	265	35	2,271
58-59	639	64	393	90	483	85	203	236	43	2,236
57-58	640	61	401	85	489	78	187	236	49	2,226
56-57	648	60	423	85	490	78	186	235	46	2,251
55-56	655	59	443	82	513	77	188	234	50	2,301
54-55	690	62	450	81	502	74	186	230	46	2,321
53-54	696	60	446	74	509	69	190	229	45	2,318
52-53	718	62	461	69	517	71	199	229	43	2,369
51-52	750	60	479	68	522	69	201	227	48	2,424
50-51	775	57	481	68	532	75	199	236	50	2,473
49-50	773	53	483	69	520	71	198	269	50	2,486
48-49	759	52	484	67	522	65	186	301	43	2,479
47-48	736	52	471	67	502	66	177	318	48	2,437
46-47	701	48	485	70	508	96	183	402	98	2,591

[1] From Annual Oklahoma Sales Tax Report of Oklahoma Tax Commission.

[2] General Merchandise.

[3] Furniture, Fixtures and Equipment.

[4] Motor Vehicle.

[5] Lumber and Materials.

APPENDIX G

C O N F I D E N T I A L

Southwest Area Adjustments
Agricultural Economics Research
Oklahoma State University

I. General:

(A) Type of Business

(1) Food and beverage_____

(2) Furniture, equipment, and repairs_____

(3) Clothing and clothing services_____

(4) General merchandise_____

(5) Transportation_____

(6) Agricultural production inputs_____

(7) Building materials_____

(8) Services_____

(B) Name of Business_____

(C) Location_____

II. Major Firm Characteristics:

(A) Number of Employees

(1) Full-time hired _____

(2) Part-time hired _____

(3) Family _____

(B) Volume of Business (Approx. Gross Receipts) $_____

(C) Total Capital in Business

(1) Fixed _____

(2) Working _____

(D) Store Area (Sq. Ft.) and Bldg. Age_____

(1) Storage or shop capacity, etc._____

(2) Number of vehicles_____

(3) Other_____

_____

(E) Year business was established_____

(F) Year current management started_____

(G) Major products or services provided_____

_____

_____

_____

_____

(H) Sources of supply (locations, firm, etc.)_____

_____

_____

_____

_____

_____

III. Trade Area Information:

(A) Customers or families served_____

(B) Percent of Business with:

	Farm Cust.	Non-Farm Cust.	Other*
(1) Percent of Customers	_____	_____	_____
(2) Percent Gross Receipts	_____	_____	_____
(3) Av. Purchases/Customers	_____	_____	_____

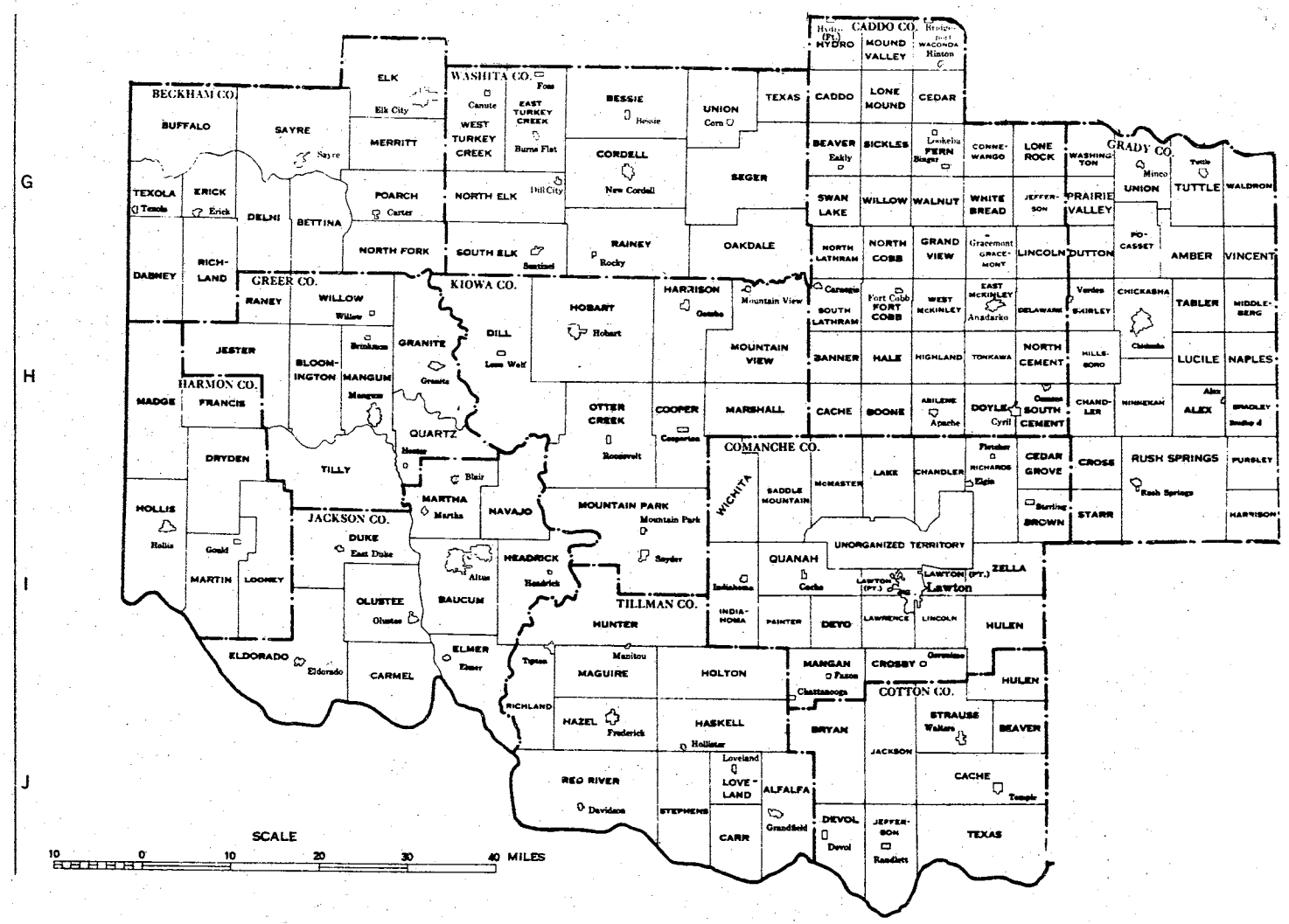
(C) What percent of your farm customers come from the following distances:

Less than 5 mi.___ 5-15 mi.___ 15-25 mi.___ Over 25 mi.___

(D) What percent of your nonfarm customers come from the following distances:

Local____ 1-15 mi.____ 15-25 mi.____ Over 25 mi.____

(E) On the following map outline the area from which most of your customers come.


G
H
I
J
BECKHAM CO.
BUFFALO
SAYRE
ELK
Elk City
WASHITA CO.
Canute
WEST TURKEY CREEK
EAST TURKEY CREEK
Burns Flat
BESSIE
Bessie
UNION
Corn
TEXAS
CADDO CO.
HYDRO
MOUND VALLEY
CADDO
LONE MOUND
CEDAR
MERRITT
CORDELL
New Cordell
SEGER
BEAVER
Eakly
SICKLES
Loveland
FERN
Binger
CONNE-WANGO
LONE ROCK
GRADY CO.
WASHING-TON
Minco
UNION
Tuttle
TUTTLE
WALDRON
TEXOLA
Texola
ERICK
Erick
DELHI
BETTINA
POARCH
Carter
NORTH ELK
Dill City
SWAN LAKE
WILLOW
WALNUT
WHITE BREAD
JEFFER-SON
PRAIRIE VALLEY
NORTH FORK
SOUTH ELK
Sentinel
RAINEY
Rocky
OAKDALE
NORTH LATHRAM
NORTH COBB
GRAND VIEW
Gracemont
GRACE-MONT
LINCOLN
DUTTON
PO-CASSET
AMBER
VINCENT
DABNEY
RICH-LAND
GREER CO.
RANEY
WILLOW
Willow
KIOWA CO.
HOBART
Hobart
HARRISON
Gotebo
Mountain View
SOUTH LATHRAM
Carnegie
Fort Cobb
FORT COBB
WEST MCKINLEY
EAST MCKINLEY
Anadarko
DELAWARE
Verden
B-AIRLEY
CHICKASHA
TABLER
MIDDLE-BERG
JESTER
BLOOM-INGTON
Bridgeton
MANGUM
Mangum
GRANITE
Granite
DILL
Lone Wolf
MOUNTAIN VIEW
BANNER
HALE
HIGHLAND
TONKAWA
NORTH CEMENT
MILLS-BORO
LUCILE
NAPLES
HARMON CO.
MADGE
FRANCIS
OTTER CREEK
Roosevelt
COOPER
Cooperton
MARSHALL
CACHE
BOONE
ABILENE
Apache
DOYLE
Cyril
Cement
SOUTH CEMENT
CHAND-LER
NINNEKAH
Alex
ALEX
BRADLEY
Bradley 4
QUARTZ
Mountain
DRYDEN
TILLY
Blair
COMANCHE CO.
Fletcher
RICHARDS
Elgin
CEDAR GROVE
CROSS
RUSH SPRINGS
Rush Springs
PURSLEY
MARTHA
Martha
NAVAJO
MOUNTAIN PARK
Mountain Park
Snyder
WICHITA
SADDLE MOUNTAIN
MCMASTER
LAKE
CHANDLER
Sterling
BROWN
STARR
HARRISON
HOLLIS
Hollis
JACKSON CO.
DUKE
East Duke
Gould
UNORGANIZED TERRITORY
MARTIN
LOONEY
Altus
HEADRICK
Hendrick
QUANAH
Oklahoma
Cache
LAWTON (PT.)
ZELLA
Lawton
OLUSTEE
Olustee
BAUCUM
TILLMAN CO.
INDIA-HOMA
PAINTER
DEVO
LAWRENCE
LINCOLN
HULEN
HUNTER
ELDORADO
Eldorado
CARMEL
ELMER
Elmer
Tipton
Manitou
MAGUIRE
HOLTON
MANGAN
Faxon
Chattanooga
CROSBY
Cheyenne
COTTON CO.
HULEN
RICHLAND
HAZEL
Frederick
HASKELL
Hollister
BRYAN
STRAUSS
Walters
BEAVER
JACKSON
RED RIVER
Davidson
Loveland
LOVE-LAND
ALFALFA
CACHE
Temple
STEPHENS
CARR
Grandfield
DEVOL
Devol
JEFFER-SON
Randlett
TEXAS
SCALE
10 0 10 20 30 40 MILES

IV. Competiton:

(A) Who do you consider your main competitors in this town: (Name or type of firm)

_____

_____

_____

_____

_____

_____

(B) Rate your Firm to Competitors (with respect to volume of sales, other "measures of size," "acceptance," etc.)

_____

_____

_____

_____

_____

_____

(C) Approximate mumber of competitors in trade are you serve._____

(D) Has this number increased or decreased?

Since 1960 _____ _____

Since 1955 _____ _____

Since 1950 _____ _____

(E) What do you consider the reason for the above change?_____

_____

_____

_____

V. Business Size and Efficiency:

(A) Given size of building and number of employees you have, what would be the--

(1) No. of customers needed for satsifactory "profits?"_____

(2) The volume of business (gross sales)?_____

(3) The amount of fixed capital?_____

(4) The amount of working capital?_____

(B) What do you consider profits?_____

_____

_____

_____

(C) What percent of your working capital is borrowed?_____

(D) What percent of fixed capital is borrowed or rented?_____

(E) Do you have sufficient capital available to you to operate your business the way you think is most profitable?_____

If no, how much more capital do you feel you need?_____

Comments_____

_____

_____

_____

VI. Future Expectations:

(A) Do you feel that there are too many competitors for the present volume of business in the area you serve?_____

Explanation:_____

_____

_____

(B) How many competitors do you expect to have in:

(1) 5 years_____

(2) 10 years_____

(3) 15 years_____

(C) What size of business will be necessary in:

	Volume	Number of Customers	Capital
(1) 5 years	$_____	_____	_____
(2) 10 years	$_____	_____	_____
(3) 15 years	$_____	_____	_____

(D) How do you believe agriculture might change in this area in the next 10 years?_____

_____

_____

_____

(E) Would you be able to stay in business in the same location if:

(1) one-fourth of the farm customers in the area are lost?___

(2) one-half_____

(3) three-fourths_____

(F) If one-half of the farm customers are lost, which of the following would you follow:

(1) Change location_____

(2) Expand firm size_____

(3) Retire_____

(4) Sell out and seek other employment_____

(If yes, what field)_____

(5) Other_____

VITA

Carl Edmund Olson

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE IMPACT OF AGRICULTURAL RESOURCE ADJUSTMENTS ON THE ECONOMY OF SOUTHWESTERN OKLAHOMA

Major Field: Agricultural Economics

Biographical:

Personal Data: Born in Northhampton, Massachusetts, September 14, 1937, the son of Carl and Elizabeth Olson.

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