KANSAS ECONOMIC DEVELOPMENT, 1985 AND BEYOND: A METHOD AND APPLICATIONS

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EXECUTIVE SUMMARY

This monograph examines the growth prospects for Kansas industries over the next decade. Within the context of a generalized life cycle for industries, nineteen potential growth industries were identified. The input-output linkages of these industries were then analyzed to determine their effects upon economic development in the state. The findings of this analysis are summarized below:

(1) The existing Kansas industrial profile does not show a high degree of investment in those industries likely to grow rapidly in the next 10 years.

(2) High opportunity industries for Kansas are not primarily high-tech industries.

(3) Nonelectrical machinery manufacture, transportation, and wholesaling are the major Kansas industries most strongly linked to potential growth industries.

(4) Nonelectrical machinery manufacture, plastic products manufacture, and transportation activities appear to be industries that can be both attracted to Kansas and expected to provide employment growth over the next decade.

As well, the analysis suggests that the outputs of Kansas industries could act as a "magnet" to out-of-state industries seeking to relocate or expand elsewhere. In particular, the drug, plastics, machinery, and instrument industries can be thought of as forming a target list of "immigrant" industries that public and private economic development efforts could focus upon.

TABLE OF CONTENTS

LIST OF TABLES

I. INTRODUCTION

At any point in time, some industries experience rapid growth; others, having matured, grow at the same rate as the economy as a whole; and yet others experience relative or absolute decline. The economic development of any region is tied to the life-cycle stages of the industries operating in that region and of the industries that region is able to attract. Given, therefore, a region's industrial profile, the projected changes in that profile, and the life-cycle stages of the industries represented in that profile, one can forecast the region's prospects for economic growth.

This monograph, like others in this series,[1] employs data gathered at the national level to draw inferences about the Kansas economy. In particular, this monograph explores the consequences of inter-industry differences in projected growth rates on economic development and employment growth in Kansas. The period of interest is 1985 to 1990. While the starting point for this analysis is the current Kansas industrial profile, attention is given, as well, to the potential for the location of new industries in the state.

An analytic approach to these issues is developed in the following section which is applied first to the existing industrial profile and, subsequently, to the prospects for change in that profile. Implications for economic development planning are addressed in the concluding section.

II. GROWTH INDUSTRIES AND INPUT-OUPTUT LINKAGES

Over time, almost all industries conform to the pattern of a generalized life cycle.[2] Initially, the introduction of a new product involves a period of slow sales growth. Successful product introduction then generates a period of

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[1] A list of previous monographs in this series is given on page

[2] See Cohen, Zinbarg, and Zeikel (1982), pp. 412-419.

rapid sales growth followed by a period of maturity (market saturation). During the period of maturity, sales growth, both in dollar value and in physical units, tracks the overall growth of the economy (nominal and real Gross National Product, respectively). Some industries, but not all, then enter a period of decline as new, substitute products are introduced.

By examining industry life-cycles, expected growth in GNP, and inter-industry linkages, one can project which industries are likely to be growth leaders, at least for the near-term. A key to the approach developed here, then, is the study of inter-industry linkages, also known as input-output analysis.[3,4]

Input-output analysis concerns the distribution of industrial output among purchasers. That is, the analyst can, using input-output methods, describe the use pattern of the output of any industry (broken down according to purchases by using industries and use by final consumers) and the inputs that go into any industry's production. The forward linkage from Industry A to Industry B is the percentage of A's output purchased by B. Similarly, the backward linkage from B to A is the percentage of B's purchases composed of A's output. Given the dollar values of inter-industry shipment (as in Table 1a), one can calculate these forward and backward linkage percentages. Those percentages then become the coefficients of input-output matrices as depicted in Table 1a and 1b.

Note that the forward linkage coefficients are not the same as the backward linkage coefficients. Indeed, without knowledge of the underlying data, forward linkage coefficients cannot be used to compute backward linkage coefficients.

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3 For a complete discussion, see Leontief (1966). A briefer treatment is Hoover (1971), ch. 8.

4 For a discussion of the relationships among input-output analysis, industrial location, and economic development, see Stabler (1970). For an application in a major study of an economic region, see Czamanski (1972).

TABLE 1

EXAMPLE INPUT-OUTPUT TABLES

(a) Dollar Values of Shipments

Producer / User	A	B	C	D	Final User	Total
A	100	20	30	40	500	690
B	0	40	5	5	20	70
C	75	75	75	0	100	325
D	25	25	25	25	200	300
Total	200	160	135	70	820	

(b) Forward Linkage Coefficients

Producer / User	A	B	C	D	Final Users	Total
A	0.14	0.03	0.04	0.05	0.72	1.00
B	0.00	0.57	0.07	0.07	0.28	1.00
C	0.23	0.23	0.23	0.00	0.31	1.00
D	0.08	0.08	0.08	0.08	0.67	1.00

(c) Backward Linkage Coefficients

Producer / User	A	B	C	D	Final Users
A	0.50	0.13	0.22	0.57	0.61
B	0.00	0.25	0.04	0.07	0.02
C	0.38	0.46	0.56	0.00	0.12
D	0.13	0.16	0.19	0.36	0.24
Total	1.00	1.00	1.00	1.00	1.00

While, in casual usage, the backward and forward linkage tables may be called the "inverses" of one another, they are not one another's inverses in the mathematical sense.[5]

Given an understanding of input-output relationships, one can identify several classes of industries which will contribute materially to the economic development of Kansas in the next decade. Two of those classes are based on the existing distribution of economic activity in the state:[6]

(a) industries now comprising significant portions of the Kansas industrial base, the final demand for whose output will grow rapidly; and

(b) industries now comprising significant portions of the Kansas industrial base which have strong forward linkages to industries, the final demand for whose output will grow rapidly. These are industries which supply inputs to those industries whose production is expected to grow.

Where industries meet the conditions of (a) and (b), above, but represent only minimal existing activity in Kansas, they can be expected to generate high investment growth in percentage terms, but not in absolute (dollar value) investment and (number of jobs) employment, given the small base from which that high growth rate proceeds.

Three other classes of industries can be identified as potential sources of economic development, based on the less predictable entry of new activities to the state:[7]

(c) growth industries (see (a), above) which locate in Kansas to enjoy some advantage inherent in such location (e.g., geographic proximity to markets);

(d) growth industries using outputs of Kansas industries (i.e., growth industries with strong backward linkage to Kansas industries); and

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5 See Hadley (1961), pp. 103-107.

6 It is on this point that the current analysis differs from the national projections made by the U.S. Department of Commerce and by the Bureau of Labor Statistics. This monograph is concerned with economic growth in Kansas, rather than in the nation as a whole, and is based on the industrial profile of Kansas, rather than that of the United States.

7 For an investigation of factors that promote and factors that retard the location of industries in Kansas, see McLean (1983).

(e) industries supplying inputs to growth industries now in Kansas (i.e., industries with strong forward linkages to growing Kansas industries).

III. IDENTIFYING GROWTH INDUSTRIES

The identification of industries that are likely to experience above average growth in output is a vexing task. Government agencies, location consultants, and securities analysts all demonstrate professional interests in this endeavor.[8] From the securities analysis literature, one can focus on several factors that are characteristic of industries with strong near-term growth prospects:

(a) successful introduction of a new product, service, or process (e.g., microcomputer parts, assembly, and software; recombinant DNA-based pharmaceutical products; cellular radio);

(b) provision of some product or service to a growing demographic group (e.g., nursing home services, pre-school toys (at this writing), residential construction); and

(c) changes in the cost of production that make a product newly competitive in domestic and world markets (e.g., steel production in Japan).

From the perspective of the analyst of a state's economy, there are three sources for identification of such industries.

(a) The analyst's own perceptions. While there is, of course, personal bias and subjective judgment inherent in such identifications, an informed, aware analyst should not ignore his own projections. Indeed, such perceptions are the foundations of industry studies in securities analysis.

(b) The popular press. Naisbitt (1983) has identified a set of emerging growth industries based on content analysis of popular periodicals. Judgments from such sources should be modified with sound analysis before becoming the basis of public policy.

(c) The U.S. Department of Commerce's Bureau of Industrial Economics's continuing study of American industry.[9] The Bureau continuously monitors the outlook for domestic industries. Those evaluations are used extensively in the analysis that follows.

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8 U.S. Department of Commerce, Bureau of Industrial Economics (1981); Naisbitt (1983); and Cohen, Zinbarg, and Zeikel (1982), ch. 11.

9 U.S. Department of Commerce, Bureau of Industrial Economics (1981).

Table 2 lists 17 industries that the Bureau of Industrial Economics has identified as having potential for rapid growth. The author's criterion for inclusion in this list is a projected annual growth rate greater than 8.0-9.0 percent for 1982-1985.

IV. KANSAS INDUSTRIAL PROFILE

Table 3 provides the most recent profile of Kansas industrial activity available at this writing. Industries at the "two-digit" level are profiled both in number and percentage of establishments and in number and percentage of employment.[10] Informed observers of the Kansas economy will find few surprises here. The agricultural services classification does not include farming, per se. The data also exclude government employees, railroad employees, and the self-employed. Data at levels finer than the two-digit level are available in County Business Patterns (U.S. Department of Commerce, Bureau of the Census, 1982) and will be discussed where appropriate.

At this point, it is sufficient to note only a few select features of the Kansas industrial profile. First, Kansas has a well-diversified economy. No industry accounts for even 10 percent of total employment or more than 6.0 percent of all establishments. These data also suggest that the manufacturing export base (at the "two-digit" level) consists primarily of machinery (except electrical) and transportation equipment (almost exclusively aircraft). Communication equipment (Standard Industrial Classification 366) and miscellaneous plastic products (SIC 307) are significant parts of the Kansas industrial profile at finer levels of aggregation. The state's largest two-digit industry (health services) dwarfs all others, both in number of establishments and in employment.

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10 "Two-digit" refers to the level of aggregation under the Standard Industrial Classification (SIC) system. Table 3 uses the two-digit (highly aggregated) level. Note that industries identified in Table 2 are at several levels of aggregation: two-, three-, and four-digit levels.

TABLE 2

POTENTIAL "HIGH GROWTH" INDUSTRIES, 1980-1985

Industry	SIC Code
Residential Construction	152
Lumber and Wood Products	24
Printing and Publishing (newspaper, periodicals, books only)	2711,2721,2732
Drugs	2833,2834
Plastic Products	3079
Aluminum	3353,3354,3355,3357
Metalworking Machinery	354,356
Machinery, except electrical	35
Electronic Computing Equipment (incl. software)	3573
Consumer Electronics	3651
Telephone and Telegraph Equipment	3661
Electronic Equipment and Components	3662
Instruments	38
Dolls, Games, Toys, and Children's Vehicles	3942,3944
Broadcasting (incl. cable TV)	4832,4833,4899
Telephone and Telegraph Services	4811,4821
Hotels and Motels	701
Automotive Services	75
Health and Medical Services	80

Source: U.S. Department of Commerce, Bureau of Industrial Economics (1981). Criterion for inclusion here is a projected compound real rate of growth of sales of 8-9% or greater.

TABLE 3

KANSAS ACTIVITY PROFILE, 1980

Sector	Industry	SIC	Number of Establishments	Percent of Establishments	Employees (March 12)	Percent of Employees
Agriculture	Agriculture Services	07	542	1.0	1,000-2,499	0.1-3.3
	Forestry	08	3	0.0	6	0.0
	Fishing, Hunting, & Trapping	09	2	0.0	0- 19	0.0
Mining	Metal Mining	10	4	0.0	20- 99	0.0
	Coal Mining	12	12	0.0	500-999	0.1
	Oil & Gas Extraction	13	979	1.8	13,359	1.8
	Non-metalic Mining	14	121	0.2	1,668	0.2
Construction	General Construction	15	1,678	3.0	13,461	1.8
	Heavy Construction	16	503	0.9	11,587	1.5
	Special Trade Constr.	17	2,964	5.4	23,086	3.0
Manufacturing	Food	20	307	0.6	22,773	3.0
	Textile	22	6	0.0	24	0.0
	Apparel	23	68	0.1	4,529	0.6
	Lumber	24	119	0.2	3,704	4.8
	Furniture	25	59	0.1	2,421	0.3
	Paper	26	46	0.1	4,462	0.6
	Printing & Publishing	27	526	1.0	16,889	2.2
	Chemicals	28	102	0.2	8,408	1.1
	Petroleum & Coal	29	35	0.1	4,181	0.5
	Rubber & Plastics	30	127	0.2	8,655	1.1
	Leather	31	9	0.0	200	0.0
	Stone, Clay, Glass	32	232	0.4	7,583	1.0
	Primary Metal	33	53	0.1	4,426	0.6
	Fabricated Metals	34	254	0.4	10,704	1.4
	Machinery, exc. elec.	35	531	1.0	32,190	4.2
	Electric & Electronic Equipment	36	102	0.2	10,277	1.3
	Transortation Equip.	37	127	0.2	54,425	7.1
	Instruments	38	40	0.1	9,645	1.3
	Miscellaneous Mfg.	39	87	0.2	1,931	0.3
Transportation & Public Utilities	Local Passenger Transit	41	94	0.2	2,273	0.3
	Trucking & Warehousing	42	1,821	3.3	19,174	2.5
	Water Transportation	44	11	0.0	79	0.0
	Transportation by Air	45	78	0.1	1,998	2.6
	Pipelines, exc. Gas	46	16	0.0	830	0.1
	Transportation Services	47	125	0.2	1,451	0.2
	Communication	48	469	0.8	15,392	2.0
	Electric, Gas and Sanitary	49	241	0.4	8,738	1.1
Wholesale Trade	Wholesale, Durable Goods	50	2,848	5.2	31,998	4.2
	Wholesale, Non-durable Goods	51	2,319	4.2	24,861	3.3
Retail Trade	Building Materials	52	986	1.8	6,911	9.0
	General Merchandise	53	470	0.8	19,851	2.6
	Food Stores	54	1,591	2.9	21,346	2.8
	Auto Dealers & Service	55	2,765	5.0	21,448	2.8
	Apparel Stores	56	1,503	2.7	10,522	1.4
	Furniture Stores	57	1,072	1.9	6,384	0.8
	Eating & Drinking Places	58	3,242	5.9	50,321	6.6
	Miscellaneous Retail	59	3,410	6.2	20,898	2.7

(continued)

TABLE 3 (con't)

Sector	Industry	SIC	Number of Establishments	Percent of Establishments	Employees (March 12)	Percent of Employees
Finance, Insurance & Real Estate	Banking	60	649	1.2	15,428	2.0
	Credit Agencies, not Banking	61	764	1.3	6,608	0.8
	Security & Commodity Brokers	62	135	0.2	763	0.1
	Insurance Carriers	63	392	0.7	11,450	1.5
	Insurance Agents	64	1,119	2.0	4,666	0.6
	Real Estate	65	1,477	2.6	7,871	1.0
	Real Estate/Insurance	66	179	0.3	643	0.1
	Holding & Other Investment Offices	67	159	0.3	1,438	0.2
Services	Hotels	70	539	1.0	7,871	1.0
	Personal Services	72	1,779	3.2	9,816	1.3
	Business Services	73	1,429	2.6	16,715	2.2
	Auto Services	75	1,100	2.0	5,186	0.7
	Misc. Repair Services	76	545	1.0	2,917	0.4
	Motion Pictures	78	176	0.3	1,615	0.2
	Amusement & Recreation	79	562	1.0	5,762	0.8
	Health Services	80	3,237	5.9	64,666	8.5
	Legal Services	81	1,043	1.9	3,985	0.5
	Educational Services	82	209	0.4	6,969	0.9
	Social Services	83	778	1.4	8,980	1.2
	Museums, etc.	84	24	0.0	74	0.0
	Membership Org.	86	1,975	3.6	13,868	1.8
	Misc. Services	89	824	1.5	7,116	0.9
TOTAL			55,021	100.0	763,326	100.0

Source: U.S. Department of Commerce, Bureau of the Census (1982)

V. GROWTH INDUSTRIES AND THE KANSAS INDUSTRIAL PROFILE

Consider, first, the potential growth industries (Table 2) as components of the existing distribution of industries in Kansas (Table 3). The prospects for growth shown by such an analysis are mixed. A major component of the manufacturing export base of Kansas is transportation equipment, especially aircraft (assembly and parts).[11] The prospects for growth in that set of industries are not strong.[12] Construction, especially residential construction, is, nationally, a strong prospect for growth in the next decade, based on a high expected rate of household formation. The rate of household formation in Kansas, however, may be lower than that for the nation as a whole, as Kansas experiences net outmigration of younger workers.[13]

Several of the potential growth industries representing from 1.0 to 4.0 percent of total private, nonfarm employment in Kansas and possibly representing sources of economic development for Kansas include printing and publishing, electrical and electronic equipment, instruments, communication, and hotels and motels. Absolute growth generated from these sources, however, will be modest, as these industries are not major employers in the state. Communication, while potentially a source of modest employment growth, should not be emphasized as a source of growth of income for the state, as production by that industry in Kansas is primarily for intrastate use. Kansas is not a major exporter of

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[11] The export base of any region is that set of industries that produce for sale outside the region--foreign or domestic--(ratio of exports to imports greater than one). It is the region's export base, then, that generates income for the region. North (1970) was one of the first to focus attention on the role of the export base in generating regional economic development.

[12] U.S. Department of Commerce, Bureau of Industrial Economics (1981), pp. 334-343.

[13] The net outmigration of individuals 20-24 years of age from Kansas has been documented by the University of Kansas Institute for Economic and Business Research using data from the Bureau of the Census. See Redwood, Bhattacharyya, and Kleiner (1981), p. 8.

communication services, as are, for example, California and New York.[14]

Growth industries representing more significant potential sources of economic development are metalworking machinery (in Table 3, subsumed under "Machinery, except electrical") and plastic products. These potential growth industries constitute significant parts of the state's export base.

The largest "two-digit" private, nonfarm industry in the state, both in employment and in number of establishments, is health care. Information in Tables 2 and 3 suggests that health care will be a major source of employment growth in the next decade. This growth will constitute only a modest contribution of income to the state, unless Kansas health care providers can become successful in exporting their services to residents of other states. Production for export in this case is quite possible if Kansas develops medical centers accepting referrals on a regional, rather than an exclusively intrastate, basis.

One must conclude, then, that the growth industries identified in Table 2 are only weakly represented in the current industrial profile of Kansas. Machinery manufacturing, plastic products manufacturing, and health services delivery represent the major exceptions to that generalization.

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[14] In this regard, consider an interesting paradox. Charles Tiebot observed that the world exports nothing, yet the world economy grows (Stabler, 1970, p. 53). National income rises (at least to its supply constraint) when employment rises. For very small economic units (households and firms, for example), however, income depends on production for sale outside the unit. States and sub-national regions fall within the continuum of self-containment from firms to nations. Income in states and regions does rise when employment for local consumption rises. Ultimately, however, sub-national regions (and nations with small economies) depend on export sales to maintain their incomes.

VI. GROWTH INDUSTRIES AND THE KANSAS INDUSTRIAL PROFILE:

A. Inter-industry Linkages

Growth industries generate increased capital investment and employment for those industries that provide their inputs. To determine the effects on Kansas economic development of the 19 potential growth industries identified in Table 2, one need only find the backward linkage from those industries to Kansas's major industries.

It would be exceptionally tedious for the reader to work through a reproduced input-output table here. The information employed in this analysis is presented in tabular form in Young and Planting (1983), pp. 69-77. Further, Paul Bylaska has transformed Young and Planting's dollar sales figure to percentage coefficients for the 19 industries in question.[15]

Unfortunately, the Department of Commerce's input-output tables do not use SIC industry categories in a consistent manner.[16] Therefore, it has been necessary to identify the input-output industries that most closely correspond to the growth industries identified according to SIC codes. These correspondences are shown in Table 4.

Tracing through the transformed input-output "purchases" columns for the potential growth industries reveals a clear, consistent picture for Kansas. Transportation and warehousing, wholesale/retail trade, and machinery (non-electrical) manufacturing are the major Kansas industries that are most often strongly linked to the projected growth industries. Chemical manufacturing and petroleum refining, representing much smaller shares of the Kansas industrial profile, also show strong linkages to several of the growth industries. Hotels and real estate sales were strongly linked to several industries, but represent special cases, discussed below.

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15 These are available from the University of Kansas Institute for Economic and Business Research on request.

16 See Young and Planting (1983), pp. 2 and 8.

TABLE 4

SIC/INPUT-OUTPUT INDUSTRY CORRESPONDENCES

Projected (SIC) Growth Industry	Corresponding Input-Output Industry
Residential Construction (152)	New Construction (11)
Lumber (24)	Lumber (20)
Printing & Publishing (2711,2721,2732)	Printing and Publishing (26)
Drugs (2833,2834)	Drugs, etc. (29)
Plastic Products (3079)	Plastics and Synthetics (28)
Aluminum (3353,3354,3355,3357)	Primary, Nonferrous Metals (38)
Metalworking Machinery (354,356)	Metalworking Machinery (47)
Machinery, except Electrical (35)	General Industrial Machinery (49)
Electronic Computing Equipment (3573)	Office, Computing, Accounting Machines (51)
Consumer Electronics (3651)	Radio, T.V., & Communication Equipment (56)
Telephone & Telegraph Equipment (3661)	Radio, T.V., & Communication Equipment (56)
Electronic Equipment & Components (3662)	Electronic Components (57)
Instruments (38)	Professional Instruments (62)
Dolls, Games, Toys, & Children's Vehicles (3942, 3944)	(no appropriate classification)
Broadcasting (4832,4833,4899)	Radio & TV Broadcasting (67)
Telephone & Telegraph Services (4811,4821)	Communications (66)
Hotels & Motels (701)	Hotels, etc. (72)
Automotive Services (75)	Automotive Services (75)
Health & Medical Serices (80)	Health, etc. (77)

Source: Young and Planting (1983), p. 8.

The criteria for inclusion in the above list, while subjective, were quite reasonable. In assessing instruments, for example, all of the industries comprising 1.0 percent or more of Kansas establishments employment accounting for one percent of more of the instrument industry's purchases were considered. These were machinery (non-electrical), transportation and warehousing, and retail/wholesale trade.

Upon applying these criteria, then, a clear picture of Kansas's future economic development emerges. The state's geographic location and its already highly developed transportation and wholesale industries provide an excellent basis for economic development serving growth industries. Employment and capital investment may experience rapid growth in the supply of materials, the shipment of these materials, and the shipping and warehousing of finished goods. While not "high-tech" activities, they are, for Kansas, "high opportunity" activities.

The machinery (non-electrical) industry presents an interesting situation. It is an activity in which Kansas has a substantial current involvement and an activity likely to grow rapidly, both because of growing demand by final users and because of strong linkages to other growth industries. If one examines the size distribution of firms in SIC code 35, however, one sees that the industry is comprised, overwhelming, of very small establishments.[17] In order for Kansas to realize the growth potential of this industry, either additional marketing activity must be coordinated for these establishments, or firms using the products of those firms must be induced to locate near clusters of these establishments (as in Wichita).

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[17] U.S. Department of Commerce, Bureau of the Census (1982), p. 6.

Hotel services and real estate sales are also activities that depend on the location of new firms for their growth. Growth of the broadcasting industry in Texas, for example, will contribute nothing to real estate sales growth in Kansas. Attention must, then, be focused on the possibilities of industrial relocation to the state.

B. Implications for Industrial Location

Earlier, three classes of industries were identified which are likely to locate in Kansas (lettering is retained from above):

(c) growth industries locating in Kansas to enjoy some advantage inherent in such location;

(d) growth industries using outputs of Kansas industries; and

(e) industries supplying inputs to growth industries now in Kansas.

The intervening analysis suggests that investment projected for (e), above, will be quite small.

The inherent advantages of location in Kansas were discussed at length in an earlier monograph.[18] These advantages are based, principally, on the geographic location of the state (its proximity to markets). Again, this fact suggests that Kansas has excellent opportunities for attracting new transportation activities.

Also attracted by proximity to markets are manufacturing activities whose output has a high weight-to-value ratio.[19] As it is uneconomical to ship the heavy, but low-value, outputs of such industries, they tend to locate near their markets. Among the growth industries identified here, machinery and plastic products fall into that class. Fortunately for Kansas, machinery production may be attracted to the state due to the presence of a labor force trained in that industry and due to input-output linkages as well as due to geographical considerations.

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[18] McLean (1983).

[19] These are known as transfer-oriented industries. See Hoover (1971), p. 22.

Industries using the outputs of Kansas industries that have strong backward linkages to industries now existing in the state include the following (Kansas industries supplying inputs are shown in parentheses):

- drugs (chemicals)
- plastic products (petroleum refining, wholesaling, transportation)
- machinery (machinery, wholesaling, transportation)
- instruments (machinery, wholesaling, transportation).

These form a list of "immigrant" industries that might be the target of public and private economic development efforts. Note, however, that the attractiveness of Kansas for these industries is not uniform. For example, the state's attractiveness to the drug industry is not strong, on the basis of input-output linkages alone (less than 1.0 percent of Kansas employment is engaged in the manufacture of chemicals). Efforts to attract the pharmaceutical industry, for example, to the state should stress other considerations than backward linkages alone. Chief among these is the role of the state's universities in industry-relevant research.

VII. DISCUSSION AND CONCLUSIONS

The approach employed in this analysis can generate only rough projections of future investment and employment growth. Precise numerical forecasts are beyond the capabilities of such a study, as there are many links in the chain of analysis, any one of which might involve erroneous assumptions.

Bearing these limitations in mind, however, one can arrive at a picture of the growth prospects for Kansas industries over the next decade. While this analysis has focused on rapidly growing industries in Kansas, the techniques are generalizable and could be applied to the study of any industry or any state.

A clear picture of Kansas's prospects for economic development has emerged. Five generalizations are suggested:

- The existing Kansas industrial profile does not show a high degree of investment in those industries likely to grow rapidly in the next decade;
- "High opportunity" industries for Kansas are not, primarily "high-tech" industries;
- Machinery (non-electrical) manufacture, transportation, and wholesaling are the major Kansas industries that are most strongly linked to potential growth industries; and
- Machinery (non-electrical) manufacture, plastic products manufacture, and transportation activities appear to be among industries that can be attracted to Kansas and that can provide growth in employment over the next decade.

REFERENCES

Cohen, Gerome G., Edward D. Zinbarg, and Arthur Zeikel. Investment Analysis and Portfolio Management, fourth edition. Homewood, Ill.: Richard D. Irwin, 1982.

Czamanski, Stan. Regional Science Techniques in Practice. Lexington, Massachusetts: D.C. Heath, 1972.

Hadley, G. Linear Algebra. Reading, Massachusetts: Addison-Wesley, 1961.

Hoover, Edgan M. An Introduction to Regional Economics. New York: Alfred A. Knopf, 1971.

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

McLean, Robert A. "Factors in Firms' Decisions to Locate or Expand in Kansas: A Sample Survey." Lawrence, Kansas: University of Kansas, Institute for Economic and Business Research, Labor Market Information Project, Monograph No. 7, April, 1983.

Naisbitt, John. Megatrends. New York: Warner Books, 1983.

North, Douglas C. "Location Theory and Economic Growth." Journal of Political Economy vol. 63, no. 6 (June 1955): 243-258. Reprinted in William L. McKee, Robert D. Dean, and William H. Leahy (editors), Regional Economics. New York: The Free Press, 1970, pp. 29-48. All references are to the 1970 publication.

Redwood, Anthony, Bharati Bhattacharyya, and Morris Kleiner. "The Kansas Labor Market: Trends, Problems, and Issues". Lawrence, Kansas: University of Kansas, Institute for Economic and Business Research, Labor Market Information Project, Monograph No. 1, November, 1981.

Stabler, J.C. "Exports and Evolution: The Process of Regional Change." Land Economics vol. 46, no. 1 (February 1968): 11-23. Reprinted in William L. McKee, Robert D. Dean, and William H. Leahy (editors), Regional Economics. New York: The Free Press, 1970. All references are to the 1970 publication.

U.S. Department of Commerce, Bureau of the Census. County Business Patterns, 1980, Kansas. Washington, D.C.: U.S. Government Printing Office, 1982.

U.S. Department of Commerce, Bureau of Industrial Economics. 1981 U.S. Industrial Outlook for 200 Industries with Projections to 1985. Washington, D.C.: U.S. Government Printing Office, 1981.

Young, Paula C. and Mark A. Planting. Summary Input-Output Tables of the U.S. Economy: 1976, 1978, and 1979. (U.S. Department of Commerce, Bureau of Economic Analysis Staff Paper 39). Washington, D.C.: U.S. Government Printing Office, 1983.