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The Interindustry Structure of the Kansas Economy

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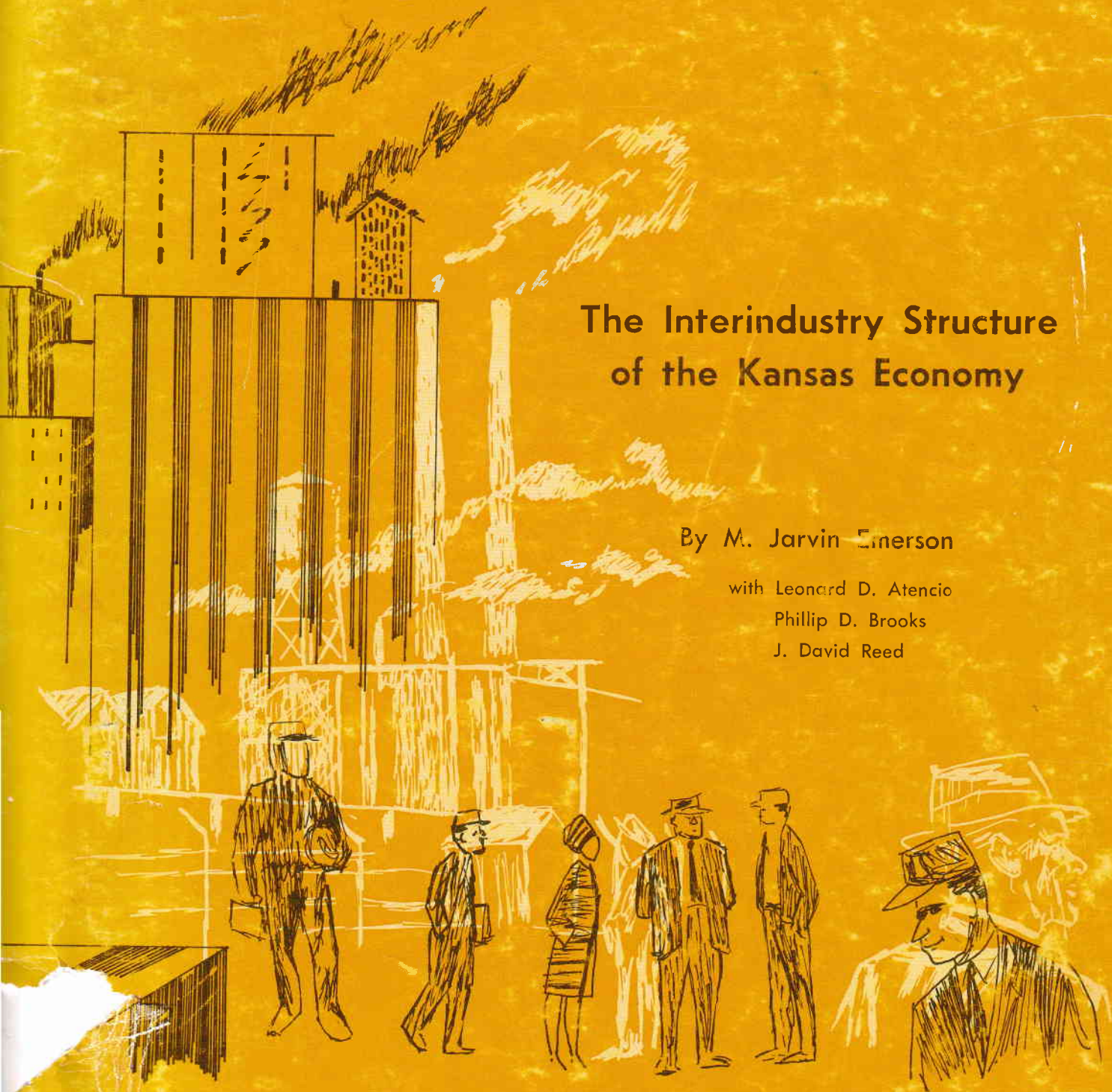
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Office of Economic Analysis
and
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PREFACE

The increasing complexity of business and government decision making in an era of economic expansion evoked this study of the Kansas economy. The Governor's Economic Development Committee which functioned in the early 1960's concluded that a meager information base existed for identifying problems and potentials in the state's economy.

When the state legislature created the Office of Economic Analysis, one of the charges to the Office was to develop a more rigorous economic information system for the state. Shortly after the Office of Economic Analysis started operations, Kansas embarked on a state planning program through the Planning Division of the Kansas Department of Economic Development. This development made it desirable to integrate the economic information system with the state economic planning effort.

This study is technically known as a regional interindustry or input-output study. The study framework was selected because of its multiple uses by both state government and business. Funding for the study was provided by a Kansas legislative appropriation to the Office of Economic Analysis and by a grant from Housing and Urban Development.

The project had an auspicious start. The day the study began my house was demolished by a tornado and the state printing plant, which was printing questionnaires, was extensively damaged. However, two years after its start the basic matrix was completed in June, 1968.

Acknowledgments for a study of this magnitude of necessity must be lengthy.

The most important contribution to this project was made by the thousands of Kansas businessmen who cooperated with the interviewers in providing the

Manhattan, Kansas
January, 1969

M. Jarvin Emerson

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Chapter 1

STATE ECONOMIC DEVELOPMENT AND ECONOMIC INFORMATION

Despite the mushrooming quantity of economic information at the national level, only a comparatively meager increase in the state and local economic data needed by businessmen and state and local government officials has become available. Businessmen require knowledge of the market structure and regional prospects for the areas in which they operate. In considering tax policy, capital expenditures, and related planning, governmental decision makers, also, need detailed information about the structure of the state's economy and the impact of factors which affect its performance. However, such knowledge of the state's production and income structure and of its economic ties with the rest of the national and world economy has been meager and has plagued decision makers in Kansas both in the state's government and private businesses.

This monograph present an economic information framework which is geared to the myriad requirements of both state government and private business. Obviously, no framework can provide all the needed data; rather, the selection or construction of the data system should, within the capabilities of project resources, provide data for maximum economic planning.

The impetus for this investigation was a request for such data as expressed by Kansas businessmen in the report of the Governor's Economic Development Committee in 1962. Thus, this monograph presents (1) data applicable to the needs of Kansas businessmen and (2) a data system applicable to state government program planning.

In preparation for the discussion of the methodology and the results of this economic study presented in later chapters, the present chapter surveys the goals and general considerations of regional economic development.

REGIONAL ECONOMIC DEVELOPMENT

I. Goals

"To facilitate the maximization of the well-being of the people" is the vague phrase that often suffices to describe the objective of a state economic development program. In addition, however, the specific goals considered in this study are the following:

A. To expand the volume of economic activity. An explicit goal of the state of Kansas is to increase the level of economic activity, particularly its total income and employment. The identification and development of new job opportunities is the charge of several pieces of legislation enacted in the past decade by the Kansas Legislature.

B. To improve the economic welfare of state residents. An increase in economic activity will not necessarily raise the standard of living of state residents. An increase in real per capita income better reflects the extent to which Kansas residents realize an improvement in their level of living.

   The distinction between these first two objectives underscores the fact that volume growth does not necessarily raise the per capita income of the state. In evaluating economic development priorities, this is often overlooked to the detriment of state development programs.

C. To strengthen the proficiency of the public sector. The expanding

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development of a state's economy will influence the demand for government services and capital expenditures.

D. To improve or conserve the environment of the region. The pollution of air and water is the most publicized kind of environmental destruction; however, numerous other conditions influencing human environment must be recognized.

II. The Development Process

Before examining the economic information contained in this report, it will be useful to sketch briefly the nature of regional economic development. What, for instance, are the processes which energize economic development in Kansas?

A useful approach to examining these processes influencing the performance of the economy is to divide the state's economic activities into two groups: (1) the economic specialties of the state that are sold to markets outside the state (the export sector) and (2) those activities that service the local population and the export industries (local sector). Since the export sector activities are linked to national and international markets and the local sector is linked to the export sector, an approach to analyzing regional growth is to distinguish between the internal and external economic linkages of the state's economy.

Internal Linkages

The pattern of internal development within a regional economy is closely tied to its structure, and the process of such economic specialization evolves in an identifiable manner. Numerous studies of growth patterns have concluded that there are "stages of economic growth" or

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"an evolving structure of development." These stages are (1) initial area economic specialization, (2) initial processing activity expansion, (3) "family" industry formation,(4) "agglomeration" development, and (5) "growth pole" concentration.

In its embryonic stage of development, a regional economy specializes in a product (i.e., cattle) or a service (i.e., railroading) of which part is marketed outside of the area (exported). After the internal processes of specialization are set in motion, the next step in the growth process will likely be tied to the first. For instance, the initial resource base will be further exploited by processors who have been attracted to and will locate at a raw material source. Thus, in these early stages of production, industries tend to locate at raw material sites, since early production processes are frequently weight or bulk reducing which lower transportation costs.

As the region continues to grow, its primary energy will be derived from new firms becoming either suppliers to the initial processors or utilizers of their outputs as inputs into these utilizing firms. In this manner linkages are established between firms' inputs or supply requirements and/or their output or markets. Consequently, one of the unique characteristics of regional development is the tendency for firms to develop in "families" which are structurally related, a tendency which encourages the growth of certain industries while virtually blocking entrance for others. This evolving nature of specialization and growth both nurtures and is constrained by the economic structure of the region.

Disregarding for the moment that the process may arrive at a plateau for any region at a level below "total development," the next phase of regional development generally exhibited is that of complexes of economic activity

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forming a more diversified economic base for the region. This stage results from and contributes to the concentration of economic activity in a large city or metropolitan area. As the raw material processing industry expands and the initial satellite firms succeed, a cumulative process begins. Area expansion takes place as new firms are attracted by the advantages accruing to those firms and industries which can derive benefit from locating in an expanding industrial area. Thus, simply stated, existing firms attract new firms. Industries provide markets for other industries, or conversely, serve as suppliers for other industries. Because of these linkages, transportation costs tend to be minimized by adjacent locations and, in turn, further area expansion. The resulting concentration of economic activity is labeled "agglomeration."

Associated with this agglomeration are certain economies of scale which transform this assemblage of economic activity into a "growth pole." The internal scale economies of an individual firm are often such that its technological production characteristics require a large scale plant to produce efficiently. For a market oriented firm such a condition requires a large immediate market of the sort which is most accessible in a metropolitan area. These characteristics of individual firms are true, also, of "agglomerations." External economies result from a concentration of firms in one geographic area. Specialized services are needed to serve a growing number of firms. These, in turn, reduce costs for the basic firms and encourage the location of other firms to take advantage of these external economies. Large pools of specialized labor, more favorable transportation rates, the availability and maintenance of business machines, highly developed utility, communication, and transportation services, and

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governmental services are but a few examples of the external cost saving features accruing even to unrelated firms in a concentration. Such activities are self-generating, and the resulting major economic concentrations have been referred to as "growth poles" to convey the idea that they are the areas within broader regions to which the bulk of economic activity gravitates. Certainly the current economic landscape lends support to such a view.

External Linkages

A region within a highly integrated national economy acts as a specialist. Characteristically unable to produce all of the goods and services it requires, a region imports these products and services, and, thus, forms linkages with external regions. Likewise, the area's exporting producers form linkages outside of the region and their activities result in a flow of income into the region which can be used for regional economic expansion and for the purchase of imports. Obviously, then, the external linkages of a regional economy play a crucial role in the performance of that economy. Too, the importance of its external markets is closely tied to the size of the region's internal economy, for a larger economy, having attracted its own service industries, is less dependent on imported goods and services. External linkages are of vital importance to Kansas' economy.

A theory of regional economic growth, important to this study, has developed around the export-base of an area. Economic activity in a region can be separated into two categories--internal and export market activity-- and this distinction is made because of what is thought to be a causal relationship. Export market activity (with markets outside the region) is viewed as the initiating force in fostering internal regional economic

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growth, and the level of activity in the remainder of the regional economy reflects the performance of the export base of the region. As income rises in the export sector, retail and service establishments expand their sales; conversely, a decline in export-derived income depresses the level of business serving the region. Thus, the level of export income, in large part, determines the performance of activity serving the local market. In addition, since capital tends to flow into a region primarily to develop export industries, increased capital promotes growth in both export activity and local activity. For these reasons, then, a major emphasis has been placed on the performance of a region's exports.

In determining the constancy of a region's exports, consideration must be given, also, to changes in demand from these external markets. Alterations in demand derived from changing tastes, income, technology, transportation rates, and government policy require close scrutiny in anticipating fluctuations in the volume and composition of a region's exports.

This brief sketch of regional economic growth has emphasized the interdependence of economic activity, the concept of economic linkage. Changes in any industry trigger multiple changes in other industries which are directly or indirectly associated with it, and often relatively small changes are multiplied into sizable total effects on the economy.

Government Policy

Industry is not alone in initiating developments which affect the private sector of the economy. Government policy often significantly changes the rate of a state's economic development.

A state government is empowered to create and administer policies which affect the state's industries and the income of its residents. Unfortunately,

taxing and spending policies, as well as regulatory policies, have economic

consequences often only casually understood. This effect is underscored by

Table 1-1 which shows that expenditures by state government have risen more

rapidly than state government income during the past two decades in response

to the public's demand for increased public services. Inevitably, the

consequences of state policy have grown.

State policy can be used, also, to consciously amplify desirable

economic trends or to mitigate the effects of adverse developments. Tax and

program policies contain the potential to improve the competitive position of

the state.

OBJECTIVES OF THE STUDY

An economic information system designed to study economic development

must focus simultaneously on the internal economic structure of the state

and on its external ties. Further, the information system's data must

facilitate the needs of public and private decision makers. For these

reasons, during the design of the study, the heads of state and local

government agencies and business and labor leaders met to discuss their

requirements of such a system. Seven objectives, each directly related to

the general goals of the state as described above, emerged as priority goals

for the study.

The preceding discussion has identified the goals of the state and the

interdependence of both business and government in determining the economic

development of the state. In order to understand the interplay of these

goals with both the state's economic structure and the government policy

impacts, an economic information framework will be presented which reveals

a major portion of this interdependence. The following pages describe the

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seven primary goals of the present study.

First, the economic information system must be capable of multiple use to facilitate the maximum measure of state economic planning. The system must make possible an analysis of the impact of events and must provide consistent economic forecasts which would afford state and local government a better opportunity to relate their activities to the needs of the state and local areas.

Second, the study should provide a framework, reflective of state problems and needs, which will utilize the wealth of statistical information gathered by state agencies on an annual basis.

Third, the study should provide a frame of reference for partial studies. Investigations of particular aspects of the Kansas economy are constantly being conducted, and such studies can be enhanced by their reference to a general framework. Further, the study should indicate areas for additional research. Through such integrated frameworks, the total research efforts on the Kansas economy would yield increased returns.

Fourth, since the state's economy is continuously affected by changes in such factors as technology, government spending policies, and transportation rates, an information system should permit an identification of the impact of such changes. It should, then, provide the rationale for state policy decisions which could derive benefits from such changes or mitigate potential adverse effects. New industry frequently evolves out of research discoveries, and the ability to capitalize on these discoveries requires information as to how they might be fitted into a regional economy.

Fifth, the study should indicate the determinants of a priority system for economic development in the state of Kansas. Certain industries are

crucial to expanding income and employment opportunities in the state. A few of these industries will continue to grow without extraordinary development efforts because of the locational advantages available in Kansas. By channeling funds into other select industries, greater returns will be realized, and through an adequate study of the determinants of "family" industry development, these select industries can be identified. Certain industries are structurally related in their inputs and in their product markets; thus, the existing structure of an economy encourages the growth of certain industries while virtually blocking entrance for others. A rigorous identification of these structural relations in a state's economy would direct development efforts into proper channels.

Sixth, the study should indicate future labor requirements to enable more effective planning by the state's education system, particularly in the expanding area of vocational-technical training and retraining.

Seventh, the study's data should make possible reliable estimates of Kansas' export markets. This would provide valuable information to existing or new states for expanding their markets. The data should also provide the information necessary to estimate those direct and indirect effects of changes in demand which affect the export of Kansas products.

Report Format

This publication was written for Kansas businessmen and state and local government leaders. It was pretested for comprehensibility by several "volunteers." As a result, difficult ideas are frequently explained in more than one manner.

Chapter 3 contains an explanation of the format of the study. It is the pivotal chapter. The remaining chapters, which are much less demanding of the

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reader, depend on an understanding of Chapter 3. The majority of readers will find it advantageous to omit the mathematical presentation of the model at the end of Chapter 3.

Sector definitions and output levels are presented in Chapter 4 as a background for interpreting the results of the study. Chapter 5 is the first of five chapters which summarize the results of the study.

The multiple uses of the study in measuring impacts on the Kansas economy and its numerous industries is presented in Chapter 10.

Finally, a survey of the techniques employed in constructing the study is contained in Chapter 11.

Chapter 2

THE KANSAS ECONOMY: HISTORICAL PERSPECTIVE

Before examining the current structure of the Kansas economy, it would be useful to sketch some of the major changes in the Kansas economy which have resulted from differential growth rates.

Aggregate Growth Trends

Total Kansas personal income was more than 2 1/2 times as large in 1967 as it was in 1950. Table 2-1 shows the expansion of state personal income from $2,765 million in 1950 to $6,961 million in 1967. The Kansas increase of 252 per cent was below the national increase of 276 per cent but above the Plains states increase of 239 per cent.

Table 2-1

PERSONAL INCOME, KANSAS, PLAINS, U. S., 1950-1967

YEARS	(Millions)			Percent change in total personal income			Kansas as a percent of	
	Kansas	Plains	U. S.	Kansas	Plains	U. S.	U. S. total personal income	Plains total personal income
1950	2,765	20,135	226,214				1.2	13.7
1951	3,077	21,912	253,233	11.3	8.8	12.0	1.2	14.0
1952	3,524	23,016	269,767	14.5	5.0	6.5	1.3	15.3
1953	3,434	23,435	285,458	−2.6	1.8	6.2	1.2	14.6
1954	3,597	24,233	287,613	4.7	3.4	0.7	1.2	14.8
1955	3,626	24,763	308,265	0.8	2.2	7.2	1.2	14.6
1956	3,804	26,075	330,481	4.9	5.3	7.2	1.1	14.6
1957	4,006	27,859	348,426	5.3	6.8	5.4	1.1	14.4
1958	4,441	29,543	358,474	10.8	6.0	2.9	1.2	15.0
1959	4,483	30,235	380,963	0.9	2.3	6.3	1.2	14.8
1960	4,712	31,871	398,725	5.1	5.4	4.7	1.2	14.8
1961	4,941	32,924	414,411	4.8	3.3	3.9	1.2	15.0
1962	5,177	35,002	440,192	4.8	6.3	6.2	1.2	14.8
1963	5,319	36,374	463,053	2.7	3.9	5.2	1.1	14.6
1964	5,572	37,958	494,913	4.7	4.3	6.8	1.1	14.7
1965	6,001	41,844	534,816	7.7	10.2	8.1	1.1	14.3
1966	6,561	45,355	580,483	8.5	8.4	8.5	1.1	14.4
1967	6,961	48,213	625,068	6.1	6.3	7.8	1.1	14.4

SOURCE: *Survey of Current Business,* August, 1968 (Office of Business Economics, U. S. Department of Commerce).

Figure 2-1

KANSAS PERSONAL INCOME, 1948-1968

(Millions of dollars)
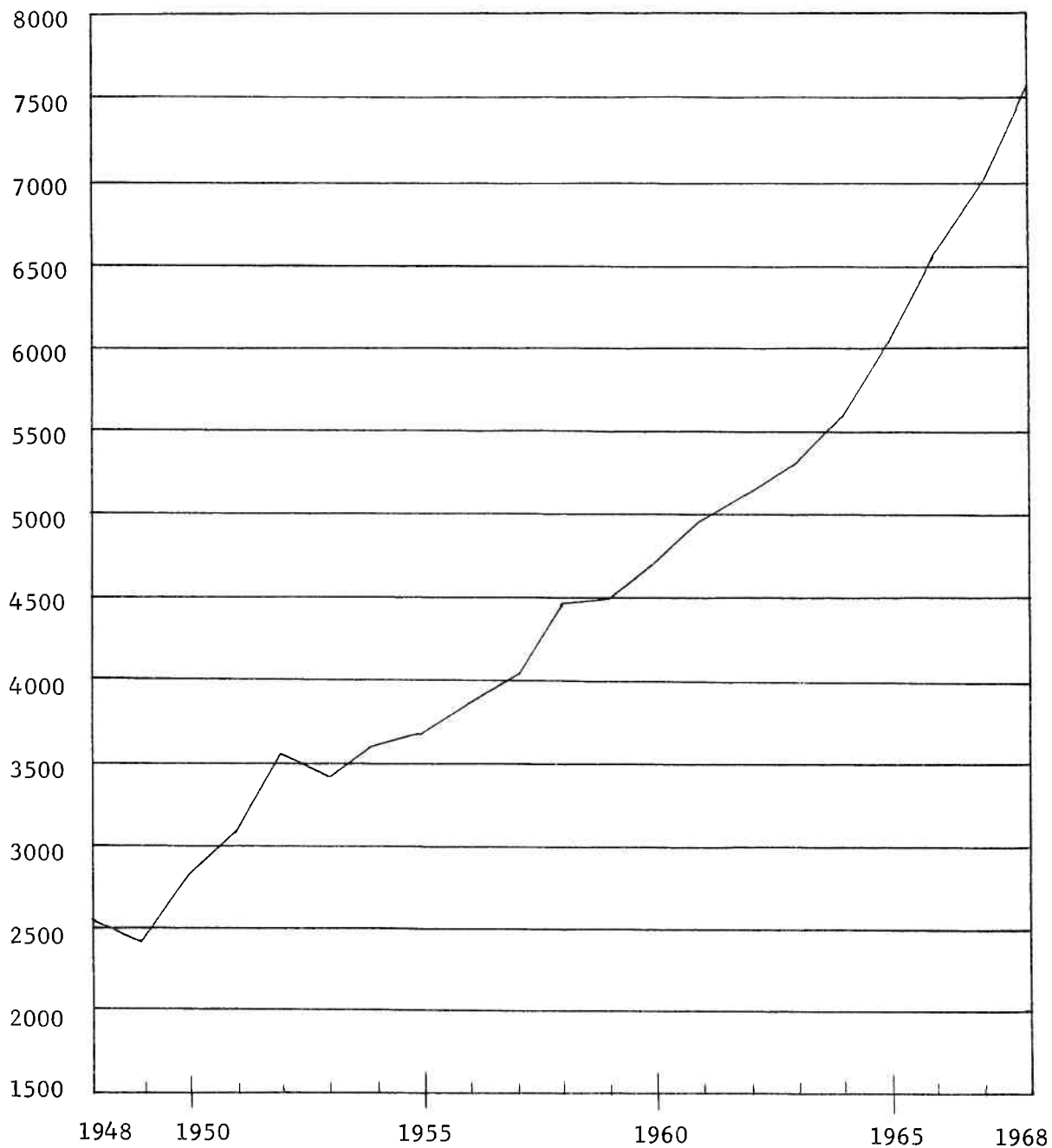
Employment expanded from 1950 to 836,000 in 1967. During the past decade, except for 1966 and 1967, the state experienced net out-migration. This means that the natural increase in population (births minus deaths) was greater than the actual increase.

Industry Growth Trends

Growth, decline and instability have been characteristic of individual industries of the state's economy. The aerospace industry has been the most unstable of the state's industries. Employment in this industry dropped from 48,000 in 1957 to 30,000 in 1961 to 27,000 in 1963 then exceeded 40,000 again in 1967 only to decline again in 1968.

Despite the gyrations in the aerospace industry, durable goods manufacturing has been expanding with the result that total manufacturing activity in the state has increased. But, nondurable goods manufacturing has declined. These decreases have been largely in food processing an historically important industry in Kansas.

Employment in the food processing industry declined by more than 17 per cent from 1958 to 1968.

Less than half as many persons are engaged in farming now than 20 years ago. From 1958 to 1968 farm employment declined by 37 per cent.

As a result of widely varying industry growth rates, the structure of the Kansas economy has undergone substantial change. In 1958 more than 17 per cent of the state's employment was in farming. By 1968 this ratio had dropped to 10 per cent. Manufacturing's share of total employment has edged up slightly from 15 to 17 per cent during the ten year period. Employment in services accounted for 8 per cent of total employment in 1958 but 11 per cent in 1968. Government employment now accounts for 18 per cent of the

Table 2-2

EMPLOYMENT AND COMPONENTS OF EMPLOYMENT CHANGE, KANSAS, 1950-1960

INDUSTRY	Employment in		Components of employment change			
			Changes related to			Total change
	1950	1960	National growth	Indus-trial mix	Regional share	
1. Agriculture	162,773	104,403	25,199	−87,812	4,243	−58,370
2. Forestry and fisheries	106	83	16	−43	4	−23
3. Mining	14,756	14,503	2,284	−6,671	4,133	−254
4. Contract construction	50,345	48,425	7,794	−2,570	−7,143	−1,919
5. Food and kindred products mfg.	22,680	22,574	3,511	3,041	6,658	−106
6. Textile mill products mfg.	398	518	62	−153	212	121
7. Apparel mfg.	3,570	5,124	553	−233	1,234	1,554
8. Lumber, wood products, furniture mfg.	2,797	2,407	433	−722	−101	−390
9. Printing and publishing mfg.	9,217	13,427	1,427	1,655	1,128	4,210
10. Chemicals and allied products mfg.	4,223	7,391	654	661	1,854	3,169
11. Electrical and other machinery mfg.	7,044	12,256	1,090	2,191	1,930	5,211
12. Motor vehicles and equipment mfg.	3,014	2,662	467	−562	−257	−352
13. Other transportation equipment mfg.	13,555	33,472	2,098	11,772	6,046	19,916
14. Other and miscellaneous mfg.	22,424	30,400	3,471	732	3,572	7,775
15. Railroads and railway express	31,936	23,135	4,944	−15,225	1,480	−8,801
16. Trucking and warehousing	8,782	12,700	1,360	1,250	1,309	3,919
17. Other transportation	6,939	7,409	1,074	−884	279	469
18. Communications	9,262	10,656	1,434	−1	−39	1,394
19. Utilities and sanitary service	11,500	13,496	1,780	−120	336	1,996
20. Wholesale trade	25,257	28,354	3,910	−964	151	3,097
21. Food and dairy products stores	19,600	19,933	3,034	−3,423	722	333
22. Eating and drinking places	20,455	22,781	3,167	−1,851	1,011	2,327
23. Other retail trade	71,791	85,119	11,114	1,375	839	13,328
24. Finance, insurance and real estate	20,330	29,767	3,147	5,045	1,245	9,437
25. Hotels and other personal services	20,815	22,734	3,222	−2,329	1,025	1,918
26. Private households	14,386	19,491	2,227	207	2,671	5,105
27. Business and repair services	17,206	16,706	2,664	1,234	−4,398	−500
28. Entertainment, recreation services	5,719	5,317	885	−791	−496	−402
29. Medical, other professional services	64,236	107,130	9,944	27,289	5,661	42,894
30. Public administration	29,203	37,111	4,521	3,476	−89	7,908
31. Armed forces	13,387	33,711	2,072	7,169	11,083	20,324
32. Industry not reported	13,302	24,593	2,059	25,816	−16,584	11,291
Total	721,008	817,588	111,617	−31,441	16,403	96,579

SOURCE: U. S. Department of Commerce, Office of Business Economics, *Growth Patterns in Employment by County 1940-1950 and 1950-1960, Volume 4 Plains.*

total compared with 13 per cent in 1958.

An interesting comparative picture of the historical performance of the state's industries is presented in Table 2-2 which was compiled in a U. S. Department of Commerce study. In addition to summarizing industry employment in three census years, the table indicates the expansion of each industry if it had grown at the national average (national growth component), if it had grown at the rate that that industry was growing nationally (industrial mix component), and the extent to which the industry grew faster or slower than that industry nationally (regional share component). The net result of the table shows that Kansas industries grew more rapidly than those industries nationally,but that Kansas had a high proportion of slow growth industries and, hence, had a slower overall growth rate than the nation.

Geographic Growth Trends

Economic activity has tended to be concentrated in a few areas of the state.

As evidenced by the changing distribution in population, the large counties are growing more rapidly. In 1950 the three largest counties in the state contained 25.9 per cent of the state's population. By 1960 this percentage had risen to 30.9 and by 1967 to 33.2 per cent. The ten largest counties contained 42.5 per cent of the state's people in 1950 and 52.9 per cent in 1967.

Figure 2-2

PER CENT CHANGE IN COUNTY POPULATION, KANSAS, 1960-1968

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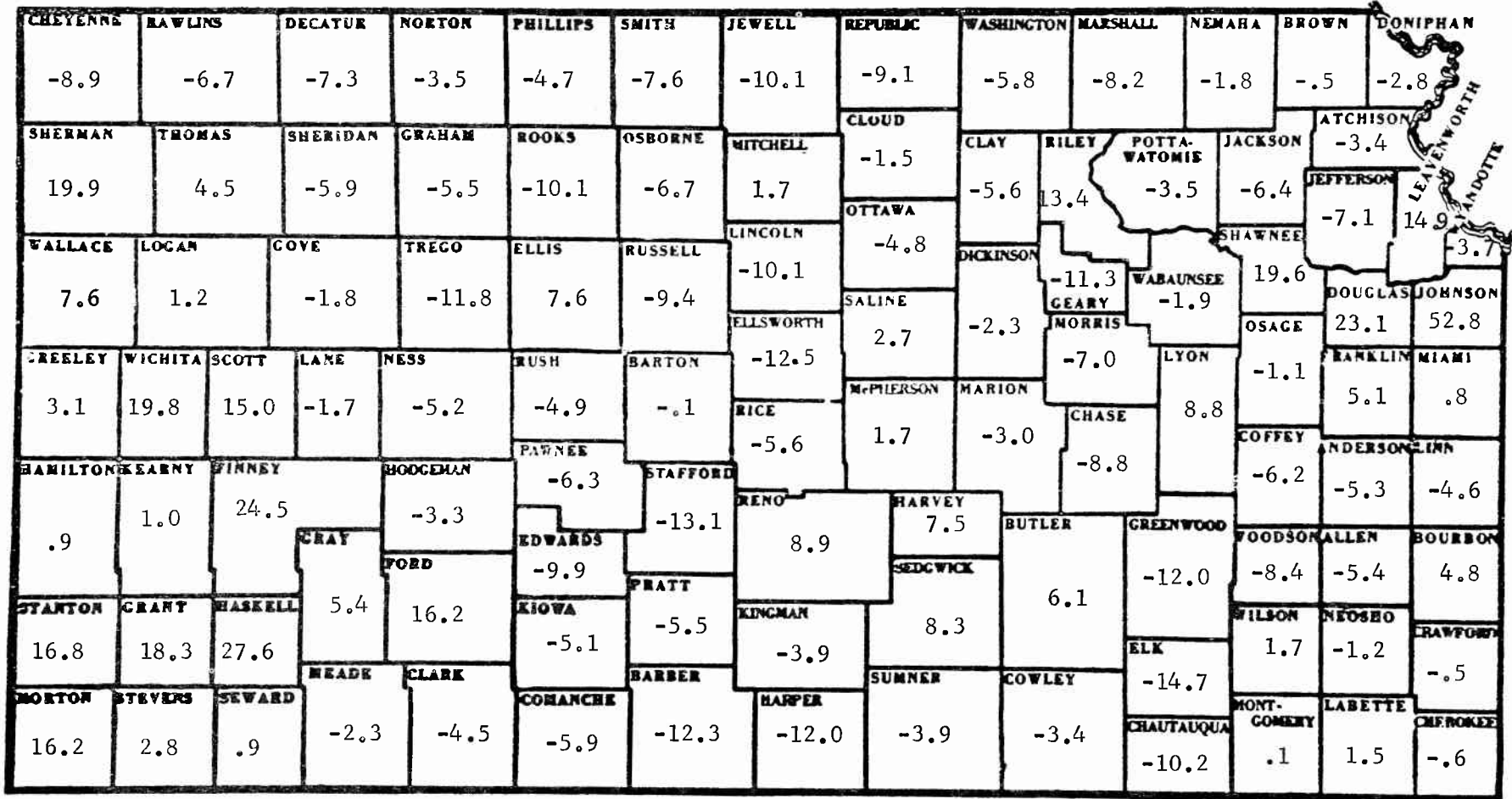
Chapter 3

THE INPUT-OUTPUT FRAMEWORK:
THE SCHEMATIC AND MATHEMATICAL MODELS

A regional input-output model provided the basic framework for this study of the Kansas economy. This chapter presents the model initially in general terms and then in a more rigorous mathematical format.

The main theme of an input-output or interindustry study is economic interdependence. In a highly specialized economy such as characterizes the United States and its geographic components, there are several stages of production involved in delivering a product or service to the ultimate consumer. Since numerous industries sell the majority of their output to other industries rather than to final markets, this intermediate demand for the production of an economy represents a sizable portion of the total activity of an economy. Nationally interindustry transactions represent more than 50 per cent of total dollar value transactions. Thus, the activity of one industry may depend on the activities of several other industries, and these are the interrelationships that are captured in an input-output investigation.

An input-output model divides the economy into a number of industries or sectors and then establishes the magnitude of the flows of products and services between these industries. These flows represent industry's purchases from and sales to other industries, individuals, or government.

Three tables are basic to an input-output system: the transactions matrix, the direct requirements matrix, and the direct and indirect requirements matrix.

This chapter explains the input-output system analysis initially through a highly simplified example and then through an interpretation of the Kansas input-output tables.

SIMPLE ILLUSTRATIVE INPUT-OUTPUT SYSTEM

Input-Output Transactions Matrix

A brief hypothetical transactions table such as Table 3-1 illustrates a typical transactions table for the Kansas economy.

Table 3-1

Hypothetical Input-Output Transactions Matrix
(millions of dollars)

Selling Sectors ↓ / Purchasing Sectors →	Farming	Mfg.	Trade	Final Demand	Total Output
Farming	4	8	2	16	30
Manufacturing	7	15	6	22	50
Trade	6	5	4	10	25
Final Payments	13	22	13	0	48
Total Inputs	30	50	25	48	153

Each column shows the purchases and payments made by that column sector. For instance, the Farming sector, in order to produce its $30 million output, purchased $4 million from Farming, $7 million from Manufacturing, $6 million from Trade, and made $13 million of payments to the Final Payments sector. Conversely each row indicates the sales of that row sector to the column sectors. Again focusing on Farming, the Farming row sector sells $4 million to Farming, $8 million to Manufacturing, $2 million to Trade, and $16 million to Final Demand for a Farming row sector total of $30 million of output.

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For each sector, total inputs (purchases and payments) equal total outputs (sales).

Direct Requirements Matrix

The second matrix is the Direct Requirements Matrix. This indicates for each column industry what proportion of purchases it makes of each row industry to produce one dollar of output. The hypothetical transactions matrix presented in Table 3-1 illustrates the manner in which the Direct Requirements Matrix is derived. If each column entry in Table 3-1 is divided by the corresponding column total, the result will be a direct requirements matrix such as Table 3-2. The sum of each column is one, and, thus, each

Table 3-2

Direct Requirements Matrix

	Farming	Mfg.	Trade
Farming	.13	.16	.08
Manufacturing	.23	.30	.24
Trade	.20	.10	.16
Final Payments	.44	.44	.52
Total	1.00	1.00	1.00

column entry indicates the direct purchases from each row sector necessary to produce one dollar of output for the column sector. For instance, the Manufacturing column indicates, in order to produce one dollar of Manufacturing output, Manufacturing must purchase $.16 from Farming, $.30 from Manufacturing, $.10 from Trade, and $.44 from Final Payments. These dollar fractions may be referred to as input coefficients.

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There is yet another way in which this matrix may be read. In one sense each column is a "production recipe" needed to produce one dollar of output for the industry which that column represents. Importantly, the assumption of such "production recipes" is that they do not change for different levels of output. This and other assumptions are elaborated in a later portion of the chapter.

The values of the Kansas Direct Requirements Matrix are derived in the fashion as those of the simple matrix of Table 3-2.

Direct and Indirect Requirements Matrix

From the direct requirements matrix, the direct effects of a change in output in a particular industry can be measured; however, an adequate measure of the effects of a change in output must indicate the multiple indirect effects of such changes. If an industry requires more rubber to increase its output, then obviously more inputs to the rubber industry are needed to produce the increase. In turn, suppliers of the rubber industry, to increase their production, require additional inputs from their suppliers. These successive rounds might be compared to the ripples resulting from a rock being dropped into a pool. This interaction is widespread, but it diminishes in intensity as successive steps are carried out.

The information contained in the hypothetical direct requirements matrix (Table 3-2) indicates an additional $10 million of Manufacturing requires $1.6 purchases from Farming $3 purchases from Manufacturing, and $1 million purchases from Trade. But, in order to supply these additional requirements each of these industries must increase its production. These sectors, in turn, must purchase more from their suppliers in the proportions indicated in Table 3-2. For instance, for Trade to produce the additional $1 million

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which the Manufacturing sector requires to produce its extra $10 million output, the Trade sector must purchase $80,000 from Farming, $240,000 from Manufacturing, and $160,000 from Trade. Of course, this requires an output increase from each of the sectors supplying Trade, and in turn, these sectors must purchase additional inputs from other sectors. As the illustration suggests, these indirect requirements diminish rapidly as they

Table 3-3

Direct and Indirect Requirements Matrix

	Farming	Mfg.	Trade
Farming	1.2844	.3242	.2149
Manufacturing	.5493	1.6360	.5174
Trade	.3712	.2710	1.3031

are traced through several "rounds." Nevertheless, these indirect requirements are critical in ascertaining the total requirements of all industries made necessary by additional output in a particular one.

The task of determining the sum of all of these indirect requirements is arduous for even so brief a matrix as the hypothetical matrix. However, by utilizing matrix algebra and a high speed computer even an extensive matrix can be manipulated to yield the total requirements of the economy whenever a particular industry increases its output.

The total direct and indirect requirements for the hypothetical matrix are presented in Table 3-3. A column shows the requirements from each industry in order for the column industry to make a one dollar delivery to final demand, or roughly, to increase its output by one dollar.

ACCOUNTING SYSTEMS AND INPUT-OUTPUT DATA

The Firm Flows

Since most of the data used in an input-output transactions matrix is gathered from individual firm records, it is worthwhile to consider the nature of the firm's transactions which are reflected in an input-output transactions matrix.

Figure 3-1 is a schematic input-output flow diagram showing the firm information which is summarized by a transaction matrix.

The schema represents firm purchase transactions on the left side; on the right side are shown the allocation of the firm's sales-transactions. The diagram shows purchases by Firm X of goods and services from the other Firms in the economy grouped into a predetermined industry classification. Firm X also pays wages, salaries, profits, and interest to Households, retains profits and depreciation allowances as Savings, and pays taxes to Government. Additionally, the firm may make purchases, Imports, from firms or individuals which are outside of the region being studied.

The right hand side of the diagram presents a general picture of the sales of the firm. Firm X sells its products to Other Firms, to Households for consumption, to Capital Formation to increase the economy's productive capacity, to Government, or to firms outside of the region (Exports).

Another approach to examining input-output data is to consider the matrix's information requirements in terms of a firm's accounting system. Table 3-4 indicates the data required of individual firms in order to construct a transactions matrix of the type used for Kansas. Table 3-4 reflects in dollar terms the debit and credit transactions or Kansas' firms and indicates the direct allocations of these transactions to other firms

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Figure 3-1

Flows Summarized By An Input-Output Matrix
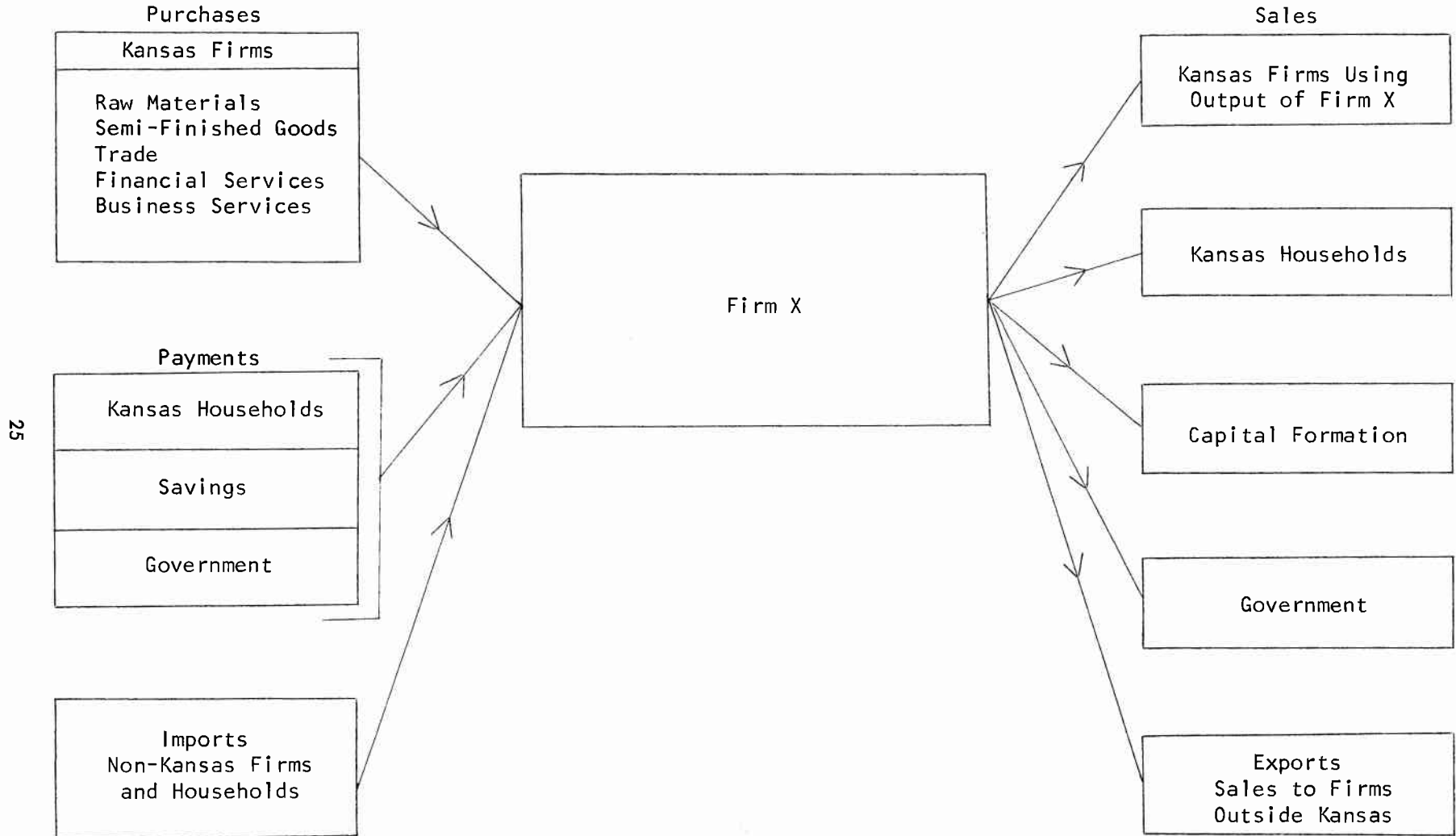
Table 3-4

Accounting Information Used in Input-Output Matrix

DEBIT	CREDIT
I. Inputs Purchased in State	I. Sales to Kansas Firms
A. From industry A 100,000	A. To industry D
B. From industry B 300,000	B. To industry E
C. From industry C 400,000	II. Sales to Firms Outside of Kansas
II. Inputs Purchased Out of State	A. To industry D
A. From industry A 50,000	B. To industry E
B. From industry B 25,000	III. Final Demand Sales
C. From industry C 40,000	A. To consumption
III. Value Added	B. To investment
Wages and salaries 500,000	C. To Government
Profits paid out 100,000	IV. Inventory Change
Profits retained 100,000	Raw materials
Interest paid 50,000	Finished goods
Depreciation 100,000	
Taxes	

and accounting entries. The debit transactions, for instance, are divided into three groups. Group I, Inputs Purchased in State, shows by individual firm, the total amounts of inputs purchased by a particular firm from supplying firms located in Kansas. Group II, Inputs Purchased Out of State, shows, again by individual supplying firms, the amount of inputs purchased by a particular firm from out of state. Group III, Value Added, allocates to other debit entries the remaining purchases of goods and services, profit allocations, depreciation costs, and interest and tax payments. The right hand side of the "ledger" indicates a firm's credit transactions. Group I, Sales to Kansas Firms, shows a firm's sales to other individual Kansas firms which use the products in their own production processes. Group II indicates sales to out-of-state firms. Group III, Final Demand Sales, allocates a firm's credits to consumption sales, to investments, to government, and to sales to out-of-state firms. Group IV, Inventory Change, shows a firm's credits that have accrued as a result of inventory balances.

AN INTERPRETATION OF THE KANSAS INPUT-OUTPUT MATRICES

To this point the present chapter, in describing a regional input-output model, has examined simplified matrix forms similar to those used in the Kansas Input-Output Transactions Matrix and has discussed input-output data in terms reflective of the accounting systems which, in part, generate that data. A further step useful in describing the manner by which the transactions matrix must be read is an illustrative discussion of one specific and complete industry section, Meat Products, from the overall transactions matrix. This discussion will relate the Meat Products sector to the Kansas Transactions Matrix, the Kansas Direct Requirements Matrix, and the Kansas Direct and Indirect Requirements Matrix.

Accounting Characteristics

A full understanding of the Kansas Input-Output Transactions Matrix requires an initial explanation of six specific accounting characteristics that affect the interpretation of the overall matrix and that make that interpretation clear.

1. The flows in the transactions matrix represent for each industry or sector in the state purchases from and sales to the other sectors valued in 1965 prices.

2. All transactions are valued in producer's prices, rather than in purchaser's prices. The difference between the former and the latter are marketing and related costs. Individual marketing costs, such as transportation, and retail and wholesale trade, are charged to the purchaser as a direct purchase from those sectors rather than as part of the purchase price of the commodity.

3. The output and associated transactions of the retail and wholesale sectors are treated on a gross margin basis, and operating costs plus net revenue are roughly gross sales minus cost of goods sold. For instance, if a machinery manufacturer purchases fabricated metal parts from a wholesaler, the transaction is treated as if he were purchasing a marketing service from the wholesaler (the wholesaler's margin) and the parts from the Fabricated Metal Industry. If the transactions were not handled in this manner many interindustry links would be blurred by showing them first flowing to a trade sector and, then, to the processing or final demand sector. In summary, commodities purchased by the trades sectors for resale do not enter either the trades columns or rows, but rather, they are

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shown as a flow directly to the consuming sector.

4. The input-output table contains only purchases used in current production; it excludes capital expenditures. The capital that is "used up" in current production appears as depreciation and is included in the Gross Savings sector. For industries selling capital goods, the goods are shown as sales to Gross Private Investment rather than to the industry making the purchase.

5. The entire output of an establishment is attributed to the industry of the establishment's primary output. Although this is consistent with standard reporting procedures, it gives rise to heterogeneity in industry groups. For instance, if an establishment which produces primarily meat products also produces soap, the total output is assigned to the Meat Products sector.

6. Although a base year was established, there were a few deviations for "abnormal" transactions. The most significant of these was the exclusion of Inventory Change in the farming sectors. It was concluded that a lesser distortion of normal relationships would result if unusually large inventory changes in the farm sectors were disregarded.

Kansas Transactions matrix: Column Interpretation

Table 3-5, a reproduction of column 21, the Meat Products sector, from the Kansas Input-Output Transactions Matrix is read in the same manner as was the hypothetical version of the matrix (Table 3-1). Column 21 shows the purchases (in thousands of dollars) by the Meat Products industry which were necessary to produce its 1965 output of $590,639,000. The overall Kansas Input-Output Transactions Matrix similarly represents all major Kansas industries.

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Table 3-5

INTERINDUSTRY FLOW

OF GOODS AND SERVICES

IN THE KANSAS

ECONOMY, 1965

(Thousands of Dollars)

			Meat Products 21
FARMING	Corn	1	0
	Sorghum	2	0
	Wheat	3	0
	Other Grains	4	0
	Soybeans	5	0
	Hay	6	43
	Dairy Products	7	64
	Poultry & Poultry Products	8	8,500
	Cattle	9	315,490
	Hogs	10	82,140
	Other Agricultural Products	11	6,069
	Agricultural Services	12	0
MINING	Crude Oil & Natural Gas	13	0
	Oil & Gas Field Services	14	0
	Nonmetallic Mining	15	0
	Other Mining	16	0
CONSTRUCTION	Maintenance & Repair	17	394
	Building Construction	18	0
	Heavy Construction	19	0
	Special Trade Construction	20	0
	Meat Products	21	25,975
	Dairy Products	22	0
	Grain Mill Products	23	0
	Other Food & Kindred Products	24	67
	Apparel	25	0
	Paper & Allied Products	26	3,587
	Printing & Publishing	27	161
	Industrial Chemicals	28	0
	Agricultural Chemicals	29	0
	Other Chemicals	30	0
	Petroleum & Coal Products	31	64
MANUFACTURING	Rubber & Plastics	32	0
	Cement & Concrete	33	0
	Other Stone & Clay	34	0
	Primary Metals	35	0
	Fabricated Metals	36	0
	Other Fabricated Metal Products	37	0
	Farm Machinery	38	0
	Construction Machinery	39	0
	Food Products Machinery	40	11
	Electrical Machinery	41	0
	Other Machinery	42	0
	Motor Vehicles	43	0
	Aerospace	44	0
	Trailer Coaches	45	0
	Other Transportation Equipment	46	0
	Other Manufacturing	47	0
TRANSPORTATION	Railroad Transportation	48	2,000
	Motor Freight	49	3,814
	Other Transportation	50	0
UTILITIES	Communications	51	351
	Electric Gas & Sanitary Services	52	952
WHOLESALE	Groceries	53	700
	Farm Products	54	4,761
	Machinery & Equipment	55	3,800
	Other Wholesale Trade	56	5,753
RETAIL	Farm Equipment Dealers	57	0
	Gasoline Service Stations	58	0
	Eating & Drinking	59	0
	Other Retail Trade	60	0
F.I.R.E.	Banking	61	2,322
	Other Finance	62	
	Insurance & Real Estate	63	3,764
SERVICES	Lodging Services	64	0
	Personal Services	65	18
	Business Services	66	367
	Medical & Health Services	67	0
	Other Services	68	782
	Education	69	0
FINAL PAYMENTS	Households	70	60,382
	Gross Savings	71	2,934
	Federal Government	72	1,145
	State Government	73	777
	Local Government	74	308
	Imports	75	53,141
	Total Purchases	76	590,639

The following discussion merely verbalizes the reading of the Meat Products sector, Industry 21. As will be recalled from the previous discussion of the hypothetical version of the matrix (Table 3-1) the amount of purchases made by the Meat Products sector can be determined by reading down the column.

a. Reading from the top, the Meat Products industry purchased $21 thousand of hay used in stockyard operations in the industry. Technically, this is not meat packing, but auxiliary stockyard operations of meat products firms are included because, as will be recalled from the discussion of the accounting characteristics of the system, the entire output of the firm is classified in the industry of its primary output.

b. Industry 21 purchased $64 thousand of Dairy Products which were used in processed meat products.

c. The industry purchased $8,500,000 from Poultry, $315,490,000 from Cattle, $82,140,000 from Hogs, and $6,069,000 from other Agricultural Products from farmers in Kansas.

d. The industry made expenditures of $394,000 for Maintenance and Repair of existing plant and equipment.

e. Firms in the Meat Products industry purchased $25,975,000 meat products from other firms in the industry, purchases attributable to industry specialization.

f. Industry purchases of Transportation underscore an additional accounting characteristic. The Meat Products industry purchased $2,000,000 of Railroad Transportation and $3,814,000 of Motor Freight Transportation in acquiring its inputs, because trans-

portation expenses are charged to the purchaser, not to the seller. Thus, transportation purchases do not represent the cost of the shipping of the output of the meat products industry. Each industry is charged with the transportation expenses involved in obtaining its inputs but not those incurred in shipping its output.

g. A third accounting characteristic employed in constructing the table is seen in purchases from the wholesale trade sectors. These represent purchases of only the services of the wholesaler, not purchases of goods, for the entire output of a trade sector is defined as total sales minus the cost of goods sold. For further discussion of the rationale for this see #3 under "Accounting Characteristics" above.

h. Row 70 indicates that the Meat Products industry made payments to Households in the amount of $60,382,000. The major portion of this total was for the wages and salaries to employees of meat products firms. Included also in the total payments to households were dividends, interest, and rent paid directly to households by firms in the industry.

i. The $2,934,000 of Gross Savings which appears in row 71 represents retained earnings and depreciation.

The depreciation item is consistent with the fourth accounting characteristic enumerated in "Accounting Characteristics" mentioned above. The purchases in any column represent purchases for current production only, and capital purchases are excluded as indicated. Depreciation represents the amount of capital "used up" in current production.

j. Taxes and fees paid to the Federal Government of $1,145,000 are
    indicated in row 72. Similarly, rows 73 and 74 indicates taxes and
    fees paid to state and local government.

k. Imports, row 75, represent the total of all goods and services
    purchased by the industry from out-of-state sources.

Kansas Transactions Matrix: Row Interpretation

Sales of the meat products industry are shown in row 21. For convenience
row 21 has been reproduced in Table 3-6. Row 21 data are to be interpreted
in the same manner as that found in the hypothetical version of the matrix
(Table 3-1).

a. Starting with column 1 and reading to the right, the first non-zero
    entry is a sale of $25,975,000 to the Meat Products industry. This
    transaction was encountered in the discussion of column 21 and needs
    no further comment.

b. The next sales listed are to Grain Mill Products firms and Other
    Food and Kindred Products firms in the amounts of $144,000 and
    $3,256,000 respectively. The $5,039,000 sale to Other Chemical
    firms is primarily tallow.

c. The next major sale is to Eating and Drinking firms in the amount
    of $6,870,000.

d. The $5,666,000 in column 63 represents Insurance claims paid to
    meat products firms by insurance companies. (For further
    information pertaining to this, see the discussion of the insurance
    industry in the section of sector definitions).

e. As indicated by the entry in column 70, the meat products industry
    sold $91,284,000 to Kansas Households. This represents the first

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Table 3-6

INTERINDUSTRY FLOW OF GOODS AND SERVICES IN THE KANSAS ECONOMY, 1965 (Thousands of Dollars)		Corn	Sorghum	Wheat	Other Grains	Soybeans	Hay	Dairy Products	Poultry & Poultry Products	Cattle
		1	2	3	4	5	6	7	8	9
Meat Products	21	0	0	0	0	0	0	0	0	0

MANUFACTURING

Other Food & Kindred Products	Apparel	Paper & Allied Products	Printing & Publishing	Industrial Chemicals	Agricultural Chemicals	Other Chemicals	Petroleum & Coal Products	Rubber & Plastics	Cement & Concrete	Other Stone & Clay	Primary Metals	Fabricated Metals	Other Fabricated Metal Products
24	25	26	27	28	29	30	31	32	33	34	35	36	37
3,256	0	0	0	0	0	5,039	0	0	0	0	0	0	0

TIES	WHOLESALE				RETAIL				F. I. R. E.				
Electric Gas & Sanitary Services	Groceries	Farm Products	Machinery & Equipment	Other Wholesale Trade	Farm Equipment Dealers	Gasoline Service Stations	Eating & Drinking	Other Retail Trade	Banking	Other Finance	Insurance & Real Estate	Lodging Services	Personal Services
52	53	54	55	56	57	58	59	60	61	62	63	64	65
6	0	0	0	0	0	0	6,870	0	0	0	5,666	165	0

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Table 3-6 (continued)

			MINING				CONSTRUCTION						
Hogs	Other Agricultural Products	Agricultural Services	Crude Oil & Natural Gas	Oil & Gas Field Services	Nonmetallic Mining	Other Mining	Maintenance & Repair	Building Construction	Heavy Construction	Special Trade Construction	Meat Products	Dairy Products	Grain Mill Products
10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	0	0	0	0	0	0	0	0	0	0	25,975	0	144

										TRANSPORTATION			UTILI
Farm Machinery	Construction Machinery	Food Products Machinery	Electrical Machinery	Other Machinery	Motor Vehicles	Aerospace	Trailer Coaches	Other Transportation Equipment	Other Manufacturing	Railroad Transportation	Motor Freight	Other Transportation	Communications
38	39	40	41	42	43	44	45	46	47	48	49	50	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0

SERVICES				FINAL DEMAND									
Business Services	Medical & Health Services	Other Services	Education	Households	Gross Private Investment	Change in Finished Goods Inventory	Federal Government Defense	Federal Government Non-Defense	State Government	Local Government	Exports	Total Final Demand	Total Output
66	67	68	69	70	71	72	73	74	75	76	77	78	79
0	5,579	0	0	91,284	0	- 654	18,773	0	618	65	427,852	537,938	590,639

entry in the "final demand" grouping. Sales prior to this were to "intermediate demand" or for further processing.

The purchase of meat products by Households ignores the fact that the meat may have been purchased from a retail or wholesale firm. The trade sectors are by-passed except for the margin as mentioned earlier.

f. The negative value in column 72 shows a decline in Finished Goods Inventory over the previous period. In other words, during 1965 the industry sold $654,000 more than it produced.

g. Federal Government Defense purchased $18,773,000 of the industry's output. State Government and Local Government both purchased small amounts.

h. The remaining $427,852,000 of Final Demand was sold to individuals or industries outside of Kansas.

i. The total output figure in column 79 of the Meat Products sector table is, of course, equal to the total purchases figure in row 76 of column 21 of the Kansas Input-Output Transactions Matrix.

The foregoing discussion emphasizes the fact that the transactions matrix is a double entry accounting system employing a few special accounting characteristics to allow for consistency or to focus on the major operational elements of the economy.

Kansas Direct Requirements Matrix

As indicated by the illustrative simple matrix of Table 3-2, the direct requirements matrix indicates in each column the purchases necessary to produce $1 of output of the column industry. These values are obtained simply by dividing the numbers in a column by the total inputs in that

column. Consequently, each column of the direct requirements matrix adds to unity.

Column 21, reproduced in Table 3-7, is used to illustrate the interpretation of the Kansas Direct Requirements Matrix. Each entry indicates the fraction of a dollar input from the respective industry required to produce one dollar of output in the meat products industry. The columns in the direct requirements matrix have been called "production recipes." Assuming that this relative input mix does not change with output levels, the direct requirements from other industries necessary to support any level of output of the meat products industry can be determined.

In order to determine the requirements from other industries to produce an additional $50 million of meat products, simply multiply each entry in column 21 by $50 million.

Kansas Direct and Indirect Requirements Matrix

The preceding section dealt with the purchases necessary to support a level of output of a particular industry. From another viewpoint the direct requirements matrix might be considered to focus on the direct impact of output changes in a given industry on other industries. However, it must be remembered that a complete direct-indirect impact study of the Kansas economy would also reveal the multi-level stages of indirect impacts as each industry would in turn make its purchases and sales felt on a variety of contributing industries.

Column 21 from the Kansas Direct and Indirect Requirements Matrix is reproduced in Table 3-8. The column shows the total direct and indirect effects on each industry resulting from a change in one dollar delivery to final demand by the Meat Products Industry. Nearly all industries experience some impact.

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Table 3-7

DIRECT PURCHASES
PER DOLLAR OF OUTPUT
KANSAS, 1965

			Meat Products 21
FARMING	Corn	1	
	Sorghum	2	
	Wheat	3	
	Other Grains	4	
	Soybeans	5	
	Hay	6	.000,072
	Dairy Products	7	.000,109
	Poultry & Poultry Products	8	.014,392
	Cattle	9	.534,151
	Hogs	10	.139,070
	Other Agricultural Products	11	.010,275
	Agricultural Services	12	
MINING	Crude Oil & Natural Gas	13	
	Oil & Gas Field Services	14	
	Nonmetallic Mining	15	
	Other Mining	16	
CONSTRUCTION	Maintenance & Repair	17	.000,667
	Building Construction	18	
	Heavy Construction	19	
	Special Trade Construction	20	
	Meat Products	21	.043,979
	Dairy Products	22	
	Grain Mill Products	23	
	Other Food & Kindred Products	24	.000,114
	Apparel	25	
	Paper & Allied Products	26	.006,073
	Printing & Publishing	27	.000,273
	Industrial Chemicals	28	
	Agricultural Chemicals	29	
	Other Chemicals	30	
	Petroleum & Coal Products	31	.000,109
MANUFACTURING	Rubber & Plastics	32	
	Cement & Concrete	33	
	Other Stone & Clay	34	
	Primary Metals	35	
	Fabricated Metals	36	
	Other Fabricated Metal Products	37	
	Farm Machinery	38	
	Construction Machinery	39	
	Food Products Machinery	40	.000,018
	Electrical Machinery	41	
	Other Machinery	42	
	Motor Vehicles	43	
	Aerospace	44	
	Trailer Coaches	45	
	Other Transportation Equipment	46	
	Other Manufacturing	47	
TRANSPORTATION	Railroad Transportation	48	.003,386
	Motor Freight	49	.006,458
	Other Transportation	50	
UTILITIES	Communications	51	.000,594
	Electric Gas & Sanitary Services	52	.001,611
WHOLESALE	Groceries	53	.001,185
	Farm Products	54	.008,061
	Machinery & Equipment	55	.006,434
	Other Wholesale Trade	56	.009,740
RETAIL	Farm Equipment Dealers	57	
	Gasoline Service Stations	58	
	Eating & Drinking	59	
	Other Retail Trade	60	
F.I.R.E.	Banking	61	.003,931
	Other Finance	62	.000,003
	Insurance & Real Estate	63	.006,373
SERVICES	Lodging Services	64	
	Personal Services	65	.000,030
	Business Services	66	.000,622
	Medical & Health Services	67	
	Other Services	68	.001,324
	Education	69	
FINAL PAYMENTS	Households	70	.102,232
	Gross Savings	71	.004,968
	Federal Government	72	.001,938
	State Government	73	.001,315
	Local Government	74	.000,521
	Imports	75	.089,971
	Total		1,000,000

Table 3-8

DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF DELIVERY TO FINAL DEMAND IN THE KANSAS ECONOMY, 1965

Sector		No.	Meat Products (21)
FARMING	Corn	1	0.054474
	Sorghum	2	0.107438
	Wheat	3	0.022753
	Other Grains	4	0.000686
	Soybeans	5	0.001337
	Hay	6	0.120729
	Dairy Products	7	0.000241
	Poultry & Poultry Products	8	0.015064
	Cattle	9	0.700583
	Hogs	10	0.151418
	Other Agricultural Products	11	0.014086
	Agricultural Services	12	0.030345
MINING	Crude Oil & Natural Gas	13	0.007354
	Oil & Gas Field Services	14	0.000764
	Nonmetallic Mining	15	0.000015
	Other Mining	16	0.000360
CONSTRUCTION	Maintenance & Repair	17	0.007641
	Building Construction	18	0.000000
	Heavy Construction	19	0.000066
	Special Trade Construction	20	0.000407
MANUFACTURING	Meat Products	21	1.046442
	Dairy Products	22	0.000159
	Grain Mill Products	23	0.070844
	Other Food & Kindred Products	24	0.008237
	Apparel	25	0.000221
	Paper & Allied Products	26	0.009781
	Printing & Publishing	27	0.002092
	Industrial Chemicals	28	0.020580
	Agricultural Chemicals	29	0.001268
	Other Chemicals	30	0.001335
	Petroleum & Coal Products	31	0.010376
	Rubber & Plastics	32	0.000178
	Cement & Concrete	33	0.000134
	Other Stone & Clay	34	0.000173
	Primary Metals	35	0.000228
	Fabricated Metals	36	0.000109
	Other Fabricated Metal Products	37	0.000499
	Farm Machinery	38	0.004863
	Construction Machinery	39	0.000156
	Food Products Machinery	40	0.000189
	Electrical Machinery	41	0.000120
	Other Machinery	42	0.000445
	Motor Vehicles	43	0.000013
	Aerospace	44	0.000003
	Trailer Coaches	45	0.000138
	Other Transportation Equipment	46	0.000051
	Other Manufacturing	47	0.000673
TRANSPORTATION	Railroad Transportation	48	0.006444
	Motor Freight	49	0.012633
	Other Transportation	50	0.000256
UTILITIES	Communications	51	0.006010
	Electric Gas & Sanitary Services	52	0.012570
WHOLESALE	Groceries	53	0.002649
	Farm Products	54	0.021722
	Machinery & Equipment	55	0.010759
	Other Wholesale Trade	56	0.041382
RETAIL	Farm Equipment Dealers	57	0.012788
	Gasoline Service Stations	58	0.002517
	Eating & Drinking	59	0.000786
	Other Retail Trade	60	0.000380
F.I.R.E.	Banking	61	0.008561
	Other Finance	62	0.000753
	Insurance & Real Estate	63	0.013601
SERVICES	Lodging Services	64	0.000747
	Personal Services	65	0.003619
	Business Services	66	0.004047
	Medical & Health Services	67	0.000116
	Other Services	68	0.003773
	Education	69	0.000082

MATHEMATICAL REPRESENTATION OF BASIC MODEL

A modified Leontief input-output model was used in this study of the Kansas economy. The components of the model were presented in schematic terms in the earlier portions of this chapter. This section develops the model in mathematical terms.

During a given period of time, an economy can be described as consisting of n-different industries. These industries produce their products, and at the same time, consume part of the products of each other. These relationships can then be expressed as a system of linear equations that describe the economy in balance.

Define the following variables as:

X_i = total output of industry i

X_{ij} = total amount of the product of industry i used up by industry j

Y_i = total amount of X_i left over for final demand (consumption apart from that of other producing industries)

M_i = total imports of commodities of the i-type (i.e., goods similar to those produced in industry i)

The balance equations are:

1. $X_i + M_i = Y_i + \Sigma_j X_{ij}$ (i = 1, 2...n) i.e., total supply equal total demand

or

2. $X_i - \Sigma_j X_{ij} = Y_i - M_i$

Let a_{ij} be the technical coefficients; these show the amount of each input used by an industry per unit of its own output. Hence, a_{ij} is the amount of industry i's product that is needed for industry j to produce one unit of its product. The commodity flows in equation 1 are shown by equation 3, the input functions:

3. $X_{ij} = a_{ij} X_j$ since by definition $a_{ij} = {}^{X_{ij}}/_{X_j}$ $(i,j = 1, 2...n)$

Substituting 3 into 2 yields:

4. $X_i - \Sigma_j a_{ij} X_j = Y_i - M_i$ $(i = 1, 2...n)$

Equation 4 represents a system of n-equations in n-unknowns X_j the levels of output; an n x n set of parameters a_{ij}, and two sets of variables (Y_i and M_i) that are given. Since the unknowns (X_j) are the output levels of each industry, equation 3 can be thought of as a simplified production function for the whole economy.

Imports are needed because domestic production cannot meet the total demand for all products. Imports of good i are, therefore, a function of the total supply of the _i_th commodity and, thus, are related to the level of domestic production of _i_th commodity. If the relationship is linear, then

5. $M_i = M_i X_i$ $(i = 1...n)$

which leads to

6. $Y_i = X_i + M_i - \Sigma_j a_{ij} X_j = X_i (1 + M_i) - \Sigma_j a_{ij} X_j$

If imports are a small amount of the total supply such that $M_i = 0$ for all i, then

7. $Y_i = X_i - \Sigma_j a_{ij} X_j$

Equation 7 is a representation of the Leontief static input-output system. In this system the final demands (Y-vector) is considered to be determined by outside forces (i.e., the system itself does not determine the value of the Y-vector, for these are either given or predetermined). This is the feature that makes the system an open system.

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The system described by equation 7 is formulated in terms of commodity flows. By adding employment, wage rates, and product prices, the system becomes more realistic. The variables that show these additions are

Z = total employment

Z_j = employment in industry j

$b_j = Z_j/X_j$ = amount of labor used by industry j to produce one unit of its output

P_i = price of the $\underline{i}$th product

W = wage rate (given)

By definition total employment is

8. $Z = \Sigma_j \, Z_j = \Sigma_j \, b_j \, X_j$

and the equality of receipts and costs in the $\underline{i}$th industry gives

9. $p_j \, X_j = \Sigma_i \, p_i \, X_{ij} + WZ_j = \Sigma_i \, p_i \, a_{ij} \, X_j + Wb_j \, X_j$

hence

10. $p_j = \Sigma_i \, p_i \, a_{ij} + Wb_j$

The set of equilibrium conditions are made up of

7. $Y_i = X_i - \Sigma_j \, a_{ij} \, X_j$

8. $Z = \Sigma_j \, b_j \, X_j$

10. $p_j = \Sigma_i \, p_i \, a_{ij} + Wb_j$

The system shown by equation 7, 8 and 10 includes n outputs X_i, n prices p_i, and employment Z. There are 2 n + 1 equations in 2 n + 1 unknowns; hence, the system is consistent. Note also that none of the equations is derivable from the others. In fact there exist two separate subsystems within the entire system. If final demand (Y_i) is given then the equilibrium outputs (X_i) can

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be determined from equation 7. These outputs then yield total employment from equation 8. Quite separately, the equilibrium prices (p_i) can be found from equation 10 for a given wage rate.

From equations 7 and 8 the transaction matrix can be constructed. Table 3-9 shows a typical representation of the transaction matrix when the data are in terms of commodity flows.

The transactions matrix shown in Table 3-9 is in terms of quantities, and the units vary from one row to another. The matrix can be summed across its rows to fit equations 7 and 8, but since the units vary, the matrix columns cannot be summed. For this reason, equation 10, the equality of receipts and costs, cannot be shown directly in Table 3-9. By adjusting the system shown by equations 7, 8 and 10 to account for money values, the entire system can be shown as a value transaction matrix.

With the equilibrium prices given (or determined), the money values of the commodities can be found. For the $\underline{i}$th industry let

$$X_i = p_i X_i$$

$$X_{ij} = p_i X_{ij}$$

$$Y_i = p_i Y_i$$

For the given wage rate W, total labor payments are Z = WZ, and the values added in the separate industries are WZ_j. The transaction matrix is now of the form shown in Table 3-10.

For the system to be in equilibrium

$$X_i = X_j \quad i = j = 1, 2 \ldots n$$

must hold (i.e., the total gross outlay of each of the processing sectors must be the same as its respective total gross output).

Table 3-9

Interindustry Transactions, Input-Output Form

Industry Producing \ Industry Purchasing	Intermediate Demand = X_{ij}						$W_i = \Sigma_j X_{ij}$	Final Demand = Y_i	Total Demand
Producing Sectors	X_{11}	X_{12}	$\cdots$ X_{1j}	$\cdots$	X_{1n}		W_1	Y_1	X_1
	X_{21}	X_{22}	$\cdots$ X_{2j}	$\cdots$	X_{2n}		W_2	Y_2	X_2
							$\cdot$	$\cdot$	$\cdot$
	$\cdot$			$\cdot$			$\cdot$	$\cdot$	$\cdot$
							W_i	Y_i	X_i
	$\cdot$			$\cdot$			$\cdot$	$\cdot$	$\cdot$
	$\cdot$			$\cdot$			$\cdot$	$\cdot$	$\cdot$
	X_{n1}	X_{n2}	$\cdots$ X_{nj}	$\cdots$	X_{nn}		W_n	Y_n	X_n
U_j = Total Produced Inputs	U_1	U_2	$\cdots$ U_j	$\cdots$	U_n				
Primary Inputs	Z_1	Z_2	$\cdots$ Z_j	$\cdots$	Z_n			0^*	Z
Total Production	X_1	X_2	$\cdots$ X_j	$\cdots$	X_n			Y	X

*Assumes that the final demand sectors do not use labor services, but the system can be modified to account for labor services in final demand by letting Z_j range from 1 to $n + 1$

Too, total final demand must equal total value added, i.e., Y = Z.

Table 3-10 shows only a column of final demand. Typically, this column includes consumer demand, investment demand, government demand, and exports. Similarly, the row of primary inputs usually includes labor requirements, capital consumption, government expenditures, and imports. Equilibrium requires that the sum of the columns of final demands be equal to the sum of the payments rows, but it is not necessary that a particular column total be equal to its corresponding row total (i.e., $Y_i = Z_j$ i = j = 1...n not necessary).

For each row in Table 3-10 there is an equation of the form $X_i = Y_i + \Sigma_j X_{ij}$.

The addition of all rows can now be shown as

11. $\Sigma_j X_i = \Sigma_i Y_i + \Sigma_i \Sigma_j X_{ij}$

Similarly, for each column the balance equation is $X_j = Z_j + \Sigma_i X_{ij}$, and addition for all columns gives

12. $\sum_{j=1}^{n} X_j = \sum_{j=1}^{n+1} Z_j + \sum_{j=1}^{n} \sum_{i=1}^{n} X_{ij}$

Since equilibrium requires that $X_i = X_j$, it follows that

$\Sigma_i X_i = \Sigma_j X_j$;

hence, equations 11 and 12 are equal to each other. This leads to

13. $\sum_{i=1}^{n} Y_i = \sum_{j=1}^{n+1} Z_j$

Equation 13 states that final demand is equal to total factor payments. The equation is a general statement of the basic national accounting identity that states that gross national income (factor payments) is equivalent to gross national product (final

Table 3-10

Value of Interindustry Transactions, Input-Output Form

Industry Purchasing / Industry Producing	Intermediate Demand = X_{ij}	Final Demand = Y_i	Total Gross Output
Producing Sectors	$X_{11}\ X_{12}\ \cdots\ X_{ij}\ \cdots\ X_{1n}$ $\cdot$ $\cdot$ $\cdot$ $\cdot$ $X_{i1}\ X_{i2}\ \cdots\ X_{ij}\ \cdots\ X_{in}$ $\cdot$ $\cdot$ $\cdot$ $\cdot$ $X_{n1}\ X_{n2}\ \cdots\ X_{nj}\ \cdots\ X_{nn}$	Y_1 Y_2 $\cdot$ $\cdot$ $\cdot$ Y_i $\cdot$ $\cdot$ $\cdot$ $\cdot$ Y_n	X_1 X_2 $\cdot$ $\cdot$ $\cdot$ X_i $\cdot$ $\cdot$ $\cdot$ $\cdot$ X_n
Primary Inputs (Value Added)	$Z_1\ Z_2\ \cdots\ Z_j\ \cdots\ Z_n$	Z_{n+1}	Z
Total Gross Outlays	$X_1\ X_2\ \cdots\ X_j\ \cdots\ X_n$	Y	X

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demands). Thus, the transactions matrix of Table 2 shows gross national income as well as interindustry transactions.

The transactions matrix of Table 3-10 can be transformed into the matrix of input coefficients. This is done by dividing each entry of column j by the total gross output of industry j, i.e., $a_{ij} = X_{ij}/X_j$. From Table 3-10 a_{11} is derived by dividing X_{11} by X_1; however, in reality X_{11} would be divided by the adjusted gross output of sector one, where adjusted gross output is total gross output less inventory depletions.

Characteristics of the Input-Output Model

The system portrayed by Table 3-10 holds only if the following assumptions hold:[5]

1. Each commodity or commodity group is supplied by only one industry or producing sector. This implies that there exists only one method of producing each group of commodities, and that each producing sector has only one primary output.

2. The inputs purchased by each producing sector depend only on the level of output of that sector. This is a variant of the linearity assumption which states that input functions are linear relationships. This also rules out substitution since it implies that there is only one way of producing a commodity.

3. The total effect of engaging in several types of production is simply the sum of the separate effects.

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[5]Chenery, Hollis B. and Clark, Paul G., Interindustry Economics (New York: John Wiley & Sons, Inc., 1962), pp. 33-34.

The system shown by Table 3-10 is static, for the analysis is based on one point observations for a given period of time. Time, therefore, is not variable in this system. However, this system can easily be extended to comparative analysis by changing final demand. This feature makes the input-output model quite useful for projection purposes.

Projections from the Input-Output Model

In order to use the input-output model for projections of future inter-industrial demands, it is necessary to assume that the input coefficients remain constant over time. If in reality these coefficients are not constant, then projections are not feasible since each time period requires a different set of input functions. Clearly, the assumption of constant input coefficients needs to be examined.

Two major factors indicate that input functions, hence, technical coefficients, are not invariant over time. First, technological changes alter the pattern of material inputs through the introduction of new products. Too, technological advance frequently phase some materials out of the production requirements (e.g. the introduction of the transistor in the production of electronic devices). However, since major technological advances are generally known in advance, the coefficients can be changed appropriately to show the effects of these changes.

Secondly, changes in the price levels of the inputs may lead to input substitution; thus, input requirements and technical coefficients will change if relative price levels are known, and if changes in price levels can be predicted, the coefficients can be altered to show price level changes. Whenever price levels vary only slightly or in proportion to one another, these variations will not significantly effect the technical coefficients.

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Doubt is also cast on the constancy of technical coefficients by the existence of what Isard[6] terms agglomeration economies, for these economies tend to change factor and material costs. Thus, the input functions that exist after these economies are realized can be quite different from those that existed prior to them. Since these economies are in the form of internal and external economies, their effect on technical coefficients is not readily handled.

For projection purposes, it is necessary to account for the above factors if the forecasts are to be of analytical value. Clearly, perfect projections are impossible, for by necessity, ours is a dynamic economic system which defies absolute projections. At the same time, however imperfect, they must be made.

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[6]
Isard, Walter. Location and the Space Economy (Cambridge, Mass.: The MIT Press, 1962) Chap. 8.
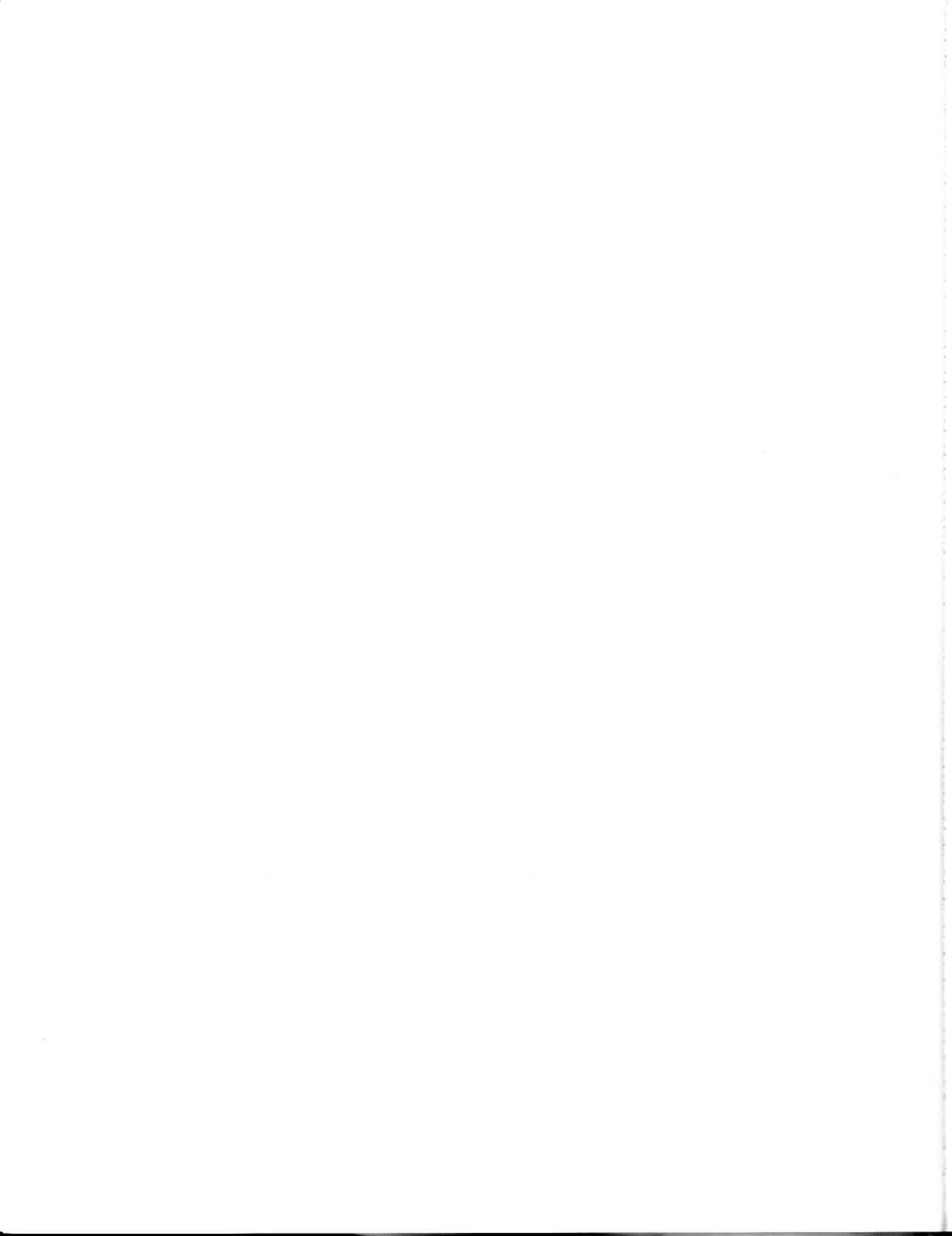
Chapter 4

DIVIDING UP THE STATE'S ECONOMY: INDUSTRIES AND SECTORS

The dissection of the Kansas economy into component parts attempts to
lay bare functional relationships which allow a better understanding of the
performance of the economy. The angle, depth, and frequency of the slicing
operation is dictated by numerous considerations. The objectives of the
study provide a guide for dividing the Kansas economy into industries and
sectors. The extent of this division is limited by financial resources and
the necessity to avoid disclosure of individual firm characteristics. But,
within these constraints the maximum amount of disaggregation was sought.

The Kansas economy was divided into 69 processing sectors, eight final
demand sectors, and six final payments sectors. The matrix, then, consists
of 77 columns and 75 rows plus the "totals" row and column.

The sectoring scheme utilized the Standard Industrial Classification
system for all industries except farming and maintenance and repair
construction. Maintenance and repair construction is a "dummy" industry
included to separate current expenditures from capital expenditures in the
construction industry.

The farm sectors are classified on the basis of crop and livestock
groups. Whereas other industries are constructed on an establishment basis
(all of a firm's output is assigned to the industry of its primary output),
farm sectors represent an allocation of the various outputs of the farms to
the individual crop and livestock sectors.

The remaining portion of this chapter defines the industries and sectors

employed in the Kansas interindustry study.

Schematically, the broad sectoring is of the form presented in Figure 4-1. The largest portion of the matrix is the intermediate demand or processing sectors which include the first 69 rows and columns. Final payments sectors include rows 70 through 75 and final demand sectors include columns 70 through 77. The bottom right hand corner of the matrix shows the transactions between final payments and final demand sectors. Definitions of the components of all these sectors are presented below. The methodology, however, appears in a later chapter.

Figure 4-1

MAJOR COMPONENTS OF INPUT-OUTPUT TRANSACTIONS TABLE

Sectors 1-69

Sectors 1-69

Intermediate Demand

Transactions of Industries Buying from
or Selling to Other Industries

Rows Show   Columns Show
    Sales   Purchases

Sectors 70-77

Final Demand

Households
Capital Formation
Government Purchases
Exports

Sectors 70-75

Final Payments

Households (Primary Wages & Salaries)
Gross Savings (Returned Earnings & Degeneration)
Taxes (Federal, State & Local)
Imports (Out-of-State Purchases)

Final Demand-Final Payments

INDUSTRY AND SECTOR DEFINITIONS
AND 1965 OUTPUT

FARMING

1. Corn - Farm value of corn produced on Kansas farms   ($000's)

Components	Output
Corn (grain)	$ 72,067
Corn (silage)	16,817
Total Sector Output	$ 88,883

2. Sorghum - Farm value of sorghum produced on Kansas farms

Components	Output
Sorghum (grain)	$ 131,242
Sorghum (silage)	33,541
Sorghum (forage)	13,827
Total Sector Output	$ 178,610

3. Wheat - Farm value of wheat produced on Kansas farms

Total Sector Output	$ 321,584

4. Other Grains - Farm value of other grains produced on
    Kansas farms

Components	Output
Oats	$ 4,854
Barley	3,291
Rye	932
Popcorn	326
Broomcorn	90
Total Sector Output	$ 9,493

5. Soybeans - Farm value of soybeans produced on Kansas farms

Total Sector Output	$ 41,952

6. Hay - Farm value of hay produced on Kansas farms

Total Sector Output	$ 122,590

7. Dairy Products - Farm value of dairy products produced on Kansas farms

Components	Output
Milk	$ 72,316
Total Sector Output	$ 72,316

8. Poultry and Poultry Products - Farm value of poultry and poultry products produced on Kansas farms

Components	Output
Chickens (including commercial broilers)	$ 1,765
Eggs	18,466
Turkeys	2,560
Total Sector Output	$ 22,791

9. Cattle - Farm value of cattle produced on Kansas farms

Total Sector Output	$ 596,977

10. Hogs - Farm value of hogs produced on Kansas farms

Total Sector Output	$ 100,852

11. Other Agricultural Products - Farm value of other agricultural products produced on Kansas farms

Components	Output
Vegetables	$ 663
Sweet potatoes	794
Dry Edible beans	825
Strawberries	111
Peaches	432
Apples	529
Lespedeza seed	232
Red clover seed	337
Sweet clover seed	91
Alfalfa seed	2,024
Sugar beets	3,588
Wool (clipped)	1,471
Honey	570
Beeswax	29
Sheep	7,711
Total Sector Output	$ 19,947

12. Agricultural Services - Includes establishments performing animal husbandry, horticultural, and other agricultural services. Some of these services are custom combining, aerial application of agricultural chemicals, farm management services, veterinary services, poultry hatchery services, etc. SIC 07

Total Industry Output	$ 58,324

13. Crude Petroleum and Natural Gas - Includes establishments engaged in operating oil and gas field properties. SIC 1311

SIC Components	Output
1311-Crude petroleum and natural gas	$ 441,761
Total Industry Output	$ 441,761

14. Oil and Gas Field Services- Includes establishments engaged in drilling wells for oil or gas, establishments engaged in geophysical, geological and other exploration work. SIC 138

SIC Components	Output
138 - Oil and gas field services	$ 46,443
Total Industry Output	$ 46,443

15. Nonmetallic Mineral Mining, excluding Fuels - Includes mining of stone, sand, gravel, clays, chemical and fertilizer minerals. SIC 14

SIC Components	Output
147 - Chemical and fertilizer mineral mining	$ 12,376
14 - (except 147)	60,756
Total Industry Output	$ 73,132

16. Other Mining - Includes mining of coal, metals, and other minerals not previously classified. SIC 10-12, 132

SIC Components	Output
103 - Lead and zinc ores	$ 2,413
12 - Bituminous coal and lignite mining	6,072
132 - Natural gas liquids	38,417
Total Industry Output	$ 46,902

CONSTRUCTION

17. Maintenance and Repair - Includes expenditures by firms for maintenance and repair services on capital assets. These include painting, re-wiring, etc. For further explanation of this "dummy" industry see the chapter on methodology.

    Total Industry Output $ 166,039

18. Building Construction - General Contractors - Includes general contractors engaged in construction of residential, farm, industrial, public, and other buildings. SIC 15

    Total Industry Output $ 367,289

19. Heavy Construction Other Than Building Construction - General Contractors - Includes general contractors engaged in the construction of highways and streets, bridges, sewers, railroads, etc. SIC 16

    Total Industry Output $ 125,000

20. Special Trade Contractors - Includes contractors specializing in activities such as plumbing, painting, plastering, carpentering, etc. SIC 17

    Total Industry Output $ 344,804

21. Meat Products - Includes establishments processing, preparing and
     packing meat products. SIC 201

SIC Components	Output
2011 - Meat packing plants	$ 548,893
2013 - Sausages and other prepared meat products	10,565
2015 - Poultry and small game dressing and packing, wholesale	31,180
Total Industry Output	$ 590,639

22. Dairy Products - Includes establishments processing milk, cream, cheese,
     butter, etc. SIC 202

SIC Components	Output
2023 - Condensed and evaporated milk	$ 8,486
2024 - Ice cream and frozen desserts	5,695
2026 - Fluid milk	98,530
Total Industry Output	$ 112,711

23. Grain Mill Products - Includes establishments processing flour, cereal,
     feeds, etc. SIC 204

SIC Components	Output
2041 - Flour and other grain mill products	$ 272,215
2042 - Prepared feeds for animals and fowls	58,830
2046 - Wet corn milling	2,683
Total Industry Output	$ 333,728

24. Other Food and Kindred Products - Includes establishments producing or
     processing beverage products, bakery products, etc. SIC 203, 205, 206,
     207-209

SIC Components	Output
203 - Canning and preserving fruits, vegetables and sea foods	$ 6,577
205 - Bakery products	53,981
207 - Confectionery and related products	241
208 - Beverage industries	31,800
209 - Miscellaneous food preparations and kindred products	114,502
Total Industry Output	$ 207,100

25. Apparel and Related Products - Includes establishments manufacturing apparel and other finished clothing and accessories and other fabricated textile products such as curtains, etc. SIC 23

SIC Components	Output
231 - Men's, youth's and boys' suits, coats and overcoats	$ 2,658
232 - Men's, youth's and boys' furnishings, work clothing and allied garments	11,553
233 - Women's, Misses' and Juniors' outerwear	12,498
236 - Girls', children's and infants outerwear	2,479
239 - Miscellaneous fabricated textile products	8,877
Total Industry Output	$ 38,066

26. Paper and Allied Products - Includes establishments manufacturing pulp from wood and other cellulose fibers, the manufacture of paper and paper products such as bags, boxes, envelopes, etc. SIC 26

SIC Components	Output
263 - Paperboard mills	$ 6,164
264 - Converted paper and paperboard products, except containers and boxes	15,008
265 - Paperboard containers and boxes	54,409
Total Industry Output	$ 75,582

27. Printing and Publishing - Includes establishments engaged in printing by one or more of the common processes; establishments which perform services for the printing trade such as typesetting, etc. and establishments engaged in publishing newspapers, books, etc. SIC 27

SIC Components	Output
271 - Newspapers: publishing, publishing and printing	$ 41,271
272 & 277 - Periodicals: publishing, publishing and printing - greeting card manufacturing	8,223
273 - Books	10,072
274 - Miscellaneous publishing	4,305
275 - Commercial printing	30,526
276 - Manifold business forms manufacturing	9,241
278 - Bookbinding and related industries	5,578
279 - Service industries for the printing trade	9,865
Total Industry Output	$ 119,080

28. Industrial Inorganic and Organic Chemicals - Includes establishments engaged in manufacturing basic industrial chemicals such as industrial gases, dyes, pigments, etc. SIC 281

SIC Components	Output
281 - Industrial inorganic and organic chemicals	$ 153,654
Total Industry Output	$ 153,654

29. Agricultural Chemicals - Includes establishments engaged in manufacturing
     fertilizers, agricultural pesticides, and other agricultural chemicals.
     SIC 287

SIC Components	Output
287 - Agricultural chemicals	$ 16,605
Total Industry Output	$ 16,605

30. Other Chemicals and Chemical Products - Includes establishments
     manufacturing unfinished plastics, drugs, cleaning preparations,
     perfumes, paints, explosives, glue, ink, etc. SIC 282-286, 289

SIC Components	Output
282 - Plastics materials and synthetic resins, synthetic rubber and other man-made fibers, except glass	$ 57,650
283 - Drugs	10,883
284 - Soap, detergents and cleaning preparations, perfumes, cosmetics, and other toilet preparations	125,230
285 - Paints, varnishes, lacquers, enamels and allied products	12,547
289 - Miscellaneous chemical products	23,587
Total Industry Output	$ 229,897

31. Petroleum and Coal Products - Includes establishments processing and
     refining crude petroleum to produce gasoline, fuel oil, lubricants,
     etc. SIC 29

SIC Components	Output
291 - Petroleum refining	$ 559,767
295 - Paving and roofing materials	3,820
299 - Miscellaneous products of petroleum and coal	16,751
Total Industry Output	$ 580,338

32. Rubber and Plastic Products - Includes establishments produing tires and
     tubes, rubber footwear, other fabricated rubber products, and
     miscellaneous finished plastic products. SIC 30

SIC Components	Output
301 - Tires and inner tubes	$ 139,075
306 - Fabricated rubber products, not elsewhere classified	2,472
307 - Miscellaneous plastics products	10,172
Total Industry Output	$ 151,718

33. Cement, Concrete and Plaster Products - Includes establishments
    producing hydraulic cement, concrete, concrete products, lime, plaster,
    and plasterboard. SIC 324, 327

SIC Components	Output
324 - Cement, hydraulic	$ 27,053
327 - Concrete, gypsum, and plaster products	49,115
Total Industry Output	$ 76,168

34. Other Stone, Clay and Glass Products - Includes establishments producing
    glass and glass products, brick, pottery, asbestos products, etc.
    SIC 321-323, 325, 326, 328, 329

SIC Components	Output
323 - Glass products, made of purchased glass	$ 9,925
325 - Structural clay products	78,337
328 - Cut stone and stone products	3,053
329 - Abrasive, asbestos, and miscellaneous non-metallic mineral products	5,228
Total Industry Output	$ 96,544

35. Primary Metal Industries - Includes establishments engaged in the
    smelting of ferrous and nonferrous metals, and in the manufacture of
    castings, forgings and other basic metal products. SIC 33

SIC Components	Output
331 - Blast furnaces, steel works and rolling and finishing mills	$ 648
332 - Iron and steel foundries	20,292
334 - Secondary smelting and refining of nonferrous metals and alloys	6,254
336 - Nonferrous foundries	3,574
339 - Miscellaneous primary metal industries	636
Total Industry Output	$ 31,405

36. Fabricated Metal Products - Includes establishments producing metal sash
    and doors, boiler plate fabrication, sheet metal work, and other
    fabricated structural metal products. SIC 344

SIC Components	Output
3441 - Fabricated structural steel	$ 29,068
3442 - Metal doors, sash, frames, molding and trim	17,101
3443 - Fabricated plate work (boiler shops)	7,881
3444 - Sheet metal work	10,246
3449 - Architectural and miscellaneous metal work	5,627
Total Industry Output	$ 69,922

37. Other Fabricated Metal Products - Includes establishments producing metal cans, cutlery, hand tools, general hardware, non-electrical heating equipment, bolts, screws, rivets, washers, metal stampings, wire products, springs, valves, pipe and other light fabricated metal products. SIC 341-343, 345-349

SIC Components	Output
341 - Metal cans	$ 533
342 - Cutlery, hand tools and general hardware	3,918
343 - Heating apparatus (except electric) and plumbing fixtures	52,052
345 - Screw machine products and bolts, nuts, screws, rivets and washers	1,531
346 - Metal stampings	1,133
347 - Coating, engraving and allied services	2,394
348 - Miscellaneous fabricated wire products	6,545
349 - Miscellaneous fabricated metal products	6,950
Total Industry Output	$ 75,057

38. Farm Machinery and Equipment - Includes establishments manufacturing tractors and other equipment for use on the farm. SIC 352

SIC Components	Output
352 - Farm machinery and equipment	$ 51,621
Total Industry Output	$ 51,621

39. Construction Machinery and Like Equipment - Includes establishments engaged in manufacturing heavy machinery and equipment used by the construction and mining industries such as bulldozers, cranes, power shovels, well drilling equipment, mineral cleaning equipment, and mine cars. SIC 353

SIC Components	Output
3531 - Construction machinery and equipment	$ 15,523
3532 - Mining machinery and equipment, except oil field machinery and equipment	6,466
3533 - Oil field machinery and equipment	11,001
3534 - Elevators and moving stairways	239
3535 - Conveyors and conveying equipment	14,609
Total Industry Output	$ 47,839

40. Food Products Machinery and Other Special Industry Machinery - Includes establishments manufacturing feed mill equipment, flour mill equipment, power saws and chain saws, printing equipment, etc. SIC 355

SIC Components	Output
3551 - Food products machinery	$ 15,704
3555 - Printing trades machinery and equipment	11,065
Total Industry Output	$ 26,770

41. Electrical Machinery - Includes establishments manufacturing apparatus and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy. The manufacture of household appliances is also included in this group. SIC 36

SIC Components	Output
361 - Electric transmission and distribution equipment	$ 289
362 - Electrical Industrial apparatus	1,125
363 - Household appliances	489
364 - Electric lighting and wiring equipment	2,980
365 - Radio and television receiving sets, except communication types	411
366 - Communication equipment	6,209
367 - Electronic components and accessories	13,832
369 - Miscellaneous electrical machinery, equipment, and supplies	19,445
Total Industry Output	$ 43,367

42. Other Machinery - Includes establishments manufacturing engines and turbines, machine tools, special dies and tools, computing and accounting machines, etc. SIC 351, 354, 356-359

SIC Components	Output
354 - Metal working machinery and equipment	$ 5,789
356 - General industrial machinery and equipment	36,681
357 - Office, computing, and accounting machines	369
358 - Service industry machines	31,973
359 - Miscellaneous machinery, except electrical	52,420
Total Industry Output	$ 127,232

43. Motor Vehicles and Equipment - Includes establishments manufacturing or assembling motor vehicles, passenger cars, truck and bus bodies, truck trailers, and parts for motor vehicles. SIC 371

SIC Components	Output
3711 - Motor Vehicles	$ 204,593
3713 - Truck and bus bodies	8,579
3714 - Motor vehicle parts and accessories	1,833
3715 - Truck Trailers	7,240
Total Industry Output	$ 223,244

44. Aerospace - Includes establishments manufacturing or assembling complete aircraft, missiles, or space vehicles, and parts for such vehicles.   SIC 372

SIC Components	Output
3721 - Aircraft	$ 551,382
3722 - Aircraft engines and engine parts	5,336

44. Aerospace - Continued

SIC Components   Output

3729 - Aircraft parts and auxiliary equipment, not
          elsewhere classified $ 4,416
          Total Industry Output $ 561,134

45. Trailer Coaches - Includes establishments manufacturing trailer coaches
    (mobile homes). Also included is the manufacture of pickup campers and
    camping trailers. SIC 3791

SIC Components   Output

3791 - Trailer coaches $ 42,313
          Total Industry Output $ 42,313

46. Other Transportation Equipment - Includes establishments manufacturing
    transportation equipment not elsewhere classified, including boats,
    motorcycles, bicycles, and parts. SIC 373, 375, 3799

SIC Components   Output

373
374 - Ship and boat building and repairing--
          railroad equipment $ 33,618
3799 - Transportation equipment, not elsewhere
          classified   10,726
          Total Industry Output $ 44,344

47. Other Manufacturing - Includes establishments manufacturing goods not
    elsewhere classified such as textile mill products, lumber and wood
    products, furniture and fixtures, leather and leather products,
    scientific instruments, photographic goods, office supplies, etc.
    SIC 21, 22, 24, 25, 31, 38

SIC Components   Output

22 - Textile mill products $ 324
24 - Lumber and wood products, except furniture   15,893
25 - Furniture and fixtures   24,025
31 - Leather and leather products   1,809
38 - Professional, scientific, and controlling
        instruments; photographic and optical goods;
        watches and clocks   5,528
39 - Miscellaneous manufacturing industry   11,861
        Total Industry Output $ 59,440

TRANSPORTATION

48. Railroad Transportation - Includes railroads, sleeping car and other
    passenger services, railway express. SIC 40

SIC Components	Output
40 - Railroad transportation	$ 249,891
Total Industry Output	$ 249,891

49. Motor Freight Transportation - Includes establishments furnishing local
    or long distance trucking service, and warehousing services. SIC 42

SIC Components	Output
42 - Motor freight transportation and warehousing	$ 137,443
Total Industry Output	$ 137,443

50. Water Transportation, Air Transportation, Pipeline Transportation, and
    Other Transportation Agencies and Services - Includes firms engaged in
    transporting goods and persons on rivers or canals, local water trans-
    portation, and services incidental to water transport; air transportation
    on certified and uncertified carriers, and fixed facilities and services
    related to air transport; firms primarily engaged in the pipeline
    transportation of petroleum (the pipeline transmission of natural gas
    is included in Sector 56); firms engaged in supplying local and inter-
    urban passenger transportation such as taxicabs, city bus lines, inter-
    city bus lines as well as firms furnishing services incidental to
    transportation such as freight forwarding, packing and crating services,
    rental of transportation equipment, and stockyard operation. SIC 41,
    44, 45, 46, 47

SIC Components	Output
41 Local and suburban transit and interurban	
44 passenger transportation - water trans-	
45 portation - transportation by air - pipeline	$ 36,705
46 transportation - transportation services	
47	
Total Industry Output	$ 36,705

UTILITIES

51. Communication - Includes establishments engaged in telephone, telegraph, radio, television, and other communication services. SIC 48

SIC Components	Output
481 - Telephone communication (wire or radio)	$ 131,088
482 - Telegraph communication (wire or radio)	204
483 - Radio broadcasting and television	13,279
489 - Communication services, not elsewhere classified	15,881
Total Industry Output	$ 160,452

52. Electric Gas and Sanitary Services - Includes firms engaged in supplying electricity, natural gas and other gas products, water, garbage collection, and other sanitation services. SIC 49

SIC Components	Output
491 4931 > Electric companies and systems - electric and other services combined	$ 161,834
492 4932 > Gas companies and systems - gas and other services combined	112,327
494 - Water supply	455
495 - Sanitary services	10,357
Total Industry Output	$ 284,973

WHOLESALE TRADE

53. Groceries and Related Products - Includes firms engaged in the wholesale distribution of groceries and related products. SIC 504

SIC Components	Output
504 - Groceries and related products	$ 45,571
Total Industry Output	$ 45,571

54. Farm Products-Raw Materials - Includes firms engaged in the wholesale distribution of farm product raw materials, most of which are used in manufacturing industries. SIC 505

SIC Components	Output
505 - Farm products-raw materials	$ 81,304
Total Industry Output	$ 81,304

55. Machinery, Equipment and Supplies - Includes establishments that whole-sale commercial and industrial machinery, equipment and supplies, farm machinery and equipment, professional equipment and supplies (used by dentists, surgeons and like professional groups), equipment and supplies for service establishments (barber shops, laundries, dry cleaning plants and related services). SIC 508

SIC Components	Output
508 - Machinery, equipment and supplies	$ 82,567
Total Industry Output	$ 82,567

56. Other Wholesale Trade - Includes wholesalers of motor vehicles and equipment, drugs, dry goods, electrical goods, hardware, and other wholesale trade. SIC 501-503, 506, 507, 509

SIC Components	Output
501 — Motor vehicles and automotive equipment - 502 drugs, chemicals and allied products - 503 dry goods and apparel - electrical goods - 506 hardware, and plumbing and heating equip- 507 ment and supplies - machinery, equipment, 508 and supplies	$ 126,731
Total Industry Output	$ 126,731

57. Farm Equipment Dealers - Includes firms engaged in the retail sale of farm equipment, machinery, and farm production supplies. SIC 5252

SIC Components	Output
5252 - Farm equipment dealers	$ 30,384
Total Industry Output	$ 30,384

58. Gasoline Service Stations - Includes firms primarily engaged in the retail sale of gasoline and lubricating oils. SIC 554

SIC Components	Output
554 - Gasoline service stations	$ 74,312
Total Industry Output	$ 74,312

59. Eating and Drinking Places - Includes establishments selling prepared foods and drinks for consumption on the premises. SIC 58

SIC Components	Output
58 - Retail trade--eating and drinking places	$ 173,890
Total Industry Output	$ 173,890

60. Other Retail Trade - Includes retailers of building materials, general merchandise such as department stores, food, motor vehicles, clothing, furniture, drugs, and other retail trade. SIC 52 (except 5252), 53, 54, 55 (except 554), 56, 57, 59

SIC Components	Output
5251 - Hardware stores	
53 - Retail trade - general merchandise	
54 - Retail trade - food	
55 (except 554) - Automotive dealers and gasoline service stations	$ 419,530
56 - Retail trade - apparel and accessories	
57 - Retail trade - furniture, home furnishings and equipment	
59 - Retail trade - miscellaneous retail stores	
Total Industry Output	$ 419,530

FINANCE, INSURANCE AND REAL ESTATE

61. Banking - Includes institutions engaged in deposit banking or closely related functions including trust activities. SIC 60

SIC Components	Output
60 - Banking	$ 166,654
Total Industry Output	$ 166,654

62. Other Financial Institutions - Includes credit and lending institutions other than banks, security and commodity dealers, investment companies, and other establishments extending financial services. SIC 61, 62, 67

SIC Components	Output
61 Credit agencies other than banks - security	
62 and commodity brokers, dealers, exchanges,	$ 315,940
67 and services - holding and other investment companies	
Total Industry Output	$ 315,940

63. Insurance and Real Estate - Includes insurance carriers (companies), agents, and insurance services. This group also includes real estate operators, agents and other real estate services. SIC 63-66

SIC Components	Output
63 Insurance carriers - insurance agents, brokers,	
64 and service - combinations of real estate,	$ 299,619
66 insurance, loans, law offices	
65 (exclude SIC 656)-Real Estate	95,273
Total Industry Output	$ 394,892

SERVICES

64. Lodging Services - Includes firms operating hotels, tourist courts, and motels. This group excludes trailer parks. SIC 701, 702, 703 (excluding 7031)

SIC Components	Output
70 - (exclude 7031)-Hotels, rooming houses, camps, and other lodging places	$ 34,298
Total Industry Output	$ 34,298

65. Personal Services - Includes establishments providing repair, laundry, photographic, entertainment, and other personal services predominantly to private individuals. SIC 72, 75, 76, 78, 79, 84

SIC Components	Output
72 - Personal services	$ 93,005
75 - Automobile repair, auto services, and garages	61,903
76 - Miscellaneous repair services	37,159
78 - Motion pictures	13,817
79 - Amusement and recreation services, except motion pictures	33,033
Total Industry Output	$ 238,917

66. Business Services - Includes establishments providing advertising, credit, collectional, janitorial and stenographic services. SIC 73 (excluding 7391)

SIC Components	Output
736 - Private employment agencies	$ 154
73 - (except 7391)-Miscellaneous business services	43,554
Total Industry Output	$ 43,708

67. Medical and Other Health Services - Includes establishments engaged in furnishing medical, surgical, and other health services primarily to private individuals. SIC 80

SIC Components	Output
80 - Medical and other health services	$ 301,090
Total Industry Output	$ 301,090

68. Other Services - Includes establishments providing trailer park services, legal services and other miscellaneous services. SIC 7031, 81, 86, 88, 89 (excluding 8921)

SIC Components	Output
495 - (except 4952)-Sanitary services	$ 331
7031- Trailer parks	1,057

68. Other Services - Continued

SIC Components	Output
7391 - Research, development, and testing laboratories	$ 1,510
81 - Legal services	9,665
86 - Nonprofit membership organizations	37,810
89 - Miscellaneous services	30,351
Total Industry Output	$ 80,723

69. Education - Includes both public and privately provided educational
    services such as elementary and secondary schools, colleges and
    universities, commercial and trade schools, and other educational
    services. SIC 82, 9282, 9382

SIC Components	Output
82 - Educational services	$ 541,826
Total Industry Output	$ 541,826
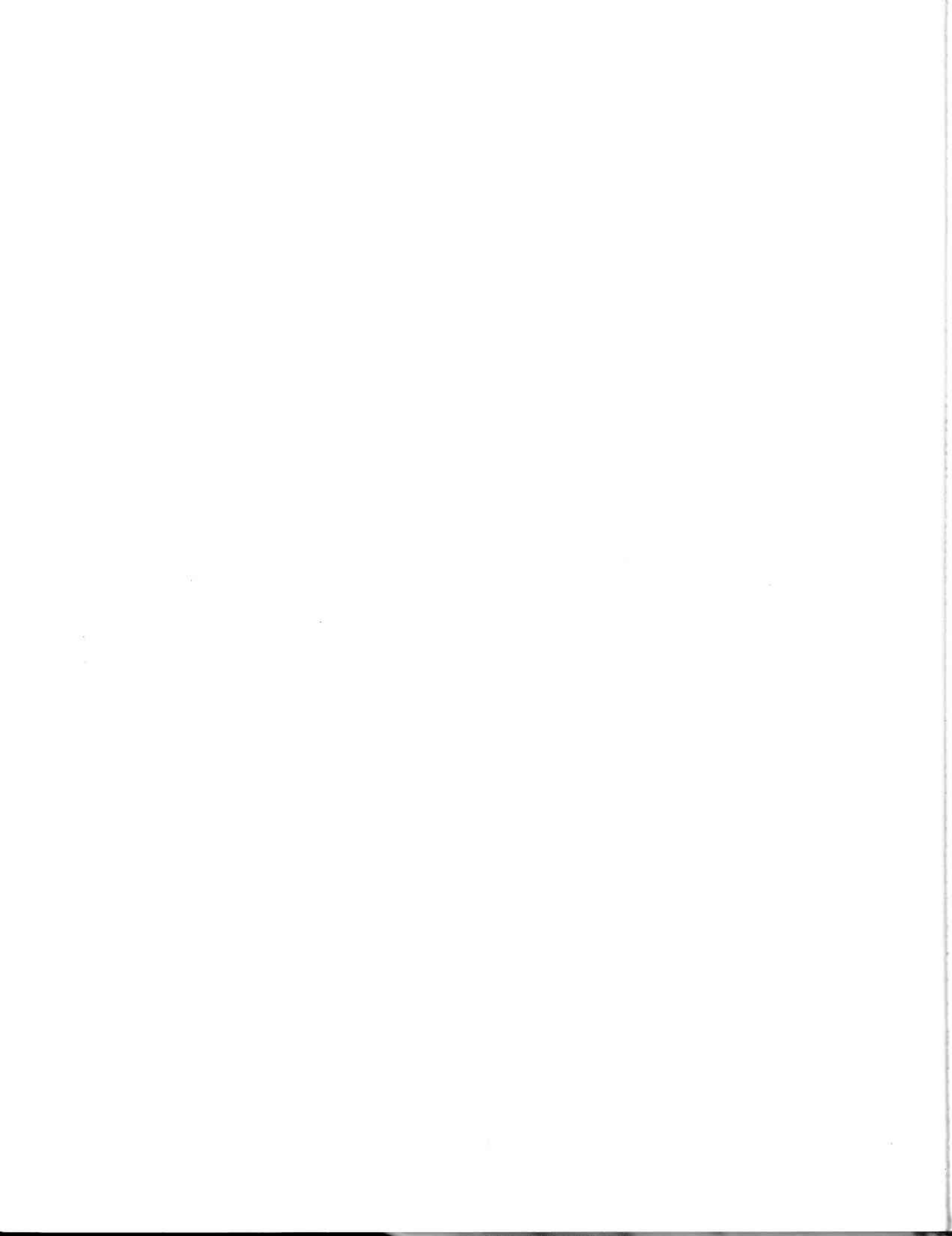
Chapter 5

INTERINDUSTRY RELATIONS OF THE KANSAS ECONOMY

"Production recipes" was the label attached to the information

contained in the columns of the input-output tables. The columns indicate

input requirements for industries to produce their output. Each of these

columns provides a substantial amount of information on the production

structure of a Kansas industry.

A major portion of the output of numerous Kansas industries is sold to

other Kansas industries as an input in their production process. This type

of market is referred to as intermediate demand since the markets are for

goods and services to be used in further production. For all Kansas

industries $11.5 billion of their total market is with other Kansas industries.

The purpose of this chapter is to sketch the major characteristics of the

interindustry relations of the Kansas economy; both an investigation of the

products and services that Kansas industries buy from other Kansas industries

as well as the sales by Kansas industries to other state industries.

Interindustry Purchases

The quantity of total inputs purchased from other Kansas industries has

wide variability among industries. As Table 5-1 shows, the per cent of total

purchases by Kansas industries from other Kansas industries ranges from a

high of nearly 80 per cent in meat products manufacturing to a low of slightly

more than one per cent for other transportation equipment and manufacturing.

Of the 22 sectors with the highest ratios, 13 are farm or farm related.

The relatively high dependence of these sectors on other sectors in the state's economy is a result of at least two characteristics of agriculture. First, Kansas agriculture has become highly specialized with the result that more inputs are purchased off the farm. Second, farm and agribusiness enterprises have been historically important. Consequently, industries supply inputs to farm and agribusiness firms have had sufficient time to develop in response to these markets. In newer industries sufficient time may not have elapsed for supplying industries to locate in the state, or the industry may be of inadequate size to attract supplying firms into the state.

As was discussed in Chapter 1, industries often tend to develop in families in that they are linked to one another by providing inputs or utilizing outputs. This is one relationship which explains the wide variation in the ratios of Table 5-1. While some industries purchase most of their inputs from other Kansas industries, other obtain almost all of their commodity and service requirements from outside the state. Of the 68[*] industries listed, 12 purchase less than 10 per cent of their inputs from Kansas industries.

The ratios in Table 5-1 provide a partial measure of the impact that each Kansas industry has on other Kansas industries. The greater the in-state purchases, the larger tends to be the effect on other state industries. As was explained in Chapter 3, this is only a partial measure.

Figures 5-1 through 69 present the distribution of major purchases for each industry. All purchases are included, not just purchases from other

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[*]Maintenance and Repair Construction was excluded because it was a "dummy" industry. See Chapter 4 for an explanation.

industries as in Table 5.   Imports are represented by "M."   All other
abbreviations are standard.

Interindustry Sales

Sales by Kansas industries to other Kansas industries are presented in
Table 5-2.   The largest dollar volume of sales to other Kansas industries is
by the cattle sector.   Of the $439 million cattle sales to other Kansas
industries, $315 million is to Meat Products manufacturing.   Crude Oil and
Natural Gas has the second highest interindustry sales with $339 million
followed by Special Trade Construction with $333 million.

In addition to reflecting the size variations among industries, the
differences in the volume of sales by Kansas industries to other Kansas
industries occur because of linkage and stage of production differences.
Many industries sell most of their output to industries outside of the state
for further processing.   Others produce a final product or service that is
sold to consumers, not industries.

Table 5-1

RANKED RATIOS OF TOTAL PURCHASES BY KANSAS INDUSTRIES FROM OTHER KANSAS INDUSTRIES

Rank	Sector	Percent
1	Meat Products	79.91
2	Cattle	66.68
3	Hogs	64.50
4	Dairy Products (Farming)	63.83
5	Dairy Products (Manufacturing)	62.40
6	Petroleum and Coal Products	58.28
7	Building Construction	56.49
8	Grain Mill Products	55.12
9	Other Mining	47.36
10	Nonmetallic Mining	42.93
11	Other Agricultural Products	40.36
12	Electric Gas and Sanitary Services	40.19
13	Farm Products (Wholesale)	37.61
14	Heavy Construction	36.33
15	Crude Oil and Natural Gas	35.54
16	Poultry and Poultry Products	35.46
17	Gasoline Service Stations	34.68
18	Oil and Gas Field Services	32.39
19	Other Grains	32.15
20	Agricultural Services	32.12
21	Farm Equipment Dealers	32.03
22	Other Food and Kindred Products	31.51

Rank	Sector	Percent
23	Business Services	29.87
24	Lodging Services	29.45
25	Machinery and Equipment	29.23
26	Communications	29.00
27	Eating and Drinking	27.81
28	Wheat	26.88
29	Cement and Concrete	26.75
30	Insurance and Real Estate	26.42
31	Other Retail Trade	25.88
32	Soybeans	25.39
33	Sorghum	23.22
34	Groceries	23.05
35	Trailer Coaches	21.10
36	Other Services	20.12
37	Corn	19.94
38	Education	17.96
39	Special Trade Construction	17.80
40	Hay	17.15
41	Other Chemicals	17.14
42	Personal Services	17.13
43	Other Transportation	17.07
44	Construction Machinery	16.98
45	Farm Machinery	16.59

Rank	Sector	Percent
46	Banking	16.37
47	Medical and Health Services	16.27
48	Industrial Chemicals	16.20
49	Paper and Allied Products	14.05
50	Agricultural Chemicals	13.82
51	Other Finance	13.40
52	Other Manufacturing	12.68
53	Other Wholesale Trade	11.54
54	Railroad Transportation	11.22
55	Motor Freight	10.70
56	Other Fabricated Metal Products	10.43
57	Other Stone and Clay	9.45
58	Electrical Machinery	9.23
59	Food Products Machinery	9.21
60	Primary Metals	9.08
61	Printing and Publishing	8.97
62	Motor Vehicles	7.54
63	Aerospace	7.46
64	Fabricated Metals	7.11
65	Other Machinery	6.24
66	Rubber and Plastics	5.81
67	Apparel	3.04
68	Other Transportation Equipment	1.24

Table 5-2

SALES BY KANSAS INDUSTRIES TO KANSAS INDUSTRIES
(thousands of dollars)

	Industry	Sales to Kansas Industries
1	Corn	49,768
2	Sorghum	107,015
3	Wheat	122,432
4	Other Grains	971
5	Soybeans	33,996
6	Hay	106,811
7	Dairy Products	62,086
8	Poultry and Poultry Products	8,889
9	Cattle	439,388
10	Hogs	86,063
11	Other Agricultural Products	12,395
12	Agricultural Services	54,458
13	Crude Oil and Natural Gas	339,105
14	Oil and Gas Field Services	46,443
15	Nonmetallic Mining	10,953
16	Other Mining	24,299
17	Maintenance and Repair	81,972
18	Building Construction	2,936
19	Heavy Construction	6,643
20	Special Trade Construction	332,919
21	Meat Products	52,701
22	Dairy Products	16,098

	Industry	Sales to Kansas Industries
23	Grain Mill Products	86,364
24	Other Food and Kindred Products	37,262
25	Apparel	3,171
26	Paper and Allied Products	30,135
27	Printing and Publishing	45,525
28	Industrial Chemicals	40,604
29	Agricultural Chemicals	7,507
30	Other Chemicals	37,297
31	Petroleum and Coal Products	63,328
32	Rubber and Plastics	9,302
33	Cement and Concrete	41,902
34	Other Stone and Clay	15,976
35	Primary Metals	15,994
36	Fabricated Metals	20,566
37	Other Fabricated Metal Products	22,538
38	Farm Machinery	16,637
39	Construction Machinery	4,918
40	Food Products Machinery	6,074
41	Electrical Machinery	10,281
42	Other Machinery	27,430
43	Motor Vehicles	694
44	Aerospace	4,231
45	Trailer Coaches	3,994
46	Other Transportation Equipment	1,949

	Industry	Sales to Kansas Industries
47	Other Manufacturing	19,113
48	Railroad Transportation	60,202
49	Motor Freight	56,641
50	Other Transportation	14,604
51	Communications	94,045
52	Electric, Gas and Sanitary Services	160,860
53	Groceries	33,766
54	Farm Products	47,951
55	Machinery and Equipment	67,479
56	Other Wholesale Trade	120,823
57	Farm Equipment Dealers	27,125
58	Gasoline Service Stations	17,443
59	Eating and Drinking	10,692
60	Other Retail Trade	15,822
61	Banking	58,120
62	Other Finance	15,064
63	Insurance and Real Estate	140,805
64	Lodging Services	12,554
65	Personal Services	42,692
66	Business Services	33,728
67	Medical and Health Services	17,410
68	Other Services	53,319
69	Education	22,077

Figure 5

1 thru 69

MAJOR INPUTS OF KANSAS INDUSTRIES

1. C O R N

Households
63
57
56
28
12
M
Other
1
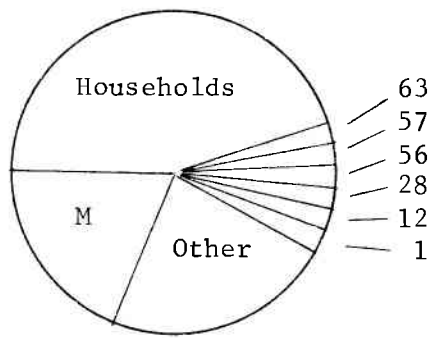
1 Corn
12 Agricultural Services
28 Industrial Chemicals
56 Other Wholesale Trade
57 Farm Equipment Dealers
63 Insurance & Real Estate

2. S O R G H U M

Households
31
57
12
M
Other
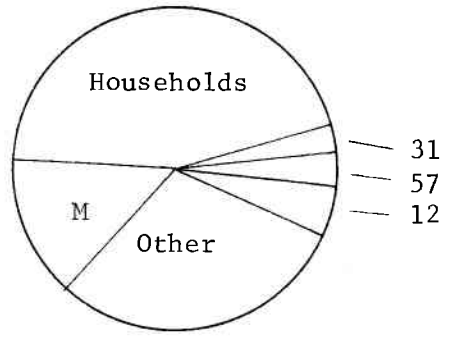
12 Agricultural Services
57 Farm Equipment Dealers
31 Petroleum & Coal Products

3. W H E A T

Households
63
56
57
12
3
M
Other
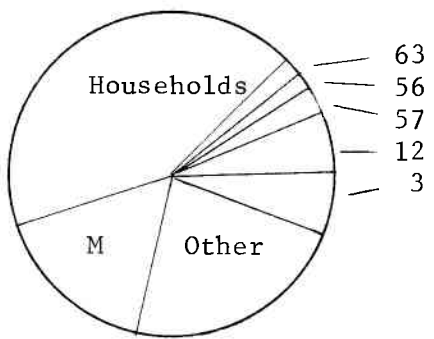
3 Wheat
12 Agricultural Services
57 Farm Equipment Dealers
56 Other Wholesale Trade
63 Insurance

4. O T H E R G R A I N S

Households
28
31
12
M
Other
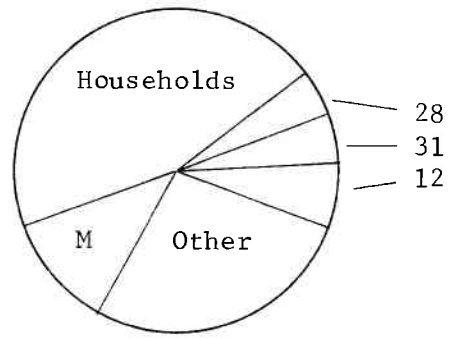
12 Agricultural Services
31 Petroleum & Coal Products
28 Industrial Chemicals

5. S O Y B E A N S

Households
31
5
57
M
Other
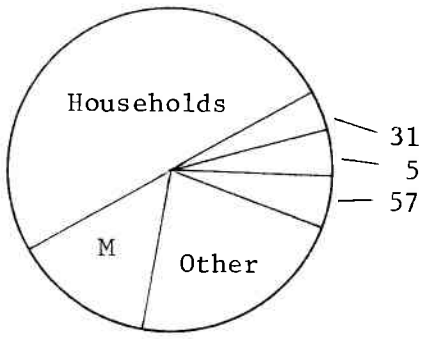
57 Farm Equipment Dealers
5 Soybeans
31 Petroleum & Coal Products

6. H A Y

Households
31
11
56
12
M
Other
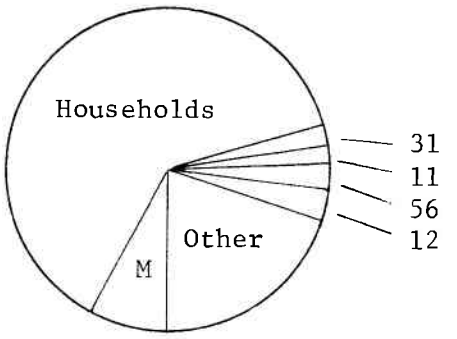
12 Agricultural Services
56 Other Wholesale Trade
11 Other Agricultural Products
31 Petroleum & Coal Products

7. DAIRY PRODUCTS

Pie chart labels: HH, M, Other — with values 12, 24, 1, 23, 2
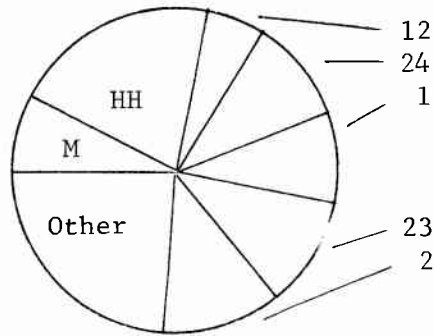
2 Sorghum
23 Grain Mill Products
1 Corn
24 Other Food & Kindred Products
12 Agricultural Services

8. POULTRY PRODUCTS

Pie chart labels: Households, M, Other — with values 28, 23
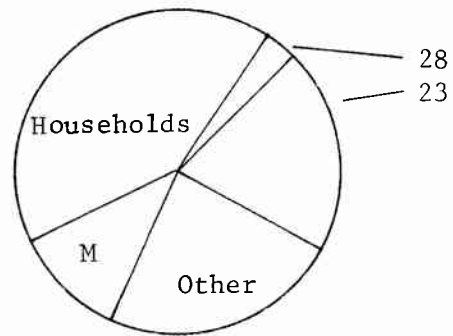
23 Grain Mill Products
28 Industrial Chemicals

9. CATTLE

Pie chart labels: HH, M, Other — with values 23, 2, 6, 9
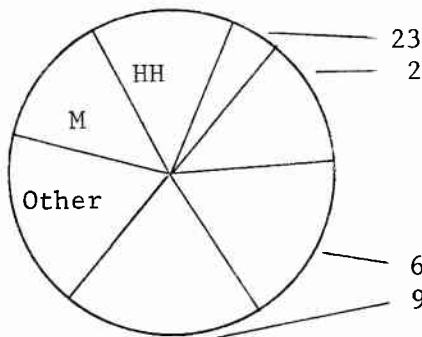
9 Cattle
6 Hay
2 Sorghum
23 Grain Mill Products

10. HOGS

Pie chart labels: HH, M, Other — with values 12, 2, 1, 23
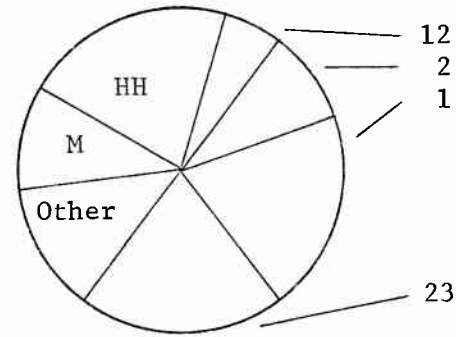
23 Grain Mill Products
1 Corn
2 Sorghum
12 Agricultural Services

11. OTHER AG PROD

Pie chart labels: Households, M, Other — with values 4, 11, 26
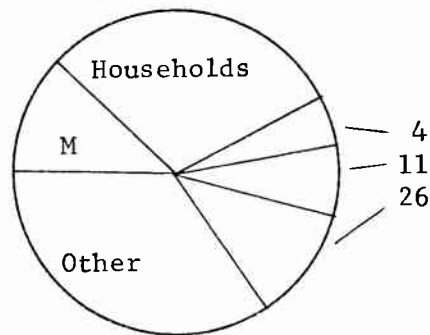
26 Paper & Allied Products
11 Other Agricultural Products
4 Other Grains

12. AG SERVICES

Pie chart labels: Households, M, Other — with values 26, 56, 28
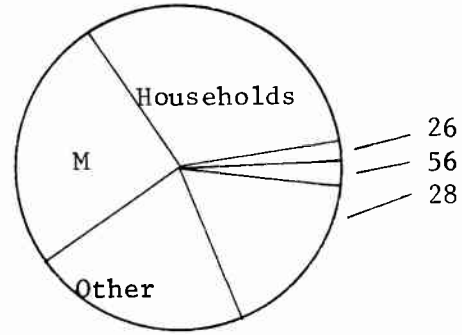
28 Industrial Chemicals
56 Other Wholesale Trade
26 Paper & Allied Products

84
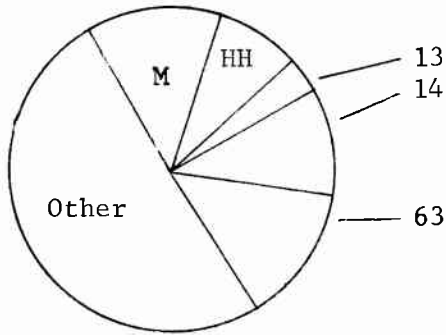
13. CRUDE OIL & NAT. GAS

63 Insurance & Real Estate
14 Oil & Gas Field Services
13 Crude Oil & Natural Gas

14. OIL & GAS FIELD SERV.
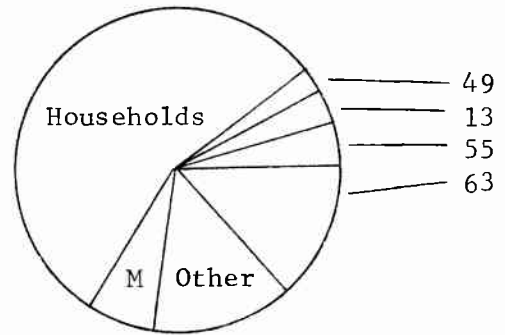
63 Insurance & Real Estate
55 Machinery & Equipment
13 Crude Oil & Natural Gas
49 Motor Freight

15. NONMETAL. MINING
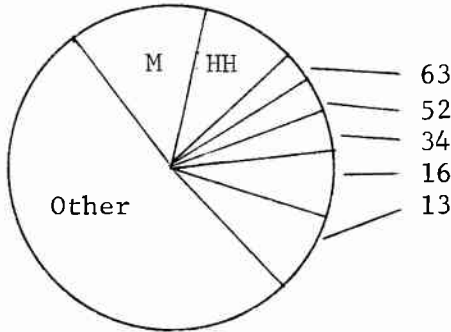
13 Crude Oil & Natural Gas
16 Other Mining
34 Other Stone & Clay
52 Electric, Gas, & Sanitary
63 Insurance & Real Estate

16. OTHER MINING
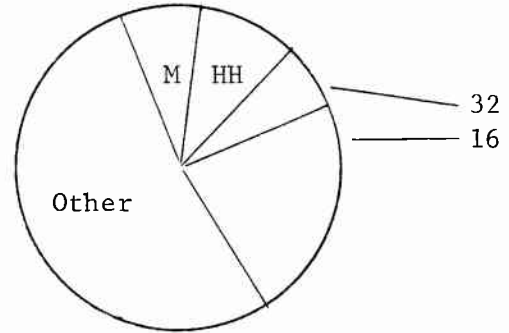
16 Other Mining
32 Rubber & Plastics

17.

Dummy Industry
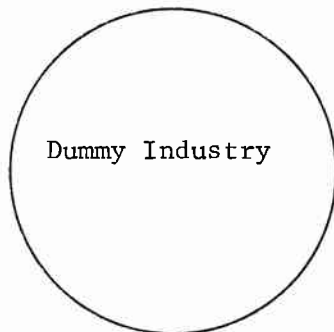
18. BLDG. CONST.
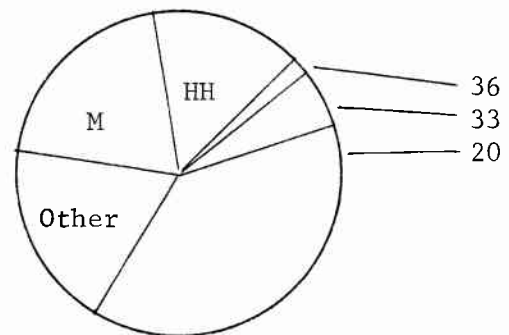
20 Special Trade Construction
33 Cement & Concrete
36 Fabricated Metals

85

19. HEAVY CONST.

Households
20
15
33
31
M
Other
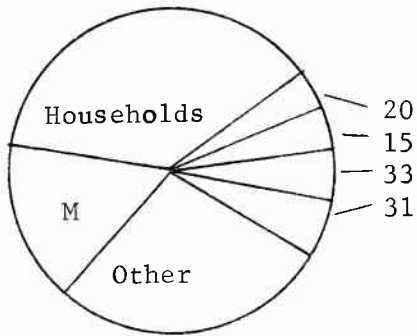
31 Petroleum & Coal Products
33 Cement & Concrete
15 Nonmetallic Mining
20 Special Trade Construction

20. SPEC. TRADE CONST.

HH
M
30
20
37
36
Other
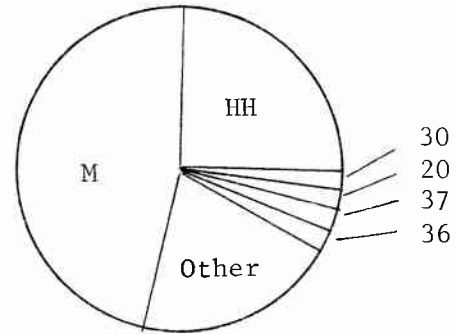
36 Fabricated Metals
37 Other Fabricated Metal Prod.
20 Special Trade Construction
30 Other Chemicals

21. MEAT PRODUCTS

21
10
M HH
Other
9
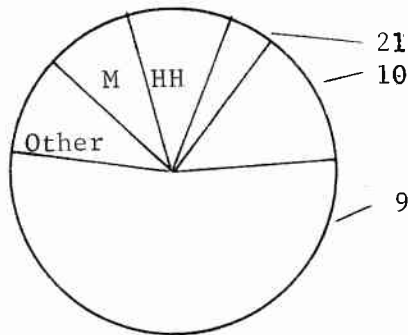
9 Cattle
10 Hogs
21 Meat Products

22. DAIRY PRODUCTS

M
HH
Other
26
22
7
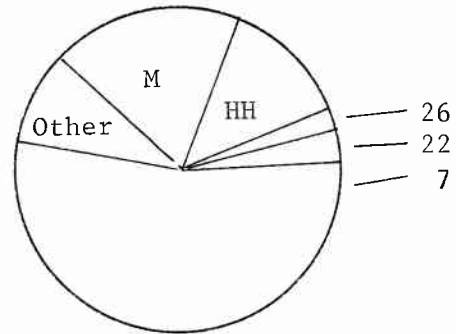
7 Dairies
22 Dairy Products
26 Paper & Allied Products

23. GRAIN MILL PROD

M HH
21
23
54
3
Other
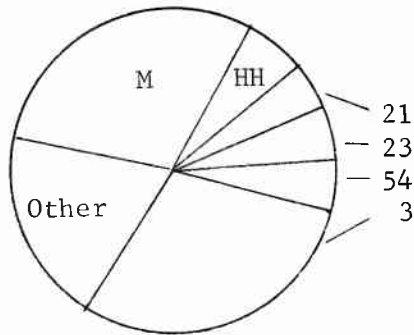
3 Wheat
54 Farm Products (Whlse.)
23 Grain Mill Products
21 Meat Products

24. OTHER FOOD PROD

HH
21
23
5
M
Other
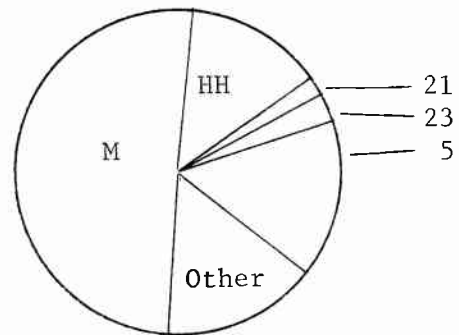
5 Soybeans
23 Grain Mill Products
21 Meat Products

25. A
   P
   P
   A
   R
   E
   L
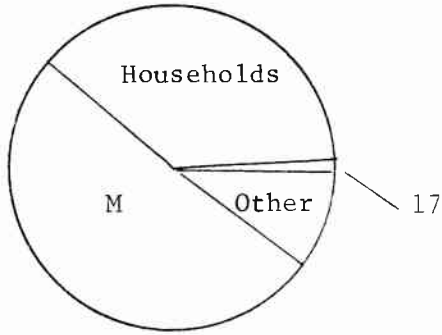
17 Maintenance & Repair
55 Machinery & Equipment
51 Communication

26. P
   A
   P
   E
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   &
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   D

   P
   R
   O
   D
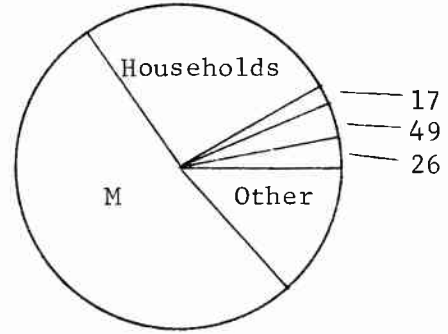
26 Paper & Allied Products
49 Motor Freight
17 Maintenance & Repair

27. P
   R
   I
   N
   T.

   &

   P
   U
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   L
   I
   S
   H.
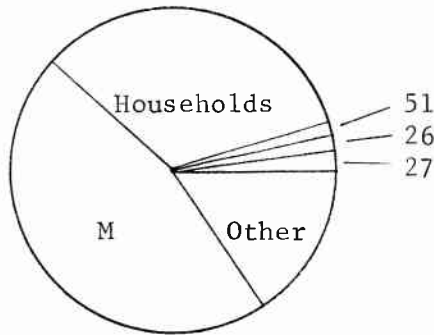
27 Printing & Publishing
26 Paper & Allied Products
51 Communications

28. I
   N
   D
   U
   S
   T
   R
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   A
   L

   C
   H
   E
   M.
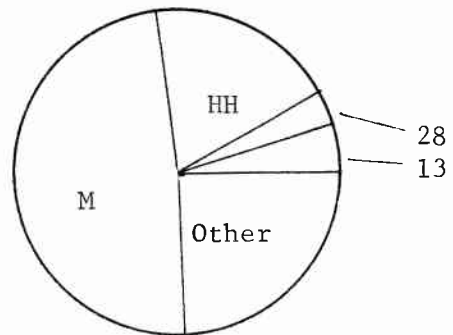
13 Crude Oil & Natural Gas
28 Industrial Chemicals

29. A
   G
   R
   I
   C.

   C
   H
   E
   M
   I
   C
   A
   L
   S
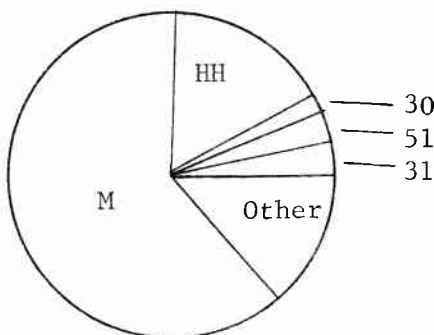
31 Petroleum & Coal Products
51 Communications
30 Other Chemicals

30. O
   T
   H
   E
   R

   C
   H
   E
   M
   I
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   A
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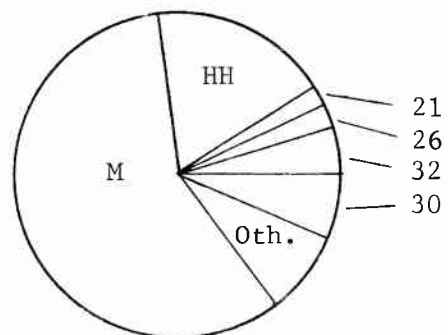
30 Other Chemicals
32 Rubber & Plastics
26 Paper & Allied Products
21 Meat Production

31. PETR. & COAL PROD.

M HH
Other
— 50
— 52
— 13
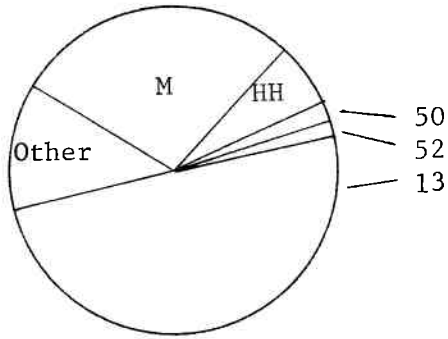
13 Crude Oil & Natural Gas
52 Elec., Gas, & Sanitary
50 Other Transportation

32. RUBBER & PLASTICS

HH
M Other
— 61
— 55
— 52
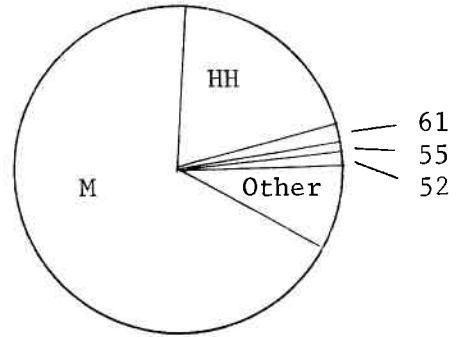
52 Elec., Gas, & Sanitary
55 Machinery & Equipment
61 Banking

33. CEMENT & CONCRETE

Households
M
Other
— 49
— 17
— 34
— 15
— 33
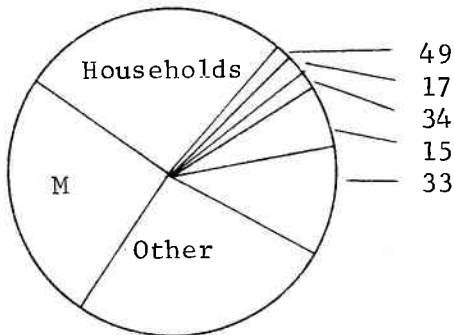
33 Cement & Concrete
15 Nonmetallic Mining
34 Other Stone & Clay
17 Maintenance & Repair
49 Motor Freight

34. OTHER STONE & CLAY

Households
M Other
— 49
— 37
— 17
— 48
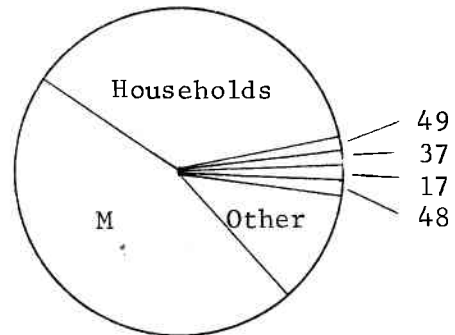
48 Railroad Transportation
17 Maintenance & Repair
37 Other Fabric. Metal Prods.
49 Motor Freight

35. PRIMARY METALS

Households
M
Other
— 48
— 35
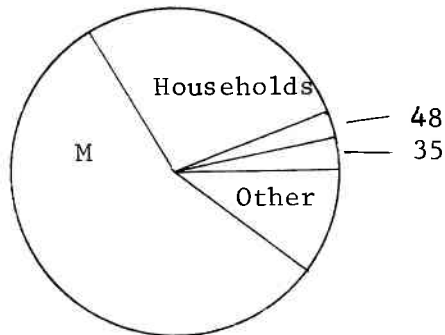
35 Primary Metals
48 Railroad Transportation

36. FABRICATED METALS

Households
M Other
— 42

42 Other Machinery

88

37. OTHER FAB. MET. PROD.

Households
26
51
49
52
M
Other
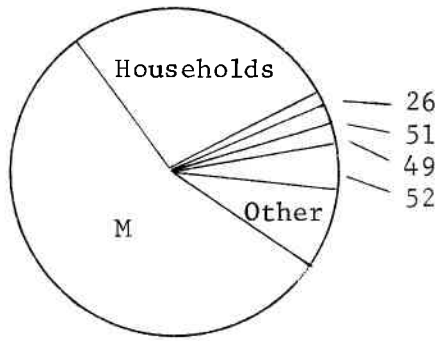
52 Elect., Gas & Sanitary Serv.
49 Motor Freight
51 Communications
26 Paper & Allied Products

38. FARM MACHINERY

Households
34
35
28
42
M
Other
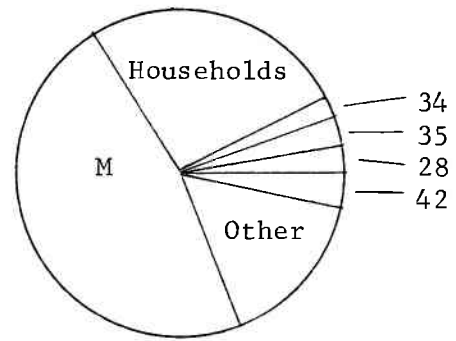
42 Other Machinery
28 Industrial Chemicals
35 Primary Metals
34 Other Stone & Clay

39. CONST. MACHINERY

Households
37
42
M
Oth.
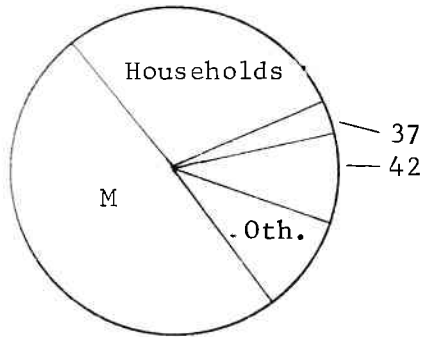
42 Other Machinery
37 Other Fab. Metal Products

40. FOOD PROD. MACH.

Households
51
61
48
37
M
Other
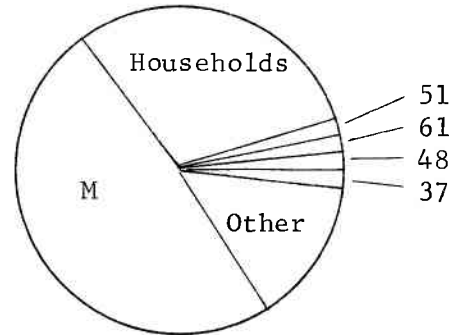
37 Other Fab. Metal Products
48 Railroad Transportation
61 Banking
51 Communications

41. ELEC. MACHINERY

HH
48
17
M
Other
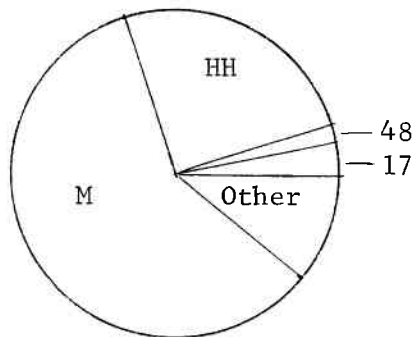
17 Maintenance & Repair
48 Railroad Transportation

42. OTHER MACHINERY

Households
52
17
M
Other

17 Maintenance & Repair
52 Elec., Gas, & Sanitary

89

43. MOTOR VEHICLES

HH
52
30
35
M
Other
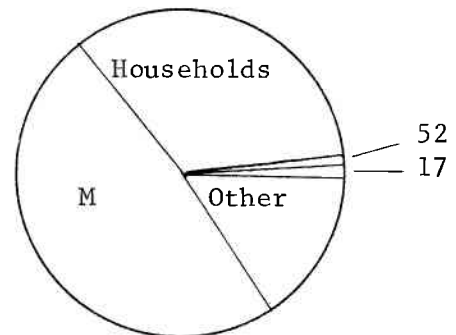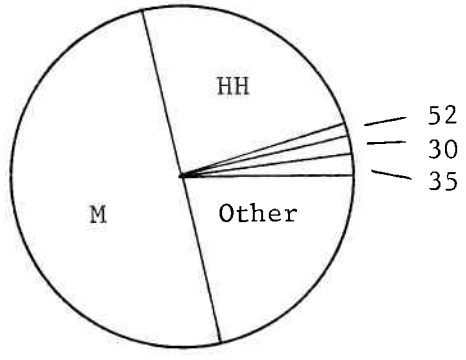
35 Primary Metals
30 Other Chemicals
52 Elec., Gas, & Sanitary

44. AEROSPACE

Households
55
42
32
M
Oth.
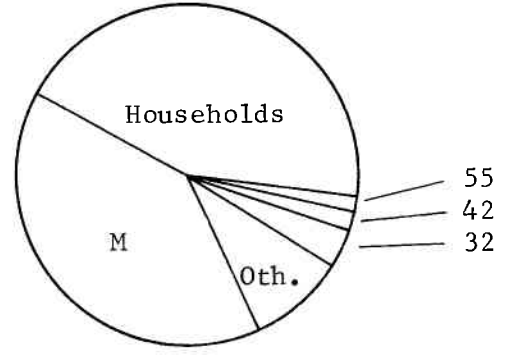
32 Rubber & Plastics
42 Other Machinery
55 Machinery & Equipment

45. TRAILER COACHES

HH
48
63
36
37
M
Oth.
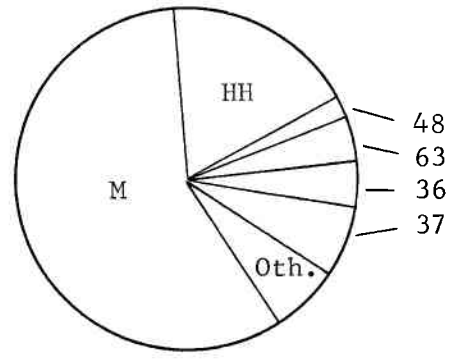
37 Other Fabric. Metal Prods.
36 Fabricated Metals
63 Insurance & Real Estate
48 Railroad Transportation

46. OTHER TRANSP.

M
HH
Oth.
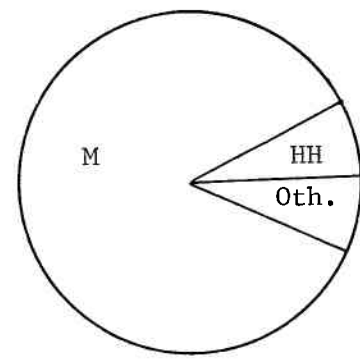
47. OTHER MANUFACTURES

Households
37
11
17
M
Oth.
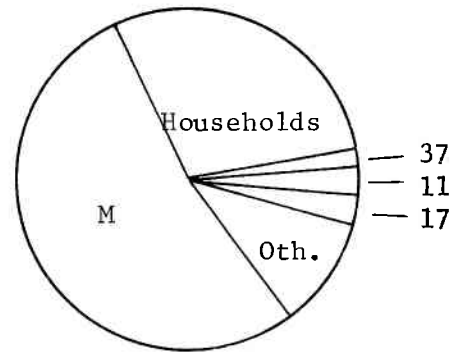
17 Maintenance & Repairs
11 Other Agricultural Prods.
37 Other Fabric. Metal Prods.

48. RAILROAD TRANSP.

Households
27
31
19
48
M
Other
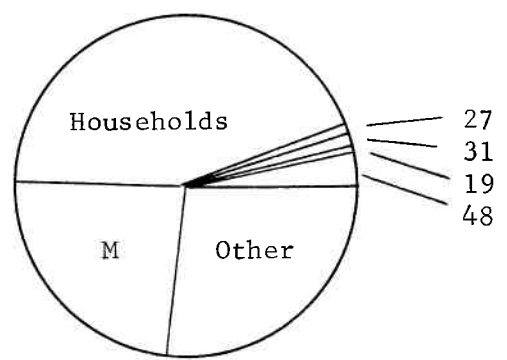
48 Railroad Transportation
19 Heavy Construction
31 Petroleum & Coal Prods.
27 Printing & Publishing

49. MOTOR FREIGHT
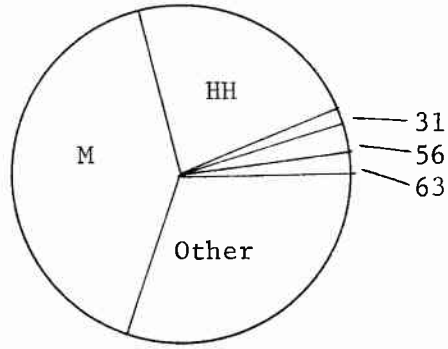
63 Insurance & Real Estate
56 Other Wholesale Trade
31 Petroleum & Coal Prods.

50. OTHER TRANSP.
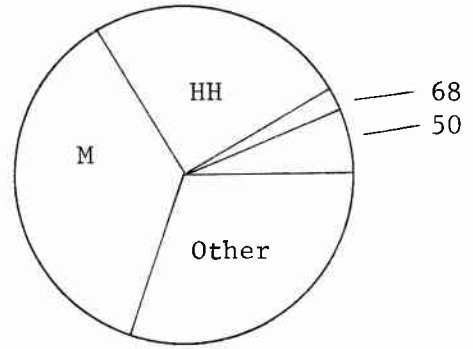
50 Other Transportation
68 Other Services

51. COMMUNICATION
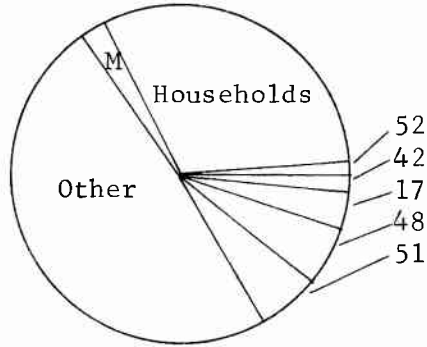
51 Communication
48 Railroad Transportation
17 Maintenance & Repair
42 Other Machinery
52 Elec., Gas, & Sanitary

52. ELEC. GAS & SANIT.
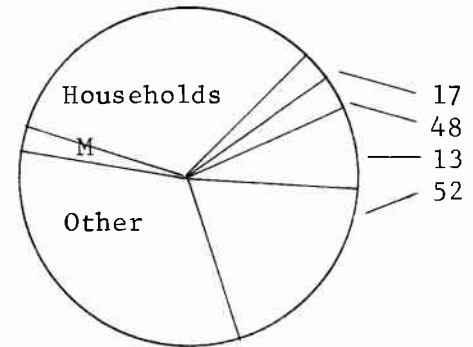
52 Elec., Gas, & Sanitary
13 Crude Oil & Natural Gas
48 Railroad Transportation
17 Maintenance & Repair

53. GROCERIES
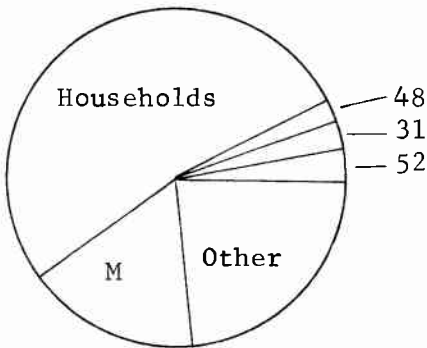
52 Elec., Gas, & Sanitary
31 Petroleum & Coal Prods.
48 Railroad Transportation

54. FARM PRODS. WHLSE.
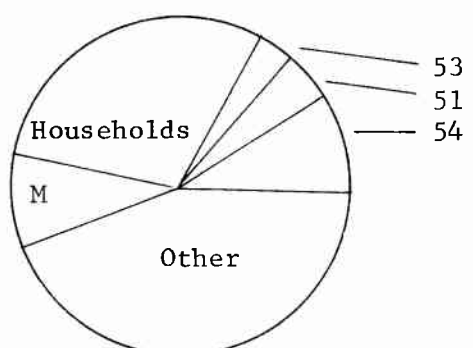
54 Farm Products (Whlse.)
51 Communications
53 Groceries & Related Prods.

55. MACHINERY & EQUIP.

Households

M

Other

68
64
59
49
51
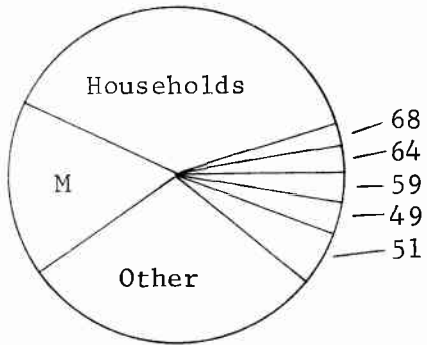
51 Communication
49 Motor Freight
59 Eating & Drinking Places
64 Lodging Services
68 Other Services

56. OTH. WHLSE. TRADE

Households

Other

M

68
51
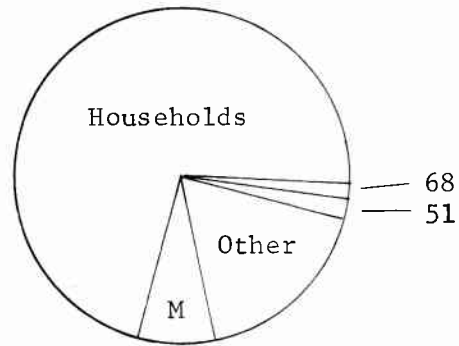
51 Communication
68 Other Services

57. FARM EQUIP. DEAL.

Households

M

Other

48
49
55
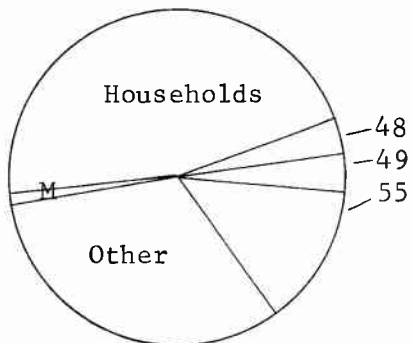
55 Machinery & Equipment
49 Motor Freight
48 Railroad Transportation

58. GAS. SERV. STA.

Households

M   Other

68
56
65
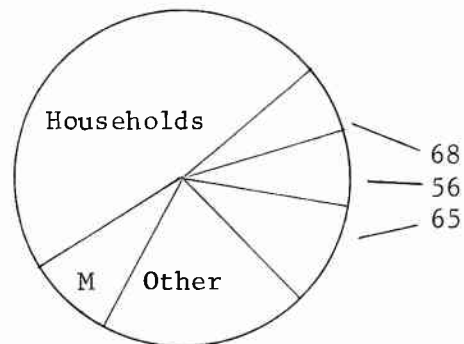
65 Personal Services
56 Other Wholesale Trade
68 Other Services

59. EATING & DRINK.

Households

M

Other

69
22
24
52
53
21
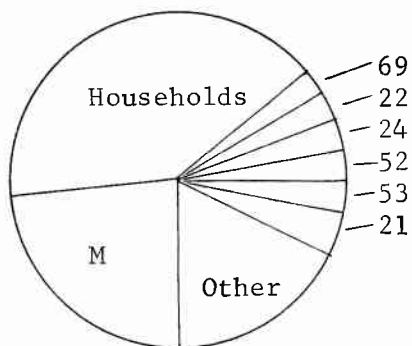
21 Meat Products
53 Groceries
52 Elec., Gas, & Sanitary
24 Food & Kindred Products
22 Dairy Products
69 Education

60. OTH. RETAIL TRADE

Households

M   Other

52
27
53
56
63
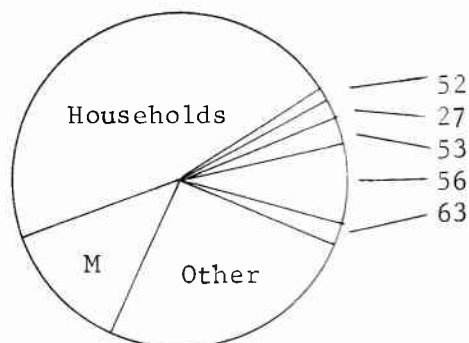
63 Insurance & Real Estate
56 Other Wholesale Trade
53 Groceries
27 Printing & Publishing
52 Elec., Gas, & Sanitary

92

61. BANKING

— 52
— 27
— 68
— 51
— 17

M

Households
Other
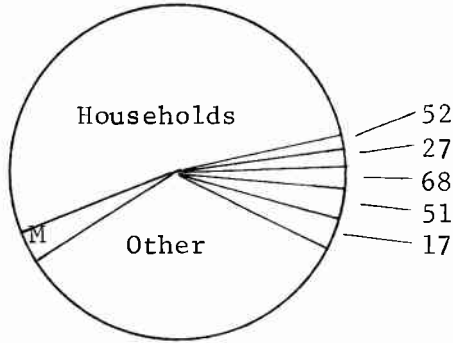
17 Maintenance & Repair
51 Communications
68 Other Services
27 Printing & Publishing
52 Elec., Gas, & Sanitary

62. OTHER FINANCE

— 68
— 27
— 51
— 61

Households
M   Other
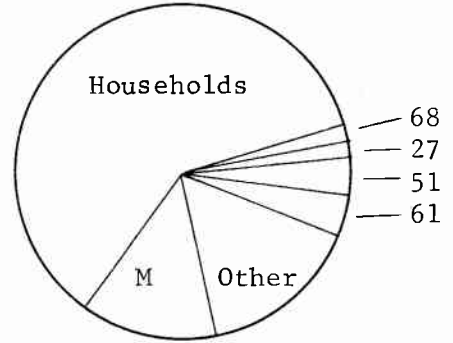
61 Banking
51 Communications
27 Printing & Publishing
68 Other Services

63. INS. & REAL ESTATE

— 68
— 63
— 24
— 21
— 27
— 51
— 31
— 62

Households
M
Other
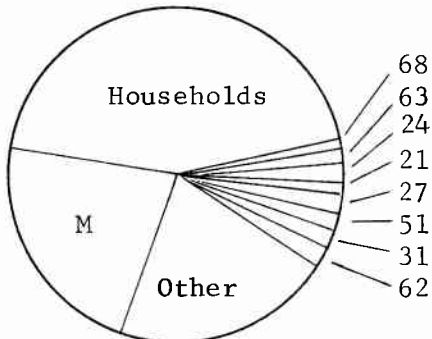
68 Other Services
62 Other Finance
31 Petroleum & Coal Prods.
51 Communications
27 Printing & Publishing
21 Meat Products
24 Food & Kindred Products
63 Insurance & Real Estate

64. LODGING SERVICES

— 55
— 63
— 52
— 65

Households
M
Other
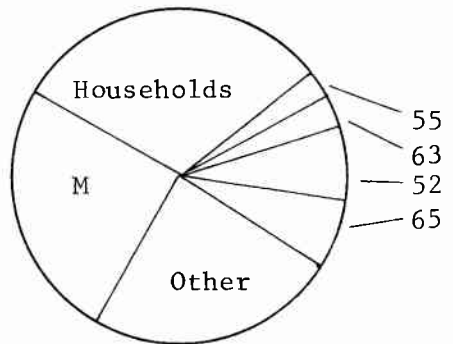
65 Personal Services
52 Elec., Gas, & Sanitary
63 Insurance & Real Estate
55 Machinery & Equipment

65. PERSONAL SERVICES

— 52
— 29
— 63
— 38
— 53

Households
M Other
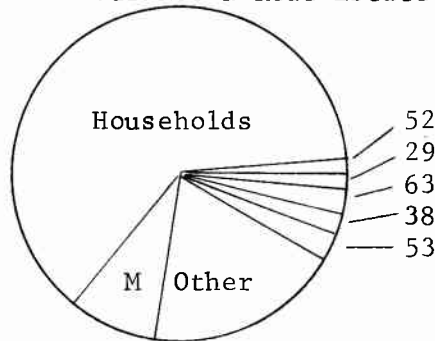
53 Groceries
38 Farm Machinery
63 Insurance & Real Estate
29 Agricultural Chemicals
52 Elec., Gas, & Sanitary

66. BUSINESS SERVICES

— 27
— 66
— 51

Households
M
Other
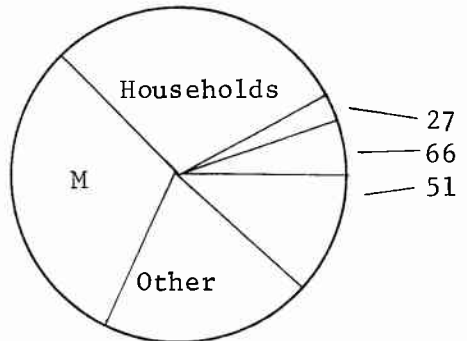
51 Communications
66 Business Services
27 Printing & Publishing

Households

M

Other

21
17
67
65
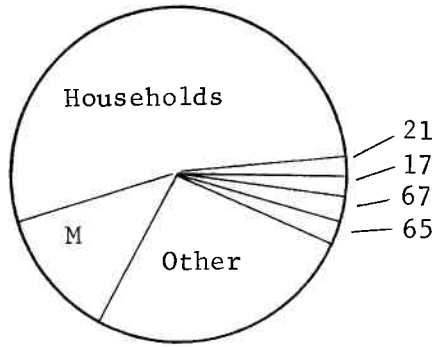
65 Personal Services
67 Medical & Health Serv.
17 Maintenance & Repair
21 Meat Products

Households

M

Other

66
68
17
63
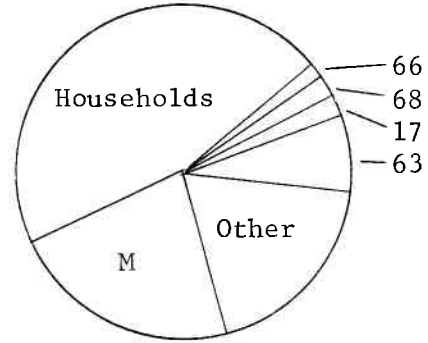
63 Insurance & Real Estate
17 Maintenance & Repair
21 Meat Products
67 Medical & Health Services

Households

M   Oth.

69
51
52
17
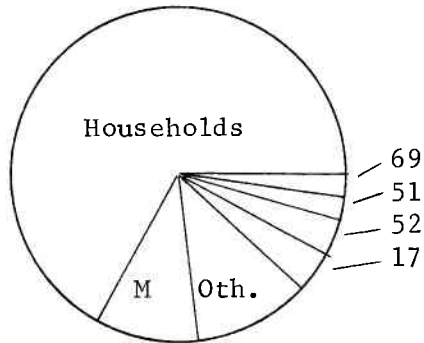
17 Maintenance & Repair
52 Elec., Gas, & Sanitary
51 Communications
69 Education

Chapter 6

FINAL PAYMENTS CHARACTERISTICS

Final payments sectors represent expenditure categories of industries other than purchases of goods and services from Kansas industries. These include Households (wages, salaries, interest, profit, and rent), Gross Savings (retained earnings and depreciation), Federal Government (primarily taxes), State Government, Local Government, and Imports (out-of-state purchases).

Households

Payments to households, primarily wages, represent the labor input into the production process. Table 6-1 summarizes the percentage that payments to households represents of total inputs. Payments to households exceed 50 per cent to total inputs for nine of the industries and are more than 30 per cent for 37 of the 69 industries.

The total of the household row represents total personal income of Kansas residents. This corresponds to the U. S. Department of Commerce definition of personal income. In 1965 Kansas personal income totaled $6,001,000,000.

The most striking characteristic of Kansas personal income is that more than $1 billion was paid to Kansas residents by business firms outside the state of Kansas and an additional $675 million was income paid to Kansas by the Federal government. Nearly one-half of the $1 billion total mentioned above was earned by Kansas residents in the Kansas City metropolitan area who work in Missouri.

Table 6-1

HOUSEHOLD PAYMENTS AS A PER CENT OF TOTAL INPUTS

1	Corn	.449
2	Sorghum	.448
3	Wheat	.427
4	Other Grains	.454
5	Soybeans	.498
6	Hay	.628
7	Dairy Products	.207
8	Poultry and Poultry Products	.420
9	Cattle	.143
10	Hogs	.215
11	Other Agricultural Products	.304
12	Agricultural Services	.324
13	Crude Oil and Natural Gas	.084
14	Oil and Gas Field Services	.546
15	Nonmetallic Mining	.095
16	Other Mining	.098
17	Maintenance and Repair	-0-
18	Building Construction	.156
19	Heavy Construction	.366
20	Special Trade Construction	.253
21	Meat Products	.102
22	Dairy Products	.130
23	Grain Mill Products	.066

24	Other Food and Kindred Products	.141
25	Apparel	.383
26	Paper and Allied Products	.267
27	Printing and Publishing	.339
28	Industrial Chemicals	.193
29	Agricultural Chemicals	.167
30	Other Chemicals	.181
31	Petroleum and Coal Products	.066
32	Rubber and Plastics	.201
33	Cement and Concrete	.274
34	Other Stone and Clay	.380
35	Primary Metals	.279
36	Fabricated Metals	.304
37	Other Fabricated Metal Products	.277
38	Farm Machinery	.261
39	Construction Machinery	.295
40	Food Products Machinery	.310
41	Electrical Machinery	.254
42	Other Machinery	.343
43	Motor Vehicles	.241
44	Aerospace	.445
45	Trailer Coaches	.185
46	Other Transportation Equipment	.071

47	Other Manufacturing	.298
48	Railroad Transportation	.440
49	Motor Freight	.235
50	Other Transportation	.257
51	Communications	.314
52	Electric Gas and Sanitary Services	.329
53	Groceries	.528
54	Farm Products	.300
55	Machinery and Equipment	.386
56	Other Wholesale Trade	.721
57	Farm Equipment Dealers	.459
58	Gasoline Service Stations	.478
59	Eating and Drinking	.409
60	Other Retail Trade	.468
61	Banking	.525
62	Other Finance	.591
63	Insurance and Real Estate	.442
64	Lodging Services	.317
65	Personal Services	.626
66	Business Services	.291
67	Medical and Health Services	.532
68	Other Services	.462
69	Education	.671

Gross Savings

Gross savings includes both retained earnings and depreciation. In the transactions table it is represented by row 71. Gross savings as a per cent of total inputs is shown in Table 6-2. The highest ratio appears in sector 13, Crude Oil and Natural Gas, because of special legal provisions permitting higher "depreciation" than other industries.

A comparison of the total for row 71 and column 71 indicates that Gross Savings equals Gross Private Investment.

However, it may also be observed that some adjustment entries appear in row 71 in the Final Demand sectors. There are four such balancing entries in the columns for Inventory Change, Federal Government-Defense, Federal Government Non-Defense and exports. These are entered in the table in this manner to focus on the differences between expenditures and receipts from these sectors.

The two negative entries in the federal government sectors indicate that Kansas received about $457 million more from the federal government that Kansas businesses and individuals paid to the federal government in taxes, fees, and miscellaneous expenditures.

The adjusting entry in the gross savings row and inventory change column reflects a $13,499,000 increase in inventory during the year for all Kansas industries.

Purchases from out-of-state (imports) exceeded out-of-state sales (exports) by $42,197,000 as indicated by the entry in row 71, column 77.

Government

Payments to federal, state, and local government appear in rows 72, 73, and 74. These are primarily taxes although fees and other payments to

Table 6-2

GROSS SAVINGS AS A PER CENT OF TOTAL INPUTS

1	Corn	.130
2	Sorghum	.157
3	Wheat	.107
4	Other Grains	.082
5	Soybeans	.086
6	Hay	.099
7	Dairy Products	.082
8	Poultry and Poultry Products	.112
9	Cattle	.045
10	Hogs	.032
11	Other Agricultural Products	.128
12	Agricultural Services	.091
13	Crude Oil and Natural Gas	.420
14	Oil and Gas Field Services	.038
15	Nonmetallic Mining	.330
16	Other Mining	.344
17	Maintenance and Repair	-0-
18	Building Construction	.019
19	Heavy Construction	.056
20	Special Trade Construction	.034
21	Meat Products	.005
22	Dairy Products	.022
23	Grain Mill Products	.005

24	Other Food and Kindred Products	.020
25	Apparel	.033
26	Paper and Allied Products	.057
27	Printing and Publishing	.051
28	Industrial Chemicals	.124
29	Agricultural Chemicals	.019
30	Other Chemicals	.039
31	Petroleum and Coal Products	.063
32	Rubber and Plastics	.046
33	Cement and Concrete	.125
34	Other Stone and Clay	.043
35	Primary Metals	.033
36	Fabricated Metals	.042
37	Other Fabricated Metal Products	.046
38	Farm Machinery	.056
39	Construction Machinery	.016
40	Food Products Machinery	.065
41	Electrical Machinery	.041
42	Other Machinery	.050
43	Motor Vehicles	.046
44	Aerospace	.029
45	Trailer Coaches	.014
46	Other Transportation Equipment	.016

47	Other Manufacturing	.026
48	Railroad Transportation	.113
49	Motor Freight	.083
50	Other Transportation	.124
51	Communications	.365
52	Electric Gas and Sanitary Services	.170
53	Groceries	.032
54	Farm Products	.162
55	Machinery and Equipment	.098
56	Other Wholesale Trade	.051
57	Farm Equipment Dealers	.109
58	Gasoline Service Stations	.070
59	Eating and Drinking	.013
60	Other Retail Trade	.095
61	Banking	.063
62	Other Finance	.035
63	Insurance and Real Estate	.032
64	Lodging Services	.086
65	Personal Services	.067
66	Business Services	.072
67	Medical and Health Services	.123
68	Other Services	.067
69	Education	.003

governments are included.

Taxes paid by the industry groups, sectors 1-69, include only business taxes and payments. For instance, the personal income tax paid by a farm proprietor on his income is not included in any of the farm sector payments to government; rather it is a personal income tax payment which appears in column 70, rows 72 and 73.

Kansas business and persons paid nearly $1.2 billion to the federal government in 1965 and more than $1.1 billion to state and local government combined.

Imports (Out-of-State Purchases)

Kansas residents and businesses purchased more than $4.9 billion of goods and services from out-of-state in 1965. About $1.8 of this total represented consumption of goods and services by Kansas residents. Imports represented over 30 per cent of total expenditures by Kansas residents.

As a per cent of total purchases, imports ranged as high as 72 per cent of Other Wholesale Trade inputs to less than 7 per cent for Petroleum and Coal Products and Grain Mill Products. Nine industries purchased more than 50 per cent of their inputs from out-of-state as indicated by Table 6-3. Of the 68 industries in Table 6-3, 48 show import ratios in excess of 25 per cent.

The study was also designed to obtain the geographic and industrial origin of Kansas imports. Thus, for each industry group it is possible to determine the type of industry from which the Kansas industry is purchasing and its geographic location. This information is contained in another publication.[*]

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[*]M. Jarvin Emerson, Ronald G. Adams, and Leonard Atencio, Interindustry Import and Export Matrices for the Kansas Economy, Office of Economic Analysis, State of Kansas, 1969.

Table 6-3

RATIO OF IMPORTS (OUT-OF-STATE PURCHASES) TO TOTAL PURCHASES

1	Other Wholesale Trade	.720770
2	Education	.670779
3	Hay	.628249
4	Personal Services	.626176
5	Other Financial Institutions	.590915
6	Oil and Gas Field Services	.545927
7	Medical and Health	.532302
8	Groceries	.527934
9	Banking	.525155
10	Soybeans	.498330
11	Gasoline Service Stations	.477557
12	Other Retail Trade	.467609
13	Other Services	.462027
14	Farm Equipment Dealers	.459296
15	Other Grains	.454131
16	Corn	.449084
17	Sorghum	.447696
18	Aerospace	.444882
19	Insurance and Real Estate	.441578
20	Railroad Transportation	.440153
21	Other Fabricated Metal Products	.433650
22	Wheat	.426986
23	Poultry	.420249

24	Eating and Drinking	.408503
25	Machinery and Equipment	.385706
26	Apparel	.382615
27	Other Stone and Clay	.379504
28	Heavy Construction	.366110
29	Other Machinery	.343494
30	Printing and Publishing	.338653
31	Electric, Gas and Sanitary Services	.328641
32	Agricultural Services	.323500
33	Lodging Services	.316752
34	Communications	.313602
35	Food Products Machinery	.309706
36	Fabricated Metals	.303881
37	Other Agricultural Products	.303900
38	Farm Products	.299630
39	Other Manufacturing	.298009
40	Construction Machinery	.295346
41	Business Services	.290578
42	Primary Metals	.279486
43	Cement & Concrete	.274437
44	Paper and Allied Products	.266999
45	Farm Machinery and Equipment	.260522
46	Other Transportation	.257388

47	Electrical Machinery	.254011
48	Special Trade Construction	.253199
49	Motor Vehicles	.240874
50	Motor Freight	.235316
51	Hogs	.215227
52	Dairy Products	.206696
53	Rubber and Plastics	.201007
54	Industrial Chemicals	.192705
55	Trailer Coaches	.184916
56	Other Chemicals	.180926
57	Agricultural Chemicals	.166866
58	Building Construction	.156101
59	Cattle	.142896
60	Other Food and Kindred	.140578
61	Dairy Products	.129615
62	Meat Products	.102232
63	Other Mining	.098409
64	Nonmetallic Mining	.095075
65	Crude Oil and Natural Gas	.083554
66	Other Transportation Equipment	.070935
67	Petroleum and Coal Products	.065993
68	Grain Mill Products	.065858
69	Maintenance and Repair	.000000

Chapter 7

FINAL DEMAND CHARACTERISTICS

As explained in Chapters 3 and 5 the markets for the product or service of an industry can be divided into intermediate and final demand. Chapter 5 examined the nature of the intermediate or interindustry demand for the output of Kansas industries. This chapter examines the nature of the final markets or final demand components.

As indicated on the transactions matrix there are eight final demand sectors which are Kansas households, gross private investment, change in finished goods inventory, federal government-defense, federal government-nondefense, state government, local government, and exports.

Sales to each of these sectors by Kansas industries is indicated in Table 7-1.

Households

The relative importance of the household sector as a market for the output of each Kansas industry is indicated by Table 7-2 and Figure 7-1. Nearly 94 per cent of the output of Other Retail Trade is sold to Kansas households. Eating and Drinking Establishments and Medical and Health Services rank next with 81 per cent of their sales to households. The highest ranking manufacturing industry is Dairy Products with 46 per cent of its output sold to households. Only six industries sell more than one-half of their total output to households. Of the 69 industries, 52 sell less than 20 per cent of their output to households and 47 sell less than 10 per cent.

Table 7-1

RATIO OF FINAL DEMAND SALES TO TOTAL SALES

1	Motor Vehicles	.996891
2	Aerospace	.992460
3	Building Construction	.992007
4	Other Retail Trade	.962288
5	Education	.959253
6	Other Transportation Equipment	.956059
7	Other Financial Institutions	.952319
8	Heavy Construction	.946854
9	Medical and Health	.942177
10	Rubber and Plastics	.938688
11	Eating and Drinking	.938511
12	Apparel	.916710
13	Meat Products	.910773
14	Trailer Coaches	.905605
15	Other Grains	.897662
16	Construction Machinery	.897214
17	Petroleum and Coal Products	.890878
18	Dairy Products	.857171
19	Nonmetallic Mining	.850229
20	Other Chemicals	.837767
21	Other Stone and Clay	.834522
22	Personal Services	.821313
23	Other Food and Kindred	.820076

24	Other Machinery	.784414
25	Food Products Machinery	.773116
26	Gasoline Service Stations	.765267
27	Electrical Machinery	.762929
28	Railroad Transportation	.759085
29	Grain Mill Products	.741216
30	Industrial Chemicals	.735742
31	Fabricated Metals	.705872
32	Other Fabricated Metal Products	.699717
33	Other Manufacturing	.678459
34	Farm Machinery and Equipment	.677705
35	Banking	.651253
36	Insurance and Real Estate	.643434
37	Lodging Services	.633961
38	Wheat	.619284
39	Printing and Publishing	.617696
40	Poultry	.609989
41	Other Transportation	.602110
42	Paper and Allied Products	.601300
43	Motor Freight	.587892
44	Agricultural Chemicals	.547885
45	Maintenance and Repair	.506308
46	Primary Metals	.490707

47	Other Mining	.481916
48	Cement and Concrete	.449878
49	Corn	.440072
50	Electric, Gas and Sanitary Services	.435527
51	Communications	.413877
52	Farm Products	.410230
53	Sorghum	.400845
54	Other Agricultural Products	.378608
55	Other Services	.339480
56	Cattle	.263978
57	Groceries	.259055
58	Crude Oil and Natural Gas	.232379
59	Business Services	.228330
60	Soybeans	.189634
61	Machinery and Equipment	.182733
62	Hogs	.146642
63	Dairy Products	.141457
64	Hay	.128712
65	Farm Equipment Dealers	.107247
66	Agricultural Services	.066287
67	Other Wholesale Trade	.046618
68	Special Trade Construction	.034470
69	Oil and Gas Field Services	.000000

Figure 7-1

PER CENT OF TOTAL SALES TO KANSAS HOUSEHOLDS

SECTOR

Sector
60. Other Retail Trade
59. Eating & Drinking
67. Medical & Health Services
62. Other Finance
65. Personal Services
58. Gasoline Service Stations
22. Dairy Products
50. Other Transportation
52. Electric, Gas, & Sanitary Serv.
64. Lodging Services
63. Insurance & Real Estate
61. Banking
11. Other Agricultural Products
24. Other Food & Kindred Products
17. Maintenance & Repair
51. Communications
31. Petroleum & Coal Products
68. Other Services
21. Meat Products
45. Trailer Coaches
34. Other Stone & Clay
47. Other Manufacturing
30. Other Chemicals
37. Other Fabricated Metal Prods.
48. Railroad Transportation
25. Apparel

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	0	10	20	30	40	50	60	70	80	90	100
8. Poultry & Poultry Products											
49. Motor Freight											
69. Education											
12. Agricultural Services											
33. Cement & Concrete											
46. Other Transportation Equipment											
66. Business Services											
53. Groceries											
10. Hogs											
7. Dairy Products											
32. Rubber & Plastics											
37. Other Fabricated Metal Prods.											
29. Agricultural Chemicals											
56. Other Wholesale Trade											
41. Electrical Machinery											
57. Farm Equipment Dealers											
26. Paper & Allied Products											
55. Machinery & Equipment											
9. Cattle											
44. Aerospace											
23. Grain Mill Products											
38. Farm Machinery											
54. Farm Products											
42. Other Machinery											
43. Motor Vehicles											

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Table 7-2

RANKED RATIOS OF SALES TO KANSAS HOUSEHOLDS BY PROCESSING SECTORS

Sector		Household Sales/Total Output
60	Other Retail Trade	.939738
59	Eating & Drinking	.871638
67	Medical & Health Services	.870943
62	Other Finance	.816410
65	Personal Services	.760775
58	Gasoline Service Stations	.669737
22	Dairy Products	.461800
50	Other Transportation	.423160
52	Electric Gas & Sanitary Services	.394255
64	Lodging Services	.368049
63	Insurance & Real Estate	.362959
61	Banking	.361047
11	Other Agricultural Products	.342583
24	Other Food & Kindred Products	.307590
17	Maintenance & Repair	.303832
51	Communications	.286330
31	Petroleum & Coal Products	.256550
68	Other Services	.195251
21	Meat Products	.154551
45	Trailer Coaches	.139747
34	Other Stone & Clay	.131552
47	Other Manufacturing	.111737

Sector		Household Sales/Total Output
30	Other Chemicals	.098372
37	Other Fabricated Metal Products	.090557
48	Railroad Transportation	.075842
25	Apparel	.071620
8	Poultry & Poultry Products	.057871
49	Motor Freight	.045976
69	Education	.039201
12	Agricultural Services	.039083
33	Cement & Concrete	.035421
46	Other Transportation Equipment	.032801
66	Business Services	.032127
53	Groceries	.028009
10	Hogs	.018056
7	Dairy Products	.016054
32	Rubber & Plastics	.014898
37	Other Fabricated Metal Products	.012664
29	Agricultural Chemicals	.012323
56	Other Wholesale Trade	.011743
41	Electrical Machinery	.010126
57	Farm Equipment Dealers	.010035
26	Paper & Allied Products	.009440
55	Machinery & Equipment	.006056
9	Cattle	.003935
44	Aerospace	.003507

Sector		Household Sales/Total Output
23	Grain Mill Products	.003147
38	Farm Machinery	.001459
54	Farm Products	.001141
42	Other Machinery	.000746
43	Motor Vehicles	.000342
	(All Other Values are Zero)	

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Federal Government

The federal government is a sizable purchaser of Kansas products and services. Because of its relative importance, federal government is divided into two categories: Federal Government-Defense and Federal Government-Nondefense. Federal Government Defense purchases from Kansas totaled $583 million and nondefense expenditures $1,052 million in 1965.

The relative importance of Federal government purchases for each Kansas industry is indicated in Table 7-3. Aerospace and wheat sell 48 and 46 per cent of their output to the Federal government. However, the former is almost entirely for defense purposes while the latter is for nondefense.

Farm sales to the federal government include sales which may be exported by the federal government under various programs, primarily Public Law 480. These exports are in addition to private exports contained in column 77.

State and Local Government

Together State and Local government purchase $1,139 million of which $1,086 million is purchased from Kansas firms and households. In each category the largest outlay is to the Education sector since education is treated as a separate industry.

Both state and local government purchase more of their commodities and services from inside the state than do most other industries. In each category the import ratio is substantially below ten per cent.

Gross Private Investment

Gross private investment in Kansas in 1965 totaled $654,520,000 of which Kansas firms and workers provided $568,887. The majority of the sales to capital formation was by the construction industry which accounted for nearly 75 per cent of the amount supplied by Kansas industries. Imports of capital

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Table 7-3

PERCENTAGE OF KANSAS INDUSTRY SALES TO FEDERAL GOVERNMENT

	Industry	Defense	Nondefense	Total
1.	Corn	-0-	15.52	15.52
2.	Sorghum	-0-	16.37	16.37
3.	Wheat	-0-	46.08	46.08
4.	Other Grains	-0-	34.60	34.60
5.	Soybeans	-0-	1.37	1.37
6.	Hay	-0-	1.15	1.15
7.	Dairy Products	-0-	1.36	1.36
8.	Poultry and Poultry Products	-0-	1.38	1.38
9.	Cattle	-0-	.82	.82
10.	Hogs	-0-	1.35	1.35
11.	Other Agricultural Products	-0-	.82	.82
12.	Agricultural Services	-0-	-0-	-0-
13.	Crude Oil and Natural Gas	-0-	-0-	-0-
14.	Oil and Gas Field Services	-0-	-0-	-0-
15.	Nonmetallic Mining	-0-	-0-	-0-
16.	Other Mining	-0-	-0-	-0-
17.	Maintenance and Repair	.05	.43	.48
18.	Building Construction	-0-	-0-	-0-
19.	Heavy Construction	-0-	-0-	-0-
20.	Special Trade Construction	-0-	-0-	-0-
21.	Meat Products	3.18	-0-	3.18
22.	Dairy Products	1.83	.35	2.18
23.	Grain Mill Products	.60	10.34	10.94

Industry	Defense	Nondefense	Total
24. Other Food and Kindred Products	.08	-0-	.08
25. Apparel	.02	-0-	.02
26. Paper and Allied Products	.03	.08	.11
27. Printing and Publishing	.05	.56	.61
28. Industrial Chemicals	.23	-0-	.23
29. Agricultural Chemicals	.01	-0-	.01
30. Other Chemicals	1.51	.25	1.76
31. Petroleum and Coal Products	.51	.58	1.09
32. Rubber and Plastics	2.67	.04	2.71
33. Cement and Concrete	5.08	.01	5.09
34. Other Stone and Clay	.08	-0-	.08
35. Primary Metals	-0-	.91	.91
36. Fabricated Metals	-0-	1.30	1.30
37. Other Fabricated Metal Products	2.86	.01	2.87
38. Farm Machinery	.05	.01	.06
39. Construction Machinery	.03	1.54	1.57
40. Food Products Machinery	-0-	-0-	-0-
41. Electrical Machinery	3.91	-0-	3.91
42. Other Machinery	.56	.01	.57
43. Motor Vehicles	15.38	-0-	15.38
44. Aerospace	47.41	.41	47.82
45. Trailer Coaches	-0-	-0-	-0-
46. Other Transportation Equipment	-0-	.24	.24

Industry	Defense	Nondefense	Total
47. Other Manufacturing	1.75	.24	1.99
48. Railroad Transportation	3.49	.62	4.11
49. Motor Freight	2.99	.75	3.74
50. Other Transportation	5.90	1.04	6.94
51. Communications	1.30	.86	2.16
52. Electric Gas and Sanitary Services	.97	.70	1.67
53. Groceries	2.46	.24	2.70
54. Farm Products	-0-	-0-	-0-
55. Machinery and Equipment	.79	.79	1.58
56. Other Wholesale Trade	-0-	.37	.37
57. Farm Equipment Dealers	.41	-0-	.41
58. Gasoline Service Stations	-0-	-0-	-0-
59. Eating and Drinking	-0-	-0-	-0-
60. Other Retail Trade	-0-	-0-	-0-
61. Banking	-0-	15.19	15.19
62. Other Finance	-0-	3.00	3.00
63. Insurance and Real Estate	-0-	.85	.85
64. Lodging Services	-0-	-0-	-0-
65. Personal Services	-0-	-0-	-0-
66. Business Services	-0-	-0-	-0-
67. Medical and Health Services	-0-	1.36	1.36
68. Other Services	-0-	.14	.14
69. Education	-0-	8.44	8.44

goods totaled $85,633,000.

Change in Finished Goods Inventory

During the 1965 production period finished goods inventory increased $13,499,000. Changes in raw materials inventory are assigned back to the producing sector as explained in Chapter 3.

Exports (Out-of-State Sales)

Out-of-state sales of Kansas goods and services amounted to $4,873,162,000 or $42,197,000 less than imports.

Column 77 of the transactions table indicates the dollar value of exports for each industry. For Other Transportation Equipment manufacturing more than 91 per cent of its market is out-of-state as indicated by Table 7-4 and Figure 7-2. Exports account for more than one-half of the market for the output of 23 industries in the state. All but three of these are manufacturing industries. Hence, 20 of the 27 manufacturing industries sell more than 50 per cent of their output outside the state's borders.

As with imports, the study identified the industrial and geographic nature of export markets. These characteristics are summarized in a separate publication.

Figure 7-2

EXPORT RATIOS OF KANSAS PROCESSING SECTORS

SECTOR	0	10	20	30	40	50	60	70	80	90	100
46. Other Trans. Equip.											
32. Rubber & Plastics											
15. Nonmetallic Mining											
25. Apparel											
45. Trailer Coaches											
42. Other Machinery											
39. Construction Machinery											
28. Industrial Chemicals											
21. Meat Products											
40. Food Products Machinery											
41. Electrical Machinery											
30. Other Chemicals											
37. Other Fabricated Metal Prods.											
23. Grain Mill Products											
31. Petroleum & Coal Products											
48. Railroad Transportation											
26. Paper & Allied Products											
34. Other Stone & Clay											
4. Other Grains											
8. Poultry & Poultry Products											
27. Printing & Publishing											
29. Agricultural Chemicals											
24. Other Food & Kindred Prods.											
47. Other Manufacturing											
44. Aerospace											
16. Other Mining											
43. Motor Vehicles											
49. Motor Freight											
36. Fabricated Metals											
35. Primary Metals											
38. Farm Machinery											
54. Farm Products											
22. Dairy Products											
1. Corn											

	0	10	20	30	40	50	60	70	80	90	100

Sector
9. Cattle
63. Insurance & Real Estate
33. Cement & Concrete
2. Sorghum
13. Crude Oil & Natural Gas
66. Business Services
64. Lodging Services
5. Soybeans
3. Wheat
6. Hay
10. Hogs
53. Groceries
7. Dairy Products
18. Building Construction
50. Other Transportation
19. Heavy Construction
51. Communications
68. Other Services
55. Machinery & Equipment
58. Gasoline Service Stations
61. Banking
62. Other Finance
65. Personal Finance
59. Eating & Drinking
57. Farm Equipment Dealers
20. Special Trade Construction
12. Agricultural Services
11. Other Agricultural Prods.
69. Education
56. Other Wholesale Trade
60. Other Retail Trade
67. Medical & Health Services
52. Electric, Gas, & Sanitary Serv.

Table 7-4

RANKED EXPORT RATIOS OF KANSAS PROCESSING SECTORS

Sector		Exports/Total Output
46	Other Transportation Equipment	.916001
32	Rubber & Plastics	.896597
15	Nonmetallic Mining	.850230
25	Apparel	.839344
45	Trailer Coaches	.765738
42	Other Machinery	.761748
39	Construction Machinery	.758871
28	Industrial Chemicals	.750402
21	Meat Products	.724388
40	Food Products Machinery	.719490
41	Electrical Machinery	.713739
30	Other Chemicals	.711547
37	Other Fabricated Metal Products	.662298
23	Grain Mill Products	.627630
31	Petroleum & Coal Products	.610587
48	Railroad Transportation	.598823
26	Paper & Allied Products	.578377
34	Other Stone & Clay	.557416
4	Other Grains	.551620
8	Poultry & Poultry Products	.538349
27	Printing & Publishing	.532823
29	Agricultural Chemicals	.519330
24	Other Food & Kindred Products	.511051

Sector		Exports/Total Output
47	Other Manufacturing	.494689
44	Aerospace	.489777
16	Other Mining	.481916
43	Motor Vehicles	.479572
49	Motor Freight	.472414
36	Fabricated Metals	.470499
35	Primary Metals	.464234
38	Farm Machinery	.452985
54	Farm Products	.409089
22	Dairy Products	.360437
1	Corn	.284837
9	Cattle	.251814
63	Insurance & Real Estate	.238524
33	Cement & Concrete	.237946
2	Sorghum	.237112
13	Crude Oil & Natural Gas	.232379
66	Business Services	.193934
64	Lodging Services	.185262
5	Soybeans	.175973
3	Wheat	.158517
6	Hay	.117248
10	Hogs	.115057
53	Groceries	.114036
7	Dairy Products	.111819

Sector		Exports/Total Output
18	Building Construction	.109121
50	Other Transportation	.099856
19	Heavy Construction	.082897
51	Communications	.081949
68	Other Services	.079464
55	Machinery & Equipment	.074416
58	Gasoline Service Stations	.073033
61	Banking	.065234
62	Other Finance	.062919
65	Personal Services	.059551
59	Eating & Drinking	.051139
57	Farm Equipment Dealers	.049068
20	Special Trade Construction	.048550
12	Agricultural Services	.027205
11	Other Agricultural Products	.025311
69	Education	.018664
56	Other Wholesale Trade	.015541
60	Other Retail Trade	.014614
67	Medical & Health Services	.006621
52	Electric Gas & Sanitary Services	.006331
14	Oil & Gas Field Services	.000000
17	Maintenance & Repair	.000000
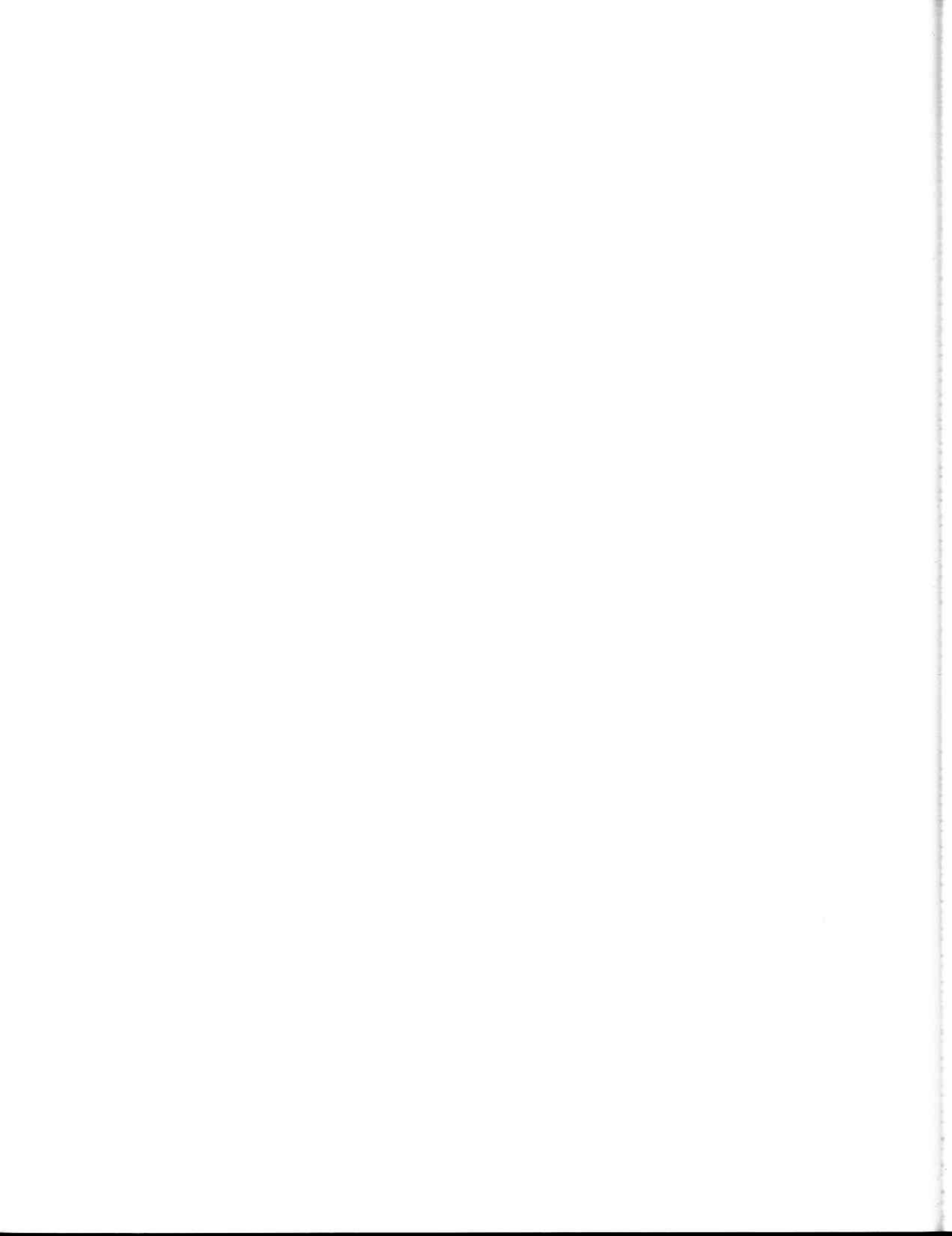
Chapter 8

GROSS STATE PRODUCT

The initial label attached to this study was "The Kansas Gross Product Study." Two main reasons were responsible for the title. First, the impetus for a detailed study of the Kansas economy was a more detailed picture of the production and income components of the state's economy. Second, the title seemed more familiar than the term "input-output analysis." However, after the study was designed and initiated, it was apparent that a detailed measure of gross state product and income was but a small part of the total study. Hence, a more encompassing title was selected.

This chapter presents the gross state product accounts as well as personal income accounts. The definitions of each is standardized with the U. S. Department of Commerce definitions.

Gross State Product-Value Added

Several approaches may be used in measuring gross state product of which one is the value added method. Roughly, this measures the difference between gross receipts and cost of goods sold. Thus, it represents the value added to goods and services by each industry. The major components are wages, interest, rent, and gross profit.

Gross state product for Kansas in 1965 was $6,945,945,000 as indicated in Table 8-1. The processing sectors, sectors 1-69, accounted for $5,010,837,000 and the final payments sectors $1,935,108,000.

Industries are ranked according to their contribution to state gross product in Table 8-1. Education, which includes both public and private at

all levels, ranks first. Since education is broadly defined to include all types of educational facilities and activities, this high value added figure is not surprising. Aerospace is the second largest component in the processing sector, followed by Other Retail Trade.

The amount of gross state product originating in each industry is specified in the remainder of Table 8-1. This is the first detailed account of the production structure of the Kansas economy.

Personal Income

Personal income by industry is shown in Table 8-2. This is the same information which appears in row 70 of the transactions table. Kansas personal income in 1965 was $6,001,000,000. Of the processing sectors, Education ranked first with $363,446,000, followed by Aerospace with $249,638,000.

By subtracting taxes from personal income, disposable personal income can be obtained. In 1965 disposable personal income totaled $4,642,410,000. Of this total, $4,440,683,000 represented consumer outlays and $201,727,000 was personal savings.

Table 8-1

GROSS KANSAS PRODUCT BY INDUSTRY ORIGINATING
1965

(In thousands of dollars)

69.	Education	390,600
44.	Aerospace	295,333
60.	Other Retail Trade	258,382
62.	Other Finance	230,543
13.	Crude Oil & Natural Gas	225,794
67.	Medical & Health Services	213,856
63.	Insurance & Real Estate	203,568
3.	Wheat	180,845
65.	Personal Services	176,400
52.	Electric Gas & Sanitary Services	163,678
48.	Railroad Transportation	162,603
61.	Banking	133,906
20.	Special Trade Construction	121,635
9.	Cattle	117,800
2.	Sorghum	111,768
51.	Communications	110,059
56.	Other Wholesale Trade	102,433
43.	Motor Vehicles	97,360
6.	Hay	91,985
18.	Building Construction	87,583

59.	Eating & Drinking	84,060
31.	Petroleum & Coal Products	76,612
49.	Motor Freight	66,146
21.	Meat Products	65,546
19.	Heavy Construction	59,614
42.	Other Machinery	57,752
30.	Other Chemicals	55,718
28.	Industrial Chemicals	54,285
1.	Corn	53,917
27.	Printing & Publishing	53,494
23.	Grain Mill Products	49,581
68.	Other Services	46,845
55.	Machinery & Equipment	44,357
54.	Farm Products	43,369
34.	Other Stone & Clay	42,824
58.	Gasoline Service Stations	42,195
32.	Rubber & Plastics	39,446
24.	Other Food & Kindred Products	37,699
33.	Cement & Concrete	36,462
15.	Nonmetallic Mining	31,207
53.	Groceries	27,447
14.	Oil & Gas Field Services	27,421
36.	Fabricated Metals	26,688

37.	Other Fabricated Metals - - - - - - -	25,541
26.	Paper & Allied Products - - - - - - -	25,479
10.	Hogs - - - - - - - - - - - - - - - -	25,289
5.	Soybeans - - - - - - - - - - - - -	25,211
12.	Agricultural Services - - - - - - - -	24,697
7.	Dairy Products - - - - - - - - - - -	21,584
16.	Other Mining - - - - - - - - - - - -	20,804
57.	Farm Equipment Dealers - - - - - - -	20,376
47.	Other Manufacturing - - - - - - - - -	20,263
38.	Farm Machinery - - - - - - - - - - -	19,374
22.	Dairy Products - - - - - - - - - - -	18,737
25.	Apparel - - - - - - - - - - - - - - -	17,466
66.	Business Services - - - - - - - - - -	17,249
50.	Other Transportation - - - - - - - -	17,097
39.	Construction Machinery - - - - - - -	16,046
64.	Lodging Services - - - - - - - - - -	15,476
41.	Electrical Machinery - - - - - - - -	13,626
8.	Poultry & Poultry Products - - - - -	12,329
40.	Food Products Machinery - - - - - - -	11,239
35.	Primary Metals - - - - - - - - - - -	10,794
11.	Other Agricultural Products - - - - -	9,464
45.	Trailer Coaches - - - - - - - - - - -	8,846
46.	Other Transportation Equipment - - -	5,699

```
  4.   Other Grains - - - - - - - - - - - - - -    5,343

 29.   Agricultural Chemicals - - - - - - - - -    3,990

 17.   Maintenance & Repair - - - - - - - - - -     -0-
```

Total Value Created in Processing Sectors $5,010,837

Value Created in Final Demand Sectors

Households	388,446
Gross Private Capital Investment	29,487
Federal Government-Defense	217,111
Federal Government-Nondefense	458,135
State Government	108,449
Local Government	129,139
Exports	1,048,340
Less: Transfer Payments	- 444,000
Value Created in Final Demand Sectors	1,935,108
GROSS KANSAS PRODUCT	$6,945,945

Table 8-2

PERSONAL INCOME BY INDUSTRY OR SECTOR,
KANSAS 1965

(In Thousands of Dollars)

Corn	39,916	Metal Products	60,382
Sorghum	79,963	Dairy Products	14,609
Wheat	137,312	Grain Mill Products	21,979
Other Grains	4,311	Other Food & Kindred Products	29,114
Soybeans	20,906	Apparel	14,565
Hay	77,017	Paper & Allied Products	20,180
Dairy Products	14,947	Printing & Publishing	40,327
Poultry & Poultry Products	9,578	Industrial Chemicals	29,610
Cattle	85,305	Agricutural Chemicals	2,771
Hogs	21,706	Other Chemicals	41,594
Other Agricultural Products	6,062	Petroleum & Coal Products	38,298
Agricultural Services	18,868	Rubber & Plastics	30,497
Crude Oil & Natural Gas	36,911	Cement & Concrete	20,903
Oil & Gas Field Services	25,354	Other Stone & Clay	36,639
Nonmetallic Mining	6,953	Primary Metals	8,777
Other Mining	4,616	Fabricated Metals	21,248
Maintenance & Repair	-0-	Other Fabricated Metal Products	20,803
Building Construction	57,334		
Heavy Construction	45,764	Farm Machinery	13,448
Special Trade Construction	87,304	Construction Machinery	14,129

Food Products Machinery	8,291	Other Retail Trade	196,176
Electrical Machinery	11,016	Banking	87,519
Other Machinery	43,703	Other Finance	186,694
Motor Vehicles	53,774	Insurance & Real Estate	174,376
Aerospace	249,638	Lodging Services	10,864
Trailer Coaches	7,824	Personal Services	149,604
Other Transportation Equipment	3,146	Business Services	12,701
Other Manufacturing	17,714	Medical & Health Services	160,271
Railroad Transportation	109,990	Other Services	37,296
Motor Freight	32,342	Education	363,446
Other Transportation	9,448	Households	388,446
Communications	50,318	Gross Private Investment	29,487
Electric Gas & Sanitary Services	93,654	Change in Finished Goods Inventory	-0-
Groceries	24,058	Federal Government Defense	217,111
Farm Products	24,361	Federal Government Non-defense	458,135
Machinery & Equipment	31,847	State Government	108,449
Other Wholesale Trade	91,344	Local Government	129,139
Farm Equipment Dealers	13,955	Exports	1,048,340
Gasoline Service Stations	35,488	TOTAL INCOME	**6,001,000**
Eating & Drinking	71,035		

Chapter 9

STATE ECONOMIC PLANNING MODELS

The recent emergence of state economic development planning in Kansas
and other states may be attributed to three factors. First, rapidly rising
state expenditures have accentuated the magnitude of state programs. Second,
persistent structural economic changes require translation into state
government program responses or alterations. Third, a multiplicity of factors
have changed the nature of the demand for state government services.

State government expenditures in all states have been rising faster than
income. Nationally, this increase in state government activity has been at
a rate nearly double the rise in personal income. As Table 9-1 shows, Kansas
has paralleled the national pattern. From 1957 to 1967, state general
expenditures increased from $435 million to $964 million, a 120 per cent
increase.   These rising expenditures increase the necessity for a state
to systematically examine its program determinants, since it is spending a
larger portion of the state's personal income for public goods and services.

Structural change is not a new phenomenon to Kansas. The outmigration
from agriculture stemming from increased efficiency has been experienced for
several decades. But structural problems are not restricted to agriculture.
Abrupt changes in defense spending, transportation rate alterations,
obsolescence of mines, and industrial spill-over effects are but a few readily
identified forces changing the shape of the state's economy. The economic
consequences range from a rapid growth area to a depressed region, both
associated with significant problems. The state's reaction to such develop-

Table 9-1

KANSAS STATE GOVERNMENT OPERATING
AND NON OPERATING EXPENDITURES, 1957-1967
(Thousands of Dollars)

Year	Expenditures
1957	435,369
1958	473,156
1959	552,072
1960	546,191
1961	608,126
1962	637,315
1963	686,161
1964	735,131
1965	776,853
1966	901,700
1967	964,309

ments requires a flow of information specifying the nature of the structural transformation.

Rising income and changing industrial structure significantly alter the composition of demand for public goods and services. Evidence of the past decade indicates that consumers prefer to spend a higher percentage of their additional income on services-both public and private. The demand for better education, health services, roads, and recreation has risen faster than income. The changing composition of the demands on state government is also a reflection of a change in industry mix and employment patterns. Increased urbanization, declining farm population, and the emergence of new industry have altered the service requirements of state government.

Data Requirements

The information requirements for state government to make decisions with respect to programs and tax policies have expanded along with its rising role. No two state agencies require exactly the same information upon which to base their decisions. However, a commonality of certain basic data was determined by surveying all state agencies with respect to their data needs. Current economic and population data as well as economic and population forecasts were the main data requirements of the majority of state agencies for their planning purposes.

Two general types of economic information systems are required for decision making purposes by state government. The following discussion sets forth both types of information systems: the short-run impact model and the long-run forecasting model.

Monitoring the performance of the Kansas economy is required for both short-run developments as well as long-term trends. The core of the

information systems to provide both is the same, however, the configuration surrounding each is dissimilar.

Short-run impact analysis is a frequent requirement for both passive and active potential responses by state government.

The response of many state agency and/or legislative decisions is geared to changes in activity levels of the state economy. For instance, total revenue is closely tied to state personal income with the result that if factors affecting personal income can be identified, revenue fluctuations can be anticipated. Short-run planning problems of state government are similar in character.

A more active role is frequently required of the state government with respect to developments affecting the state's economy. This action may take the form of either programs or persuasion. If an adverse development affects a state industry or region, the state may choose to mitigate these effects. Likewise, the consequences of the desirable development might be amplified with proper state programs. Because of the substantial role which the federal government plays in influencing the well-being of the state's economy, monitoring its impact is of crucial importance in attempting to properly represent the state's interest in the national government arena.

Prior to the completion of the Kansas input-output matrices, the state possessed meager information flows to measure impacts of actual or potential developments on the state's economy. Although the input-output system is not a panacea to answer all "impact type" questions, it is capable of measuring a myriad of impacts-actual or potential.

The general structure of the short-run impact system is presented in Figure 9-1. The core of the information system consists of either the

Figure 9-1

SHORT-RUN IMPACT MODEL
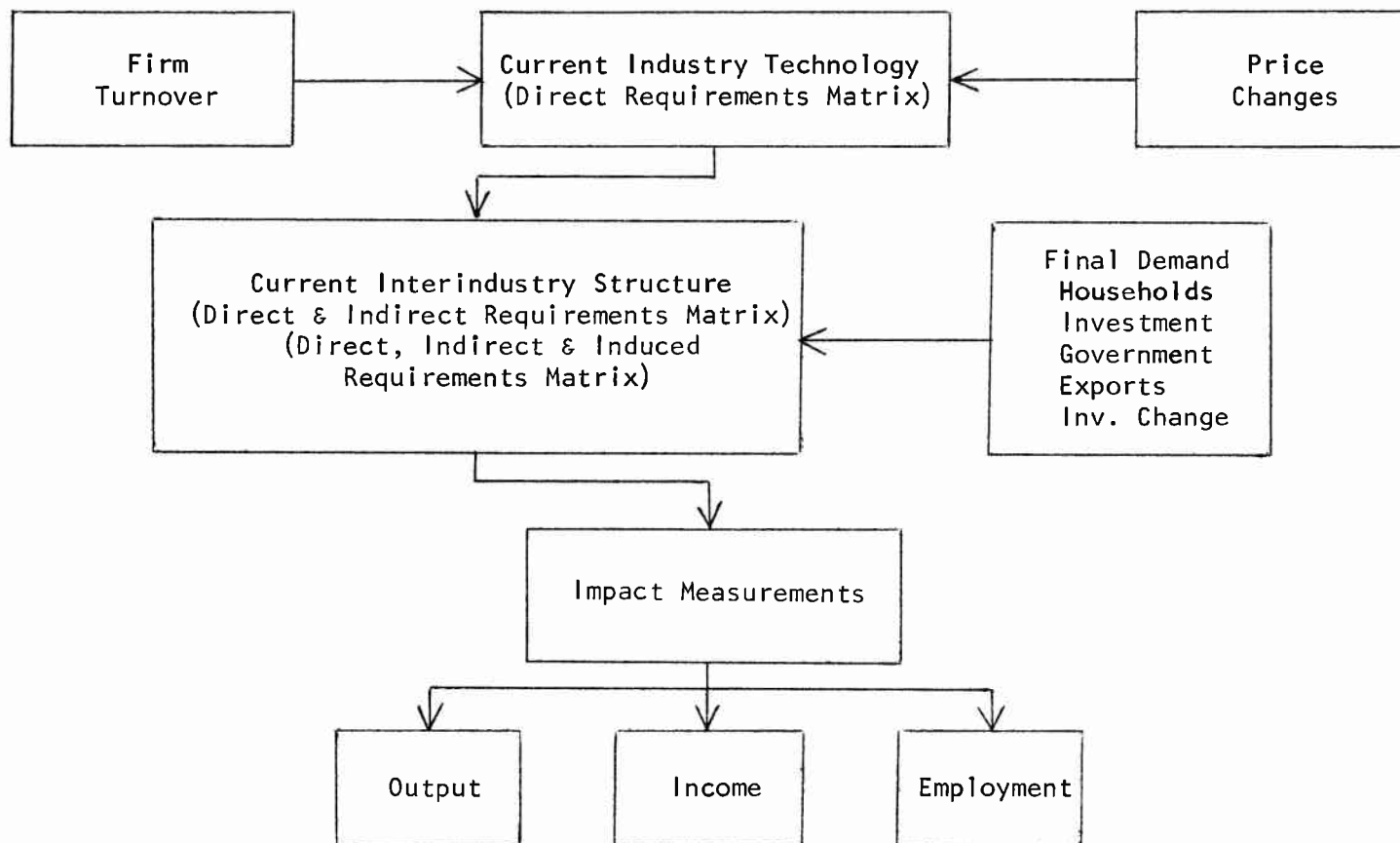
Direct and Indirect Requirements Matrix or the Direct, Indirect, and Induced Requirements Matrix discussed in Chapter 3. Either of these represent the interindustry structure of the Kansas economy.

The components of final demand are the variables in the system. For instance, if the level of federal government spending is changed for any number of industries, the impact system can measure:

(1) the resulting output changes for each industry in the state as well as the change in total state output and Gross State Product

(2) the resulting changes in personal income from each industry and the total change in state personal income

(3) the resulting changes in employment by industry and for the state

Chapter 10 explains the procedures involved in measuring impacts of developments on the Kansas economy. Several examples are included in the discussion.

Since planning usually has a longer time horizon than short-run analysis, long-run trends must also be considered in an economic information system for state government. Such a system is essentially an economic forecasting system. In the context of the input-output core of the system, it is an interindustry forecasting system.

The forecasting model considers both technological change and changes in the demand for Kansas goods and services-changes in the competitive position of the state. Forecasts and the forecasting methodology are contained in a separate publication.[*] A format of the model is contained in Figure 9-2.

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[*]M. Jarvin Emerson and Leonard D. Atencio, An Interindustry Forecast of the Kansas Economy, Kansas Office of Economic Analysis, 1969.

Figure 9-2

FORMAT OF INTERINDUSTRY FORECASTING MODEL FOR STATE ECONOMIC PLANNING

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Assumptions

Assumptions

| Time Series and Cross-Sectional Technological Forecasting Models | Projected Technological Production Structure of State's Industries | Final Demand Forecasts
- Consumer Expenditures
- Investment
- Federal Government
- State Government
- Local Government
- Exports (Out-of-State) |

| Sub-State Population Projections | Sub-State Employment Projections | Sub-State Industry Output Forecasts | Shift-Share Model | Projected Industry Output | Projected Employment Requirements | Projected State Population |

Chapter 10

IMPACT ANALYSIS

What will be the impact on Kansas industries of a reduction in military
purchases? What will be the effect on Kansas personal income of a new sugar
beet refining plant? What will be the impact on the Kansas economy of an
increase in meat production? To what extent will the industries supplying
farm inputs be affected by a decrease in wheat acreage?

These are a sample of frequently asked questions which can be answered
by the analytical potential of an input-output system. This section offers an
explanation of the procedures for using interindustry analysis to measure the
impacts of actual or anticipated developments affecting the Kansas economy.
The first part presents a discussion of output and income multipliers. The
second part presents some examples of the uses of the impact measuring
potential of the input-output system.

Output Multipliers

Linkages among industries were discussed in general in Chapter 3. In
that earlier discussion it was shown how a change in output in one industry
would initiate changes in output in other industries. These relationships
were summarized in the matrix of direct and indirect requirements. Since
this matrix is the core of impact analyses, a brief review of its contents is
useful.

The values in a column in the matrix of direct and indirect requirements
showed the output increases by each industry in the state which would result
from a one dollar increase in demand from the industry represented in the
column.

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In order to determine the effects on each industry of an increased demand for the output of a particular industry, the procedure is to simply multiply the values in the column of the industry experiencing the increased demand by the amount of the demand increase. Thus, if the Meat Products industry increased its output by $1 million, multiply the values in column 21 by $1 million. Among the numerous industry effects, this calculation would indicate that if the Meat Products industry increased its output by $1 million, the output of the Other Food and Kindred Products industry would rise by more than $51,000. Nearly all industries would be effected to some degree.

The total output increases of all industries as a result of a one dollar increase in output of the industry labeled in the column can be obtained by summing the values in the respective columns of the matrix of direct and indirect requirements. For instance, the sum of column 21 is 2.590568. This indicates that the output of all Kansas industries increases by about $2.59 when the Meat Products industry increases its output by one dollar. Such a relationship is called an output multiplier. If demand for Meat Products increases by one dollar, total output of all Kansas industries rises by 2.59 times the demand increase of the Meat Products industry. So that if demand for Meat Products were to increase by $500,000, total output of all Kansas industries would increase by $1,295,000.

The output multiplier may be summarized as follows:

An Industry Output Multiplier = Sum of that industry's column
values in the matrix of direct
and indirect requirements.

The output multipliers for each of the 69 Kansas industries or sectors are presented in Table 10-1. All, of course, are larger than unity. Meat Products, Maintenance and Repair, Dairy Products, and Cattle are the sectors with the highest multipliers. Interestingly, the Aerospace industry, which

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Table 10-1

OUTPUT MULTIPLIERS: TOTAL DIRECT AND INDIRECT OUTPUT REQUIREMENTS FOR KANSAS INDUSTRIES TO MAKE AN ADDITIONAL $1 DELIVERY TO FINAL DEMAND

Sector	Output Multiplier
1. Corn	1.277570
2. Sorghum	1.067126
3. Wheat	1.380008
4. Other Grains	1.465618
5. Soybeans	1.370114
6. Hay	1.251677
7. Dairy Products	1.930507
8. Poultry & Poultry Products	1.565853
9. Cattle	2.031102
10. Hogs	1.974438
11. Other Agricultural Products	1.575500
12. Agricultural Services	1.419273
13. Crude Oil & Natural Gas	1.495314
14. Oil & Gas Field Services	1.463595
15. Nonmetallic Mining	1.614402
16. Other Mining	1.714711
17. Maintenance & Repair	2.218130
18. Building Construction	1.706107
19. Heavy Construction	1.516684
20. Special Trade Construction	1.218130
21. Meat Products	2.590568
22. Dairy Products	2.205620
23. Grain Mill Products	1.786472

Sector	Output Multiplier
24. Other Food & Kindred Products	1.470625
25. Apparel	1.048788
26. Paper & Allied Products	1.199799
27. Printing & Publishing	1.118773
28. Industrial Chemicals	1.225635
29. Agricultural Chemicals	1.198508
30. Other Chemicals	1.245607
31. Petroleum & Coal Products	1.853648
32. Rubber & Plastics	1.080503
33. Cement & Concrete	1.393208
34. Other Stone & Clay	1.135211
35. Primary Metals	1.114068
36. Fabricated Metals	1.089149
37. Other Fabricated Metal Products	1.144391
38. Farm Machinery	1.199104
39. Construction Machinery	1.206864
40. Food Products Machinery	1.126168
41. Electrical Machinery	1.142594
42. Other Machinery	1.093538
43. Motor Vehicles	1.099205
44. Aerospace	1.094682
45. Trailer Coaches	1.256355
46. Other Transportation Equipment	1.016526

Sector	Output Multiplier
47. Other Manufacturing	1.196927
48. Railroad Transportation	1.144334
49. Motor Freight	1.146545
50. Other Transportation	1.220918
51. Communications	1.404125
52. Electric Gas & Sanitary Services	1.636593
53. Groceries	1.339305
54. Farm Products	1.544942
55. Machinery & Equipment	1.403110
56. Other Wholesale Trade	1.163072
57. Farm Equipment Dealers	1.422614
58. Gasoline Service Stations	1.452235
59. Eating & Drinking	1.461033
60. Other Retail Trade	1.334287
61. Banking	1.243952
62. Other Finance	1.178661
63. Insurance & Real Estate	1.376783
64. Lodging Services	1.414058
65. Personal Services	1.235321
66. Business Services	1.408283
67. Medical & Health Services	1.258409
68. Other Services	1.285427
69. Education	1.283494

is one of the larger industries in Kansas has a low multiplier. This means
that the Aerospace industry purchases a very small percentage of its inputs
from Kansas industries.

These output multipliers, which are summary indices of a large matrix,
provide an expedient way of estimating certain impacts. For instance, if
Building Construction increases by $10 million, total output of all Kansas
industries will expand by more than $17 million (the output multiplier of
1.706107 multiplied by the initial increased demand of $10 million). Of
course the increased output of any industry as a result of an increased
demand for another industry's output can be determined directly from the
column of the industry experiencing the increased demand.

A Multiplier Matrix

In order to determine the impact on each state industry of a change in
the demand for a single industry or several industries, the matrix of direct
and indirect requirements is employed.

The arithmetic of the procedure is to multiply each column in the matrix
by the sum of all the final demand entries for the industry which the column
represents and then sum across the rows. The result is a column of new total
outputs for each industry which can then be compared with the outputs prior
to the actual or hypothetical changes in the demand for the industries' output.
This process is presented diagramatically in Figure 10-1. The matrix of
direct and indirect requirements is multiplied by a final demand vector which
is obtained by combining columns 70 through 77 into one final demand column.

Because of the size of the Kansas matrix the calculations require the
use of a computer. The matrix is continually stored in the memory of a
computer to facilitate rapid results for such impact calculations. The

Figure 10-1

Schematic Representation of Technique
for Computing Output Impacts on Industries

| Matrix of Direct and Indirect Requirements | X | Final Demand Vector | = | Total Output Vector |
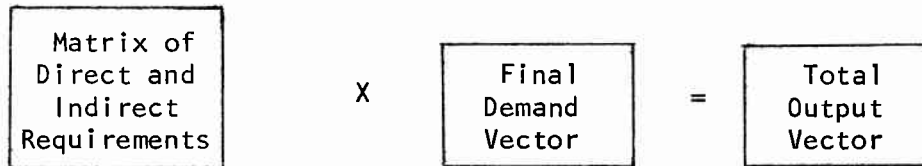
computer requires slightly over two minutes to calculate the impact of changes in demand on all industries in the state.

Examples of actual impact studies are contained in the latter part of the chapter. A more rigorous treatment of the technique may be found in the mathematical portion of Chapter 3.

Income Multipliers

A second approach to measuring the impact of economic events on industries of the Kansas economy is through income multipliers.

The income multiplier technique requires the use of a fourth matrix which appears in the appendix entitled Direct, Indirect, and Induced Requirements Matrix. This matrix includes both the household row and column and is similar in interpretation to the matrix of direct and indirect requirements. However, included in the expanded matrix are the effects of additional consumer income and expenditures.

This matrix considers not only the effects of additional purchases from other industries but also the additional income to households which enables consumers to spend more which represents additional demand for the output of most state industries.

The values in row 70 show the amount of total additional income resulting from a one dollar change in output in the column industry. These values are

a type of multiplier in that they relate income generated by a one dollar increase in output in a particular industry. A summary of these values is contained in Table 10-2 and also in row 70 of the Direct, Indirect, and Induced Requirements Matrix.

An additional multiplier formulation relates total income change to initial income change. In the household row the matrix of direct requirements indicated the amount of income paid to households directly by the column industry. If the values in Table 10-2 are divided by the corresponding values in the household row of the direct requirements matrix, the result is an income multiplier of the type summarized in Table 10-3.

In addition to the multiplier indices, the matrix of Direct, Indirect, and Induced effects can be used in the same manner as was described in the previous section except the household column is excluded from the final demand vector because it was included in the matrix.

Table 10-2

DIRECT, INDIRECT, AND INDUCED INCOME CHANGES RESULTING
FROM A ONE DOLLAR CHANGE IN DELIVERY TO FINAL DEMAND

Corn	0.749904	Grain Mill Products	0.472813
Sorghum	0.764852	Other Food & Kindred Products	0.433528
Wheat	0.767985	Apparel	0.543655
Other Grains	0.803092	Paper & Allied Products	0.440163
Soybeans	0.861766	Printing & Publishing	0.517053
Hay	0.979334	Industrial Chemicals	0.340417
Dairy Products	0.699993	Agricultural Chemicals	0.295333
Poultry & Poultry Products	0.757975	Other Chemicals	0.334758
Cattle	0.714726	Petroleum & Coal Products	0.329487
Hogs	0.708472	Rubber & Plastics	0.316050
Other Agricultural Products	0.679883	Cement & Concrete	0.511537
Agricultural Services	0.602359	Other Stone & Clay	0.579009
Crude Oil & Natural Gas	0.382486	Primary Metals	0.435279
Oil & Gas Field Services	0.975247	Fabricated Metals	0.457454
Nonmetallic Mining	0.355188	Other Fabricated Metal Products	0.441835
Other Mining	0.355007	Farm Machinery	0.442198
Maintenance & Repair	0.443651	Construction Machinery	0.502736
Building Construction	0.485541	Food Products Machinery	0.484086
Heavy Construction	0.704142	Electrical Machinery	0.398414
Special Trade Construction	0.443651	Other Machinery	0.511037
Meat Products	0.710349	Motor Vehicles	0.369936
Dairy Products	0.613504		

Aerospace	0.655191	Farm Equipment Dealers	0.843312
Trailer Coaches	0.370268	Gasoline Service Stations	0.943521
Other Transportation Equipment	0.103896	Eating & Drinking	0.767301
Other Manufacturing	0.483029	Other Retail Trade	0.854149
Railroad Transportation	0.668700	Banking	0.823536
Motor Freight	0.399121	Other Finance	0.905670
Other Transportation	0.451096	Insurance & Real Estate	0.767061
Communications	0.615078	Lodging Services	0.659495
Electric Gas & Sanitary Services	0.682891	Personal Services	0.975425
Groceries	0.874135	Business Services	0.587066
Farm Products	0.659372	Medical & Health Services	0.850652
Machinery & Equipment	0.712726	Other Services	0.774021
Other Wholesale Trade	1.065846	Education	1.043874
		Households	1.373255

Table 10-3

INCOME MULTIPLIERS: RATIO OF INITIAL
INCOME EFFECT TO TOTAL INCOME EFFECT

Sector	Multiplier
1. Corn	1.669853
2. Sorghum	1.708417
3. Wheat	1.798618
4. Other Grains	1.768416
5. Soybeans	1.729307
6. Hay	1.558831
7. Dairy Products	3.386584
8. Poultry & Poultry Products	1.803633
9. Cattle	5.001746
10. Hogs	3.291745
11. Other Agricultural Products	2.237196
12. Agricultural Services	1.862006
13. Crude Oil & Natural Gas	4.577211
14. Oil & Gas Field Services	1.786405
15. Nonmetallic Mining	3.735876
16. Other Mining	3.607454
17. Maintenance & Repair	n.d.[*]
18. Building Construction	3.110438
19. Heavy Construction	1.923307
20. Special Trade Construction	1.752181
21. Meat Products	6.948381
22. Dairy Products	4.733268
23. Grain Mill Products	7.179258

[*]n.d. = not defined

Sector	Multiplier
24. Other Food & Kindred Products	3.083890
25. Apparel	1.420892
26. Paper & Allied Products	1.648554
27. Printing & Publishing	1.522298
28. Industrial Chemicals	1.766516
29. Agricultural Chemicals	1.769881
30. Other Chemicals	1.850250
31. Petroleum & Coal Products	4.992734
32. Rubber & Plastics	1.572335
33. Cement & Concrete	1.863949
34. Other Stone & Clay	1.525700
35. Primary Metals	1.557425
36. Fabricated Metals	1.505374
37. Other Fabricated Metal Products	1.594097
38. Farm Machinery	1.697356
39. Construction Machinery	1.702190
40. Food Products Machinery	1.563050
41. Electrical Machinery	1.568493
42. Other Machinery	1.487759
43. Motor Vehicles	1.535807
44. Aerospace	1.472730
45. Trailer Coaches	2.002357
46. Other Transportation Equipment	1.464673

Sector	Multiplier
47. Other Manufacturing	1.620854
48. Railroad Transportation	1.519245
49. Motor Freight	1.696108
50. Other Transportation	1.752595
51. Communications	1.961336
52. Electric Gas & Sanitary Services	2.077923
53. Groceries	1.655767
54. Farm Products	2.200621
55. Machinery & Equipment	1.847849
56. Other Wholesale Trade	1.478760
57. Farm Equipment Dealers	1.836100
58. Gasoline Service Stations	1.975727
59. Eating & Drinking	1.878326
60. Other Retail Trade	1.826629
61. Banking	1.568176
62. Other Finance	1.532657
63. Insurance & Real Estate	1.737091
64. Lodging Services	2.082056
65. Personal Services	1.557749
66. Business Services	2.020341
67. Medical & Health Services	1.598062
68. Other Services	1.675272
69. Education	1.556211

Examples of Impact Measurement

Two examples of hypothetical, but typical, changes in final demand are presented in this section to illustrate impact analysis. The first example examines the effects of a $10 million increase in demand for meat products. The second example traces the impact of a $100 million cut in federal government purchases of airplanes.

In Example 1 the output increases required of each state industry are detailed in the three columns. Each column is obtained by multiplying $10 million by the values in column 21 of the three matrices identified by the column labels in the example. Many industries supply nothing directly to the Meat Packing industry but nearly all are affected in some magnitude. For instance, the Meat Packing industry makes no direct purchase from the Corn sector but because increased meat production requires more cattle and cattle are fed on corn, the Corn sector must increase its output $544,740, or $556,280 when induced effects also are considered.

The total direct, indirect, and induced effects of the $10 million increase in final demand for meat products is a $36,876,530 increase in the output of all state industries.

Although payments to Households by the Meat Products industry increase $1,022,320, total income increases are about seven times as large or $7,103,490.

In Example 2 the direction of change in final demand is larger and in the opposite direction. However, the procedure is the same as in the example above. Total output of all state industries decreases by $210,549,190. Personal income falls by $65,519,100.

Example 1. Suppose the meat packing industry experienced an increased demand for its output of $10 million. What would be the output increases in each state industry in order to provide the necessary inputs? What would be the total output impact on the Kansas economy? What would be the total personal income increase?

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Corn	-	544,740	556,280
Sorghum	-	1,074,380	1,094,390
Wheat	-	227,530	235,200
Other Grains	-	6,860	7,430
Soybeans	-	13,370	27,850
Hay	720	1,207,290	1,225,900
Dairy Products	1,090	2,410	43,970
Poultry & Poultry Products	143,920	150,640	154,480
Cattle	5,341,510	7,005,830	7,100,460
Hogs	1,390,700	1,514,180	1,535,620
Other Agricultural Products	102,750	140,860	152,610

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Agricultural Services	-	303,450	314,030
Crude Oil & Natural Gas	-	73,540	190,150
Oil & Gas Field Services	-	7,640	19,770
Nonmetallic Mining	-	150	770
Other Mining	-	3,600	10,110
Maintenance & Repair	6,670	76,410	169,130
Building Construction	-	-	-
Heavy Construction	-	660	1,730
Special Trade Construction	-	4,070	182,130
Meat Products	439,790	10,464,420	10,597,100
Dairy Products	-	1,590	75,010
Grain Mill Products	-	708,440	728,850
Other Food & Kindred Products	1,140	82,370	171,520
Apparel	-	2,210	6,850
Paper & Allied Products	60,730	97,810	108,160
Printing & Publishing	2,730	20,920	60,320

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Industrial Chemicals	-	205,800	211,600
Agricultural Chemicals	-	12,680	16,890
Other Chemicals	-	13,350	49,100
Petroleum & Coal Products	1,090	103,760	297,350
Rubber & Plastics	-	1,780	5,800
Cement & Concrete	-	1,340	9,130
Other Stone & Clay	-	1,730	20,770
Primary Metals	-	2,280	5,640
Fabricated Metals	-	1,090	7,260
Other Fabricated Metal Products	-	4,990	12,870
Farm Machinery	-	48,630	56,150
Construction Machinery	-	1,560	4,120
Food Products Machinery	180	1,890	4,610
Electrical Machinery	-	1,200	4,730
Other Machinery	-	4,450	9,550
Motor Vehicles	-	130	370

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Aerospace	-	30	2,420
Trailer Coaches	-	1,380	10,630
Other Transportation Equipment	-	510	2,640
Other Manufacturing	-	6,730	21,410
Railroad Transportation	33,860	64,440	110,230
Motor Freight	64,580	126,330	152,060
Other Transportation	-	2,560	26,810
Communication	5,940	60,100	155,950
Electric Gas & Sanitary Services	16,110	125,700	337,910
Groceries	11,850	26,490	56,000
Farm Products	80,610	217,220	230,670
Machinery & Equipment	64,340	107,590	130,370
Other Wholesale Trade	97,400	413,820	477,630
Farm Equipment Dealers	-	127,880	131,760
Gasoline Service Stations	-	25,170	92,260
Eating & Drinking	-	7,860	191,590

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Other Retail Trade	-	3,800	478,070
Banking	39,310	85,610	185,380
Other Finance	30	7,530	321,970
Insurance & Real Estate	63,730	136,010	359,350
Lodging Services	-	7,470	28,370
Personal Services	300	36,190	278,260
Business Services	6,220	40,470	57,250
Medical & Health Services	-	1,160	326,300
Other Services	13,240	37,730	84,230
Education	-	820	37,760
Households	1,022,320	-	7,103,490
Gross Savings	49,680	-	-
Federal Government	19,380	-	-
State Government	13,150	-	-
Local Government	5,210	-	-
Imports	899,710	-	-
TOTAL	10,000,000	25,812,630	36,876,530

Example 2.   Suppose the federal government reduced its purchase of airplanes and related components from Kansas firms by $100 million.   What would be the output decreases in each state industry as a result of this cut back?   What would be the total output reduction?   How would state personal income be affected?

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Corn	-	600	107,100
Sorghum	-	1,100	185,600
Wheat	-	500	71,200
Other Grains	-	400	5,600
Soybeans	-	600	134,100
Hay	-	1,400	173,000
Dairy Products	-	1,500	384,800
Poultry & Poultry Products	-	300	35,700
Cattle	-	5,800	878,400
Hogs	-	1,200	198,900
Other Agricultural Products	400	7,600	115,800

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Agricultural Services	-	700	98,200
Crude Oil & Natural Gas	-	155,560	1,229,900
Oil & Gas Field Services	-	16,200	127,900
Nonmetallic Mining	100	600	5,900
Other Mining	-	20,600	80,600
Maintenance & Repair	72,000	186,300	1,040,500
Building Construction	-	-	-
Heavy Construction	-	4,300	12,400
Special Trade Construction	17,300	41,000	1,153,600
Meat Products	-	8,500	1,123,190
Dairy Products	-	2,800	679,900
Grain Mill Products	-	1,400	189,500
Other Food & Kindred Products	-	3,700	825,900
Apparel	5,900	7,400	50,100
Paper & Allied Products	26,700	46,300	141,300
Printing & Publishing	260,800	309,900	672,800

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Industrial Chemicals	10,600	13,000	66,500
Agricultural Chemicals	1,200	3,200	42,000
Other Chemicals	142,500	160,200	479,700
Petroleum & Coal Products	114,000	165,200	1,948,900
Rubber & Plastics	183,400	187,600	224,700
Cement & Concrete	-	1,400	66,800
Other Stone & Clay	-	2,500	171,000
Primary Metals	109,300	121,100	148,000
Fabricated Metals	23,100	28,500	72,900
Other Fabricated Metal Products	131,300	145,900	207,700
Farm Machinery	-	3,000	72,300
Construction Machinery	1,900	2,800	26,400
Food Products Machinery	-	2,500	27,600
Electrical Machinery	150,100	158,500	185,900
Other Machinery	1,920,800	1,946,600	1,993,200
Motor Vehicles	100	100	2,300

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Aerospace	603,000	100,617,000	100,639,100
Trailer Coaches	-	800	86,100
Other Transportation Equipment	-	3,400	23,100
Other Manufacturing	225,100	243,000	373,900
Railroad Transportation	286,900	420,900	842,300
Motor Freight	17,100	95,300	331,800
Other Transportation	26,500	33,100	254,400
Communication	467,400	648,000	1,530,500
Electric Gas & Sanitary Services	638,300	894,000	2,848,900
Groceries	-	7,500	279,600
Farm Products	-	8,200	132,200
Machinery & Equipment	1,407,900	1,460,200	1,668,200
Other Wholesale Trade	82,100	112,000	695,200
Farm Equipment Dealers	-	300	36,000
Gasoline Service Stations	800	12,900	629,700
Eating & Drinking	27,800	72,800	1,767,000

Industry	Direct Requirements	Direct & Indirect Requirements	Direct, Indirect & Induced Requirements
Other Retail Trade	100	6,800	4,380,900
Banking	146,400	193,000	1,110,700
Other Finance	5,700	12,100	2,911,600
Insurance & Real Estate	-	75,000	2,131,500
Lodging Services	39,600	79,700	272,100
Personal Services	41,800	81,800	2,314,100
Business Services	128,500	180,800	335,200
Medical & Health Services	5,500	9,700	3,007,100
Other Services	130,600	197,100	623,000
Education	5,100	7,500	348,100
Households	44,488,200	-	65,519,100
Gross Savings	2,909,000	-	-
Federal Government	4,744,400	-	-
State Government	284,100	-	-
Local Government	205,700	-	-
Imports	39,910,900	-	-
TOTAL	100,000,000	109,241,260	210,549,190

Chapter 11

AN ABRIDGED METHODOLOGY FOR CONSTRUCTING
THE KANSAS INPUT-OUTPUT STUDY

A number is relatively meaningless without some labels to identify its purpose and its origin. Thus, this chapter explains the procedures used in arriving at the appropriate numbers with which to measure the economic structure of the Kansas economy via a regional input-output study. Since a complete methodology would interest only a few persons, an abridged methodology is presented in this chapter.

That the overall study is a comprehensive one can be seen by citing a few statistics. First, the Kansas transactions matrix contains 5,775 cells in its 75 rows and 77 columns. Second, the majority of the data were obtained by personal interview with business establishments. Third, the study took two years and $120,000 to complete.

Approaches to Implementing an Input-Output Matrix

The data appetite of an input-output matrix is substantial. The number of potential data cells rises exponentially as the matrix is expanded, and each matrix cell represents a summary of from several dozen to several hundred data items. Because of these large data requirements, a variety of approaches have been used in implementing regional input-output matrices. Before presenting the general methodology used in implementing the Kansas matrix, it would be useful to examine these varied techniques in order to understand the similarities and differences of the Kansas study.

Regional input-output studies may be classified into two categories: primary data studies and secondary data studies.

Primary data studies are those which utilize data obtained from individual firms specifically for the input-output study and usually employ a sampling procedure designed for each industry group to be surveyed. They are both more accurate and more expensive than the secondary data studies. Although no study utilizes only primary data, those that rely essentially on survey data are generally considered primary data studies.

The survey approach also permits a valuable short cut by utilizing double entry bookkeeping techniques. A matrix cell reflects both a "sale" by a "producer" and a "purchase" by a "purchasing" industry; consequently an adequate index to input-output activity may be compiled by gathering sales or purchase data from an industry rather than both. When a study obtains only sales information, it is called a "rows only" input-output study. When only purchase data are sought, the label "columns only" is applied.

Secondary data studies may use several techniques to construct regional input-output tables. The use of adjusted national coefficients to approximate regional coefficients is the most frequent one. The adjustment process varies, but the Moore-Petersen approach gave impetus to the practice of constructing regional input-output tables by adjusting national coefficients. Location quotients, the Leontief-Stroud approach, and the production vs. requirements approach have all been attempts at constructing regional input-output tables from secondary data. More secondary data studies than primary data ones have been undertaken because of their low cost. However, their validity remains unsubstantiated.

A Methodological Overview

Most of the Kansas input-output matrix was based on survey data. Of the 69 processing sectors only the four retail trade sectors did not use survey data.

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The sampling strategy, which is discussed in each industry group below, stratified firms by size and Standard Industrial Classification subsectors. In most industry groups all of the large firms were included in the sample. For instance, in the manufacturing industries all firms employing more than 25 persons were included in the sample survey. Collectively they accounted for about 90 per cent of total manufacturing output.

Both sales and purchases information was obtained by personal interview with firms. Because of sampling errors, variable response rates, and differences in accounting periods, the amount that an industry sold to another industry was not exactly equal to the amount that the purchasing industry indicated that it bought from the selling industry. These differences resulted in the necessity of reconciling the sales and purchase matrices in light of other data.

Since the Office of Economic Analysis has statutory authority to gain access to all information gathered by state agencies, these data sources were used to supplement the samples and to check the accuracy of the information obtained by personal interview.

With the exception of farming, all data were obtained on an establishment basis, and all of the output of an establishment is assigned to the industry of its primary output. This is the typical reporting mechanism of nearly all statistical reporting units.

Output estimates were obtained initially from published data. However, many of these were revised on the basis of the survey data.

General Survey Procedures

With the aid of the firm lists of the Kansas State Labor Department, Employment Security Division, the universe of firms in the state was

determined. The Standard Industrial Classification 4-digit codes assigned by the Employment Security Division were used to assign firms to sectors. A few had to be reclassified after the survey. Firms employing less than four persons were not included in the list; however, their omission is unimportant in the study.

An adequate use of news media prepared the state's industry for the survey interviews. A press release explaining the purpose of the study was distributed to the state's newspapers. The news departments of radio and television stations carried interviews with the Chief Economist concerning the purpose of the study. A few days prior to the contact by the interviewer, letters were sent to the firms being contacted to explain the purpose of the interview.

Although the interviewing continued through the summer of 1967 in some sectors, the major portion of the interviewing was completed during the summer of 1966. The amount of time spent with each firm ranged from 30 minutes to three weeks.

The questionnaires used for each sector are included in the discussion below. Individual questionnaires were designed for each major industry group. Most of the questionnaires sought a complete detailing of a firm's sales and purchases in accord with the study's sectors. However, a few, such as construction, requested only limited information to supplement existing data on the industry.

The remainder of this chapter presents the methodology employed in constructing the Kansas input-output matrix.

FARM SECTORS

Input Coefficients

Relative to its size, probably no sector of the economy has as much data available on its performance as farming. Despite this numeric mass the task of ascertaining the input structure for the crop and livestock sectors of the Kansas economy was no less difficult than any of the other sectors. As Hackbart[*] demonstrated, there are numerous missing data pieces which remain after the mountain of secondary data is filtered through an input-output matrix. Consequently, implementation of the input structure of the Kansas farm sectors relied heavily on survey data obtained by the extension service at Kansas State University.

The initial data source for the farming sectors was the survey data obtained annually through the Farm Management Associations. This survey was supplemented by individual sector research studies primarily when dis-aggregation was required. Summary data were available from each of the six Farm Management Associations[**] as well as the individual farm firm records.

The sample of farm firms included in Farm Management Association records was about 2400 farm units. These are compiled annually by Kansas State University extension economists. Since the sample is biased in the direction of the more efficient enterprises, an adjustment was made to correct for this tendency.

Unlike the other sectors of the matrix, the farm sectors were not

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[*]Merlin M. Hackbart, Regional Input-Output Impact Analysis: An Evaluation and a Secondary Data Approach, (Unpublished Ph.D. dissertation) Kansas State University, 1968.

[**]For a survey of the types of data available, see Farm Management Summary and Analysis Report, Extension Service, Kansas State University, Manhattan, Kansas, 1965.

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classified on an establishment basis but rather on a crop and livestock group. Thus, if a farm unit raised both corn and cattle, the costs associated with producing the corn and the output distribution of the corn would be assigned to the corn sector and similarly with the cattle.

The Farm Management summary data yielded the following relevant purchase information for major crops and livestock:

Feed bought
Fuel and oil
Machinery repairs
Trucking and machine hire
Veterinary and livestock expense
Fertilizer and annual lime expense
Seed and crop expense
Telephone and electricity expense
Farm organization fees, etc.
Taxes, cash rent, interest, and insurance
Repairs on permanent improvements
Depreciation
Net farm income

These provided an aggregate input structure, but two additional steps were required in order to meet the specifications of the matrix. First, many of the categories required disaggregation in order to conform to the more detailed sectors of the input-output matrix. Second, imports needed to be estimated for each input to obtain a total import value.

The disaggregation utilized three data sources. First, the reports completed to the farm operators contained more detailed information than the summary categories outlined above. These records were examined only for the data that would permit further disaggregation. For instance, it was possible to separate the category of Taxes, Cash Rent, Interest, and Insurance into four separate categories because these items had been reported separately on the individual farm unit records. Second, a few detailed studies were available on the input structure of some of the sectors. Such studies were

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particularly useful in disaggregating feed costs into the four categories defined in the matrix. The data were also adjusted for the value of feed grown by farm operator, including pasture. The studies used are cited at the end of this section. Third, sales by other industries to agriculture were obtained by survey. These data filled several voids which remained after disaggregating the FMA data as described above.

Because of the data sources employed in constructing the inputs to farming, the determination of imports utilized a different procedure than was used for industries with a complete survey base. Total requirements were established by the FMA data. These were then compared with the quantities of imports sold to the farm sectors according to the survey data. The residual provided the basis for the import value.

Although the remaining 58 sectors were constructed on the basis of relative 1965 prices, the farming sectors were modified to smooth out some of the extreme price fluctuations which are prevalent in the industry. This was accomplished by computing the input coefficients on the basis of a five year average. This procedure seemed preferable to using a single year which might be viewed as atypical.

Market Structure

The distribution of farm output to the 69 processing sectors and the seven final demand sectors utilized both survey data and published data.

Sales to other farm sectors were determined by the input requirements of the sectors to which the farm sector was selling.

Sales to manufacturing, trade, and service sectors were obtained from survey data of the purchases of the firms in these three groups.

Final demand sales were obtained from government reports on government purchases and private foreign export sales. Data sources for final sales are

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presented below.

References

    (1)   Kansas Farm Facts. 1966

    (2)   Farm Management Association Summary Report

    (3)   Farm Income. USDA Report

    (4)   1964 Census of Agriculture

Output Estimates

The Statistical Reporting Service of the U. S. Department of Agriculture annually provide both volume and value of production for all crop and live-stock groups. These were used as the output estimates for the farm sectors. The output values and composition of each sector was presented in Chapter 4.

MINING SECTORS

Input Coefficients

The determination of the input coefficients for the three mining sectors was a blend of three data sources. First, the U. S. Bureau of Mines completed a 48 sector disaggregation of the mining industries for the nation in 1967 based on the 1958 U. S. input-output table.[*] Because of the detail offered by this study, a useful benchmark was available. Second, the Kansas Geological Survey publications provided numerous parts of the required input structure. Third, a limited survey of the industry was undertaken primarily to determine imports and exports.

The Bureau of Mines study was used as a major point of reference in constructing the columns for the three Kansas mining groups. A sample of firms and the Kansas Geological Survey were querried for differences in the Kansas input structure. Imported inputs were determined from the same two sources.

The Crude Oil and Natural Gas sector is a combination of S.I.C. 1311, and 1321. The relative size of each was presented in Chapter 4.

Oil and Gas Field Services includes all 4-digit parts of S.I.C. 138. This is a relatively more important industry in Kansas than the nation; consequently, the Bureau of Mines data was supplemented with survey to correct the structure of the industry to reflect the Kansas input coefficients.

Nonmetallic mining and other mining consisted of a composite of S.I.C. groups as indicated in Chapter 4.

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[*]Kung-Lee Wang and Robert G. Kokat. The Interindustry Structure of the U. S. Mining Industries-1958, Bureau of Mines Information Circular 8338. (Washington: 1967).

Market Structure

In-state markets for the output of the mining industries were determined from the survey data on the purchases of the other state industries. Although some data were obtained from survey data of the mining firms, the purpose of the survey was limited to determining imports and exports.

Output Estimates

The published output estimates of the Kansas Geological Survey for mineral products were used as the source of the output values.

CONSTRUCTION SECTORS

Undoubtedly the most difficult industry group for an input-output study is the construction industry. The high variability of the activity level and composition of the industry has plagued most researchers attempting to construct a picture of the current status of the industry or, alternatively, a typical year for the construction industry.

Input Coefficients

A two-stage survey was conducted to provide the data base for the input coefficients for the sector. Initially, the largest firms in the industry were interviewed using a questionnaire which was nearly identical to the one used for manufacturing firms. Next, a larger sample of the smaller firms was employed. This second-stage sample sought only limited information, but was augmented by data on total sales and cost of goods sold from other sources available only to the Office of Economic Analysis. The total sample included 132 firms.

Market Structure

Because of the relatively small sample size, particularly in Special Trade Construction, purchase data from other industries provided the main basis for identifying in-state markets. Since most of the output of the construction industry is sold to Gross Private Investment, this posed no serious problem.

Output Estimates

Value of construction data was obtained from the following three sources:

(1) Department of Commerce, Bureau of the Census, "Construction Reports," 1966.

(2) Department of Commerce, Bureau of the Census, "Construction Review," 1966.

(3) F. W. Dodge Company, "Dodge Construction Contract Statistics Service," McGraw-Hill, 1966.

MANUFACTURING SECTORS

The manufacturing sectors represent the largest group of industries (27) and more than one-half of the effort in constructing the input-output matrix.

Input Coefficients

Data to measure the input structure of each manufacturing industry in the state were obtained from personal interviews of a sample of firms in each industry. The sample was designed to include all firms employing more than 25 employees. In addition, a stratified random sample of smaller firms was drawn. The stratification was on the basis of firm size and Standard Industrial Classification.

A total of 715 firms was included in the sample. Usable data were obtained from 517 of these firms. The remainder either did not cooperate or provided insufficient information. The sample output, total output, and coverage ratios are contained in Table 9-1. These vary from 92.6 per cent to 22.4 per cent. The low ratio in the latter category occurred because of a large number of small firms in the industry.

Two stages were involved in constructing an input flow matrix for manufacturing. First, some inputs were too aggregated to satisfy the detail required in the matrix. Where this occurred, it was necessary to allocate a purchase category to two or more sectors on the basis of the input structure of the other firms in the same S.I.C. 4-digit group. Examples of the purchase categories requiring disaggregation are office supplies, travel expenses, agricultural raw materials, and unidentified purchases from manufacturing. Second, using 4-digit S.I.C. outputs wherever possible, the sample data was inflated to the total output figures for the S.I.C. subgroups and then aggregated to the sector total. Since coverage rates in the sample varied

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within subgroups of the sector, this procedure was necessary to prevent sub-sector bias and to attain consistency with the stratification procedure employed in the sampling.

An output flow matrix was constructed in a similar manner. A few sales categories required allocation followed by the calculation of inflators to adjust the sample to the output control totals.

The allocation procedure and the sample inflation procedure was computerized to facilitate handling the mass of data and also to enable up-dating the study by adding and deleting firms.

These procedures resulted in the determination of an input matrix and an output matrix for the 27 manufacturing industries. Two figures appeared in each cell of the combined matrix which ideally would be identical. However, because of differences in accounting periods and sampling discrepencies, these two entries deviated from one another. Reconciling the discrepency involved considering the two factors mentioned above.

Output Estimates

Output estimates for the manufacturing industries were obtained from four sources.

(1) 1965 Survey of Manufactures, U. S. Department of Commerce, 1968.

(2) 1963 Census of Manufactures, U. S. Department of Commerce, 1965. Changes in wages paid were used to adjust the 1963 output figures.

(3) The U. S. Department of Commerce complied with a special request for additional data.

(4) The survey data indicated that the output of several industries required adjustment from published data.

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Table 11-1

MANUFACTURING SECTOR TOTAL OUTPUT,
SAMPLE OUTPUT, AND SAMPLE/TOTAL OUTPUT

Sector	Total Output	Sample Output	Sample/Total Output
21. Meat Products	$590,639	$396,933	.672
22. Dairy Products	121,711	71,898	.591
23. Grain Mill Products	333,728	216,648	.649
24. Other Food & Kindred Products	207,100	124,198	.600
25. Apparel & Related Products	38,066	20,194	.530
26. Paper & Allied Products	75,582	56,189	.743
27. Printing & Publishing	119,080	48,768	.410
28. Industrial Chemicals	153,654	89,987	.586
29. Agricultural Chemicals	16,605	10,768	.648
30. Other Chemicals	229,897	137,554	.598
31. Petroleum & Coal Products	580,338	281,910	.486
32. Rubber & Plastic Products	151,718	143,555	.946
33. Cement, Concrete & Plaster Prod.	76,168	49,041	.644
34. Other Stone, Clay & Glass Prod.	96,544	21,626	.224
35. Primary Metal Industries	31,405	18,354	.590
36. Fabricated Metal Products	69,922	56,154	.803
37. Other Fabricated Metal Prod.	75,057	53,671	.715
38. Farm Machinery & Equipment	51,621	34,825	.675
39. Construction Machinery	47,839	30,857	.645

	Sector	Total Output	Sample Output	Sample/Total Output
40.	Food Products Machinery	26,770	10,699	.400
41.	Electrical Machinery	43,367	25,537	.589
42.	Other Machinery	127,232	78,837	.620
43.	Motor Vehicles & Equipment	223,244	208,672	.926
44.	Aerospace	561,134	512,694	.914
45.	Trailer Coaches	42,313	37,422	.884
46.	Other Transportation Equipment	44,344	21,617	.487
47.	Other Manufacturing	59,440	24,216	.407

TRANSPORTATION SECTORS

Input Coefficients

The data required to estimate the inputs of the transportation sectors were obtained from two sources: surveys of firms in the industry and from reports filed with the Kansas Corporation Commission. Motor freight and passenger carriers were interviewed on a sample basis in order to determine all input coefficients. Railroads, however, were interviewed only to supplement data obtained from Kansas Corporation Commission reports. Data for pipeline operations were obtained entirely from published reports of the Kansas Corporation Commission.

Market Structure

In the accounting scheme employed in the input-output matrix, transactions are recorded in producer's prices as explained in Chapter 3. Thus, transportation costs are assigned as a purchase to the industry making the materials purchase. The assignment of the transportation costs to the purchasing industry rather than the producing industry is made irregardless of the actual payer.

Because of the accounting definition, the market structure of the transportation industry is determined largely by purchasing industry data and by transportation rate structures which would be applicable to the purchasing industry. For instance, the transportation expenses in Crude Oil and Natural Gas column represent only the cost of acquiring the necessary inputs to the industry. Costs of transporting the output are charged to the purchasing industry.

Output Estimates

Output estimates for the transportation sectors were obtained from the following sources:

Kansas Corporation Commission, Twenty-Eighth Report, (Topeka, Kansas: State Printing Office, 1966).

Interstate Commerce Commission, Transport Statistics in the United States, (Washington: U. S. Government Printing Office: 1966).

Department of Commerce, Bureau of the Census, 1963 Census of Transportation: Commodity Transportation Survey, (Washington: U. S. Government Printing Office: 1966).

Department of Transportation, Federal Avaiation Administration, FAA Statistical Handbook of Aviation, (Washington: U. S. Government Printing Office: 1966).

PRIVATE UTILITIES

Input Coefficients

Data from personal interviews of a sample of firms in these two industry groups formed the basis for determining the input structure of these industries. Utilities operated by local units of government were not included in this sector, but rather were defined as part of the local government sector.

Market Structure

A combination of sales data from the utilities and purchase data from their customers was used to estimate the output patterns of these two industries. For instance, gas and electric utilities were usually able to provide detail on their industrial users. However, firm purchases were more reliable for telephone and telegraph.

Output Estimates

A variety of sources were used in constructing total output estimates for each industry group.

Kansas Corporation Commission, Twenty-Eighth Report, (Topeka, Kansas: State Printing Office, 1966).

Federal Communication Commission, Annual Report, (Washington: U. S. Government Printing Office, 1966).

Federal Communication Commission, Statistics of Communication Common Carriers, (Washington: U. S. Government Printing Office, 1966).

Federal Communication Commission, TV Broadcast Financial Data and AM-FM Broadcast Financial Data, (Washington: U. S. Government Printing Office, 1966).

WHOLESALE TRADE

Input Coefficients

Interviews, obtained from a random sample of firms, yielded the data
necessary to construct input coefficients for wholesale trade. These, of
course, were reconciled with sales data from other industries. Inputs did
not include goods purchased for resale as explained in Chapter 3. Only the
purchases included in the firm's "margin" were included. The margin is a
more accurate measure of the service provided by the firm.

Market Structure

Survey data was used almost exclusively in determining the market
structure of the wholesale trade sectors. Firms in other industries were
instructed to by-pass wholesalers and retailers in identifying industrial
sources of inputs. Thus, prime reliance was placed on wholesale trade sales
data.

Output Estimates

Total sales of each Wholesale Trade sector were obtained by adjusting
sales reported in the 1963 Census of Business by the ratio of wages paid in
the sectors in 1963 and 1965 and corresponding retail trade growth. Margins
were computed from the interview data and applied to the total sales estimates.

The following sources were used:

Department of Commerce, Bureau of the Census, U. S. Census of Business:
   1963-Kansas, (Washington: U. S. Government Printing Office, 1966).

Employment Security Division, Kansas State Department of Labor,
   unpublished wage data.

Kansas Department of Revenue, Sales Tax Collections by Type of Business,
   (Topeka, Kansas: mimeographed, 1966).

RETAIL TRADE

Because of the large number of firms engaged in retail trade, and because of the availability of secondary data, retail trade establishments were not surveyed. Coefficients were derived from several studies and regular statistical series.

All retail sectors, except Eating and Drinking Establishments, were handled on a margin basis. Since Eating and Drinking Establishments change the form of the good which they sell, they are manufacturers and are treated as such in the matrix.

The sources utilized in estimating coefficients for retail trade as well as output estimates are summarized below.

Department of Commerce, Bureau of the Census, U. S. Census of Business: 1963, Retail Trade-Kansas, (Washington: U. S. Government Printing Office, 1966).

Kansas Department of Revenue, Sales Tax Collections by Type of Business, (Topeka, Kansas: mimeographed, 1966).

Robert Morris Associates, Annual Statement Studies, (Philadelphia: Robert Morris Associates, 1967).

Goldman, Morris, R., Martin Marimont, and Beatrice H. Vaccara, "The Interindustry Structure of the United States," Survey of Current Business, Vol. 44, No. 11, (November 1964).

Miernyk, William H., Ernest Bonner, John H. Chapman, Jr., and Kenneth Shellhammer, The Impact of Space and Space-Related Activities on a Local Economy, Part I: The Input-Output Analysis, (Boulder: University of Colorado, 1965).

FINANCE, INSURANCE AND REAL ESTATE

The Banking Sector consists of total banking establishments in the state as listed by the 1965 bank directory. In 1965 there were 602 banks in Kansas showing total assets of $3,776,879,896.

Total output for banking is defined as total income of the banks, which consists of interest income, investment income, rent and other miscellaneous incomes. Total output was obtained by expanding the sample output to the total income for banks.

In order to arrive at the interindustrial ties with banking, questionnaires were sent to a selected number of banks. If the banks showed over $15,000,000 in total assets, personal interviews were conducted in place of the mail questionnaire.

The Insurance Sector consists of companies underwriting life, accident and health, and a multiplicity of non-life insurance risks. This sector also includes insurance agents and insurance services. The output of this sector is defined as total income of the members listed above. Totals were given in the 1965 report of the insurance commission.

Information for this sector was obtained from the annual reports filed at the insurance commissioner's office, by all insurance carriers doing business in Kansas. For accident and health and life insurance carriers, the information was listed in the desired form. A short questionnaire was mailed to those that did not give the desired information, particularly source of income and exports. A similar approach was used to determine the types of risks underwritten by non-life carriers. In general, the non-life carriers listed only the loss or premium receipt by type of insurance rather than the type of business insured. Thus, the supplementary questionnaire

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was needed for all the non-life carriers.

The sample of non-life carriers for Kansas consisted of the 20 largest companies of a total of 26. The sample was then expanded to the total output by the proper inflator. The sample for life insurance carriers also consisted of the twenty largest companies. These companies were then used as the basis for forming the insurance row and column. The insurance carriers based out of Kansas were then added into the row and column; their expenses being added directly with that of the Kansas based companies while their consumers were treated as imports of insurance by the Kansas user.

The losses paid to Kansas businesses by insurance carriers were treated as a profit, i.e., a liquidation of assets. This was done in order to keep payments for capital (payment for the loss of a capital asset) to be shown in the processing sectors. Similarly, losses to households were treated as a payment to profits. In this case the capital problem is not as relevant as in the prior case since the household sector is not treated as a processing sector.

The Real Estate sector consists of real estate agents and brokers and real estate operators. The output of this group is defined as total annual revenue, and is estimated by average revenue of employees multiplied by the total employment in the group.

Data for this group was gathered by mail questionnaires to the real estate operators and brokers in the state. Questionnaires were mailed to the 100 real estate agencies that belonged to the Kansas Board of Realtors. The response rate for this group in general was low; however, those reporting gave sufficient detail to establish intersector flows and develop the technical coefficients. A double sampling procedure was used in that a small sample

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of personal interviews was included to detect bias in the mail survey.

The Savings and Loan Association group consists of all savings and loan associations engaged in business in the state of Kansas in 1965. The output of this group is defined as the earnings from their operation during the base year.

Information for this sector was obtained from the Federal Home Loan Bank of Topeka and supplementary mail questionnaires. The information from the Federal Home Loan Bank was given in broad categories and as totals. To obtain a breakdown of these totals, a brief questionnaire was mailed to all state chartered savings and loan associations; the federally chartered institutions were contacted by personal interview. The resulting information was then used to construct the row and column for Sector 66 of the input-output matrix, with the technical coefficients being derived in the usual manner.

Unpublished data were obtained from the following state and federal agencies:

> State Banking Department
> Federal Home Loan Bank
> Office of the Commissioner of Insurance
> Kansas Real Estate Commission

SERVICES

A sample survey provided the data base for constructing the input coefficients for all service sectors. Output coefficients were determined from the service sector survey and surveys of purchases of other sectors.

Service industries are the least clearly identified by published data. The Bureau of the Census publishes its census reports only for selected services. This necessitated the utilization of numerous sources to estimate total outputs for Medical and Health Services and Other Services in particular.

The following sources were used in deriving output estimates for the service sectors:

Department of Commerce, Bureau of the Census, U. S. Census of Business, 1963: Selected Services-Kansas, (U. S. Government Printing Office, 1966).

Printers' Ink, (New York: Decker Communications, 1966).

Internal Revenue Service, Statistics of Income, 1965, Corporation Income Tax Returns.

Department of Health, Education and Welfare, Health Resources Statistics and Vital Health Statistics, 1966.

Department of Labor, Monthly Labor Review, January, 1967.

Department of Health, Education and Welfare, Social Security Bulletin, February, 1967.

American Hospital Association, Hospitals, (Chicago, 1966), Guide Issue.

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FINAL DEMAND AND FINAL PAYMENTS

Determination of the input and output coefficients and flows for the

Final Demand and Final Payments sectors is simply an extension of the methods

for the processing sectors described above.

Total output estimates were obtained from the following:

Department of Commerce, Survey of Current Business, August, 1966.

Office of Economic Opportunity, Summary of Federal Social and Economic
Programs, Fiscal Year 1967.

Kansas Department of Administration, Annual Financial Report, Fiscal
Year 1966.

Unpublished reports of local units of government submitted to the
Post-Audit Division, Kansas Department of Administration.

Department of Commerce, Bureau of the Census, Census of Governments.
Various reports.

APPENDIX A

SAMPLE QUESTIONNAIRES

SALES ANALYSIS

1. List the major products or services you produce: _____

2. Please indicate the 1965 sales of your Kansas establishments. Total Sales: $_____ Number of establishments covered by this questionnaire _____.

3. Allocation of Sales among Markets:

   (a) In column 1 below, allocate your sales among markets. Remember, sales to wholesalers and retailers <u>for resale</u> should be shown as sales to the processing or consuming markets to which they are <u>next</u> resold. In the parenthesis in column 1 estimate the percentage of your total sales representing capital goods. Capital goods are buildings, machinery, or equipment which your customers treat as fixed depreciable assets.

   (b) In column 2 below, estimate for each market the percentage of sales made to Kansas users. Place an estimate in the parenthesis of the percentage of your total sales to Kansas users which represents capital goods.

   (c) In column 3 below, indicate your dollar sales by state of destination of shipment for each type of market.

MARKETS Brief Description	(1) Sales Distribution	(2) Dollar Sales made in Kansas	(3) State Destination of Out-of-State Sales
Household Consumers _____	_____ ( )	_____ ( )	_____
Kansas Government-State _____	_____ ( )	_____ ( )	_____
Kansas Government-Local _____	_____ ( )	_____ ( )	_____
Federal Government, Non-Defense _____	_____ ( )	_____ ( )	_____
Federal Government, Defense* _____	_____ ( )	_____ ( )	_____
Foreign Export _____	_____ ( )	_____ ( )	_____
Industrial Markets (briefly identify) ___	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
_____	_____ ( )	_____ ( )	_____
TOTAL	_____	_____	

* Sales to the Department of Defense, National Aeronautics & Space Administration, Atomic Energy Commission

PURCHASES ANALYSIS

4. Please indicate the approximate cost of the materials, parts, supplies, and business services you purchased from other establishments in 1965. (Do not include capital expenditures.)

$ _____ or _____% of your sales dollar

5. In column 1 below, please allocate your purchases according to supplying industries and location of producers.

Remember, purchases from wholesalers and retailers should be shown as purchases from industries producing the product. A list of industries is attached but IF YOU PREFER TO LIST SPECIFIC MATERIALS please identify such purchases so we may assign their industrial sources.

SUPPLYING INDUSTRIES Brief Description	(1) $ or % of Sales dollar	Proportion supplied from producers in::		
		Kansas	Other States	Foreign
Purchased Materials: _____				
_____				
_____				
_____				
_____				
_____				
_____				
_____				
_____				
_____				
_____				
_____				
Purchased Business Services: _____				
_____				
_____				
_____				
_____				
_____				
Total Purchases	$_____ %			

KANSAS GROSS PRODUCT STUDY

Financial Sector

	In State	Out-of-State	% By State
I. Earnings			
A. Premium Income			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
B. Investment Income			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
C. Other Income			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
II. Expenses			
A. Claims			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
B. Salaries (Employees and Officers)	_____	_____	_____
C. Rent			
1. Rent on land	_____	_____	_____
2. Rent on equipment	_____	_____	_____
3. Rent on buildings	_____	_____	_____

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	In State	Out-of-State	% By State
D. Taxes			
1. Federal			
2. State			
3. Local			
4. Other			
a. _____			
b. _____			
c. _____			
E. Depreciation			
F. Advertising			
1. Radio and TV			
2. Newspapers, journals and billboards			
3. Other			
G. Legal			
1. Court			
2. Attorney			
H. Utilities			
1. Telephone and telegraph			
2. Gas			
3. Electricity			
4. Water			
J. Supplies			
1. _____			
2. _____			
3. _____			
K. Miscellaneous Expenses (identify if possible)			
1. _____			
2. _____			
3. _____			
4. _____			
5. _____			
6. _____			
7. _____			

	In State	Out-of-State	% By State
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
13.	_____	_____	_____	_____
14.	_____	_____	_____	_____
15.	_____	_____	_____	_____

RECEIPTS - Service Establishments

Major Sources of Revenue	Dollar Value	% Received from Private Firms		% Received from Government			% Received from Individuals	
		In Kansas	Out of State	Federal	State	Local	In Kansas	Out of State
Total Receipts								

EXPENDITURES - Service Establishments

Major Types of Expenditures	Dollar Value	% Paid to: Individuals, Firms, or Governments		% Purchased from Retailers		% Purchased from Others (Specify)	
		In Kansas	Out of State	In Kansas	Out of State	In Kansas	Out of State
Total Expenditures							

KANSAS GROSS PRODUCT STUDY
Office of Economic Analysis

State of Kansas

WHOLESALE TRADE

Identification Number _____

Directions: Please provide the requested information. If you do not have the information in this form, please estimate rather than leave an item blank. The information which you supply in this questionnaire is considered CONFIDENTIAL and will be used only for statistical purposes in totals with numerous other wholesalers.

Average Annual Employment _____
Total Annual Wages and Salaries _____

Purchases from Suppliers Located in:

		Kansas	Other States (Specify)	Foreign
ANNUAL EXPENDITURES FOR POWER AND ENERGY				
Coal	_____	_____	_____	_____
Gas	_____	_____	_____	_____
Oil	_____	_____	_____	_____
Electricity	_____	_____	_____	_____
TRANSPORTATION EXPENSES				
Total Annual Transportation Expense_____		_____	_____	_____

If you own or operate your own transportation vehicles, please estimate the following expenses related to your vehicles.

Wages and Salaries	_____	_____	_____	_____
Maintenance and Repairs	_____	_____	_____	_____
Fuel and Oil	_____	_____	_____	_____
Other	_____	_____	_____	_____

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OTHER CURRENT EXPENSES		Kansas	Other States (Specify)	Foreign
Advertising and Sales Promotion				
Newspapers & Printed Material	_____			
Communications	_____	_____	_____	_____
Other (please specify	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
Rent	_____	_____	_____	_____
Insurance	_____	_____	_____	_____
Taxes		_____	_____	_____
Federal	_____	_____	_____	_____
State	_____	_____	_____	_____
Local	_____	_____	_____	_____
Other	_____	_____	_____	_____
Telephone and Telegraph	_____	_____	_____	_____
Business and Professional Services (Specify)	_____	_____	_____	_____
Other Current Expenses				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

PURCHASES - Wholesale Trade

Product Purchased	Total Cost	Transport Costs Paid By You	% Purchased from Wholesalers		% Purchased from Producers		% Purchased from Others (Specify)	
			In Kansas	Out of State (Specify)	In Kansas	Out of State (Specify)	In Kansas	Out of State (Specify)
Total Cost of Goods Sold								

SALES - Wholesale Trade

Product Sold	Total Cost	Transport Costs Paid By You	% Sold to Wholesalers		% Sold to Retailers		% Sold to Others (Specify)	
			In Kansas	Out of State	In Kansas	Out of State	In Kansas	Out of State
Total Sales								

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	In State	Out of State	% By State
I. Earnings			
A. Interest			
1. Consumer loans	_____	_____	_____
2. Industrial loans			
a. _____	_____	_____	_____
b. _____	_____	_____	_____
c. _____	_____	_____	_____
3. Other (Identify briefly)			
a. _____	_____	_____	_____
b. _____	_____	_____	_____
c. _____	_____	_____	_____
d. _____	_____	_____	_____
B. Income			
1. Service charge	_____	_____	_____
2. Security trading	_____	_____	_____
3. Data processing service	_____	_____	_____
4. Other (Identify briefly)			
a. _____	_____	_____	_____
b. _____	_____	_____	_____
c. _____	_____	_____	_____
d. _____	_____	_____	_____
II. Expenses			
A. Dividends paid			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
B. Salaries (Employees & officers)	_____	_____	_____
C. Rent			
1. Rent on buildings	_____	_____	_____
2. Rent on machinery & equipment	_____	_____	_____
3. Rent on land	_____	_____	_____

	In State	Out of State	% By State

D. Taxes

    1. Federal

    2. State

    3. Local

    4. Other (identify)

        a. _____

        b. _____

        c. _____

E. Depreciation

F. Insurance

    1. FSLIC insurance

    2. Other (identify)

        a. _____

        b. _____

        c. _____

G. Advertising

    1. Radio & TV

    2. Newspaper & billboard

    3. Promotions

H. Supplies

J. Legal

    1. Court

    2. Attorney

K. Utilities

    1. Telephone & telegraph

    2. Gas

    3. Electric

    4. Water

L. Miscellaneous expense (identify if possible)

    1. _____

    2. _____

    3. _____

    4. _____

    5. _____

INSTRUCTIONS

This questionnaire is designed to help you provide us with information on your earnings and expenses. All information will be kept strictly confidential. Please do not write your company name on the questionnaire. Individual insurance company characteristics will not be disclosed in the final published tables. The following general instructions are suggested in completing the questionnaire.

1. Use your records for 1965, calendar or fiscal, to complete all items in the questionnaire that apply to your company.

2. Indicate as best possible, the sources of expenses and earnings. Claims paid to consumers can be shown as a payment to consumers whereas claims paid for hail damage should be shown as a payment to agriculture or farmers. Similarly, payment for fire damage to a firm that manufactures fertilizers should be shown as payment to fertilizer plants.

3. If exact information is not available, please estimate. Please indicate all entries that are estimated.

4. When a miscellaneous category is used, please indicate as best possible what this category includes.

5. If you have out of state earnings or expense items, use column three (3) to indicate the state(s) and to estimate what part of the out of state total goes to each state.

_____ Check if you would like a copy of the final tables.

Average employment 1965 _____

KANSAS GROSS PRODUCT STUDY

Construction Activities

Information is requested for some of the purchases made by your firm during your most recently completed fiscal year. Percentages, not dollar values, are desired.

	Material Purchases	% of Total Purchases	% Purchased in Kansas
Example:	Portland Cement	10%	5%

	Subcontracts	% of Total Purchases	% Purchased in Kansas
Example:	Electrical	5%	3%

What percent of your total expenditures goes for wages and salaries?

_____

What percent of your total expenditures goes for machinery and equipment?

_____

What percent of your work is done outside the state of Kansas?

_____

Please indicate in the following questions what type of business you receive payments from or make payments to. If fire losses were paid to both consumers and retail grocers, show this as a payment to household consumers and retail grocers; also estimate the per cent of the total payment paid to each, e.g., household consumers 70%, grocers 30%.

	Expense Items	Paid to (Indicate type of business and % of total paid to each		
1.	Fire losses	____%	____%	____%
2.	Extended coverage	____%	____%	____%
3.	Commercial multiple peril	____%	____%	____%
4.	Inland marine	____%	____%	____%
5.	Liability other than auto	____%	____%	____%
6.	Auto liability	____%	____%	____%
7.	Glass insurance	____%	____%	____%
8.	Other allied lines	____%	____%	____%
9.	Rent of equipment	____%	____%	____%
10.	Rent	____%	____%	____%

Income Items

1.	Mortgage loans	____%	____%	____%
2.	Real estate	____%	____%	____%
3.	Premium income			
	a. Fire	____%	____%	____%
	b. Extended coverage	____%	____%	____%
	c. Commercial multiple peril	____%	____%	____%
	d. Inland marine	____%	____%	____%
	e. Liability other than auto	____%	____%	____%
	f. Auto liability	____%	____%	____%
	g. Other allied lines	____%	____%	____%

Accounting Period _____ to _____ Code _____ Year Began Operation _____

Total Expenses for Year (exclude capital expenditures) _____

	Total $ Expense	Kansas	Out of State		
I. Expenses					
A. Material purchased					
1. Gas and oil	_____	_____	_____	_____	_____
2. Rubber	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____
B. Wages and salaries	_____	_____	_____	_____	_____
C. Rent	_____	_____	_____	_____	_____
D. Interest	_____	_____	_____	_____	_____
E. Taxes					
1. Federal	_____	_____	_____	_____	_____
2. State	_____	_____	_____	_____	_____
3. Local	_____	_____	_____	_____	_____

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	Total $ Expense	Kansas	Out of State		

F. Depreciation ____ ____ ____ ____ ____

G. Miscellaneous expenses

1. Office supplies ____ ____ ____ ____ ____

2. Insurance ____ ____ ____ ____ ____

3. Maintenance and repairs ____ ____ ____ ____ ____

4. Advertising

   a. Newspaper and journals ____ ____ ____ ____ ____

   b. Radio and television ____ ____ ____ ____ ____

   c. Billboards ____ ____ ____ ____ ____

5. Utilities

   a. Gas and electricity ____ ____ ____ ____ ____

   b. Telephone and telegraph ____ ____ ____ ____ ____

   c. Water ____ ____ ____ ____ ____

6. Travel expenses ____ ____ ____ ____ ____

7. Legal and professional ____ ____ ____ ____ ____

8. Claims ____ ____ ____ ____ ____

9. _____ ____ ____ ____ ____ ____

10. _____ ____ ____ ____ ____ ____

11. _____ ____ ____ ____ ____ ____

12. _____ ____ ____ ____ ____ ____

	Total $ Income	Kansas	Out of State		
II. Income					
Total Sales and Receipts _____					
A. Household consumers	_____	_____	_____	_____	_____
B. Government-State	_____	_____	_____	_____	_____
C. Government-Local	_____	_____	_____	_____	_____
D. Government-Federal non-defense	_____	_____	_____	_____	_____
E. Government-Federal defense	_____	_____	_____	_____	_____
F. Industrial market (identify)					
1. _____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____
G. Miscellaneous receipts	_____	_____	_____	_____	_____

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	Total $ Income	Kansas	Out of State		

III. Capital Expenditures

    A. New construction and additions
        to plant   _____   _____   _____   _____   _____

    B. New machinery and equipment   _____   _____   _____   _____   _____

    C. Used and second hand capital goods   _____   _____   _____   _____   _____

IV. Miscellaneous Operating Statistics

    A. Average number employed during period _____

    B. Total after tax profits _____

    C. Profits paid out (dividends, withdrawals) _____

    D. Type of ownership: Proprietorship _____ Partnership _____ Corp. _____ Coop. _____

Information is requested for calendar or fiscal 1965. If it is not possible to provide data for 1965, please use the nearest available year. If other than 1965 data is used, please indicate the period used.

A. Average Annual Employment   _____

B. Total Annual Wages and/or Salaries   _____

C. Annual Revenue (excluding personal financial earnings)   _____

	Total Expense	Estimated % of Expense in Kansas
D. Expenses		
1. Gas, Electric and Sanitary Service	_____	_____
2. Telephone and Telegraph	_____	_____
3. Advertising (indicate type)		
a. Newspaper	_____	_____
b. Mail	_____	_____
c. Radio - TV	_____	_____
d. Other _____	_____	_____
4. Rent	_____	_____
5. Printing	_____	_____
6. Legal	_____	_____
7. Auto Expense		
a. Gas and Oil	_____	_____
b. Repair	_____	_____
8. Postage	_____	_____
9. Taxes		
a. Federal	_____	_____
b. State	_____	_____
c. Local	_____	_____
10. All Other	_____	_____

Please make estimates to the following questions for the year 1965. If information for 1965 is not available, please use data for the year nearest to 1965 and indicate that you have used other than 1965 data. Please indicate roughly the type of business you receive income from or make payments to.

Operating Income

	Estimated % of Total Income	Estimated % in Kansas
1. Bank interest	_____	_____
2. Mortgage loans to:		
a. Household consumers	_____	_____
b. Farm operations	_____	_____
c. Business concerns by type of business		
(1) _____	_____	_____
(2) _____	_____	_____
3. Bonds and stocks		
a. U. S. Government bonds	_____	_____
b. State Government obligations	_____	_____
c. Local Government	_____	_____
d. Utilities	_____	_____
e. Industrials (Please list those that are Kansas owned)		
_____	_____	_____
_____	_____	_____
4. Fees and discounts on loans:		
a. Household consumers	_____	_____
b. Others		
(1) _____	_____	_____
(2) _____	_____	_____
5. Rent and real estate (Please identify source of income by type of business)		
_____	_____	_____

Operating Expense

	% of Total Expenses	% in Kansas
1. Wages and salaries	————	————
2. Gas, electric & sanitary service	————	————
3. Telephone & telegraph	————	————
4. Advertising (indicate type)		
a. Newspaper	————	————
b. Radio and TV	————	————
c. Mail	————	————
d. Other	————	————
5. Rent (indicate to what type of business concern paid)	————	————
6. Printing	————	————
7. Legal	————	————
8. Postage	————	————
9. Depreciation	————	————
10. Insurance	————	————
11. License and fees	————	————
12. Taxes		
a. Federal	————	————
b. State	————	————
c. Local	————	————
13. Dividends paid	————	————
14. All other	————	————

APPENDIX B

COMPUTER PROGRAMS FLOWCHART

MATRIX SYSTEM FLOWCHART
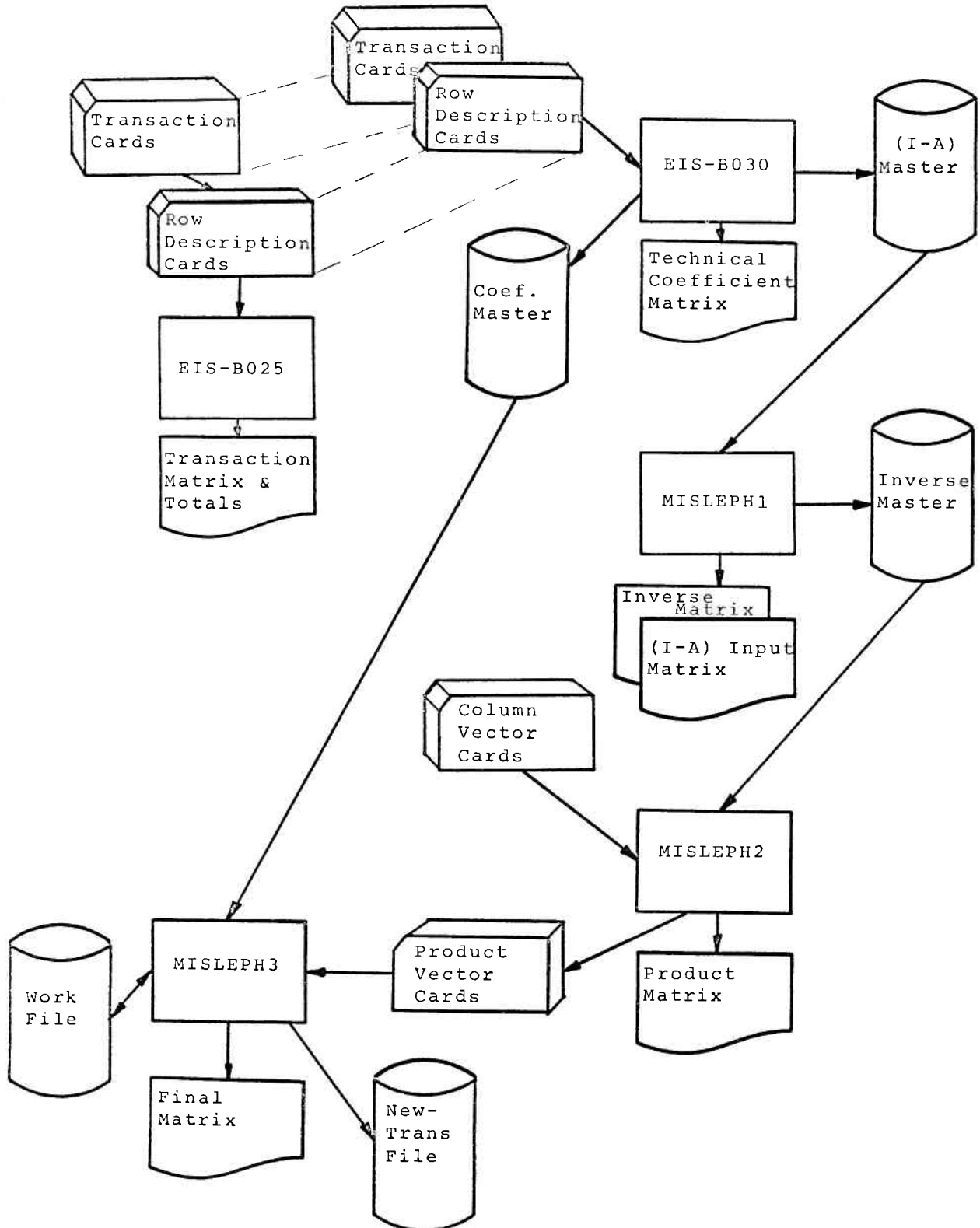
Langston, Kitch & Associates, Inc.
12/06/68

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APPENDIX C

INPUT-OUTPUT TABLES

KANSAS INPUT-OUTPUT TRANSACTIONS MATRIX

_____ Each row in the matrix shows the sales of a Kansas industry to all other Kansas industries, to Kansas Households, to government, to capital formation, and to exports (out-of-state sales).

_____ Each column shows the purchases of a Kansas industry from each row industry.

KANSAS INPUT—OUTPUT TRANSACTIONS MATRIX

READ SALES ACROSS ⟶

READ PURCHASES DOWN ↓

INTERINDUSTRY FLOW
OF GOODS AND SERVICES
IN THE KANSAS
ECONOMY, 1965

(Thousands of Dollars)

Column group headers: FARMING · MINING · CONSTRUCTION · MANUFACTURING · TRANSPORTATION · UTILITIES · WHOLESALE · RETAIL · F.I.R.E. · SERVICES · FINAL DEMAND

* — Less than $500

KANSAS DIRECT REQUIREMENTS MATRIX

_____ Each column shows the dollar fraction purchases from row industries necessary for the column industry to produce $1 of output.

KANSAS DIRECT REQUIREMENTS MATRIX

DIRECT PURCHASES PER DOLLAR OF OUTPUT KANSAS, 1965

READ PURCHASES DOWN

Column group headers: FARMING · MINING · CONSTRUCTION · MANUFACTURING · TRANSPORTATION · UTILITIES · WHOLESALE · RETAIL · F.I.R.E. · SERVICES

Row sectors (READ PURCHASES DOWN): FARMING, MINING, CONSTRUCTION, MANUFACTURING, TRANSPORTATION, UTILITIES, WHOLESALE, RETAIL, F.I.R.E., SERVICES, FINAL PAYMENTS

KANSAS DIRECT AND INDIRECT
REQUIREMENTS MATRIX

_____ Each column shows the direct and indirect requirements
of all Kansas industries for the column industry to
make a $1 delivery to final demand.

KANSAS DIRECT AND INDIRECT REQUIREMENTS MATRIX

DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR OF DELIVERY TO FINAL DEMAND IN THE KANSAS ECONOMY, 1963

Column group headers: FARMING · MINING · CONSTRUCTION · MANUFACTURING · TRANSPORTATION · UTILITIES · WHOLESALE · RETAIL · F.I.R.E. · SERVICES

Row labels:

1. Corn
2. Sorghum
3. Wheat
4. Other Grains
5. Soybeans
6. Hay
7. Dairy Products
8. Poultry & Poultry Products
9. Cattle
10. Hogs
11. Other Agricultural Products
12. Agricultural Services
13. Crude Oil & Natural Gas
14. Oil & Gas Field Services
15. Nonmetallic Mining
16. Other Mining
17. Maintenance & Repair
18. Building Construction
19. Heavy Construction
20. Special Trade Construction
21. Meat Products
22. Dairy Products
23. Grain Mill Products
24. Other Food & Kindred Products
25. Apparel
26. Paper & Allied Products
27. Printing & Publishing
28. Industrial Chemicals
29. Agricultural Chemicals
30. Other Chemicals
31. Petroleum & Coal Products
32. Rubber & Plastics
33. Cement & Concrete
34. Other Stone & Clay
35. Primary Metals
36. Fabricated Metals
37. Other Fabricated Metal Products
38. Farm Machinery
39. Construction Machinery
40. Food Products Machinery
41. Electrical Machinery
42. Other Machinery
43. Motor Vehicles
44. Aerospace
45. Trailer Coaches
46. Other Transportation Equipment
47. Other Manufacturing
48. Railroad Transportation
49. Motor Freight
50. Other Transportation
51. Communications
52. Electric Gas & Sanitary Services
53. Groceries
54. Farm Products
55. Machinery & Equipment
56. Other Wholesale Trade
57. Farm Equipment Dealers
58. Gasoline Service Stations
59. Eating & Drinking
60. Other Retail Trade
61. Banking
62. Other Finance
63. Insurance & Real Estate
64. Lodging Services
65. Personal Services
66. Business Services
67. Medical & Health Services
68. Other Services
69. Education

KANSAS DIRECT, INDIRECT, AND INDUCED
REQUIREMENTS MATRIX

_____ Each column shows the direct, indirect, and induced
effects on all Kansas industries of a $1 delivery of the
column industry to final demand.

KANSAS DIRECT, INDIRECT AND INDUCED REQUIREMENTS MATRIX