THE KANSAS HIGH-TECH LABOR FORCE: TRENDS AND PROJECTIONS

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June 1983

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PREFACE

This study, prepared for the Governor's High-Technology Task Force was conducted by the Institute for Economic and Business Research under a contractual agreement with the Kansas Department of Economic Development (KDED). The ensuing report is organized to closely conform to the guidelines set forth in the contractual agreement. Because it was desirable to produce as concise a manuscript as possible, digressions and persual of tangential points were minimized.

A number of officials and researchers from within state government and Kansas higher education contributed needed information to the study for which its authors are very grateful. We would particulary like to note the contributions of the Kansas Department of Human Resources--Research and Analysis Section--headed by Mr. Fred Rice, who in their own report "structure of the Kansas Labor Force," provided a significant portion of the material used in Chapter II of this report. The study also benefited considerably from the many useful suggestions and valuable resource materials provided by Ms. Deanne Vieux of KDED.

EXECUTIVE SUMMARY

This report provides an analysis of the present and projected future labor force in Kansas, emphasizing particularly the workforce in occupations closely oriented to high-technology. Also contained in the report are a series of projections of high-tech related labor force demands in Kansas for 1990. These analyses provide the framework for development of recommendations that outline a number of high-tech oriented post-secondary educational training programs that the state might consider implementing as means both to attract high-tech industry and to provide a satisfactory supply of workers with high-tech related skills. The ensuing summary provides a concise compilation of the study's key findings.

In surveying the characteristics of the present Kansas workforce, the following represent the dominant findings:

- The overall demographic structure of the Kansas workforce is not particularly different from that of the U.S. as a whole. The state's workforce is, however, slightly older and has a lower rate of female participation.

- Since 1970, the Kansas labor force has grown at a slightly slower rate than the nation's. Among the state's urban areas, the Kansas City, Kansas area has experienced the greatest labor force expansion during this time.

- Relative to the U.S., a smaller proportion of the Kansas labor force is currently employed in high-tech related occupations. Specifically, it was calculated that Kansas currently has about 41,000 workers or 3.7 percent of the workforce (compared to 4.1 percent nationally) engaged in 33 occupations which embody significant high-tech characteristics.

- The largest concentration of high-tech skills is in the Wichita area, due principally to the aircraft industry. By contrast, Riley County and the Lawrence SMSA have comparatively low proportions of high-tech workers in spite of the strong university presence in these areas.

- Kansas in 1981 had 290 firms in high-tech manufacturing industries based on a classification system developed by the Kansas Department of Economic Development. Eighty-five of these were located in the Kansas City, Kansas area and 64 including the dominant employer, aircraft--were located in Wichita. By comparison, no perceptible high-tech industry existed in Riley County, the Lawrence SMSA, or the Topeka SMSA.

In developing a projection of labor supply in Kansas to 1987, the following were the principal findings:

- The Kansas working age population will grow only about 1.3 percent from 1980-87. The labor force though, is apt to grow at a somewhat faster rate, near 5.6 percent.

- Relative to 1980, the workforce in 1987 will involve a greater proportion of women and a greater bunching of workers in the middle age brackets.

- Between 1983-87 Kansas post-secondary educational institutions are expected to grant 59,325 bachelors degrees, 18,327 graduate degrees, 1,391 professional degrees, 25,002 associate degrees, and 17,490 program completions from state voc-ed institutes.

- Only relatively small proportions of these degrees will be in high-tech areas such as engineering, math, the sciences, or technical occupations.

- Women currently comprise the majority of students at the state's two-year colleges, the group of independent four-year universities, and the bulk of the Regents institutions.

Projections of Kansas labor force needs to 1990 in high-tech areas were made based in past growth trends in the state relative to the U.S. and on a set of national labor force projections prepared by the Bureau of Labor Statistics. The basic findings from this analysis were as follows:

- Job growth of 53-57 percent during 1980-90 is expected in Kansas for the 33 high-tech occupations. This growth rate would translate into about 22,000-23,500 new jobs by the end of the decade in these occupations.

- Among these occupations, those projected to be the fastest growers are in the computer field, engineering, and certain technical occupations. By comparison, job growth for scientists is expected to be relatively slow.

- Those high-tech industries expected to grow most rapidly in Kansas during the '80s include office and accounting machines, electronic computing equipment, and aircraft. Conversely, little growth is expected in engines and turbines, soaps and cosmetics, agricultural chemicals, and certain types of electrical machinery.

- If these projections materialize, aircraft will remain by far the state's most dominant high-tech industry, employing over 65,000 workers by 1990, while none of the others in the high-tech area is projected to employ more than 5,000 by that time.

Based upon analysis of projected supply trends in the Kansas high-tech workforce relative to forecasted demands, a number of inferences were drawn which, in turn, sugggested types of training programs which might be implemented

to help meet future labor force needs in the high-tech area. Summarization of the key points for this aspect of the investigation is as follows:

- Slow growth in the overall labor force may inhibit economic expansion in Kansas over the next several years.

- Based on projections, Kansas will be able to meet and exceed its own needs for engineers and scientists. Certain personnel shortages in technical occupations are apt to occur, however.

- Transferral of community college resources from liberal studies programs to skill-oriented, terminal degrees programs in high-tech areas was suggested as a means of confronting the possible shortage of workers in the skilled, technical occupations. Augmentation of high-tech programs at area vo-tech institutes, particularly those near the four Kansas SMSAs and Riley County, was also suggested in this regard.

- Although short-term skill shortages in Kansas are not expected in engineering or other high-tech professional areas, it was suggested, nevertheless, that the state consider upgrading certain elements of these university programs as a signal to high-tech firms of the state's willingness to accommodate high-tech industry and as a contingency should high-tech expand more rapidly in the state than these projections indicate.

In sum, this study shows that high-tech is not a very potent force in Kansas at present, nor will to be in 1990 unless the state is successful in generating growth beyond what this report's projections call for.

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I. Introduction

A. Overview

This report analyzes the Kansas labor force and its relation to the development of high-technology industry in the state. Its basic purposes are 1) to inventory the state's existing labor force and project its future course over the next several years, 2) to forecast future high-tech related labor needs in Kansas, and 3) to attempt a reconciliation of projected labor availability with the forecasted needs.

The report's structure closely mirrors this three-part division. More specifically, following upon some additional introductory remarks, Chapter II provides a description of the current Kansas labor force by age, sex, and occupational and industrial breakdowns and analyzes its growth trends over the past several years. In addition to viewing the state as a whole, particular attention is given to labor force developments in the four Kansas SMSAs (Kansas City, Kansas, Lawrence, Topeka, and Wichita) and Riley County (the home of Kansas State University). This narrowing of focus is based upon the research finding of the Kansas Department of Economic Development (KDED) that within these areas exist the state's best opportunities to develop high-technology industries. Also included in Chapter II is a five-year projection of labor force development in Kansas including forecasts of future output from Kansas post-secondary educational institutions.

The substantial task of forecasting future labor force needs for Kansas is taken on in Chapter III. Projections of labor demand in 1990 are made under alternative "high-trend" or "low-trend" scenarios for a list of high-tech oriented occupations and also for occupations within a group of high-tech industries. The basic methodology for developing the Kansas projections is to adapt national occupational and industrial employment growth forecasts to fit the local situation.

The material in Chapters II and III is synthesized in Chapter IV wherein projected labor force availability and forecasted labor needs are compared. In situations when a skill shortage or mismatch is indicated, suggestions are made concerning the types of training programs which will be necessary to meet the state's labor requirements or to enhance the state's attractiveness to high-tech enterprise.

B. Need for the Study

High-technology firms often have labor force requirements which differ significantly from the needs of other types of businesses.[1] Moreover, considerable evidence exists to suggest that the cost, quality, and availability of needed labor are important locational criteria for high-technology firms.

According to a 1982 study by Battelle, high-tech firms, in general, require experienced scientists and engineers as well as a "readily accessible" pool of newly trained personnel in these fields.[2] Skilled, high-quality personnel in the trades, crafts, support areas, and administration are also called for.

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1 See Chapter IV of the recent study on university research parks conducted by the Institute for Economic and Business Research ("An Investigation of University Research Parks: Implications for the Lawrence/KU Community," April 1982) for a discussion and references concerning the locational requirements of high-tech firms.

2 C.W. Minshall, "Development of High Technology Industries in New York State," Battelle-Columbus Division, April 1982. Prepared for the New York State Science and Technology Foundation.

The overall quality of the Kansas workforce is well-known, and, in relative terms, labor costs in Kansas are quite low. For these reasons, Kansas workers have, in the past, represented one of the state's primary enticements to industry. The single, critical question remaining, then, concerns whether Kansas will be able to generate the types of labor skills necessary to service the needs of growing high-technology industries within the state. Providing a basis upon which to answer this question is, therefore, the essential purpose to which this report is directed.

II. The Kansas Labor Force: Recent Trends and Projected Growth[3]

A. General Trends

Historically, the Kansas population has been among the slowest growing in the nation. In fact, Kansas' proportion of the total U.S. population has declined over every census period during this century, falling from nearly 2.0 percent of the total in 1900 to about 1.0 percent in 1980.

The total labor force available to be employed is determined by the product of total population and the labor force participation rate. Traditionally, the participation rate in Kansas has been somewhat lower than in the nation due, in large part, to a greater proportion of retirement age persons in the state and, as well, to a lower participation rate by women in Kansas. Over recent census years, however, female participation rates in the state have risen relative to the nation. As a result, the overall Kansas participation rate now quite closely approximates the U.S. average as indicated in Table II-1 below.

Table II-1

RECENT LABOR FORCE PARTICIPATION RATES IN KANSAS AND THE U.S.

	Kansas			United States		
	Total	Male	Female	Total	Male	Female
1960	57.1	78.7	32.4	59.4	83.3	37.7
1970	58.2	77.5	40.3	60.4	79.7	43.3
1980	62.4	75.0	50.8	63.8	78.0	51.7

[3] This chapter relies heavily on information gathered by the Research Analysis Section of the Kansas Department of Human Resources (KDHR) and presented in their monograph "Structure of the Kansas Labor Force," May 1983. Although individual citations are made when specific material is adapted from this report, we wish to make a general acknowledgement of the Research and Analysis Section's contribution to this chapter.

More recent trends in the state's total labor supply are discernible from Table II-2 which details the annualized rate of change in the Kansas labor force from 1970 to the present. The table indicates that, although unemployment in the state has been low in recent years relative to national levels, year-to-year growth in employment also has generally been low. This has been particularly true during the 1980s--a result of the recent recession, the impact of which was unusually severe in the Sunflower State. More specifically, since 1970, the Kansas labor force has grown 29.7 percent compared to 33.1 percent growth nationally. Over the four most recent years (1979-82), however, the labor force in Kansas has not grown at all, although nationally it has risen 5.1 percent over this same period.

Table II-3 profiles recent labor force trends in the four SMSAs and Riley County. From 1970-82, the Kansas portion of the Kansas City SMSA has experienced more rapid growth than the other urbanized regions in the state, generating labor force growth over this period of 56.5 percent, with the bulk of the increase concentrated in Johnson County. The labor force growth from 1970-1982 in the Lawrence and Wichita areas was also somewhat above the state average (33.5 and 35.4 percent, respectively). On the other hand, growth in the Topeka area (27.5 percent) and Riley County (26.9 percent) has lagged slightly behind the state average.

Further analysis of the table reveals that Kansas City is the only one of the five areas to have experienced continuous growth over the entire reporting period. Topeka and Wichita in particular, because of their manufacturing orientation, are prone to wider-than-typical business cycle fluctuations, whereas Lawrence and Kansas City tend to be more stable because their economies are more diversified and service oriented. It should be noted, however, that

TABLE II-2
RECENT TRENDS IN THE LABOR FORCE FOR KANSAS AND THE UNITED STATES

	Kansas			United States		
Year	Civilian Labor Force	Change from Previous Year	Unemployment Rate	Civilian Labor Force(Thousands)	Change from Previous Year	Unemployment Rate
1970	929,600	0.1 %	4.8 %	82,771	2.5 %	4.9 %
1971	935,400	0.6	5.5	84,382	1.9	5.9
1972	968,600	3.5	3.9	87,034	3.1	5.6
1973	1,014,100	4.7	3.1	89,429	2.8	4.9
1974	1,043,900	2.9	3.5	91,949	2.8	5.6
1975	1,067,900	2.3	4.8	93,775	2.0	8.5
1976	1,102,600	3.2	4.4	96,158	2.5	7.7
1977	1,137,800	3.2	3.9	99,009	3.0	7.1
1978	1,172,200	3.0	3.1	102,251	3.3	6.1
1979	1,204,900	2.8	2.9	104,962	2.7	5.8
1980	1,213,100	0.7	3.9	106,940	1.9	7.1
1981	1,215,300	0.2	4.0	108,670	1.6	7.6
1982	1,205,800	-0.8	5.7	110,204	1.4	9.7

Source: Kansas Data from KDHR report "Structure of the Kansas Labor Force," U.S. Data from Economic Report of the President

TABLE II-3
RECENT LABOR FORCE TRENDS IN THE KANSAS SMSAs AND RILEY COUNTY

	Kansas City SMSA (Kansas Port)			Lawrence SMSA			Topeka SMSA			Wichita SMSA			Riley County		
	Civilian Labor Force	Change From Previous Year	Unemployment Rate	Civilian Labor Force	Change From Previous Year	Unemployment Rate	Civilian Labor Force	Change From Previous Year	Unemployment Rate	Labor Force	Previous Year	Unemployment Rate	Civilian Labor Force	Change From Previous Year	Unemployment Rate
1970	175,050	--- %	3.9%	24,075	3.6%	2.9%	74,250	---%	3.0%	165,000	-5.0%	8.1%	17,250	--- %	2.8%
1971	180,800	3.3	4.3	24,450	1.6	4.7	76,350	2.8	4.7	160,750	-2.6	9.1	17,950	4.1	3.2
1972	189,300	4.7	3.7	24,950	2.0	3.8	79,350	3.9	4.0	163,800	1.9	5.1	17,650	-1.7	2.8
1973	204,500	8.0	3.7	26,100	4.6	3.1	81,700	3.0	3.4	174,250	6.4	3.6	18,025	2.1	2.6
1974	209,450	2.4	4.2	27,200	4.2	3.5	83,850	2.6	4.2	184,500	5.9	3.7	18,625	3.3	2.6
1975	215,150	2.7	5.8	28,100	3.3	5.0	86,200	2.8	6.0	192,750	4.5	5.7	19,325	3.8	4.0
1976	229,650	6.7	5.1	29,350	4.4	3.9	87,800	1.9	4.8	197,550	2.5	5.4	19,925	3.1	3.6
1977	243,000	5.8	4.4	31,000	5.6	3.9	90,000	2.5	4.1	201,300	1.9	4.7	20,400	2.4	3.6
1978	256,600	5.6	3.6	32,600	5.2	3.4	93,500	3.9	3.6	210,000	4.3	3.3	20,650	1.2	2.9
1979	265,700	3.5	3.4	34,300	5.2	2.9	94,900	1.5	3.5	220,400	5.0	2.7	21,200	2.7	3.2
1980	267,000	0.5	4.5	34,700	1.2	4.0	95,600	0.7	4.9	225,000	2.1	3.8	21,450	1.2	8.2
1981	269,300	0.9	4.5	34,400	-0.9	3.8	95,200	-0.4	5.0	226,400	0.6	3.9	21,525	0.3	3.3
1982	273,900	1.7	5.1	33,500	-2.6	4.2	94,200	-1.1	6.2	223,400	-1.3	7.7	22,000	2.2	3.3

Source: KDHR report "Structure of the Kansas Labor Force."

Lawrence's legacy of continuous, steady growth in labor force and employment was abruptly ended by the 1980-82 recession which impacted strongly upon the area's substantial public sector.

On the whole, the urban areas of Kansas have been growing much more rapidly than have the state's rural areas. Forty-three of the 62 Kansas counties with 1970 populations under 10,000 lost population between 1970-80, even though the state on the whole grew 5.1 percent over this period. It is expected that high-tech industries will locate primarily in urbanized areas, exacerbating the growth dichotomy between urban and rural regions.

B. Characteristics of the Kansas Labor Force

Demographics

Over the last decade, the labor force in Kansas has grown at a proportionally faster rate than the overall population due to an increase in the rate of labor force participation. As indicated in Table II-4, much of this trend is due to sharply higher participation by women in the state, particularly younger women, than 10 years ago. Also, participation rates for young males, those in the 16-19 and 20-24 age groups, rose sharply over the decade, reflecting increasing numbers of part-time working students and declining rates of post-secondary enrollment.

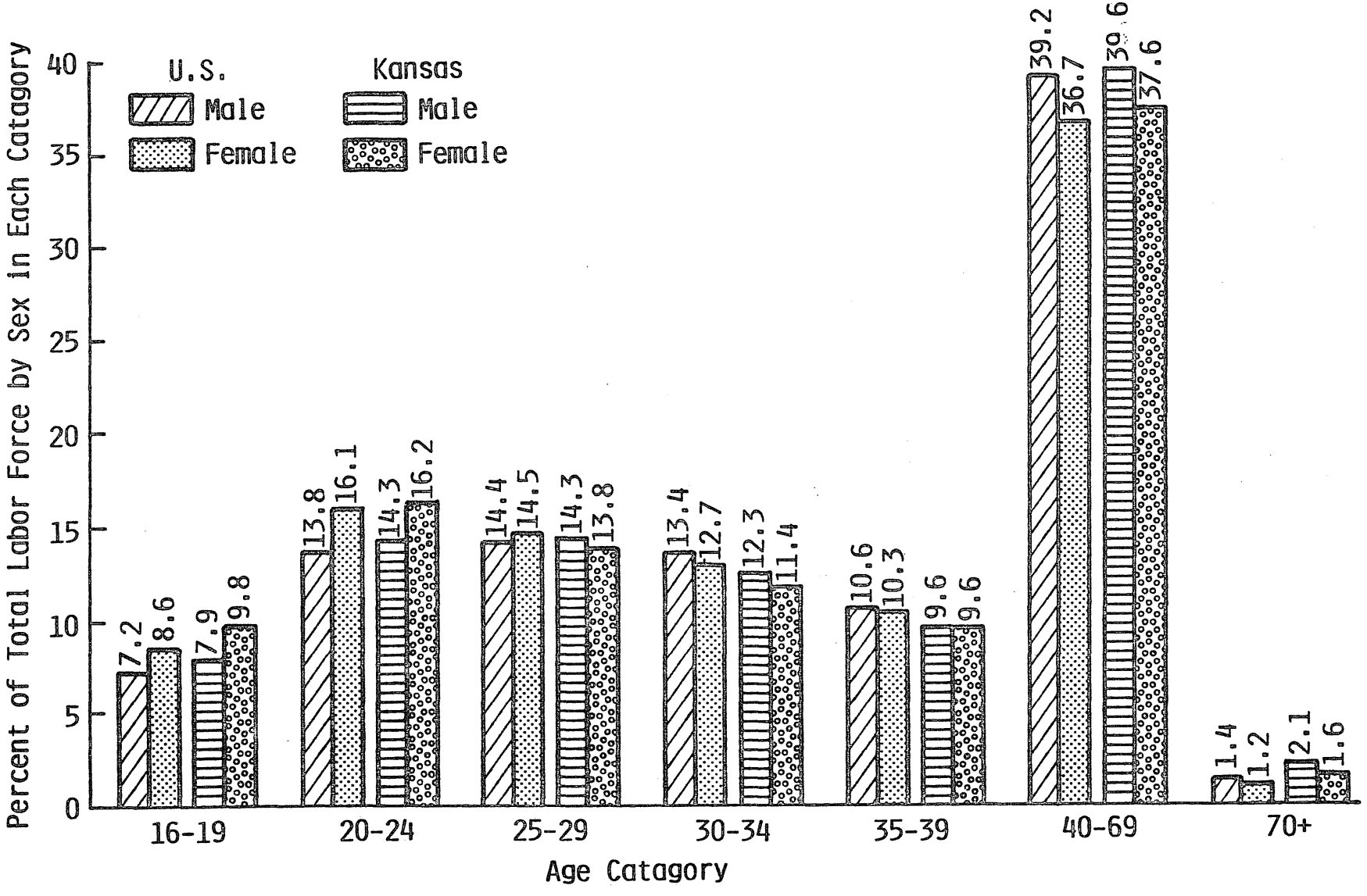
A commonly held belief is that the Kansas workforce is older on average than that of the rest of the country. Figure II-1 sheds light on this matter by depicting the proportion of the male and female labor force which falls in each of the seven age categories for both Kansas and the U.S. In general, the Kansas proportions do not deviate dramatically from the national averages, but, nonetheless, the data do confirm the aging of the Kansas workforce. When both sexes are combined, about 40.6 percent of the Kansas workforce is 40 years or older compared with 39.4 percent for the U.S.

TABLE II-4
CIVILIAN LABOR FORCE BY AGE BY SEX
1970, 1980
KANSAS

	Civilian Labor Force		Labor Force Participation Rate	
Age in Years	1970	1980	1970	1980
Both Sexes	886,624	1,123,496	56.0	62.4
16-19	74,884	97,690	43.7	54.8
20-24	109,107	169,704	58.5	72.9
25-29	89,776	158,089	65.0	78.0
30-34	79,797	134,152	66.6	78.0
35-39	79,972	107,654	68.0	79.6
40-69	429,399	435,335	64.2	65.4
70 & Over	23,689	20,872	13.0	9.8
Male	556,895	650,132	72.9	75.0
16-19	42,706	51,303	49.0	56.2
20-24	60,006	92,951	62.6	77.5
25-29	60,235	92,662	86.8	89.8
30-34	53,582	80,013	90.3	92.1
35-39	52,259	62,075	89.9	92.3
40-69	272,418	257,589	85.0	80.8
70 & Over	15,689	13,539	21.3	16.9
Female	329,729	473,364	40.2	50.8
16-19	32,178	46,387	38.2	53.2
20-24	49,101	76,753	54.2	68.0
25-29	29,541	65,427	43.0	65.8
30-34	26,215	54,139	43.4	63.6
35-39	27,713	45,579	46.6	67.1
40-69	156,981	177,746	45.1	51.2
70 & Over	8,000	7,333	7.4	5.6

Source: KDHR Report, "Structure of the Kansas Labor Force."

Figure II-1 AGE DISTRIBUTION OF THE MALE AND FEMALE LABOR FORCE FOR THE U.S. AND KANSAS



Interestingly, however, the proportion of the Kansas workforce comprised of very young workers, those 16-24 years, is considerably higher (25.8 percent versus 22.6 percent) than it is in the U.S. Also worth noting is that in 1960 workers in the 16-24 age group comprised only 16.9 percent of the Kansas labor force. This increase indicates an influx of youth into the economy, and also suggests that today's young Kansans are participating in the workforce at higher rates than were their predecessors.

Data on age group and sex decompositions of the workforce for the Kansas urban areas are provided in Tables A-1 through A-5 in the Appendix to this report. Examination of these data indicates that, relative to the state as a whole, the workforce is somewhat younger in each of the SMSAs and in Riley County. The workforce in Lawrence and Riley County is particularly young due to the strong university presence in these areas. The rate of participation by females is remarkably consistent, around 55 percent, in each of the SMSAs and is somewhat higher than the 50.8 percent participation rate for the state as a whole. Higher female participation in urban areas is a reflection of the job opportunities created in the secondary and tertiary industries of a well-developed local economy. Traditionally these industries have been the most frequent employers of women.

The labor force participation rates for males in Kansas City, Wichita, and Topeka (82, 80, and 77 percent, respectively) exceed the 75 percent average for the state. The male participation rates in Lawrence and Riley County are considerably below the average--another reflection of the overt university influence in these areas.

Occupational Decomposition

As stated previously, the types of labor force skills available in a state or community have a strong influence on that area's ability to attract high-tech industry. Male and female labor force totals for eight aggregate occupational

categories for the U.S., Kansas, the Kansas SMSAs, and Riley County are contained in Table II-5.[4] Table A-6 in the Appendix contains disaggregated male/female labor force data for 514 specific occupations for the state and each of the relevant urban areas. In examining these data for the Kansas City SMSA, readers should note that they are for the entire SMSA, not just the Kansas portion. The entire SMSA is included to provide a more appropriate inventory of high-tech skills in the Kansas City area. From the viewpoint of establishing a base of high-tech firms and high-tech related skills from which to draw or expand upon, the Kansas/Missouri breakdown is irrelevant.

In terms of the needs of high-tech firms, the most important occupational categories to examine are the professional, technical, and managerial; skilled worker; and operatives groupings. In respect to the percentages of the labor force in each of these categories, Kansas falls slightly, but perhaps not significantly, below the national average. As would be expected, each of the five Kansas urban areas ranks above the state and the nation in terms of the proportion of professional, technical, and managerial workers. Almost one third of the labor force in Lawrence and Riley County is comprised of workers in this category--once again, a reflection of the dominant presence of the University of Kansas and Kansas State University in these communities.

The skilled worker category, which includes occupations such as machine repairer and the various crafts, comprises a smaller proportion of the labor force relative to the state in each of the urban areas with the exception of the Wichita SMSA. Wichita, due to its strong manufacturing base, contains almost one fourth of the state's total inventory of skilled workers.

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[4] The data in Table II-5 were generated by the U.S. Census Bureau and do not necessarily conform exactly to comparable data gathered by other sources, e.g., Department of Labor or KDHR.

TABLE II-5

LABOR FORCE BY OCCUPATION GROUP AND SEX FOR THE UNITED STATES, KANSAS, RILEY COUNTY, AND THE KANSAS SMSAs

				SMSA			
	United States (thousands of workers)	Kansas	Riley	Kansas City	Lawrence	Topeka	Wichita
Total civilian labor force	104,449.8	1,123,496	23,773	668,623	34,129	93,255	208,739
Male	59,926.5	650,132	12,342	374,783	19,227	51,465	119,726
Female	44,523.3	473,364	11,431	293,840	14,902	41,785	89,013
Professional, technical, managerial	25,716.3	265,889	7,809	172,976	10,930	23,754	52,901
Percent of total labor force	24.6	23.7	32.1	25.9	32.0	25.5	25.3
Male	15,178.9	155,440	4,458	99,877	6,494	13,252	32,548
Female	10,537.4	110,449	3,351	73,099	4,436	10,502	20,353
Sales	10,257.3	113,232	2,408	72,757	3,336	8,976	21,053
Percent of total labor force	9.8	10.1	6.3	10.9	9.8	9.6	10.1
Male	5,262.0	60,515	1,070	39,612	1,762	4,773	11,396
Female	4,995.3	52,717	1,338	33,145	1,574	4,203	9,657
Clerical	17,563.6	181,484	4,038	134,278	5,374	19,644	35,757
Percent of total labor force	16.8	16.2	17.0	20.1	15.8	21.1	17.1
Male	4,018.2	36,287	758	29,889	1,265	4,136	7,586
Female	13,545.4	145,197	3,280	104,389	4,109	15,508	28,171
Service	13,606.1	143,626	4,047	82,356	5,205	12,419	23,769
Percent of total labor force	13.0	12.8	17.0	12.3	15.3	13.3	11.4
Male	5,585.4	48,345	1,565	36,601	2,431	5,089	8,261
Female	8,020.7	95,281	2,482	45,755	2,774	7,330	15,508
Miscellaneous agricultural occupations	3,032.2	67,843	1,053	7,186	865	2,372	2,967
Percent of total labor force	2.9	6.0	4.4	1.1	2.5	2.5	1.4
Male	2,581.0	60,727	903	5,977	721	2,097	2,506
Female	451.2	7,116	150	1,209	144	275	461
Skilled workers	13,554.6	138,815	1,892	69,212	3,005	10,099	32,562
Percent of total labor force	13.0	12.4	8.0	10.4	8.8	10.8	15.6
Male	12,498.6	129,487	1,801	65,666	2,820	9,593	28,920
Female	1,056.0	9,328	91	3,546	185	506	3,642
Operatives	11,434.0	157,502	1,476	94,148	4,135	11,608	31,219
Percent of total labor force	10.9	14.0	6.2	14.1	12.1	12.5	15.0
Male	10,424.7	115,730	1,042	69,269	2,763	8,940	21,752
Female	1,009.3	41,772	434	24,879	1,372	2,668	9,467
Laborers	5,086.1	51,907	917	33,099	1,514	4,151	8,012
Percent of total labor force	4.9	4.6	3.9	5.0	4.4	4.5	3.8
Male	4,076.8	42,409	738	26,802	1,240	3,468	6,555
Female	1,009.3	9,498	179	6,297	274	683	1,457

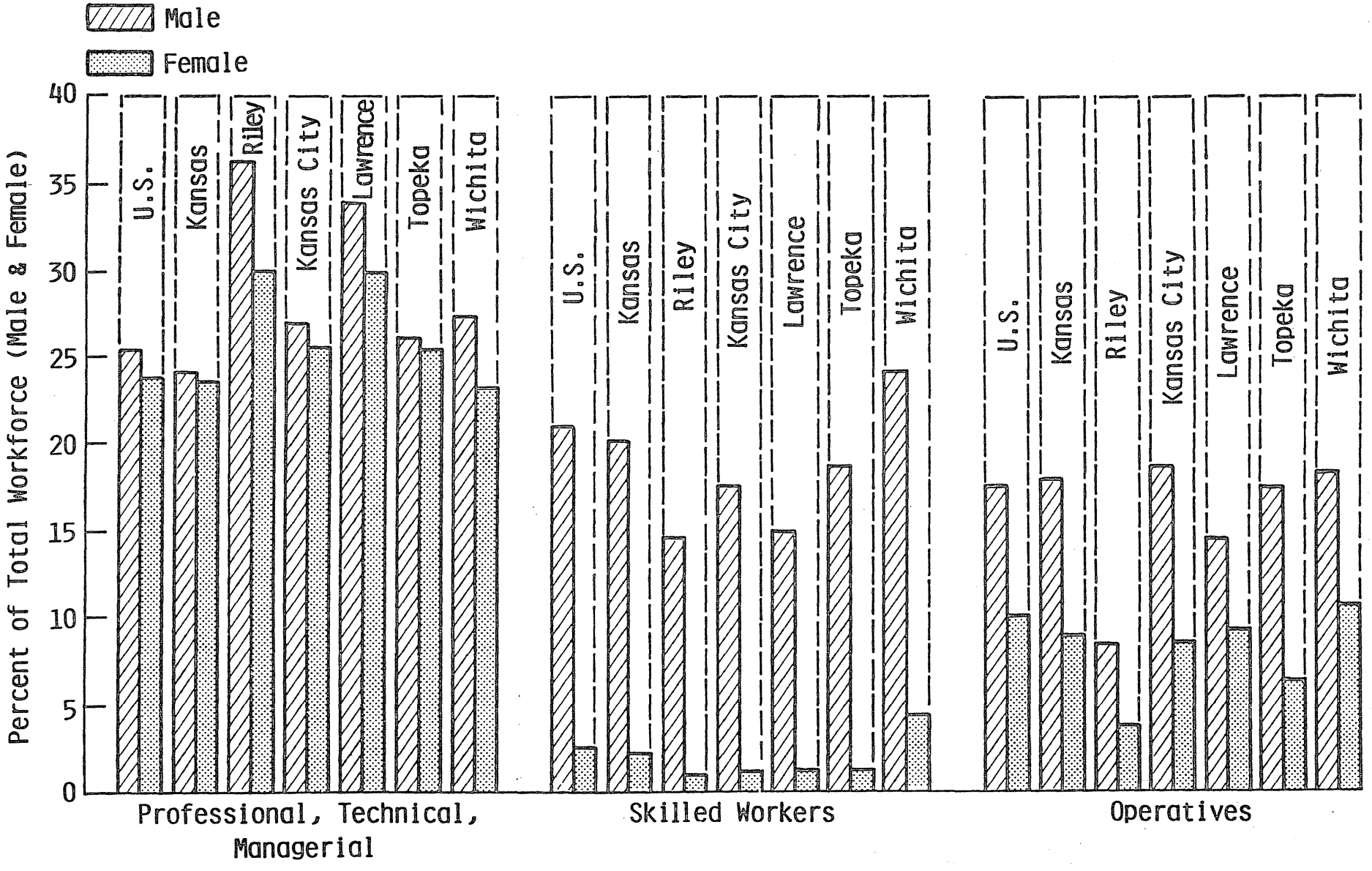
Source: Bureau of the Census 1980 Kansas Equal Employment Opportunity (EEO) Tape.

A fairly similar pattern emerges in respect to the operatives category. Wichita again has the highest concentration of these workers in the state, with the Kansas City area also containing a slightly-above-average proportion. Relative to the state and the other urban areas, Lawrence and Riley County have the smallest concentrations of skilled workers and operatives.

Jobs in each of these three occupational groupings tend to be male-dominated. This conclusion is readily apparent from an examination of Figure II-2, which delineates the proportion of the male/female workforce in professional, technical, and managerial; skilled; and operative occupations for the U.S., Kansas, and the Kansas urban areas. Each of these aggregate categories comprises a smaller portion of the female workforce in Kansas than nationally. Particularly significant is the extremely small percentages of female workers in Kansas employed in skilled crafts or as operatives. Interestingly, larger proportions of the Wichita female workforce fall into these categories relative to the state as a whole and to the other urbanized areas within the state. What these data indicate is that, in most Kansas regions, larger-than-typical proportions of the female workforce are locked into low-pay, low-tech sales, service, and clerical occupations.

To further identify the extant base of a high-technology labor force in Kansas and its urban areas, the Institute for Economic and Business Research identified 33 specific occupations which embody significant high-tech characteristics. Twenty-five of the selected occupations are from the professional and technical category, four are from the skilled group; the remaining four fall within the operatives category. The chosen occupations are skewed towards the professional and technical end because it is often not possible to establish specifically whether the various skilled and operative occupations are, indeed, identifiable with high-tech industries, i.e., they are occupations which could be associated with either high-tech or low-tech industries.

Figure II-2 PORPORTION OF MALE AND FEMALE WORK FORCE
IN SELECTED OCCUPATIONAL CATAGORIES FOR THE U.S. AND KANSAS



The occupations and the number in the labor force for each are listed in Table II-6 for Kansas and the urban areas. It bears repeating that the Kansas City data are for the entire SMSA. It also should be noted that those listed under each occupation are either directly working in that field or available for work. Teachers in these fields are not included in these data. For this reason, Lawrence and Riley County, each of which had a high concentration of professional and technical occupations, actually have comparatively few people working directly in high-tech oriented occupations once the university element is excluded.

By this occupational breakdown, Kansas has about 41,000 workers with high-tech related skills, about 3.7 percent of the workforce. Nationally, 4.1 percent of the workforce emanate from these occupations. As such, by comparative standards, the Kansas percentage represents a relatively small base of high-tech skills from which to draw upon and suggests a potential problem the state faces in attempting to stimulate high-tech development. By far the largest concentration of high-tech skills in Kansas is in the Wichita area which, thanks principally to the aircraft industry, has 13,445 people or 6.4 percent of its labor force in high-tech occupations, about one third of the total in the state. The Kansas City area has over 28,000 workers with high-tech skills, although the percentage concentration of high-tech workers is considerably lower than in Wichita.

Some important inferences can be drawn from this analysis of the occupational decomposition of the Kansas workforce:

- Overall, Kansas does not have a large existing base of high-tech occupational skills. The most significant concentration is in Wichita and is related to the aircraft industry.

TABLE II-6

THE HIGH-TECHNOLOGY WORKFORCE IN KANSAS, RILEY COUNTY AND THE KANSAS SMSAs

OCCUPATION	Kansas	Riley County	SMSAs			
			Kansas City*	Lawrence	Topeka	Wichita
Aeronautical and astronautical engineers	2,235	0	153	0	4	2,084
Chemical engineers	344	6	281	70	23	59
Civil engineers	2,435	36	1,848	39	390	370
Electrical engineers	2,074	8	1,904	39	238	705
Industrial engineers	1,985	0	1,259	14	54	944
Mechanical engineers	1,467	8	1,306	25	62	448
Metallurgical engineers	100	0	74	0	0	43
Mining engineers	40	0	11	0	0	0
Petroleum engineers	415	0	59	0	0	86
Agricultural scientists	392	86	111	8	45	18
Biological scientists	350	52	264	35	45	36
Chemists	740	23	719	30	81	111
Geologists	640	12	72	72	19	364
Medical scientists	174	49	102	0	6	55
Physicists	32	0	42	5	0	16
Mathematicians and other math specialists	91	0	0	0	0	78
Statisticians	201	0	200	6	46	36
Drafters	3,701	63	2,558	101	235	906
Electrical and electronic technicians	1,899	44	1,583	56	118	566
Industrial engineering technicians	39	0	36	0	0	18
Mechanical engineering technicians	173	0	100	15	17	65
Medical technicians and laboratory technologists	2,639	70	1,751	68	270	661
Tool programmers	72	0	20	0	0	58
Computer programmers	3,008	126	2,412	147	323	870
Computer systems analysts	1,487	24	1,188	49	207	535
Computer operators	4,215	97	2,072	149	605	926
Peripheral EDP equipment operators	161	0	235	6	45	24
Electricians	6,274	73	3,514	192	577	1,462
Data processing machine mechanics	467	11	417	21	84	127
Office machine repairs	453	18	336	0	47	131
Tool and die makers	1,970	0	770	27	12	1,330
Electrical and electronic assemblers	773	7	924	27	3	282
Numerical control machine tool operators	64	0	12	0	0	31
Total	41,110	813	28,333	1,052	3,556	13,445
% of total labor force	3.7	3.4	4.2	3.1	3.8	6.4

*includes Missouri portion

- Lawrence and Riley County, though home to Kansas' two most significant research universities, have not developed a base of high-tech activity outside the universities. Research-oriented universities have elsewhere acted as magnets in attracting research-oriented and other types of high-tech firms, so on the surface it would appear that Kansas has not been fully exploiting its opportunities in this respect.

- The female portion of the Kansas workforce has not been actively involved in professional, technical, skilled crafts, or other high-tech related occupations. Much of the female workforce is concentrated in low-pay, low-skill clerical and sales positions. Although this is a problem nationally as well, the situation in Kansas is more pronounced and, hence, may suggest an area in which to target high-tech training initiatives.

Decomposition by High-Tech Industry

A number of attempts have been made to pinpoint which industries would fall into a high-technology classification.[5] Efforts usually revolve around identification by standard industrial classification (SIC) codes of industries which satisfy certain predetermined high-tech criteria. For example, the criteria listed in the KDHR report are as follows:[6]

1. A high proportion of scientists and engineers in the workforce.
2. Highly sophisticated technology incorporated into products.
3. Firms of relatively small size with high growth rates and a high ratio of research and development expenditures to sales.
4. Products tend to incorporate technological innovation, have a high degree of value-added, and are often recognized as "state of the art" in a given line.

For purposes of this report, industries classified as high-tech oriented are those contained in a listing compiled for this project by KDED which contains 26 three-digit SIC industries. Table II-7 lists the employment and number of establishments in each of these industries for Kansas, the Kansas

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5 Recent efforts include the Battelle report, op. cit.; Linda Thornton, "Is there a High-Tech Firm in Your Future," Midwest Research Institute; and "Towards a Definition and Listing of 'High-Tech' Occupations," a report prepared by the research Analysis Section of KDHR.

6 KDHR, op. cit.

TABLE II-7
EMPLOYMENT AND NUMBER OF HIGH TECHNOLOGY ESTABLISHMENTS IN KANSAS,
THE KANSAS PORTION OF THE KANSAS CITY SMSA, AND THE WICHITA SMSA FOR 1981

SIC	Industry Description	KANSAS # of employees	KANSAS # of establishments	KANSAS CITY SMSA (Kansas Portion) # of employees	KANSAS CITY SMSA (Kansas Portion) # of establishments	WICHITA SMSA # of employees	WICHITA SMSA # of establishments
282	Plastics Materials & Synthetics	100-299	4	20-99	2	---	---
283	Drugs	1865	13	600-1248	8	---	---
284	Soap, Cleaners, & Toilet Goods	1292	19	1600-2499	8	---	---
348	Ordnance & Accessories	500-999	2	---	---	---	---
357	Office Computing & Accounting Machines	1702	12	100-249	7	1000-2499	3
358	Refrigeration and Service Machinery	2382	14	100-249	3	1000-2499	4
361	Electric Distribution Equipment	100-249	4	---	---	---	---
362	Electrical Industrial Apparatus	1584	13	20-99	2	100-249	2
363	Household Appliances	200-499	4	250-499	1	---	---
364	Electric Lighting & Wiring Equipment	907	10	120-348	3	20-99	2
365	Radio & TV Receiving Equipment	73	8	---	---	---	---
366	Communication Equipment	3376	20	2500-4999	9	116	4
367	Electronic Components & Accessories	100-249	36	929-1078	26	20-99	3
369	Misc. Electronic Equipment & Supplies	2228	14	500-998	9	---	---
372	Aircraft & Parts	42,195	49	---	---	40,390	37
376	Guided Missiles & Space Vehicle Parts	---	---	---	---	---	---
379	Misc. Transportation Equipment	628	17	---	---	---	---
381	Engineering & Scientific Instruments	607	6	---	---	586	5
382	Measuring & Controlling Devices	460	8	20-99	2	250-499	3
383	Optical Instruments & Lenses	20-99	2	---	---	---	---
384	Medical Instruments & Supplies	1731	19	500-999	5	---	---
385	Opthalmic Goods	20-99	3	---	---	---	---
386	Photographic Equip & Supplies	250-499	3	---	---	100-249	1
387	Watches, CLocks & Watchcases	---	---	---	---	---	---
	TOTAL HIGH-TECH MANUFACTURING ESTABLISHMENTS	---	290	---	85	---	64
737	Computer & Data Processing Services	2772	145	691	44	1308	49
739	Miscellaneous Business Services	6767	688	2030	209	2119	184

Source: Kansas County Business Patterns 1981, Bureau of the Census.

portion of the Kansas City SMSA,[7] and the Wichita SMSA. All but two of the designated high-tech industries are in manufacturing. Table II-7 includes no information for Riley County, the Lawrence SMSA, or the Topeka SMSA because no employment was indicated in any of the manufacturing-based, high-tech industries for these locations. The Census Bureau does not separately list data for any industry with less than 50 employees. Therefore, no listing need no imply complete absence of that industry from these areas. It does indicate, however, that the industry is very small, if it exists at all. Each did, however, register some employment in the two service industries--computer and data processing services and miscellaneous business services--designated as high-tech, but there is no solid indication of the extent to which this employment emanated from specifically high-tech related work.

The Census Bureau is prohibited from releasing employment data when it may reveal information about the operations of individual firms. For this reason, exact numbers of employees are often not provided; rather, the information is given only for an interval. Nonetheless, some valuable insight may be gained from an examination of Table II-7. At the outset, it further identifies the extent to which Kansas must develop a high-technology base. Based on the KDED classification, there are 290 establishments in high-tech manufacturing industries in the state; that is, about 10 percent of the state's 2,919 manufacturing establishments are in high-tech related industries. The high-tech establishments employ approximately 63,000 workers or about 8.4 percent of the total Kansas nonpublic sector employment at the time these data were gathered. Aircraft industry accounts for almost exactly two thirds of the state's total employment in high-tech industries, with about 96 percent of Kansas aircraft employment being located in Wichita.

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[7] Only the Kansas portion is considered in this section because the relevant data is available only at the county level and not by SMSAs. Therefore, data for Johnson and Wyandotte Counties were aggregated to comprise the Kansas portion of the Kansas City SMSA.

Relative to aircraft, all other high-tech manufacturing industries in Kansas are very small. The second largest is communication equipment--primarily TV and radio manufacturing--which employed 3,376 workers in 1981. Much of this activity is concentrated in Kansas City. The refrigeration and service machinery industry employed 2,382 workers in 1981, with the primary concentration of activity in Wichita. Only one other high-tech manufacturing industry, miscellaneous electronic equipment and supplies (e.g., storage batteries and engine components), employed more than 2,000 workers in the state. The primary concentration in this industry was centered in Kansas City, with some additional activity taking place in Montgomery and Saline counties.

The Kansas portion of the Kansas City SMSA contains a smattering of activity in a number of high-tech industries. Eighty-five high-tech manufacturing establishments were indicated in 1981, about 30 percent of the state's total. None of the industries, however, is a major employer on a scale comparable to the aircraft industry in Wichita.

Wichita, however, has not successfully expanded its high-tech base beyond aircraft. Only 27 nonaircraft-related, high-tech manufacturing firms were reported in the SMSA, and no other high-tech manufacturing industry generated significant employment in the area. Also worth noting is that none of the high-tech firms reported in the Wichita SMSA are located in Butler County.

Finally, the Riley County, Lawrence, and Topeka areas are conspicuous by their absence from the table. Although, as Table II-6 indicated, there are some workers in these areas with high-tech related skills, there is literally no base of high-tech manufacturing industry, according to the KDED definition, in any of these areas.

C. A Five-Year Projection of the Kansas Labor Force Potential

Since 1970, The Kansas civilian labor force (those employed and those unemployed but actively seeking work) has increased at an average annual rate of 2.03 percent. A considerable amount of variability has existed, however, among the year-to-year percentage changes, due primarily to business-cycle effects. In particular, over the time period being analyzed, Kansas has suffered relatively severe recessions in 1970-71 and 1980-82. Labor force growth over each of these periods was insignificant due to people leaving the workforce because of the lack of employment opportunities. Examining only the eight non-recession years since 1970 indicates an average annual growth rate in the labor force of 3.2 percent. As such, it becomes obvious that labor force participation is very much a function of economic conditions and employment opportunities. To accurately forecast actual labor force totals, then, necessitates a multiyear forecast of future economic conditions, which is arguably impossible to do and, regardless, is certainly beyond the scope of this project.

As such, what is offered in this section is an outline of the parameters concerning the Kansas labor force potential over the next five years and only a tentative estimate--based on forward projection of the 1980 population--of the 1987 labor force. In pursuit of the first objective, long-term growth trends for the overall state population and population in the urban areas are surveyed. This discussion is followed by the tentative projections of the total labor force and estimates of future supplies of skilled workers in the state which are based upon projected output from Kansas post-secondary institutions.

General Population Trends

Population growth data for Kansas since 1900 are contained in Table II-8. With two explainable exceptions, the Kansas population grew within a narrow band from 3.2 to 6.3 percent over each decade since 1920. Population declined from 1930-40 during the Depression and Dust Bowl era, and it rose significantly

between 1950-60 as part of the baby-boom phenomenon. No such extraordinary trends appear to be in the offing during the 1980s, but a ripple upturn in population is, in fact, occurring due to the baby-boom generation bearing children. This trend is borne out, for example, by recent marked increases in Kansas public school enrollments. More specifically, 1982 kindergarten enrollment at 32,629 was 1,847 students above grade one enrollments which, in turn, exceeded grade two registrants by 1,173. Finally, there were also 1,189 more second graders than third graders, meaning that the 1982 kindergarten class exceeded the third grade class by 4,209 students. This upsurge in young people in Kansas will not affect the labor force until the 1990s, but Kansas will have to stimulate considerable economic growth in the interim if there are to be sufficient job opportunities to accommodate the forthcoming labor force surge. Until this "mini baby-boom" enters the workforce, however, growth in the working age population should be relatively stable.

TABLE II-8
KANSAS POPULATION AND GROWTH RATES FOR
CENSUS YEARS SINCE 1900

Year	Population	Growth Rate
1900	1,470,495	3.0%
1910	1,690,949	15.0
1920	1,769,257	4.6
1930	1,880,999	6.3
1940	1,801,028	- 4.3
1950	1,905,299	5.8
1960	2,178,611	14.3
1970	2,249,071	3.2
1980	2,363,679	5.1

Population trends over the past 50 years for Riley County and the SMSAs are contained in Table II-9. Considerable irregularity is apparent in the 10-year growth trends for each area; however, certain patterns can be observed in each. For example, the Topeka area has consistently experienced the slowest growth rates of the group and Wichita, after growing rapidly in the 1940-60 period, has

TABLE II-9
POPULATION GROWTH IN RILEY COUNTY AND THE KANSAS SMSAs FOR CENSUS YEARS SINCE 1930

	1930	1940	1950	1960	1970	1980
Riley County	19,882	20,617	33,405	41,914	56,788	63,505
Percent change from prior census	-3.7	3.7	62.0	25.5	35.5	11.8
Kansas City SMSA (Kansas Portion	162,390	178,398	228,101	392,287	406,568	442,604
Percent change from prior census	15.6	9.9	27.9	72.0	3.6	8.9
Lawrence SMSA	25,143	25,171	34,086	43,720	57,932	67,640
Percent change from prior census	4.8	0.1	35.4	28.3	32.5	16.8
Topeka SMSA	116,867	119,083	129,313	165,424	180,619	185,442
Percent change from prior census	14.0	1.9	8.6	27.9	9.2	2.7
Wichita SMSA	172,234	175,324	253,291	381,626	389,352	411,313
Percent change from prior census	26.6	1.8	44.5	50.7	2.0	5.6

Source: Kansas Statistical Abstracts, various issues.

since moved into a period of population stability. A similar pattern holds for the Kansas City, Kansas area. Somewhat conversely, the Lawrence SMSA has continued to experience quite rapid growth over each of the past four censuses.

For a given participation rate, the labor force moves proportionately with population changes. Based upon past trends, the total labor force will grow slowly over the next decade in each of the SMSAs except Douglas County. This interpretation should be viewed with caution, however, because of the close relationship between labor force and population and employment opportunities. Thus, if one or more of the Kansas SMSAs experiences substantive growth in high-tech industries over the next decades, it may induce short-term employment shortages. However, the migration of workers from less advantaged areas to the sites of job opportunities should minimize over time the deleterious impact of the slow-growth scenario presently characterizing the population pattern in most Kansas urban areas.

Five-Year Projection of the Kansas Labor Force by Age Group

Perhaps surprisingly, no up-to-date comprehensive population forecasts exist for Kansas. Therefore, in order to project the size of the labor force, it is first necessary to develop a set of population parameters for the state. This task involves projecting current population by age groups, taking into account expected mortality rates and migration trends.

Recent migration patterns for Kansas are outlined in Table II-10. The data are percentages of the total workforce. From the table, it is apparent that considerable mobility exists within the Kansas labor force, with nearly one fifth of the workers leaving the state during the five-year period from 1975-79. However, an even greater portion of workers entered the state during this period creating, as a result, net inmigration. For each two-year period contained in the table, net migration percentages are very low, reflective of the near offset between inflows and outflows. Of course, it may be possible that aggregated

migration figures conceal significant migratory patterns among certain subgroups of the population. This possibility is often difficult to investigate, however, due to substantial problems in data collection of migration and lags in its availability. A further point to note is that migration patterns, like the labor force participation rate, are often an economic phenomenon, i.e., migration is often induced by job opportunities elsewhere or lack of such possibilities at a workers present location.

Table II-10
MIGRATION TO AND FROM KANSAS: 1975-1979
(Percentages of the total workforce)

	Immigration	Outmigration	Net
1975-76	5.2	5.0	0.2
1976-77	5.4	4.6	0.8
1977-78	4.8	4.9	-0.1
1978-79	5.8	4.9	0.9
Total	21.2	19.4	1.8

Because of the small magnitude of past net migration percentages and the difficulty in projecting future migration trends without knowing future economic conditions in Kansas and the other states, it was assumed in making Kansas population projections that net migration would be zero for each age group over the 1980-87 period.

Projections for 1981 by five-year age groups for the Kansas adult population are contained in part (a) of Table II-11. the projections reveal that, although total growth in the state's working age population is expected to be only 1.3 percent, significant changes are likely to occur in the age composition of the population. These changes are primarily reflective of movement across age groups by the baby-boom generation. In particular, the number of young Kansas adults--those ages 16-24--is expected to decline nearly 20 percent by 1987. These reductions, though, are likely to be more than offset

TABLE II-11

a) PROJECTED POPULATION FOR KANSAS IN 1987

Age Group	1980 Population	1987 Population	Percent Change
16-19	179,398	140,465	-21.7%
20-24	232,788	192,356	-17.4
25-29	202,671	233,528	15.2
30-34	171,947	213,191	24.0
35-39	135,209	182,256	34.8
40-44	114,441	145,268	26.9
45-49	112,515	116,092	3.2
50-54	118,914	105,817	-11.0
55-59	119,932	107,972	10.0
60-69	200,241	199,767	0.1
70 & over	212,055	186,429	-12.1
Total Population 16 and over	1,800,111	1,823,141	1.3%

b) PROJECTED CIVILIAN LABOR FORCE BY SEX FOR KANSAS IN 1987

	Projected 1987 Civilian Labor Force		Percent Change From 1980		
Age Group	Male	Female	Male	Female	Total Labor Force
16-19	40,415	39,760	-21.2%	-14.3%	-17.9%
20-24	76,096	65,917	-18.1	-14.1	-16.3
25-29	108,033	76,992	16.6	17.7	17.0
30-34	100,245	68,871	25.3	27.2	26.1
35-39	85,526	60,924	37.8	33.7	36.0
40-69	254,052	189,875	- 1.4	6.8	2.0
70 & Over	11,889	7,888	-12.2	7.6	- 5.2
Total	676,256	510,227	4.0%	7.8%	5.6%

Sources: 1980 age data from 1980 U.S. Census Kansas General Population Characteristics, 1980 labor force data from KDHR, see Table II-4; projections made by the Institute for Economic and Business Research.

by marked increases in the number of people in the middle age brackets--those encompassing ages 25-44. As the table indicates, increases ranging from 25-35 percent are expected in these age groups. Finally, little change in population is expected in the 50-69 age class although some shifting among individual brackets is indicated.

Also important to bear in mind as a long-term trend is the large group of Kansans presently in the 0-7 years age bracket. This phenomenon, as discussed earlier, is a ripple effect of the baby boom, and, although it will not affect the labor force by 1987, its influence in the 1990s and into the twenty-first century will be marked.

Labor force projections for Kansas were derived from the population projections and are contained in part (b) of Table II-11. Although the population estimates are thought to be highly accurate, the labor force forecasts should be interpreted circumspectly because their construction necessitates inputing labor force participation rates for each age group. These rates, however, are quite dependent upon economic conditions which cannot be projected accurately to 1987. The male labor force projections were based upon the 1980 male labor force participation rates (see Table II-4). The rationale for this approach was based upon the recognition that male participation rates have not fluctuated widely in recent years except in reaction to significant exogenous shocks, such as military conscriptions. As noted, economic conditions in Kansas in 1980 were marked by the beginning of the severe 1980-82 recession, but in the immediately preceding years, the state had enjoyed several years of sustained prosperity. As such, 1980 was a transition year for the Kansas economy, and the male participation rates are probably reflective of average economic conditions. They would be expected to be slightly higher (lower) during an expansion (a recession).

In projecting the female workforce, participation rates for women in 1980 were adjusted upward in reflection of trends towards increasing female participation. The adjustments were made according to increases in participation rates by age group recorded for the 1970-80 period and upon recommendations provided by University of Kansas labor force experts. The largest adjustments were made for the younger age groups--a reflection that the work habits of older Kansans are relatively implanted.

Examining the projections themselves indicates that the total labor force is expected to grow 5.6 percent from 1980-87. The larger increase is in the female workforce, which is expected to grow 7.8 percent compared to a projected 4.0 percent growth for males. Distribution of the labor force among age groups is reflective of the population trends identified earlier. Substantial declines in the numbers of both male and female young workers is indicated, though this trend is more than offset by a major increase in the number of young-to-middle-aged workers. The number of males in the "mature worker" category--those aged 40-69--is expected to decline slightly, but a modest increase is suggested in the number of female workers in this category.

The 1987 population and labor force projections suggest a number of important inferences:

- Although the state's working age population is likely to grow only about 1.3 percent, the labor force, reflecting higher female participation rates and the movement of the baby-boom group into higher participation age brackets, is apt to increase more rapidly--an estimate of 5.6 percent--over the period. In turn, these figures suggest the need for some job expansion in the state to meet the requirements of the larger workforce. However, by historical standards, the projected labor force growth is not large. For example, growth during the 1970-77 period, a time of relatively rapid expansion, the Kansas labor force grew by 22.4 percent. Therefore, labor force shortages may become a problem in Kansas during the next several years if the state's economy moves into a sustained, expansionary phase.

- The movement of more workers into the high productivity, middle age brackets, with fewer very young and very old workers, suggests that the 1987 workforce will be more skilled and relatively more productive than the present and recently past workforces.

- Continued increases in the rate of female labor force participation sharpens the need to create job opportunities in the state for women and to focus training of female workers away from low-pay, low-skill occupations to the higher-skill, technical and professional occupations which are apt to face the greatest demand increases in the ensuing decades.

A Five-Year Projection of Professional and Technical Workers Produced by Kansas Post-Secondary Institutions

As discussed earlier, high-technology firms require greater-than-average proportions of skilled and technically-oriented workers. In addition, they demand high overall quality in their workforce. As such, the magnitude and types of skills available in the workforce are, perhaps, an even more important factor in attracting high-tech firms than is overall labor force availability. The types of skills and occupations available in the present workforce were assessed in an earlier section to this report. The general finding derived from that examination was that the state does not currently have a large inventory of workers with high-tech related skills. This section looks at the short-term prospects for generating additional skilled and professional workers from the state's post-secondary educational institutions. This investigation is relevant to the issue of Kansas' high-tech potential because a state's ability to consistently produce needed supplies of workers with desired skills and specializations is an important element in attracting and retaining businesses, e.g., a reserve of such workers enables businesses to reduce recruitment costs and develop a stable workforce.

The methodology employed in making this assessment involved developing a five-year projection of output from Kansas' post-secondary institutions. Output, measured in terms of number of degrees awarded by type of degree, was projected individually for each Regents institution and jointly for the four-year independent colleges and universities; community colleges and private two-year institutions; and vocational institutes.

The rationale for this approach is that Kansas post-secondary educational institutions represent the principal and most readily available source of skilled and professional workers for Kansas firms. As such, the projections contained in this section represent an approximate inventory of the number and types of new, educated workers from which Kansas firms can conveniently draw over the next several years.

The pragmatic significance for Kansas of the new worker inventory projection concept is enhanced by noting that most students in Kansas higher education originate from within the state. Specific figures on proportions of home-grown students are as follows: Regents institutions--84 percent, private colleges and universities--65 percent, and community colleges--92 percent. These facts suggest that most Kansas graduates would remain in the state if sufficient job opportunities existed.

Differences in the nature and magnitude of data available for the various post-secondary educational programs in the state necessitated use of several alternative projection methodologies. In particular, because future graduates from four-year degree programs for the next few years are already enrolled, it was possible to project bachelors degree awards from 1983-86 on the basis of Fall 1982 enrollments for each Regents institution and for the other four-year universities. Graduates for 1987--the fifth and final year to be projected--were estimated by trend regression analysis. Use of regression analysis was also necessary to project the number of associate degrees to be awarded from Kansas' two-year colleges for 1983-87 because of the shorter time required to earn these degrees than needed to attain four-year degrees. No significant short-term trends were discernible for program completions from Kansas area vocational institutions, and the number of degrees and completions from these programs was estimated to be the simple average of the number of program completions in recent years.

Finally, the averaging method was also necessarily employed in projecting professional and graduate degrees to be awarded from Kansas institutions for 1983-87. Problems here included the indeterminate length of many programs and the impossibility, based on available data, of determining students' stages of matriculation within a program. Because these types of programs generally have limited enrollments which exhibit little annual fluctuation, few projection problems are created through the use of averages.

In all cases for which degree awards are broken down by type, their projections were made by computing the proportion of total degrees comprised by each degree type for each institution or groups of institutions and then by multiplying the projected total number of degrees by these proportions.

Results derived from these various projecting techniques are presented below in Tables II-12 through II-15 which, respectively, contain projections for bachelors degrees, graduate and professional degrees, associate degrees, and vocational degrees.

Table II-12 is a summary of Appendix Table A-7 which contains projections by degree type for each Regents university, Washburn University, and the total for four-year independent colleges and universities. The projected number of total degree awards in Table II-12 should be highly accurate because, for each year except 1987, future degree recipients for 1983-87 are already in the post-secondary educational "pipeline." The accuracy of the type-of-degree projections depends upon the constancy over the next five years of the current pattern of degree distribution by type.

According to the estimates in Table II-12, more than 59,000 bachelors degrees will be awarded from Kansas universities from 1983-87. Output of degrees is expected to decline in each year after 1983, with the exception of a mild upturn in 1986. As can be seen in Table A-7 in the Appendix, the trend towards declining numbers of undergraduate degrees holds for each Regents

TABLE II-12

NUMBER OF BACHELORS DEGREES BY TYPE TO BE AWARDED FROM KANSAS UNIVERSITIES: PROJECTIONS TO 1987

Year	Total	Business	Education	Science	Mathematics	Health	Engineering	Social Sciences
1983	12,468	2,577	2,024	882	85	1,126	963	818
1984	12,191	2,574	2,002	872	87	1,149	929	812
1985	11,502	2,381	1,861	800	79	1,028	940	760
1986	11,675	2,416	1,860	816	81	1,103	950	772
1987	11,489	2,388	1,839	813	80	1,089	920	765
Total	59,325	12,336	9,586	4,183	412	5,495	4,702	3,927
Percent of total degrees awarded		20.8	16.2	7.1	0.7	9.3	7.9	6.6

Projections by the Institute for Economic and Business Research

Sources: Kansas Legislative Research Department Kansas Postsecondary Education Profile, Second Edition, 1983, and Kansas Higher Education Enrollment Report, Fall 1982.

university except the University of Kansas (KU) and Wichita State University (WSU) at which the numbers are projected to remain relatively stable over the five-year period. Some decline in degree production is expected for the group of independent universities as well. These projected declines are quite consistent with recent decreases in the number of graduating seniors in the state.

Business degrees are expected to account for over one fifth of the total bachelors degrees awarded over this period with KU and Kansas State University (KSU) being the primary producers. However, as a proportion of the total degrees issued within the university, Emporia State University (ESU) and Fort Hays State University (FSU) have more dominant business programs.

Education degrees are expected to be second largest, totaling nearly 9,600 over 1983-87. As a group, the independent universities will produce a plurality of these degrees.

High-tech related degrees, those in engineering, the sciences, and mathematics, do not presently constitute major portions of the total number of bachelors degrees awarded by Kansas universities. If this pattern continues, approximately 4,700 new engineering degrees, 4,200 new science degrees, and 400 new math degrees will be issued during 1983-87 by Kansas universities. Almost all engineering degrees issued in the state presently emanate from KSU, KU, WSU, and Pittsburg State University (PSU). Although all the universities have programs in the sciences, KSU and KU are the primary degree issuers. No university in the state presently issues a significant number of math degrees.

Graduate and professional degree projections for Kansas are contained in Table II-13. The state's most significant graduate programs are at KU and KSU and, to a lesser extent, at WSU. Graduate programs do exist at each of the other Regents institutions, but they are concentrated primarily in business, education, library science, and other fields not closely related to high-tech.

TABLE II-13

PROFESSIONAL AND GRADUATE DEGREES TO BE AWARDED FROM KANSAS UNIVERSITIES: PROJECTIONS TO 1987

	GRADUATE					PROFESSIONAL				
	1983	1984	1985	1986	1987	1983	1984	1985	1986	1987
Emporia State University	343	336	340	340	340					
Fort Hays State	164	183	174	174	174					
Kansas State University	1,003	935	969	969	969	101	97	99	99	99
Pittsburg State University	248	265	257	257	257					
University of Kansas	1,342	1,486	1,434	1,434	1,434	173	167	170	170	170
Wichita State University	470	474	472	472	472					
Washburn University	12	14	13	13	13	167	165	166	166	166
Four-Year Private Universities	7	7	7	7	7					
Totals	3,629	3,700	3,666	3,666	3,666	441	429	435	435	435

Projections made by the Institute for Economic and Business Research

Data Sources: Kansas Legislative Research Department, Kansas Postsecondary Education Profile, Second Edition, 1983 and Kansas Higher Education Enrollment Report, Fall 1982.

Graduate degrees (masters, specialist, and Ph.D.) awarded from Kansas unversities for each year from 1983-87 are expected to total in the range from 3,600-3,700. About 1,400 or 39 percent of these degrees will be produced from KU, with nearly 1,000 or about 27 percent being awarded at KSU.

Comprehensive projections by type of masters degree were not made, but, in terms of high-tech fields, 146 masters degrees in engineering were awarded over the past academic year (KU--75, KSU--42, WSU--29) and 25 Ph.D. degrees (KU--14, KSU--10, WSU--1). A total of 63 masters and 31 doctorates were also awarded in the physical sciences with KU being the largest grantor of each. Masters and doctorates are also awarded at KU and KSU in the biological sciences (masters only at WSU, PSU, ESU, and FSU), and, while many of these degrees emanate from high-tech related fields (aspects of cell biology, physiology, biochemistry, microbiology, and radiation biophysics), it is impossible to determine exactly how many biology degrees are directly involved.

Professional degrees (those in medicine, veterinary medicine, and law) are exclusively awarded in Kansas from KU, KSU, and Washburn University. Combined, these are expected to total about 435 for each year through 1987. These types of professional skills, however, are probably ancillary to high-technology industries.

Summary information on projected two-year or associate degrees to be awarded from Kansas colleges is contained in Table II-14. Appendix Table A-8 contains similar information broken down by community colleges, private two-year colleges, and the Kansas Technical Institute. Total degrees awarded by these institutions have been on the increase in recent years, and the accuracy of the Institute's projections is dependent upon this trend continuing for the next few years as well. Even though the college-age population will decline over the

next few years, enrollments at two-year institutions may not be affected significantly because they tend to draw substantial numbers of students from a wide range of age groups, not just those in the 17-21 year old bracket.

Table II-14

NUMBER OF ASSOCIATE DEGREES BY TYPE TO BE AWARDED FROM KANSAS INSTITUTIONS: PROJECTIONS TO 1987

(Percent distribution by degree type based on 1980-81 school year)

Year	Total[†]	Business	Liberal Studies	Health	Engineering
1983	4,799	272	2,754	557	145
1984	4,895	250	2,801	573	150
1985	5,006	291	2,848	600	157
1986	5,103	298	2,895	616	163
1987	5,199	306	2,942.	633	167
TOTAL	25,002	1,477	14,240	2,979	782
Percent of Total Degrees Awarded		5.8	57.0	11.9	3.1

[†]Washburn, Regents institutions, and private four-year schools also offer associates degrees which are not included in these totals. For the 1980-81 school year, 458 associates degrees were granted by these schools.

Projections by the Institute for Economic and Business Research

Information Sources: Kansas Legislative Research Department
Kansas Postsecondary Education Profile, Second Edition, 1983 and Kansas Higher Education Enrollment Report, Fall 1982.

Institute projections are that associate degrees awarded by the two-year colleges will total about 28,000 over 1983-87, with the output tending to increase annually. Note that some double counting is likely in these figures because many two-year degree recipients go on to earn four-year degrees at other institutions and, hence, are included in those projections as well. As such, it may be misleading to aggregate degrees across the various types.

Double-counting problems are highlighted by noting that liberal studies, a preparatory program for the bachelors degree, is the degree type projected to be awarded most frequently (56.5 percent of the time) over the next five years by these institutions. Degrees in health-related fields are expected to number approximately 2,430 or 9.8 percent of the total projected awards. By comparison, awards from 1983-87 in engineering fields will be comparatively few--only about 1,125 or 4.5 percent. About half of these will be awarded from the Kansas Technical Institute.

Finally, in respect to vocational programs, no significant trends in program completions are discernible based upon examination of recent data. Therefore, no unique projections for individual years were possible. The data in Table II-15 represent estimates for the five-year total for 1983-87 and were based on averages computed for the prior years. Program completions are expected to total about 17,490 with nearly one half in industrial education programs and another 25 percent in health fields. These training programs often represent terminal degrees for their recipients, and, as such, they are primary sources for skilled craftsmen and operatives, both of which are important to high-tech development.

Total degrees projected to be awarded from Kansas post-secondary institutions for the period 1983-87 are summarized in Table II-16. As discussed earlier, these totals cannot be summed to yield a grand total. Nonetheless, the table provides some indication of the magnitude of new professional and skilled workers who might conceivably enter the Kansas labor force over the next five years. Interestingly, a large portion of these new well-educated entrants will be women. As Table II-17 indicates, women currently comprise the majority of students matriculating at the independent colleges, the two-year universities, and most of the Regents universities. A challenge facing policy makers will be to focus this talent in the direction of high-tech occupations.

TABLE II-15

PROJECTED TOTAL NUMBER OF VOCATIONAL-TECHNICAL DEGREES TO BE AWARDED FROM KANSAS INSTITUTIONS, 1983-87

Field	% of Total Degrees by Field	Projected # of Degrees
TOTAL	100 %	17,490
Agriculture	2.5	440
Distributive education	1.5	263
Health	24.7	4,320
Occupational home economics	4.0	700
Office occupations	14.8	2,595
Technical education	2.8	490
Industrial education	49.6	8,680

Projections made by the Institute for Economic and Business Research

Data Source: Kansas Legislative Research Department, Kansas Post-Secondary Education Profile, Second Edition, 1983.

TABLE II-16

SUMMARY OF TOTAL DEGREES PROJECTED TO BE AWARDED FROM KANSAS POST-SECONDARY INSTITUTIONS FOR 1983-87

Degree Type	Projected Total awarded: 1983-87
Bachelors	59,325
Graduate	18,327
Professional	1,391
Associate	25,002
Voc-Ed	17,490

TABLE II-17

RECENT ENROLLMENT BY SEX AT SELECTED KANSAS POST-SECONDARY INSTITUTIONS

	Male	Female
Regent's Institutions:		
Emporia State	.42	.58
Fort Hays State	.43	.57
Kansas Technical Institute	.75	.25
Kansas State University	.57	.43
Pittsburg State	.38	.62
University of Kansas	.52	.48
Wichita State	.49	.51
Washburn University	.50	.50
Community and Private Two-Year Colleges	.40	.60
Independent Four-Year Colleges	.49	.51

Sources: Kansas Board of Regents; Post Secondary administration, Kansas Department of Education; and Comparative Guide to American Colleges, 1979

D. Summary of Principal Findings

Four of purposes have defined this chapter's central concern: 1) to inventory the state's present labor force by totals, age, sex, and high-tech industry occupation; 2) to identify recent trends within the labor force; 3) to forecast labor force growth, and 4) to project labor force additions emanating from Kansas' post-secondary educational institutions.

The inventory of Kansas' current labor force revealed the following dominant characteristics:

- that both the state's population and workforce are among the slowest growing in the nation,
- that Kansas' workforce is slightly older than the nation's,
- that the rate of female participation in the state's labor force is below the national average,
- that Kansas has relatively few workers with high-tech skills and very few women in high-tech occupations, and
- that the majority of high-tech workers are concentrated in the state's urban areas.

Recent trends in the Kansas labor force are characterized by the following developments:

- that the state's northeast corridor is the most rapidly growing area for employment,
- that the rate of female participation in the workforce is increasing, and
- that an increasing number of workers in the state's labor force are entering the middle age bracket.

Forecasts of the anticipated rates of growth from 1980-87 for the state's population and workforce reveal:

- that the population will increase by about 1.3 percent over the period from 1980-87; the workforce by approximately 5.6 percent over the same period.

The disparity between these rates of growth is accounted for by the increasing rate of female participation in the labor force and the movement of the baby-boom generation into that age bracket most highly employed. These influences will swell the state's workforce beyond the dimensions suggested by normative population growth.

Projected graduations for Kansas post-secondary educational institutions interpreted within a high-tech context suggest the following conclusion:

·that a comparatively small proportion of the total of degrees issued will be in high-tech related fields.

A synthesis of this host of analytic findings provides a profile of Kansas' potential for high-tech development. Among its prominent features are two major conclusions with significant implications for state policy- and decision-makers:

1. Given the forecasted increase in female participation in the state workforce, this group represents the state's best opportunity for training a substantial portion of its labor force in high-tech skills.

2. Presently, no major high-tech base exists in Kansas outside the Wichita aircraft industry. Notably, neither Riley County or the Lawrence area with their great potential for attracting high-tech industrial development have been exploited as high-tech magnets.

III. Employment in High-Technology Occupations and High-Technology Industries: Projections for Kansas to 1990.

A. Introduction

As its title denotes, this chapter develops high-technology employment projections for Kansas to 1990. Two distinct sets of projections are made. One set is for the 33 high-tech oriented occupations discussed earlier and identified in Table II-6. The other is for the high-technology industries identified in Table II-7. Both sets develop alternative "high-trend" and "low-trend" scenarios based upon different assumptions regarding future economic conditions. The basic input to both projected sets is a base of national industrial and occupational employment forecasts to 1990 prepared by the Bureau of Labor Statistics (BLS).[8] The BLS forecasts were then adjusted to make them more applicable to the Kansas situation. Specific forecasts for years beyond 1990 were not made due to lack of data and the extremely dubious nature of such long-term projections.

The purpose of these projections is to provide an indication of the types of labor demands which high-technology may place on Kansas. Alternative trends are projected in recognition of the difficulty of accurately predicting long-run economic conditions. In many respects, Kansans will determine, through the types of economic policy and high-technology initiatives they pursue, whether high-growth or low-growth trends will more closely approximate reality.

B. Projected Employment by High-Technology Occupations

Employment trends in the U.S. and Kansas for the 33 high-tech occupations from 1970-80 with alternative projections for 1980-90 are contained in Table III-1. The U.S. projections are those computed by the BLS. The high-trend pro-

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8 Department of Labor, Bureau of Labor Statistics Economic Projections to 1990, Bulletin 2121, March 1982, and Occupational Projections and Training Data: A Statistical Supplement to the 1982-83 Occupational Outlook Handbook, Bulletin 2202, December 1982.

jections are based upon rates of economic growth for the rest of the decade comparable to those experienced during the prosperous 1955-68 period whereas the low-trend projections are more reflective of the less robust economy which characterized the 1973-80 period. Both trends assume a middle-range growth in the labor force over the projection period. In actuality, the two alternative trends often produce quite similar sets of projections. An additional set of high-trend projections has also been calculated by the BLS but was rejected for use in this study because it appears, in light of recent economic developments, to be excessively optimistic. The interested reader is urged to consult the BLS publications referenced in the first footnote of this chapter for further discussion of the key assumptions involved in making the national projections.

In making projections for Kansas, the national forecasts for each occupation were modified to reflect past differences in growth trends between the U.S. and Kansas. The modification involved computing the percent change in employment from 1970-80 for each occupation for the U.S. and Kansas and adjusting the 1980-90 projected national growth rates by the difference in the 1970-80 actual growth rates between the U.S. and Kansas, i.e., for each occupation: Kansas projected 1990 percent growth in employment equals U.S. projected 1990 percent growth in employment plus the difference between 1970-80 Kansas percent growth in employment and 1970-80 U.S percent growth in employment.

For certain occupations, this adjustment procedure yielded nonintuitive results primarily due to unrealistic 1970-80 percentage employment growth rates for Kansas caused by the small existing base of workers in the occupation tending to generate large employment swings on a percentage basis. When these instances occurred, the adjustment mechanism was omitted, and the U.S. projections were directly applied to Kansas.

Examination of the past growth trends for high-tech occupations provided in Table III-1 indicates that employment in the 33 selected occupations grew by 17,871 workers or 76.9 percent in Kansas between 1970-80. The Kansas growth rate compares favorably with the 42.9 percent growth recorded in the U.S. for these occupations over the same period. The proportion of total jobs in Kansas provided by the high-tech occupations rose from 2.6 percent to 3.5 percent over this period. Kansas' lack of a substantial high-tech base is reaffirmed, however, by noting that the state's high-tech employment proportionately remained well below the national proportions, which rose from 3.6 to 4.1 percent during the '70s.

The Institute for Economic and Business Research projections indicate continued rapid growth in demand for high-tech occupations in Kansas between 1980-90. High-trend projections call for 56.9 percent growth over the '80s while, under the low-trend projections, 53.6 percent growth is expected. If these projections materialize, the high-tech occupations will account for 5.4 percent of the total jobs in Kansas under the high-trend scenario and 5.3 percent under the low-trend.

Under the high-trend, 23,404 new jobs are expected to be created in the 33 high-tech occupations. Job creations would be 22,051 under the low-trend. The relative homogeneity of the projections under the two scenarios is, in part, a reflection of the high degree of immunity from cyclical perturbations which these types of jobs tend to enjoy.

Examination of growth trends for individual occupations can often be misleading due to the small-base problem alluded to earlier. For this reason, the occupations listed in Table III-1 were grouped into four classifications (engineers, scientists, computer personnel, and other technical occupations) to facilitate further analysis. Information on employment by these classifications is contained in Table III-2 which presents the total number of jobs in each

TABLE III-1

EMPLOYMENT IN HIGH TECHNOLOGY OCCUPATIONS FOR THE UNITED STATES AND KANSAS FOR 1970 AND 1980 WITH PROJECTIONS FOR KANSAS TO 1990

	US Employment (thousands)			Kansas Employment			Projected Kansas Employment 1990 Low		1990 High	
OCCUPATION	1970	1980	% Change	1970	1980	% Change	Trend	% Change	Trend	% Change
Aeronautical and Astronautical Engineers	68.9	68.0	-1.31%	1,569	2,235	42.45%	4,184	87.2%	4,269	91.0%
Chemical Engineers	52.6	55.5	5.51	381	344	-9.71	372	8.0	381	10.8
Civil Engineers	175.1	165.4	-5.54	2,161	2,435	12.68	3,504	43.9	3,538	45.3
Electrical Engineers	286.0	326.7	14.23	1,533	2,074	35.29	3,240	56.2	3,289	58.6
Industrial Engineers	188.0	115.9	-38.35	1,459	1,985	36.05	2,497	25.8†	2,541	28.0†
Mechanical Engineers	181.3	212.9	17.43	1,035	1,467	41.74	2,245	53.0	2,280	55.4
Metallurgical Engrs.	15.5	15.4	-0.65	97	100	3.09	136	36.1	138	38.4
Mining Engineers	4.6	6.1	32.61	12	40	233.33	55	37.7†	57	42.6†
Petroleum Engineers	11.1	17.9	61.26	215	415	93.02	737	77.5	731	76.1
Agricultural Scientists	12.9	19.8	53.49	127	392	208.66	428	9.1†	437	11.5†
Biological Scientists	29.7	44.8	50.84	245	350	42.86	371	6.1	382	9.0
Chemists	110.2	93.6	-15.06	693	740	6.78	1,054	42.4	1,070	44.6
Geologists	20.1	39.8	98.01	399	640	60.40	833	30.1†	836	30.7†
Medical Scientists	--	8.1	--	--	174	--	201	15.6†	202	15.8†
Physicists	22.3	20.5	-8.07	48	32	-33.33	36	12.5†	37	14.8†
Mathematicians & Other Math Specialists	7.8	17.7	126.92	10	91	810.00	103	13.0†	105	15.3†
Statisticians	23.0	26.5	15.22	110	201	82.73	235	16.7†	240	19.3†
Drafters	294.5	321.6	9.20	2,329	3,701	58.91	6,573	77.6	6,584	77.9
Electrical and Electronic Technicians	158.9	359.5	126.24	888	1,899	113.85	2,228	17.3	2,302	21.2
Indust Engineering Tech	20.9	32.4	55.02	303	39	-87.13	48	24.0†	49	25.7†
Mechan Engineering Tech	13.5	48.5	259.26	63	173	174.60	217	25.5†	222	28.1†
Med Techs & Lab Techs	119.4	193.2	61.81	1,263	2,639	108.95	4,792	81.6	4,803	82.0
Tool Programmers	3.2	11.9	271.88	30	72	140.00	83	15.8†	85	17.9†
Computer Programmers	163.9	228.2	39.23	1,020	3,008	194.90	4,479	48.9†	4,566	51.8†
Comp Systems Analysts	81.0	204.6	152.59	429	1,487	246.62	2,494	67.7†	2,549	71.4†
Computer Operators	--	184.6	--	--	4,215	--	7,233	71.6†	7,376	75.0†
Peripheral EDP Equipment Operators	--	48.7	--	--	161	--	232	44.0†	244	51.6†
Electricians	483.1	560.3	15.98	4,150	6,274	51.18	9,706	54.7	9,869	57.3
Data Processing Machine Mechanics	32.0	83.0	159.38	271	467	72.32	902	93.2†	938	100.8†
Office Machine Repairs	40.0	55.4	38.50	454	453	-0.22	724	59.8†	747	65.0†
Tool & Die Makers	206.8	166.0	-19.73	1,885	1,970	4.51	2,602	32.1	2,656	34.8
Electrical & Electronic Assemblers	--	233.1	--	--	773	--	904	17.0†	917	18.6†
Numerical Control Machine Operators	--	52.7	--	--	64	--	74	16.1†	76	19.2†
TOTAL	2,826.3	4,038.3	42.9	23,239	41,110	76.9	63,161	53.6	64,314	56.9

†unadjusted national projection

TABLE III-2

EMPLOYMENT IN KANSAS BY HIGH-TECHNOLOGY OCCUPATIONAL CATEGORIES WITH PROJECTIONS TO 1990

	ACTUAL EMPLOYMENT			PROJECTED EMPLOYMENT			
	1970	1980	Percent Change	1990 High-Trend	Pecent Change	1990 Low-Trend	Percent Change
Engineers	8,462	11,095	31.1%	17,225	55.3%	16,611	49.7%
Scientists	1,632	2,620	60.5	3,307	26.2	3,260	24.4
Computer personnel	1,720	9,338	442.9	15,673	67.8	15,339	64.3
Other Technical Occupations	11,425	18,057	58.0	28,309	56.8	27,951	54.8
Total	23,239	41,110	76.9	64,514	56.9	63,161	53.6

classification for 1970 and 1980 and the projected numbers for 1990 and in Figure III-1 which depicts comparative percentage growth information for the classifications.

Computer-related positions were the most rapidly growing of all high-tech oriented occupations between 1970-80, recording an astronomical 442.9 percent increase during this period. These positions are also expected to grow most rapidly from 1980-90, although the rate of increase is expected to be only about 65 percent. Even at this reduced growth rate, about 6,000 additional positions in the computer field are expected to be created in Kansas between 1980-90.

Engineering occupations grew only 31.1 percent in Kansas between 1970-80, a comparatively slow rate. More substantial growth in the 50-55 percent range is expected, however, in the '80s. If this pattern materializes, Kansas will have about 6,000 more positions for engineers in 1990 than in 1980.

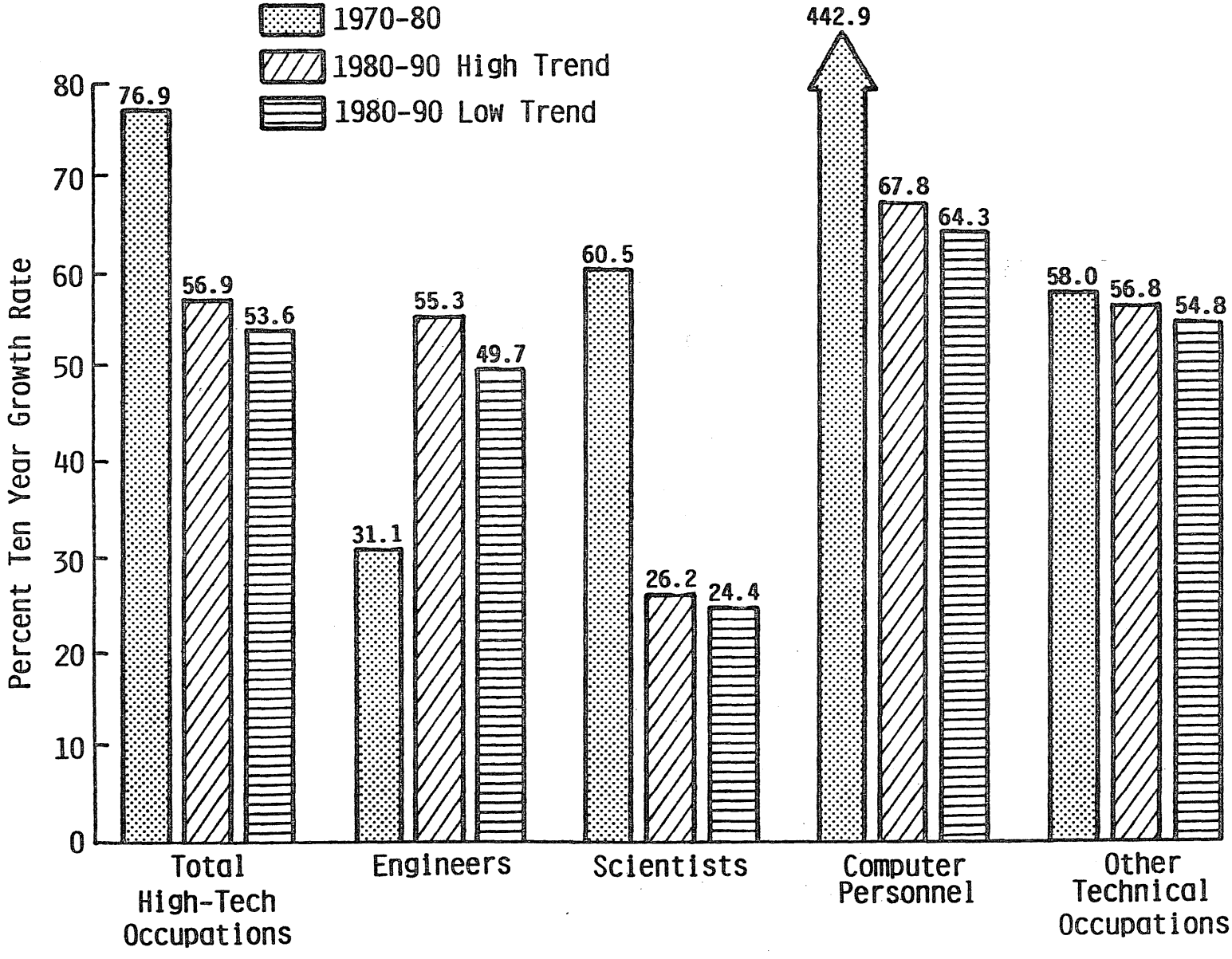
Demand for skilled technicians in Kansas is also expected to grow rapidly during the '80s. About 10,500 more positions are expected to exist in 1990 compared to 1980. This increase translates into approximately a 55 percent growth rate for the decade, a rate comparable to that experienced in this category between 1970-80.

Somewhat conversely, growth in demand for scientists in high-technology fields is expected to be comparatively slow in Kansas between 1980-90 with only about 25 percent growth (650 new jobs) being expected for the decade--a much slower rate of growth than the 60-65 percent recorded for these occupations during the '70s.

C. Employment Projections for Selected High-Technology Industries

Developed within this section is a set of projections for overall employment growth and growth within selected occupations for a group of high-technology industries. The industries chosen for this purpose conform closely, but

Figure III-1 GROWTH RATES FOR HIGH-TECH OCCUPATIONAL GROUPINGS IN KANSAS FOR 1970-80 WITH PROJECTIONS FOR 1980-90 GROWTH RATES



not exactly, to that group of industries inventoried in Table II-7. Differences exist because Bureau of Labor Statistics (BLS) industry employment forecasts[9]--which provide the basis for the Institute's projections--do not themselves conform completely to the SIC-industrial decomposition. Therefore, it was not possible to provide projections for some of the industries listed in Table II-7.

Kansas industry employment projections were developed using a methodology analogous to the approach used in deriving the Kansas occupational projections. Specifically, whenever possible, the national projections were adjusted to reflect differences in past growth trends between the U.S. and Kansas. Unfortunately, for most of the industries analyzed, it was not possible to establish past employment growth trends for Kansas because, in many cases, the industries did not exist on any significant scale in the state prior to 1970.

Table III-3 contains total employment projections to 1990 for 18 high-technology industries for which projection data were available. Once again, high-trend and low-trend projections are used. The economic assumptions underlying each are the same as those discussed in Section B of this Chapter.

The 1969-79 employment growth rates in the U.S. for these industries indicate varying states of economic health for these industries over the decade. Among the high-tech manufacturing industries, electronic computing equipment grew very rapidly as did drugs and medicines and some types of electrical machinery. In contrast were a number of industries with high-tech elements which lost ground during the '70s. For example, aircraft and parts and ordnance declined, a development attributable to the end of the Vietnam War effort. Less

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9 Department of Labor, Bureau of Labor Statistics, Economic Projections to 1990, Bulletin 2121, March 1982.

TABLE III-3

TEN-YEAR GROWTH RATES IN SELECTED HIGH-TECHNOLOGIES FOR THE UNITED STATES AND KANSAS WITH PROJECTIONS FOR KANSAS TO 1990

	US Employment (thousands)			Kansas Employment			Projected Kansas Employment 1990 Low		1990 High	
INDUSTRY	1969	1979	% Change	1969	1979	% Change	Trend	% Change	Trend	% Cha
Ordance	175	75	-57.1 %	b	750[a]	-- %	1,020	36.00 %	960	28.(
Engines & turbines	112	145	29.5	na	375[a]	--	479	2.76	414	10.3
Office & accounting mach.	52	48	-7.7	na	1,750[a]	--	2,807	60.42	2,661	52.(
Electron. computing equip	224	350	56.3	na	750[a]	--	1,183	57.71	1,189	58.5
Other machinery except electrical	246	309	25.6	2,054	3,170	54.3	4,440	40.05[c]	4,737	49.4
Electrical machinery (industrial)	223	251	12.6	3,665	1,506	-58.9	1,842	22.31	1,890	25.5
Household appliances	187	180	-3.7	na	375[a]	--	400	6.67	396	5.5
Radio, TV, Communications equipment	565	472	-16.5	b	4,605	--	5,093	10.59	5,190	12.7
Other electrical mach.	125	180	44.0	970	2,352	142.5	2,274	-3.33	2,300	-2.2
Aircraft and parts	805	632	-21.5	33,097	40,415	22.1	66,733	65.12[c]	67,436	66.8
Scientific instruments	195	218	11.8	b	668	--	772	15.60	907	35.7
Photo equip & supplies	111	134	20.7	b	750[a]	--	806	7.46	851	13.4
Industrial chemicals (organic and inorganic)	296	323	9.1	2,394	2,198	-8.2	2,457	11.79[c]	2,512	14.2
Drugs and medicines	143	194	35.7	174	1,442	728.7	1,695	17.53	1,724	19.5
Soaps and cosmetics	123	140	13.8	1,387	1,750[a]	26.2	1,812	3.57	1,900	8.5
Agricultural chemicals	65	70	7.7	273	947	246.9	988	4.29	961	1.4
Misc. business services	1,691	3,149	85.9	4,045	6,138	52.5	6,370	3.78[c]	6,751	9.9
Engineering and architectural services	1,046	1,720	64.4	1,860	3,089	66.1	3,964	28.33	4,167	34.9

[a]value is the mean of an employment range.

[b]data not reported to avoid disclosure of information pertaining to the operation of specific firms.

[c]U.S. growth rate adjusted to reflect special Kansas trends.

na = information not reported for Kansas, indicating no significant Kansas base of this industry during the time considered

Sources: Industry employment data calculated from various issues of County Business Patterns, U.S. Census Bureau. Projections were adapted from Economic Projections to 1990, Bulletin 2121, Bureau of Labor Statistics.

easily explained are the employment retrenchments which occurred in office and accounting equipment; household appliances; and radio, TV, and communications equipment.

As discussed earlier, 1970 growth trends in Kansas cannot be charted for many of these industries. However, for those which could be so tracked, the fastest growers in Kansas were drugs and medicines, agricultural chemicals, and some types of electrical machinery. Although subject to considerable year-to-year volatility, aircraft and parts--Kansas' major high-tech industry--exhibited only moderate long-term growth over this period.

The 1990 projections contained in Table III-3 suggest the likelihood of considerable variability in growth rates during the '80s among these industries. Under either the high-trend or low-trend scenarios, 11-year employment growth rates in excess of 50 percent might be expected to occur for Kansas in the office and accounting machines, electronic computing equipment, and aircraft and parts industries.

Total employment growth in the U.S. is expected to increase 19.4 percent from 1979-90 within the low-trend scenario and 21.4 percent under high-trend conditions. On the basis of these benchmark growth rates, Kansas might expect above average employment growth in a number of other industries as well, including ordnance, other nonelectric machinery, and industrial electrical machinery. Conversely, little or no growth is expected in other electrical machinery, engines and turbines, soaps and cosmetics, and agricultural chemicals.

If these high-tech industries follow their projected growth rates, all except aircraft will remain comparatively small employers in Kansas in 1990. In fact, under the high-trend and low-trend scenarios, total employment in the 16 manufacturing industries listed in Table III-3, excluding aircraft, are projected to be only 28,592 and 28,085, respectively, by 1990. Either projected

figure amounts to an increase in jobs of only about 5,000 compared to what is estimated to have existed for these industries in 1979. Moreover, their projected total employment is only about 42 percent of what is expected in the state's aircraft industry by 1990 under either trend scenario.

Of course, the industries being projected here do not exhaust what is known as high-tech. Regardless, the data do illustrate that the levels of high-tech development anticipated under either scenario will not represent the answer to this state's economic conundrum. Therefore, Kansas must be successful in attracting high-tech expansion at a rate far greater than implied by these projections if the high-tech explosion is to have more than a minor effect on the state's economy.

All of these projections, however, should be interpreted somewhat cautiously. They are dependent upon the accuracy of the overall BLS projections, the continuance of past growth rate differentials between the U.S. and Kansas for certain industries, and, for others, on the similarity of growth rates between the nation and the state. In this sense, the projections might be best interpreted not as estimates of the growth rates Kansas actually will experience by 1990 but, rather, as an indication of the kinds of growth the state may realistically face if its economic development conforms approximately to the national average and to past trends.

Projection of Occupation Growth Within High-Tech Industry

It was also possible to develop employment projections to 1990 by occupation for each of the 18 selected high-tech industries. This task was accomplished through use of the BLS National Industry-Occupation Employment Matrix[10] which represents the proportion of total employment accounted for by each of 425 detailed occupations for 260 industries. The BLS Bulletin

[10] Department of Labor, Bureau of Labor Statistics, The National Industry-Occupation Employment Matrix, 1970, 1978, and Projected 1990, Bulletin 2086, April 1981.

referenced in the footnote below contains employment matrices for 1970 and 1978 as well as a projected matrix for 1990. Interested readers are urged to consult the BLS document for further information on construction of the matrices, limitations on their use, and projection methodology used in developing the 1990 matrix.

Armed with the proportional breakdown of occupations by industry provided by the matrices, with data on total employment by industry, and with the total industry employment projections discussed previously, estimates of the occupational requirements inventory for each of the high-tech industries as well as projections to 1990 were developed. Information on the occupational decomposition within high-tech industry can be very valuable because it illuminates the total occupational requirements of high-tech firms rather than merely highlighting their need for a few skilled occupations. However, to place reasonable limits on the required computations, breakdowns by each of the 425 occupations were not attempted. Instead, only high-tech occupations were studied individually, with other positions assigned to more general categories.

Regardless, the volume of data generated in computing these occupational inventories and 1990 projections under both trend scenarios remained quite substantial. As such, the occupational decompositions for individual industries are not presented in this report. Rather, occupational requirements for 1979 and projections to 1990, aggregated across all 18 high-tech industries, are presented in Table III-4. Also, because of its marked prominence in Kansas, occupational data for the aircraft industry is presented as well in Table III-5. Individual data for the other 17 industries may be obtained upon request from the Institute for Economic and Business Research.

The 18 selected high-tech industries employ a greater percentage of professional and technical (P&T) workers than does the typical firm. The actual difference, 25.6 percent versus 23.7 percent, is not large but is somewhat mis-

Table III-4

PROJECTED GROWTH TO 1990 IN SELECTED OCCUPATIONS WITHIN SELECTED HIGH-TECHNOLOGY INDUSTRIES IN KANSAS

Occupation	Kansas Employment				
	1979	1990 Low-Trend	Percent Change from 1979	1990 High-Trend	Percent Change from 1979
Total employment	73,030	105,135	44.0 %	106,946	46.4 %
Professional and technical	18,698	27,389	46.5	27,870	49.1
Engineers, Technical	7,797	13,186	69.1	13,377	71.6
Aeronautical	2,965	6,160	107.8	6,225	110.0
Chemical	209	271	29.7	273	30.6
Civil	358	501	39.9	521	45.5
Electrical	1,555	2,097	34.9	2,128	36.9
Industrial	954	1,526	60.0	1,547	62.2
Mechanical	1,128	1,794	59.0	1,823	61.6
Metallurgical	94	137	45.7	138	46.8
Sales	49	55	12.2	56	14.3
Other engineers	465	632	35.9	647	39.1
Life and Physical scientists	517	639	23.6	649	25.5
Engineering, science technicians	3,797	5,396	42.1	5,511	45.1
Computer specialists	1,262	1,495	18.5	1,511	19.7
Computer programmers	676	821	21.5	835	23.5
Computer systems analyists	463	551	19.0	560	21.0
Other professional and technical	3,210	4,108	28.0	4,201	30.9
Managers, officials, proprietors	5,586	7,804	39.7	7,951	42.3
Sales workers	1,029	1,549	50.5	1,582	53.7
Clerical workers	11,947	13,975	17.0	14,274	19.5
Stenographers, typists, secretaries	3,982	5,488	37.8	5,609	40.9
Office machine operators	1,221	1,076	-11.9	1,097	-10.2
Other clerical workers	6,741	7,409	9.9	7,570	12.3
Crafts and kindred workers	14,164	24,889	75.7	25,208	78.0
Construction crafts workers	1,587	2,449	54.3	2,499	57.5
Blue collar workers	2,851	4,544	59.4	4,599	61.3
Metalworking craft workers excluding mechanics	4,543	8,257	81.8	8,369	84.2
Mechanics, repairers, installers	4,266	8,478	98.7	8,577	101.1
Other crafts, kindred workers	543	700	28.9	784	44.4
Operators	18,140	25,785	42.1	26,191	44.4
Semi-skilled metalworking	3,317	4,298	29.6	4,378	32.0
Semi-skilled packing inspecting	3,304	4,629	40.1	4,692	42.0
Other operatives excluding transport	10,779	15,885	47.4	16,131	49.7
Transport equipment operatives	743	984	32.4	997	34.2
Service workers	2,432	2,614	7.5	2,723	12.0
Labors, except farm	1,036	1,132	9.3	1,155	11.5

leading because the statewide figures include a number of teaching and public service professionals in addition to those employed by industry. Under either growth scenario, the BLS matrix indicates only a slight increase to 26.1 percent in the proportion of P&T occupations in these industries by 1990. Nonetheless, projections call for a 45-50 percent increase in the number of P&T occupations in these industries by 1990.

Within the P&T category, above average occupation growth is expected for engineers. This group accounted for 10.7 percent of the total occupations in the high-tech industries compared to only 1.2 percent of total occupations statewide. From 1979-90, engineering jobs in Kansas for these industries are expected to increase by 5,387-5,580 jobs, approximately a 70 percent rate of growth.

The importance of skilled crafts workers and operatives to high-tech industry is reinforced by Table III-4 as well. They comprised 19.4 and 24.8 percent, respectively, of the total number of occupations in these industries. In both cases, these percentages are significantly above the statewide average. Crafts jobs are expected to increase rapidly in these industries during the '80s with projected growth in the 75 percent range, meaning nearly 11,000 new jobs. Operative positions are expected to grow at near the rate for total occupations--about 40-45 percent, or 8,000 jobs.

By comparing the overall projected employment growth in these industries with the projected change in each occupation, it is possible to preview what types of occupations will be in relatively greater demand as high-technology industry grows. Although for the most part this exercise is left to the reader, a few summary observations are made. For example, it is noteworthy that in these industries computer-related occupations are expected to increase at only about half the rate of overall employment. The fact that various computer-related jobs are expected to grow from 50-70 percent over all industries during

the '80s suggests that the extensive use of computers is already standard practice in high-tech industries and that most of the computer-related job growth in Kansas may occur outside of high-tech. Also notable is that near zero growth in clerical and other office jobs is expected, as these workers are being replaced by mechanical devices. Secretaries, however, are expected to remain in relatively high demand.

The occupational breakdown contained in Table III-5 for just the Kansas aircraft industry is quite similar to the 18 industry decomposition--another reflection of aircraft's dominant position within Kansas high-tech industry. On the basis of national forecasts and past trends, the Institute projects that engineering positions in the Kansas aircraft industry will increase 88-90 percent (about 5,000 jobs) from 1979-90. Not surprisingly, the biggest percentage increase will be for aeronautical engineers.

Computer-related jobs will grow only modestly relative to overall job growth in the industry. Conversely, extremely rapid growth, in excess of 100 percent, is expected in skilled craft occupations, with secretarial and operative positions also projected to rise rapidly.

D. Summary of Principal Findings

Kansas projections of employment to 1990 were made in this chapter for 1) 33 high-tech occupations across all industries, 2) total employment in each of 18 high-tech industries, and 3) employment by occupation within these industries. The principal findings are listed below.

- Although on a percentage basis high-tech employment grew faster in Kansas than in the U.S. between 1970-80, the Kansas high-tech base remains rather small, and high-technology's proportion of total employment in Kansas remains below that in the U.S.

- Under normal or average circumstances, a 53-57 percent growth in high-tech jobs is expected in Kansas during the '80s. This increase translates into 22,000-23,400 new jobs.

Table III-5

EMPLOYMENT BY OCCUPATION IN THE AIRCRAFT AND PARTS INDUSTRY
WITH PROJECTIONS TO 1990

Occupation	Kansas Employment				
	1979	1990 Low-Trend	Percent Change from 1979	1990 High-Trend	Percent Change from 1979
Total employment	40,415	66,733	65.1 %	67,436	66.9 %
Professional and technical	10,957	18,218	66.3	18,410	68.0
Engineers, Technical	5,597	10,524	88.0	10,635	90.0
Aeronautical	2,942	6,133	108.5	6,197	110.6
Chemical	48	73	52.1	74	54.2
Civil	101	167	65.4	169	67.3
Electrical	820	1,301	58.7	1,315	60.4
Industrial	663	1,161	75.1	1,173	76.9
Mechanical	760	1,308	72.1	1,322	74.0
Metallurgical	81	120	48.2	121	49.4
Sales	20	27	35.0	27	35.0
Other engineers	162	240	48.2	243	50.0
Life and Physical scientists	154	240	55.8	243	57.8
Engineering, science technicians	1,794	2,769	54.4	2,799	56.0
Computer specialists	687	834	21.4	843	27.7
Computer programmers	368	480	30.4	486	32.1
Computer systems analyists	242	280	15.7	283	16.9
Other professional and technical	1,621	2,309	42.4	2,333	43.9
Managers, officials, proprietors	2,777	4,531	63.2	4,579	64.9
Sales workers	186	487	161.8	492	164.5
Clerical workers	5,929	7,127	20.2	7,202	21.5
Stenographers, typists, secretaries	1,790	2,876	60.7	2,906	62.4
Office machine operators	626	534	-14.7	539	-13.9
Other clerical workers	3,512	3,710	5.6	3,749	6.8
Crafts and kindred workers	9,873	19,846	101.0	20,055	103.1
Construction crafts workers	1,095	1,915	74.9	1,935	76.7
Blue collar workers	1,908	3,564	86.8	3,601	88.7
Metalworking craft workers excluding mechanics	3,443	7,014	103.7	7,088	105.9
Mechanics, repairers, installers	3,096	6,700	116.4	6,771	118.7
Other crafts, kindred workers	255	514	101.6	519	103.5
Operators	9,736	15,636	60.6	15,800	62.3
Semi-skilled metalworking	2,061	2,776	34.7	2,805	36.1
Semi-skilled packing inspecting	1,794	2,996	67.0	3,028	68.8
Other operatives excluding transport	5,589	9,403	68.2	9,502	70.0
Transport equipment operatives	291	467	60.5	472	62.2
Service workers	626	607	-3.0	614	-1.9
Labors, except farm	331	287	-13.3	290	-12.4

- During this time, computer-related positions are expected to be the most rapidly expanding, with significant job growth anticipated as well for engineers and skilled technicans.

- Based on the projection methodology developed in this chapter, most rapid job growth is expected in office and accounting machinery, electric computer equipment, and aircraft.

- Under the average growth circumstances projected, all Kansas high-tech industries except aircraft will remain comparatively small--providing fewer than 5,000 jobs. In fact, based on the Institute's projections, aircraft will provide over 60 percent of total employment by 1990 in the 18 high-tech industries analyzed.

- The most rapidly growing occupations within Kansas high-tech industries during the '80s are expected to be for engineers, crafts workers, operatives, and secretaries. Slower job growth in these industries is anticipated for computer personnel, and almost no growth is expected for clerical workers, office machine operatives, and laborers.

In essence, the analysis in this chapter has shown that high-technology employment in Kansas is expected to grow during the '80s at a rate above the industry-wide norm. However, even at the projected growth rates, high-technology will not become a significant employment force in the state by 1990. This conclusion, in turn, re-emphasizes the imperative that Kansas must attain growth rates in high-technology above those projected for the nation as a whole if high-tech is to become a new catalyst for prosperity in the state.

IV. Analysis of Future Labor Force Supplies Relative to Assessed Needs

A. General Considerations

In this chapter, work presented in the previous chapters is synthesized to assess the adequacy of future labor supplies in Kansas, particularly in high-tech areas, relative to the needs projected. This undertaking is somewhat limited due to lack of enrollment data for specific degree programs, and, as such, attention is necessarily concentrated on broad skill areas and general labor force considerations. Also, as part of the assessment process, a more extensive examination is made of the current status of the state's post-secondary high-tech offerings and of the types of training required for specific high-tech occupations. Finally, suggestions are made for program development, expansion, and upgrading in situations where it appears that, based upon existing programs, Kansas will be unable to provide an adequate in-state supply of workers with certain skills.

From an overall labor force perspective, the Kansas working age population will be moving through a period of very slow growth over the next several years. Barring significant changes in the migration pattern to and from the state, the working age population is only expected to grow 1.3 percent from 1980-87. A significant increase in the growth rate for this population group will probably not occur until the mid-1990s when the large 0-7 years age bracket begins to enter the workforce. Projections in Chapter II called for more substantial growth in the labor force--about 5.6 percent--over 1980-87 relative to the working age population as a whole. Nevertheless, even this rate of increase is small by historical standards. Consequently, it stands to reason that a sustained period of high economic growth rates may introduce short-term labor shortages in the state, thereby engendering wage increases and undermining the state's attractiveness to enterprise.

A likely response to labor force shortages would be an increased rate of labor force participation within the state as well as immigration of workers from elsewhere. These facts, however, are not completely reassuring for, if Kansas is only part of a more general economic expansion, it will be difficult for this state to attract workers from other states. Also, the 5.6 percent growth projection already incorporates higher participation rates by women. Thus, it may be that little slack remains in the potential workforce, i.e., labor force participation rates may be nearing levels from which further significant increases are not possible.

Based on these considerations, it is not unrealistic to suggest that general labor force shortages may be a significant factor in limiting Kansas' rate of economic expansion over the next several years. At present, however, the labor force contains substantial slack in terms of relatively high numbers of unemployed workers and reduced participation rates within the population. As such, no general labor shortage will occur in the near term, and the concerns expressed this Chapter should be interpreted from a longer-term perspective.

B. The High-Tech Labor Force and the Expected Adequacy of High-Tech Training Programs

In Chapter III of this report, the Institute for Economic and Business Research, under a set of realistic economic assumptions, projected growth of about 20,000-22,000 jobs in 33 high-tech related occupations. Most of these occupations require specialized training and/or post-secondary degrees. Table IV-1 provides a breakdown of the specific skill levels required for entry into particular high-tech fields. Most professional positions in high-technology require a bachelors degree as a prerequisite to entry; comparatively few--e.g., those in chemistry, physics, and molecular biology--require advanced degrees. Holders of upper-level positions within high-tech enterprises almost always, however, possess advanced degrees.

TABLE IV-1

NECESSARY SKILL LEVELS TO ENTER SPECIFIC HIGH-TECH OCCUPATIONS

Occupation	Training Requirements
Professional Occupations	
Engineer	Bachelors degree in engineering.
Mathematician	Advanced degree in math, although bachelors degree holders may qualify for other high-tech occupations.
Statistician	Bachelors degree in statistics or a related field.
Chemist	Bachelors degree in chemistry; graduate training needed for most research positions.
Geologist	Bachelors degree in geology or related field; graduate training may also be needed.
Physicist	Graduate training in physics.
Agricultural scientist	Graduate training is often needed.
Biological scientist	Graduate training is often needed.
Biochemist	Advanced degree in biochemistry.
Technical Occupations	
Drafter	Training at a technical institute or two-year college.
Engineering technician	Training at a technical institute or two-year college.
Medical technician	Skills often learned on job; vo-tech or community college training is helpful.
Medical lab worker	Undergraduate training in chemistry, biology, and related areas with specialized training in medical technology.
Tool & die maker	Formal apprenticeships; vocational training.
Electrician	Formal apprenticeship.
Business machine repairman	One year training in electronics.
Computer Personnel	
Systems analyst	Bachelors or graduate degree in business or scientific field plus working experience.
Programmer	Bachelors degree in computer science or closely related field.
Computer operator	Training at a vo-tech institute, community college, or business college.
Computer service technician	One or two years training in electronics or electrical engineering.

Completion of four-year degrees is not necessary for most of the technical positions within high-tech industries. Most positions require preparation of the type commonly offered at vocational and technical institutes and two-year colleges. As well, on-the-job training and formal apprenticeships are important.

Education requirements necessary to enter the computer field vary with the type of position. Systems analysts often possess graduate degrees, and programmers usually have undergraduate degrees in computer science or closely related fields. On the other hand, operators and repairers of computer equipment generally are only required to have training from vo-tech institutes or community colleges.

A number of Kansas post-secondary institutions have training programs in high-tech related fields. These would include all of the Regents universities as well as many of the independent four-year institutions which offer degrees in the sciences or computer-related fields. Appendix Table A-7 summarizes the offerings for Regents schools, Washburn University, and the group of private four-year universities. Among this groups of institutions, KU, KSU, and WSU, which jointly issue 85 percent of all four-year engineering degrees and all graduate degrees in that field, must be considered the dominant high-tech oriented universities.

At present, the bulk of programs at the state's two-year colleges and vocational institutions are not geared towards high-technology. Those high-tech programs which do presently exist are detailed in Table IV-2. Examination of this table indicates that data processing, electronics, and word processing programs are quite common among those institutions and also that some experimentation has begun with programs in computer-aided drafting, robotics, avionics, micro-processing, and computer repair.

TABLE IV - 2

CURRENT HIGH-TECH PROGRAMS IN KANSAS AREA VOCATIONAL SCHOOLS AND COMMUNITY COLLEGES

	Computer Aided Drafting	Data Processing	Electronics	Word Processing
Allen County Community College[1]				X
Barton County Community College		X		X
Butler County Community College			X	
Colby Community College				X
Cowley County Community College		X	X	X
Dodge City Community College				X
Garden City Community College			X	X
Hutchinson Community College[2]			X	X
Independence Community College		X		X
Johnson County Community College[3]		X	X	X
Kansas City Community College		X	X	X
Neosho County Community College			X	X
Seward County Community College		X		
Northeast Kansas AVTS		X	X	X
North Central Kansas AVTS		X	X	X
Southeast Kansas AVTS	X		X	
Flint Hills AVTS		X	X	
Northwest Kansas AVTS		X	X	
Salina AVTS	X		X	
Kaw AVTS		X	X	
Manhattan AVTS		X	X	X
Wichita AVTS[4]		X	X	X
Liberal AVTS			X	
Kansas City AVTS[5]			X	X

[1]This school also offers robotics.
[2]This school also offers micro-processors.
[3]This school also offers manufacturing Technology (including robotics).
[4]This school also offers avionics.
[5]This school also offers computer maintenance & repair technology.

Source: Dean Prochaska, Kansas Vocational-Education Administration, KDE

Following upon this background information, the discussion now turns to an analysis of how well the Kansas post-secondary institutions are meeting the state's present need for high-tech related skills and, under the projections made in Chapters II and III, how likely they are to meet future needs. Unfortunately, the ability to precisely analyze these important questions is compromised by a number of factors. One problems is that data limitations necessitated a somewhat different projection time frame for labor demand relative to the period over which labor supply was projected. More serious, though, was the Institute's inability to obtain comprehensive information on disaggregated degree output in a timely fashion. Because of this problem, evaluation is limited to the four general occupation categories outlined in Table III-2.

Engineers: No doubt engineering represents the occupation with the most high-tech characteristics. In 1980, 11,095 engineers were employed in Kansas with 43 percent of them working in Wichita. For 1980-90, the Institute has projected a 5,500-6,130 net addition to jobs in engineering. And over the five-year period from 1983-87 Kansas is pro-jected to graduate about 4,700 students with bachelors degrees in engineering. On the basis of these projections, more engineering graduates will be produced in the state than will be needed by Kansas firms during the '80s. However, even if these projections hold, there is no guarantee that shortages will not occur for individual occupations.

Scientists: Only about 600-700 net additions to jobs for scientists are expected to occur in Kansas from 1980-90. The state, though, is expected to produce 4,183 graduates from 1983-87 with bachelors degrees in the sciences. This comparison may not be completely relevant, however, because, as Table IV-1 indicates, graduate degrees are often necessary in these occupations. Yet for the 1981-82 academic year, Kansas generated nearly 100 graduates with advanced degrees in the physical sciences and others with advanced life-science degrees. Therefore, it appears that, even on the basis of just graduate degrees, Kansas would be able to meet its own needs.

Computer Personnel: To produce an inventory of personnel in the computer field requires involvement of both the universities and the community colleges and vocational institutes. As outlined in Table IV-1, systems analysts and most programmer jobs require at least a bachelors degree, while operators and repair technicians require training in specialized two-year or voc-ed programs. Computer jobs are expected to be the fastest growing during the '80s of those in the high-tech area. The Institute estimated that between 6,000 and 6,500 net job additions would occur in this area from 1980-1990. Unfortunately, based on present data it is not possible to predict how well the Kansas educational system will meet this need. A 1980 study by

the state's Vocational Education Administration[11] did seem to indicate, however, that even at that time, shortages of computer-related technical skills were occurring across the state.

Other Technical Occupations: A number of technical occupations, such as drafter, electrician, and engineering technician are, critically important to high-tech development. Training for most of these positions is at two-year colleges and technical and vocational institutes. As a group, these positions are expected to grow by nearly 10,000 during the '80s. Kansas' two-year colleges are projected to graduate 1,121 students with two-year technical engineering degrees between 1983-87 and 2,428 degrees in health fields, some of which may have high-tech significance. Also, 8,680 students at Kansas voc-ed institutes are expected to complete programs in trade and industrial education over the same period. A significant but indeterminate number of these completions will be in drafting and electronics; nevertheless, the 1980 vocational education needs assessment study indicated significant educational deficiencies relative to assessed needs in some parts of the state for occupations in drafting, electronics, and engineering technology.

From this general overview, it appears on the basis of the Institute's projections that Kansas will probably be able to satisfy its own needs for high-tech skills requiring four-year or advanced degrees. Less certain, though, is its ability to internally meet needs for rapidly growing computer-related and other technical occupations.

C. Suggested Improvements in High-Tech Related Programs

Community Colleges and Other Two-Year Institutions

Given the analysis in the previous section, the state's most immediate educational concern with respect to high-tech should be the upgrading of technical training in high-tech related fields. Although data limitations make conclusions from the previous section somewhat tentative, it appears that skill shortages have already materialized around the state in high-tech areas, and, based upon projections for their rapid growth, further shortages may be expected to occur in the future within these occupations. At present, over one half of

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[11] Kansas State Department of Education, Vocational Education Administration, "Vocational Education Needs Assessment Study," January 1980.

the degrees awarded from Kansas community colleges and private two-year institutions are in liberal studies, a program which primarily prepares students to pursue four-year degrees and does not provide specific employment skills. Because the basic course work that goes into the liberal studies degree is also offered at the state's four-year universities, it would seem that an element of needless competition is occurring within the post-secondary educational hierarchy. A recommendation which would appear to have merit on several fronts would be for some of the community colleges, particularly those in close proximity to the five likely high-tech growth areas in Kansas, to pare back their liberal studies programs and concentrate more heavily on producing terminal degrees in skill areas of projected high demand. By reducing duplication, enactment of this recommendation would allow additional resources to flow into high-technology areas without engendering significant cost increases. Because high-tech skills are currently in shortage and face strong projected demand, a long-term effect should be greater enrollment for the two-year colleges which pursue this type of recommendation. Also, emphasis on terminal programming at the two-year colleges would result in better use of the liberal studies resources at four-year universities and, hence, reduce the present rate of cutback in these programs. Thus, this recommendation offers something for the state, the community colleges, and the four-year universities.

Area Voc-Ed Institutions

The primary charge of the state's area vocational-technical institutes (AVTI) is to meet local needs for workers with specific skills. Therefore, as demand for high-tech skills expands in certain areas, program offerings in these fields should be initiated or expanded by nearby vo-tech institutes. Indeed, as Table IV-2 showed, some movement into high-tech training programs has already begun by the AVTIs. In spite of this effort, however, some problems areas are still apparent. Most notable are the projected skill shortages in high-tech

areas reported in the needs assessment study. Another potentially nettlesome problem is the relative lack of AVTIs and community colleges (CC) near the areas of Kansas in which high-tech is expected to make it biggest impact. Only one AVTI and one CC lie in the Wichita SMSA. None are in the Lawrence SMSA, and Kaw AVTI is the only representative in the Topeka SMSA. The situation is somewhat better in the Kansas portion of the Kansas City SMSA within which two CCs and one AVTI are located.

At the minimum, it would seem necessary to upgrade the high-tech offerings at AVTIs in or nearby to the five designated high-tech target sites. If skill shortages are still indicated after this step is taken, new vo-tech facilities may need to be developed.

Finally, another problem plaguing efforts to develop high-tech programs within the AVTI system is lack of students to participate in these programs. The problem, a function of small populations in the outlying areas, has been exacerbated by recent population declines in Kansas in the 17-21 year age bracket. Most people in this group have been making the choice to pursue four-year degrees or to seek employment upon completion of secondary education. This fact re-emphasizes the imperative for offering high-tech programs at AVTIs proximate to the state's larger population centers and, as well, points out the need to offer these programs in the evenings and on weekends to attract those who hold regular jobs.

Regents Schools and Other Four-Year Colleges

It should have come as no surprise to most that Kansas can apparently meet with relative ease the likely demands placed upon it during the '80s for high-tech professionals. This conclusion in merely another reinforcement to the axiom that Kansas' biggest export has been brain power--a rather wry reference to the annual flight of many recent graduates from the state's university system away from Kansas for lack of local employment opportunities.

The fact that Kansas appears able to meet its immediate needs for professionals in high-tech fields does not necessarily imply that no program upgrading is needed at this level. On the contrary, a number of factors would tend to mitigate such a conclusion. Primary among these is that the Institute's projections for high-tech in Kansas were based on growth patterns comparable to those predicted for the entire U.S. They imply solid, but not spectacular growth. If Kansas were to stimulate growth in high-tech substantially above the national average, it would introduce general skill shortages for almost all high-tech occupations.

Another consideration is the signaling role that a state's high-tech programs play. Perception of a state's willingness to accommodate high-tech industry is based, at least in part, upon how well high-tech programs are supported in the state's university system. Also, specific enterprises are attracted or repelled by the strengths or weaknesses exhibited by university programs in specific high-tech areas.

A final argument for upgrading high-tech at the university level is that it increases the chances of stimulating "home-grown" enterprises in the high-tech area through the entrepreneurship of faculty and graduates. It is well-known that this sort of phenomenon has contributed markedly to growth in the Silicon Valley.

Based upon these perspectives, it is possible to present several recommendations for upgrading high-tech at the university level.

- Established graduate programs in high-tech fields, primarily those at KU and KSU, should be upgraded to provide a signal to high-tech enterprises. This action may also stimulate high-tech development in the areas around these universities which, until now, has been absent.

- Undergraduate programs in the computer-related fields should be upgraded because undergraduate degrees are the primary entrance requirement to these fields and because resource shortages in these areas are already being reported by many universities. In this

regard, particular attention should be paid to programs in computer science and engineering at WSU because the Wichita area will probably be the source of the greatest demand for these resources in the state.

- Because almost all high-tech related degrees require extensive knowledge of mathematics, undergraduate training in this field should be upgraded coincidental to the upgrading of programs in other high-tech fields.

- At a more general level, it is recommended that comparative advantages within specific universities be exploited as a vehicle for choosing which programs to upgrade at each institution. Given the state's limited resources, duplication of excellence in high-tech programs, at least in the short-term, does not constitute a wise use of resources.

D. Summary of Key Findings

From analysis of the results in Chapters II and III, it was found in this chapter that Kansas will likely be able to meet its needs during the '80s for most high-tech professionals. However, shortages in particular technical occupations are already apparently occurring and appear imminent in the future as well, unless corrective action is taken.

Recommendations made from this analysis included transferring of resources at community colleges from liberal studies programs to terminal programs in high-tech related occupations such as engineering and science technology and various computer fields. Devoting resources to the development of high-tech skill programs at AVTIs near to one or more of the prospective high-tech growth areas was also recommended. These programs should include electronics, drafting, data processing and business machine repair, and certain computer skills, and they should be offered at the most flexible time periods possible.

Upgrading of certain high-tech programs within the university system was also recommended, not necessarily as a response to an immediate need but, rather, to provide a signal to high-tech firms, to enhance prospects for locally-based entrepreneurship, and to accommodate the prospect that Kansas high-tech may develop faster than the projections indicate.

Finally, note is made of an alternative strategy for attracting high-technology enterprise which involves providing specific skill training for the workforce of particular high-tech firms. The underlying approach to these programs involves retraining, at state expense, workers with general skills to meet specific skill requirements of new or expanding firms. These programs act as a further signal of a state's desire to accommodate high-tech industry and also provide a financial inducement to desired forms of enterprise. Implementation of a program of this nature would, no doubt, draw upon the state's voc-ed institutes and community colleges.

V. Concluding Remarks

Summaries of this study's key findings are contained at the ends of Chapters II, III, and IV and, as well, in an executive summary. They are not restated at this point; rather, what if offered in the following paragraphs is a concluding statement about the nature of high-tech development in Kansas.

The projections for growth in high-tech occupations made in Chapter III assumed in some cases that Kansas growth would mirror that projected for the nation. It is appropriate, therefore, to consider the Kansas projections as being reflective of somewhat average growth rates. On this basis, net growth in jobs of 20,000-22,000 by 1990 was projected in the 33 high-tech occupations. When 18 high-tech industries were individually considered, projected growth in total employment within these industries was about 30,000. The reason that these numbers are not very large on a relative basis is that the high-tech base in Kansas is currently quite small. Even fairly rapid employment growth rates, when applied to a negligible employment base, do no result in very many new jobs.

As an illustration, note that 62,987 new entrants are projected to enter the Kansas workforce between 1980-87, in spite of a slow rate of labor force growth. Based upon this study's projections, Kansas cannot expect that more than a minority of these workers will be employed in jobs opened up through the expansion of high-tech in the state. Therefore, perhaps the most obvious and important conclusion generated from this study is that Kansas will have to capture more than its proportionate share of the anticipated growth in high-tech industry if the forthcoming wave of technology is to have more than a ripple effect in Kansas.

TABLE A-1
CIVILIAN LABOR FORCE BY SEX
1980
RILEY COUNTY

	Civilian Labor Force	Labor Force Participation Rate
Both Sexes	23,770	46.5%
Male	12,342	42.0%
Female	11,428	52.6%

Source: KDHR report, "Structure of the Kansas Labor Force."

TABLE A-2
CIVILIAN LABOR FORCE BY AGE BY SEX
1980
KANSAS CITY SMSA
(Kansas Part)

Age in Years	Civilian Labor Force	Labor Force Participation Rate
Both Sexes	223,917	67.9%
16-19	18,081	57.6
20-24	30,552	80.9
25-29	33,279	82.6
30-34	30,204	79.6
35-39	24,451	82.0
40-69	84,867	67.4
70 & over	2,483	9.4
Male	127,337	82.0%
16-19	9,658	60.7
20-24	15,716	88.5
25-29	18,428	94.9
30-34	17,626	96.7
35-39	14,005	97.0
40-69	50,389	84.0
70 & Over	1,515	15.7
Female	96,580	55.4%
16-19	8,423	54.5
20-24	14,836	74.2
25-29	14,851	71.2
30-34	12,578	63.8
35-39	10,446	67.9
40-69	34,478	52.3
70 & Over	968	5.7

Source: KDHR report, "Structure of the Kansas Labor Force."

TABLE A-3
CIVILIAN LABOR FORCE BY AGE BY SEX
1980
LAWRENCE SMSA

Age in Years	Civilian Labor Force	Labor Force Participation Rate
Both Sexes	34,129	61.7%
16-19	3,358	41.0
20-24	5,706	76.7
30-34	4,202	80.8
35-39	2,741	79.9
40-69	8,614	67.0
70 & Over	428	12.0
Male	19,227	69.4%
16-19	1,693	42.6
20-24	4,787	61.4
25-29	3,221	82.9
30-34	2,548	91.5
35-39	1,549	90.6
40-69	5,189	83.2
70 & Over	240	18.4
Female	14,902	53.9%
16-19	1,665	39.5
20-24	4,293	62.7
25-29	2,485	70.0
30-34	1,654	68.4
35-39	1,192	69.3
40-69	3,425	51.7
70 & Over	188	8.3

Source: KDHR report, "Structure of the Kansas Labor Force."

TABLE A-4
CIVILIAN LABOR FORCE BY AGE BY SEX
1980
TOPEKA SMSA

Age in Years	Civilian Labor Force	Labor Force Participation Rate
Both Sexes	93,249	66.1
16-19	7,754	58.9
20-24	13,710	82.2
25-29	13,432	81.6
30-34	12,039	83.5
35-39	9,042	82.0
40-69	35,858	67.8
70 & Over	1,414	8.6
Male	51,465	77.0
16-19	3,926	59.2
20-24	6,940	85.9
25-29	7,358	92.1
30-34	6,888	95.8
35-39	4,960	91.5
40-69	20,579	80.6
70 & Over	814	13.6
Female	41,784	56.3
16-19	3,828	58.6
20-24	6,770	78.7
25-29	6,074	71.7
30-34	5,151	71.2
35-39	4,082	72.8
40-69	15,279	55.9
70 & Over	600	5.7

Source: KDHR report, "Structure of the Kansas Labor Force."

TABLE A-5
CIVILIAN LABOR FORCE AND 16 BY AGE BY SEX
1980
Wichita SMSA

Age in Years	Civilian Labor Force	Labor Force Participation Rate
Both Sexes	208,739	67.4%
16-19	17,365	59.8
20-24	33,919	78.2
25-29	31,898	80.1
30-34	25,581	79.5
35-39	19,473	81.8
40-69	77,885	67.9
70 & Over	2,618	9.7
Male	119,726	80.0%
16-19	9,031	61.8
20-24	18,440	84.8
25-29	18,914	92.4
30-34	15,219	92.4
35-39	11,394	95.6
40-69	45,163	82.3
70 & Over	1,565	16.3
Female	89,013	55.6%
16-19	8,334	57.9
20-24	15,479	71.6
25-29	12,984	67.1
30-34	10,362	66.0
35-39	8,079	68.0
40-69	32,722	54.6
70 & Over	1,053	6.1

Source: KDHR report, "Structure of the Kansas Labor Force."

Table A - 6

Occupational Listing by Sex for Kansas, Kansas SMSAs, and Riley County

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
EXECUTIVE, ADMIMISTRATIVE & MANAGERIAL	75620	31068	1247	760	52374	24857	2091	992	6300	3029	14134	5913
Legislators	81	17	0	0	44	0	0	0	7	9	25	0
Chief Execs & Gen. Admin. Public Administration	242	85	5	0	161	66	10	2	29	29	31	6
Admin.& Officials, Public Administration	2045	1318	23	31	1022	627	68	22	343	150	306	110
Admin., Protective Ser.	373	90	0	0	139	57	9	0	17	13	40	15
Financial Managers	2590	1160	44	36	1913	645	88	33	196	111	485	233
Personnel & Labor Rel. Managers	1497	675	44	22	939	499	64	45	138	71	283	98
Purchasing Managers	560	109	12	6	359	95	16	0	48	14	184	23
Mgrs., Marketing, Advert., & Public Relations	5846	1028	30	9	4759	949	132	6	297	101	1009	182
Admin., Education & Related Fields	3269	1578	168	130	1288	708	199	114	289	174	426	219
Mgrs. Medicine & Health	764	700	9	6	336	374	25	23	104	70	131	102
Mgrs., Properties & Real Estate	1001	818	35	13	746	891	54	52	71	77	254	249
Postmaster & Mail Supers.	405	301	4	9	97	41	3	2	20	12	9	12
Funeral Directors	509	116	14	0	169	31	2	0	48	6	40	5
Mgrs. & Admin.,N.E.C.,Sal.	34243	12139	485	294	26205	9814	896	412	2828	1151	6236	2561
Mgrs. & Admin.,N.E.C., Self-Employed	4989	1970	114	36	2021	673	132	39	269	75	886	290
Accountants & Auditors	6362	3898	80	50	4969	4689	144	140	738	432	1503	814
Underwriters	59	149	0	10	40	80	0	7	0	26	20	12
Other Financial Officers	3271	1627	77	55	1860	1497	65	9	211	151	537	280
Management Analysis	612	227	0	6	665	201	13	13	55	18	145	50
Pers., Training, & Labor Relations Specialists	1741	1499	36	25	1682	1442	81	38	165	197	361	327
Purch. Agents & Buyers, Farm Products	684	35	0	0	160	20	6	0	13	0	66	7
Buyers, Whlsle & Retail Trade, exc. Farm Prod.	868	595	5	7	708	668	22	12	122	50	204	110
Purch. Agents & Buyers, N.E.C.	1312	466	6	0	684	287	23	13	74	41	421	145
Bus. & Promotion Agents	51	38	5	5	74	54	3	0	10	0	7	0
Construction Inspectors	462	12	12	2	298	6	5	0	29	0	71	0
Inspect. & Compliance Off., exc. Econstruction	1602	309	34	0	963	295	13	10	179	42	368	50
Mgmt. Related Occup.; N.E.C.	182	109	5	8	73	148	18	0	0	9	86	13
ENGINEERS, SURVEYORS, & ARCHITECTS	14329	636	106	15	9557	506	283	15	1175	47	5330	260
Architects	1122	47	38	8	901	33	56	0	137	2	256	9
Aerospace Engineers	2168	67	0	0	147	6	0	0	4	0	2023	61
Metallurg. & Materials Eng.	100	0	0	0	74	0	0	0	0	0	43	0
Mining Engineers	40	0	0	0	11	0	0	0	0	0	0	0
Petroleum Engineers	415	0	0	0	52	7	0	0	0	0	86	0
Chemical Engineers	321	23	6	0	263	18	62	8	23	0	50	9
Nuclear Engineers	31	0	0	0	10	0	0	0	0	0	23	0
Civil Engineers	2383	52	29	7	1772	76	36	3	390	0	368	2
Agricultrual Engineers	92	0	0	0	68	7	5	0	2	0	0	0
Elect. & Electron. Engrs.	1941	133	8	0	1779	125	35	4	209	29	669	36
Industrial Engineers	1784	201	0	0	1110	149	14	0	44	10	837	107
Mechanical Engineers	1442	25	8	0	1289	17	25	0	60	2	438	10
Marine & Naval Architects	27	0	0	0	10	0	0	0	0	0	0	0
Engineers, N.E.C.	2166	81	11	0	1912	68	50	0	253	4	479	19
Surveyors & Mapping Sci.	297	7	6	0	159	0	0	0	53	0	58	7
NATURAL SCIENTISTS & MATHEMATICIANS	4043	1035	201	59	2503	915	192	39	406	140	1198	297
Comp. Systems Analyst& Sci	1228	259	20	4	878	310	43	6	154	53	447	88
Operat. & Systems Res. & Analysts	298	129	2	0	265	132	6	6	21	8	116	46
Actuaries	51	7	0	0	45	5	2	0	0	7	0	0
Statisticians	85	116	0	0	75	125	6	0	27	19	13	23

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Math. Scientists, N.E.C.	73	18	0	0	0	0	0	0	0	0	60	18
Physicists & Astronomers	32	0	0	0	42	0	5	0	0	0	16	0
Chemists, ex. Biochemists	578	162	21	2	598	121	24	6	67	14	102	42
Atmospheric & Space Scientists	138	0	0	0	133	0	0	0	39	0	26	0
Geologists & Geodesists	619	21	12	0	65	7	72	0	19	0	345	19
Physical Scientists,N.E.C.	25	30	0	0	27	40	0	0	3	0	8	0
Agricultural & Food Scientists	288	104	65	21	59	52	8	0	21	24	17	1
Biological & Life Scientists	246	104	40	12	195	69	13	21	30	15	11	25
Forestry & Conservation Scientists	283	10	12	0	60	13	13	0	19	0	12	5
Medical Scientists	99	75	29	20	61	41	0	0	6	0	25	30
MEDICAL WORKERS	8934	17218	177	365	5414	10991	268	468	876	1800	1619	3245
Physicians	3809	458	57	0	2477	405	99	12	356	50	749	95
Dentists	1237	59	27	0	715	43	33	0	146	9	224	11
Veterinarians	613	40	46	8	225	39	9	2	38	5	31	5
Optometrists	384	16	16	0	171	21	22	0	45	5	48	0
Podiatrists	68	0	0	0	23	0	0	0	8	0	23	0
Health Diagnosing Practitioners, N.E.C.	387	41	6	0	218	21	8	1	28	15	53	0
Registered Nurses	610	13725	0	295	292	8569	15	278	98	1388	144	2753
Pharmacists	1016	302	17	0	776	281	56	52	79	43	191	42
Dietitians	51	653	0	33	38	376	0	17	9	83	6	107
Inhalation Therapists	239	314	0	7	207	256	5	7	30	25	34	28
Occupational Ther.	15	224	0	0	0	159	0	45	0	7	8	52
Physical Therapists	52	489	0	13	55	278	0	16	3	40	0	64
Speech Therapists	73	332	0	5	20	218	0	15	7	20	25	33
Therapists, N.E.C.	174	458	8	4	60	226	6	23	23	96	30	37
Physician's Assistants	206	107	0	0	137	99	15	0	6	14	53	18
TEACHERS, LIBRARIANS,& COUNSELORS	19068	35530	1445	1330	7149	19635	2045	1780	1097	2795	2728	5520
Postsecondary Earth, Environ.&Marine Science Teachers	30	8	0	0	8	8	6	0	0	0	8	0
Postsec. Bio. Sci. Teachers	136	31	31	0	27	25	30	0	0	0	6	0
Postsec. Chem. Teachers	97	8	31	0	57	1	26	0	0	0	8	0
Postsec. Physics Teachers	35	6	1	0	7	0	20	0	0	0	0	4
Postsec.Nat. Science Teachers, N.E.C.	0	5	0	0	0	0	0	5	0	0	0	0
Postsec. Psych. Teachers	57	18	6	0	6	0	12	7	0	0	6	0
Postsec. Econ. Teachers	70	5	13	5	8	0	26	0	0	0	8	0
Postsec. History Teachers	53	31	13	0	20	19	4	6	0	6	0	0
Postsec. Poli-Sci Teachers	28	12	0	4	0	0	5	8	2	0	6	0
Postsec. Soc. Teachers	11	5	0	0	0	0	5	0	0	0	0	0
Postsec. Social Science Teachers, N.E.C.	14	2	7	0	0	7	0	2	0	0	0	0
Postsec. Eng. Teachers	120	15	46	0	60	11	12	0	0	0	16	0
Postsec. Math. Teachers	138	78	4	7	26	19	61	15	0	7	23	16
Postsec. Computer Science Teachers	54	2	19	0	18	21	9	0	0	0	3	0
Postsec. Medical Science Teachers	100	28	5	0	123	12	14	6	0	0	0	5
Postsec. Health Specialties Teachers	37	221	0	6	33	131	7	10	0	4	8	38
Postsec. Bus. Commerce & Marketing Teachers	67	53	0	0	12	10	0	17	22	0	12	10
Postsec. Agriculture & Forestry Teachers	70	8	11	6	0	0	0	0	0	0	2	0
Postsec. Art, Drama & Music Teachers	275	204	21	31	68	110	48	20	0	8	65	29
Postsec. P.E. Teachers	86	46	20	38	2	0	14	0	0	0	13	0
Postsec. Educ. Teachers	42	28	0	0	8	11	0	0	0	0	0	0
Postsec. English Teachers	150	204	30	40	10	42	74	29	0	0	13	23
Postsec. Foreign Language Teachers	46	75	12	0	0	16	31	24	0	0	0	13
Postsec. Law Teachers	36	0	0	0	22	0	5	0	28	0	3	0
Postsec. Social Work Teachers	6	8	0	0	0	0	0	0	0	0	6	6

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Postsec. Theology Teachers	22	6	5	6	7	0	10	0	0	0	0	0
Postsec. Trade & Industrial Teachers	11	2	0	0	9	5	0	0	0	0	0	0
Postsec. Home Ec. Teachers	0	10	0	0	0	0	0	0	0	0	0	0
Teachers, Postsec., N.E.C.	52	0	7	0	6	0	9	0	23	0	0	0
Postsec. Teachers, subject not specified	3938	2023	732	273	869	643	1127	462	128	67	510	243
Teachers, Pre-kindergarten & Kindergarten	75	2250	0	81	54	1608	20	104	0	225	7	339
Teachers, Elementary	5451	18941	130	414	2540	10966	113	548	354	1612	804	3080
Teachers, Secondary	4781	5486	114	130	1847	3117	102	201	346	400	667	808
Teachers, Special Educ.	107	300	10	5	82	145	11	4	6	41	35	28
Teachers, N.E.C.	1318	2275	20	76	581	1256	60	129	110	150	308	422
Counselors, Educ.&Voc.	1082	960	87	66	509	526	91	54	62	98	120	199
Librarians	385	2111	63	142	119	882	66	117	16	171	57	242
Archivists & Curators	88	65	7	0	11	44	27	12	0	6	14	15
SOCIAL SCIENTISTS, SOCIAL WORKERS, RELIGIOUS WORKERS, & LAWYERS	11921	4950	219	123	7152	3442	384	227	1509	763	2221	875
Economists	384	183	5	11	374	155	5	0	41	23	91	43
Psychologists	665	555	30	8	287	249	59	27	110	137	97	48
Sociologists	0	29	0	0	0	5	0	0	0	18	0	6
Social Scientists, N.E.C.	68	28	7	0	30	26	12	7	10	10	19	6
Urban Planners	94	30	5	0	65	47	0	0	7	2	19	14
Social Workers	1294	2636	9	81	742	1926	55	138	230	376	246	549
Recreation Workers	101	404	0	7	83	105	0	9	21	33	22	53
Clergy	4376	298	122	9	1937	162	84	7	391	26	689	48
Religious Workers, N.E.C.	245	314	6	7	208	169	5	11	39	39	68	64
Lawyers	4407	447	35	0	3299	598	164	28	616	99	927	37
Judges	287	26	0	0	127	0	0	0	44	0	43	7
WRITERS, ARTISTS, ENTERTAINERS & ATHLETES	6213	5661	299	154	4312	4056	407	257	543	497	1429	1074
Authors	84	168	0	6	76	169	15	10	7	2	5	29
Technical Writers	277	117	7	0	138	126	19	8	3	22	174	20
Designers	979	1784	28	36	870	1269	72	75	55	133	200	308
Musicians & Composers	483	421	20	10	573	313	50	22	37	37	99	72
Actors & Directors	266	101	6	7	206	68	21	0	23	10	78	20
Painters, Sculptors, Craft-Artists, & Artist Printmakers	640	640	18	16	611	691	42	11	61	63	150	161
Photographers	694	281	31	11	432	146	61	25	93	24	183	78
Dancers	6	32	0	0	25	53	0	0	0	0	0	12
Artists, Performers, & Related Workers, N.E.C.	209	235	11	12	150	181	2	2	23	18	21	57
Editors & Reporters	937	1167	60	32	563	622	44	57	56	100	170	124
Public Relations Spec.	544	505	18	12	339	366	29	33	105	88	110	136
Announcers	620	86	42	0	187	24	15	0	55	0	113	35
Athletes	474	124	58	12	142	28	37	14	25	0	126	22
TECHNOLOGISTS & TECHNICIANS	15312	14351	764	542	10966	8699	824	658	1346	1431	3889	3169
Clinical Lab. Tech.	494	2145	18	52	325	1426	13	55	27	243	114	547
Dental Hygienists	2	391	0	1	0	256	0	7	2	42	0	106
Health Record Tech.	12	215	0	5	14	129	0	0	5	40	7	49
Radiologic Tech.	229	1025	11	7	141	559	11	28	50	62	61	295
Licensed Prac. Nurses	79	4263	0	71	113	2404	0	116	34	459	19	866
Health Tech, N.E.C.	505	936	35	12	257	521	27	31	57	90	96	222
Electrical & Electonic Tech	1652	247	44	0	1374	209	43	13	88	30	533	33
Indust. Eng. Technicians	28	11	0	0	20	16	0	0	0	0	18	0
Mechan. Eng. Technicians	127	46	0	0	92	8	0	15	5	12	52	13
Eng. Technicians, N.E.C.	2132	585	94	72	1033	399	53	43	294	39	599	121
Drafting Occupations	2409	662	36	27	2095	463	65	36	194	41	710	196
Surveying & Mapping Tech.	529	48	15	0	243	51	16	0	57	0	48	10
Biological Technicians	230	209	38	13	114	142	0	15	10	22	7	22
Chemical Technicians	308	79	16	12	334	73	31	12	4	0	71	16
Science Technicians, N.E.C.	565	260	114	67	240	105	30	7	24	27	105	42
Airplane Pilots & Navig.	900	16	20	0	924	2	13	0	67	0	200	7
Air Traffic Controllers	595	74	18	7	558	61	22	0	20	9	104	16
Broadcast Equip. Operators	340	591	6	0	189	171	15	29	24	17	83	77
Computer Programmers	2045	963	82	44	1642	770	103	44	282	141	661	209

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Tool Programmers, Numerical Control	70	2	0	0	18	2	0	0	0	0	58	0
Legal Assistants	191	628	0	9	129	407	0	12	18	56	48	170
Technicians, N.E.C.	1870	955	217	143	1111	525	382	195	84	101	295	152
MARKETING & SALES OCCUPATIONS	60555	52717	1070	1338	39592	33145	1762	1574	4773	4203	11396	9657
Supervisors & Proprietors, Sales Occup., Salaried	10517	3874	209	124	5723	2107	255	107	849	293	1948	735
Supervisors & Proprietors, Sales Occup., Self-Emp.	4517	1794	65	17	1327	485	91	30	253	87	616	202
Insurance Sales Occup.	5447	1498	71	27	3604	1616	103	46	571	163	880	242
Real Estate Sales Occup.	3326	2881	20	41	2322	2591	104	78	367	209	691	680
Securities and Financial Sales Occupations	973	159	13	0	755	149	25	0	55	12	251	29
Advertising & Related Sales Occupations	829	538	19	13	494	397	29	32	74	34	235	79
Sales Occup., Other Business Services	2199	1198	10	2	2373	1179	41	47	126	129	365	195
Sales Engineers	488	12	7	0	400	7	0	0	21	0	125	0
Sales Reps, Mining, Manufacturing & Wholesale	12565	1816	117	45	10007	1618	215	15	709	132	2598	426
Sales Workers, Motor Vehicles & Boats	3195	272	75	0	1893	132	64	16	373	6	634	66
Sales Workers, Apparel	992	4619	20	165	605	2331	57	132	133	333	179	799
Sales Workers, Shoes	390	775	13	39	343	488	0	6	64	61	99	183
Sales Workers, Furn. & Home Furnishings	847	828	34	12	524	433	27	26	74	54	151	123
Sales Worlers, Radio, TV, Hi-Fi, & Appliances	1116	420	43	26	659	278	64	7	118	41	215	28
Sales Workers, Hardware & Building Supplies	1931	766	32	8	1043	348	60	21	159	40	424	53
Sales Workers, Parts	2512	202	27	0	1348	117	73	0	135	17	438	53
Sales Workers, Other Commodities	4465	13053	144	280	3156	7727	236	507	356	936	759	2458
Sales Counter Clerks	227	642	0	31	157	461	26	17	12	37	34	155
Cashiers	2689	13726	121	443	1915	8520	244	451	211	1200	538	2516
Street & Door-to-Door Sales Workers	542	3098	14	52	466	1814	19	30	58	337	90	531
News Vendors	636	448	9	7	446	206	25	6	44	60	94	92
Demonstrators, Promoters & Models, Sales	5	62	0	0	0	82	0	0	0	22	5	10
Auctioneers	132	18	7	0	20	23	4	0	4	0	22	2
Sales Support Occup., N.E.C.	15	18	0	6	12	36	0	0	7	0	5	0
ADMINISTRATIVE SUPPORT, INCLUDING CLERICAL WORKERS	36297	145197	758	3280	29843	104389	1265	4109	4136	15508	7586	28171
Supervisors, Gen. Office	2722	3829	53	85	1867	3025	28	62	373	518	497	622
Supervisors, Computer Equipment Operators	356	99	9	0	248	71	13	6	90	2	83	22
Supervisors, Financial Records Processing	792	837	4	15	698	694	18	13	135	100	154	259
Chief Communications Oper.	431	225	0	0	368	148	14	7	71	59	63	64
Supervisors, Distribution, Scheduling Clerks	1208	405	9	0	1013	335	21	0	71	32	302	128
Computer Operators	1525	2690	33	64	1636	2436	70	79	272	333	330	596
Peripheral Equip. Oper.	81	80	0	0	70	165	6	0	30	15	0	24
Secretaries	428	43221	17	896	274	27128	30	1283	69	4251	51	8427
Stenographers	80	784	7	37	38	710	0	22	6	113	11	75
Typists	244	7151	13	316	134	5379	39	282	48	1044	17	1093
Interviewers	262	1155	0	14	227	882	25	25	32	99	64	177
Hotel Clerks	176	456	18	5	169	236	0	17	40	25	32	71
Transportation Ticket & Reservation Agents	376	301	7	12	362	682	0	0	12	6	98	35
Receptionists	235	5457	81	257	58	3380	24	208	11	416	30	1132
Information Clerks, N.E.C.	109	785	5	14	113	608	9	31	12	52	11	156
Classified-Ad Clerks	30	164	0	5	25	137	0	17	5	2	4	37
Correspondence Clerks	12	143	0	0	26	186	0	3	2	72	0	7
Order Clerks	905	2317	14	76	860	1936	19	70	100	195	165	516

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Personnel Clerks, Ex. Payroll & Timekeeping	58	745	12	31	51	583	0	5	7	84	15	170
Library Clerks	322	1442	24	74	128	559	94	152	12	114	60	217
File Clerks	427	2743	25	158	480	2535	7	60	93	434	99	509
Record Clerks	119	1640	8	21	123	976	8	38	27	133	10	355
Bookkeepers, Accounting & Auditing Clerks	2100	22480	35	313	1370	11999	24	424	325	1806	219	4010
Payroll & Timekeeping Clerks	242	1326	0	46	222	1231	0	26	51	189	38	281
Billing Clerks	150	1133	0	27	126	923	0	18	26	131	19	201
Cost and Rate Clerks	335	605	6	0	251	764	18	20	34	52	69	97
Billing, Posting, & Calculating Machine Operators	49	607	0	8	43	508	0	10	19	78	2	112
Duplicating Machine Oper.	33	172	0	21	24	59	7	24	13	25	5	59
Mail Preparing & Paper Handling Machine Oper.	18	57	0	0	24	42	0	11	7	8	0	6
Office Machine Oper., N.E.C.	38	321	9	7	73	247	0	10	0	109	0	31
Telephone Operators	281	2766	8	58	177	2020	0	52	56	243	89	707
Telegraphers	96	20	0	0	34	34	0	0	7	0	7	8
Communications Equipment Operators, N.E.C.	8	15	0	0	6	42	0	8	0	0	0	2
Postal Clerks, Ex. Mail Carriers	1720	1086	13	9	1959	705	23	37	216	71	310	240
Mail Carriers, Postal Ser.	2755	390	31	6	1544	189	74	20	193	23	421	38
Mail Clerks, Ex. Postal Ser.	677	1056	13	37	766	1252	49	46	102	206	162	189
Messengers	226	252	7	3	303	166	0	7	26	45	53	57
Material Dispatchers	677	294	0	0	566	230	15	16	16	13	143	64
Material Production Coordin.	1238	1352	6	13	785	918	26	45	117	149	567	445
Traffic, Shipping & Receiving Clerks	3022	1219	40	17	2871	976	83	24	157	49	764	270
Stock & Inventory Clerks	3625	2309	79	60	2825	1491	93	62	276	144	1076	723
Meter Readers	600	90	1	0	323	38	0	5	48	4	64	50
Material Weighers, Measurers & Checkers	393	415	0	7	455	186	4	27	39	41	21	74
Material Samplers	9	0	4	0	13	10	0	0	0	0	0	0
Materials Expediters	553	701	0	6	298	577	32	0	29	32	312	343
Material Recording, Sched. & Distributing Clerks, N.E.C.	75	294	0	7	66	217	0	9	5	45	12	58
Insurance Adjusters, Exam., & Investigators	785	1049	34	6	499	1183	5	0	64	374	191	127
Investigators & Adjustors, ex. Insurance	777	1177	7	5	1177	1648	35	23	112	130	126	275
Eligibility Clerks, Social Welfare	34	123	0	0	18	59	0	0	0	11	7	32
Bill & Account Collectors	258	436	0	4	297	641	0	11	37	26	45	113
Gen. Office Clerks	2218	11137	49	206	2157	11764	171	350	308	1390	282	2015
Bank Tellers	417	4566	13	120	237	2546	44	110	66	372	45	725
Proofreaders	69	383	0	0	56	230	0	20	19	83	0	18
Data-Entry Keyers	267	4188	11	81	251	4399	24	130	61	795	47	743
Statistical Clerks	346	1394	10	22	208	1197	7	22	42	191	83	305
Teacher's Aides	139	2207	18	59	105	936	27	71	13	235	11	347
Admin. Support Occup., N.E.C.	1169	2908	25	52	746	2171	79	91	134	339	300	714
SERVICE WORKERS	48385	95281	1565	2482	36601	45755	2431	2774	5089	7330	8261	15508
Launderers & Ironers, Private Household	0	11	0	0	0	11	0	0	0	5	0	0
Cooks, Private Household	0	19	0	0	0	36	0	0	0	4	0	0
Housekeepers & Butlers	2	202	0	0	0	180	0	0	0	9	0	29
Child Care Workers, Private	11	2140	0	57	37	621	0	96	2	151	0	406
Private Household Cleaners & Servants	97	2976	7	76	141	1499	2	91	5	175	29	533
Supervisors, Firefighters & Fire Prevention Occup.	202	0	7	0	257	10	6	0	8	0	57	0
Supervisors, Police & Detectives	364	0	0	0	354	6	22	0	61	0	95	0
Supervisors, Guards	135	11	0	0	171	30	24	0	6	3	32	0
Fire Inspection & Fire Prevent. Occupations	167	4	0	0	99	4	0	0	18	0	26	0
Firefighting Occupations	1704	14	4	0	1447	33	110	0	113	2	451	0
Police & Detectives, Public Ser.	3167	178	86	14	2515	166	90	6	295	4	559	44
Sheriffs, Bailiffs, & Other Law Enforcement Officers	571	90	5	0	188	18	12	5	65	2	94	8
Correctional Inst. Officers	624	147	7	11	211	66	7	5	84	20	21	6

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Crossing Guards	156	115	4	2	112	103	13	8	2	0	2	0
Guards & Police, ex. Public Service	2833	502	24	0	2928	674	171	51	357	75	500	117
Protective Service Occup., N.E.C.	138	171	9	6	43	76	36	6	5	16	26	26
Supervisors, Food Prep. & Service Occupations	740	1927	26	46	563	1117	36	56	101	145	157	322
Bartenders	1130	1347	114	49	682	757	121	114	98	113	148	189
Waiters & Waitresses	1142	13320	90	433	1010	6989	100	463	99	867	271	2474
Cooks, ex, Short Order	5394	11861	259	230	4478	4409	281	215	494	720	1035	1412
Short Order Cooks	508	381	30	7	449	158	18	20	31	16	118	73
Food Counter, Fountain & Related Occupations	444	2566	18	112	280	1414	25	106	64	134	62	462
Kitchen Workers, Food Preparation	126	686	7	59	177	625	7	17	22	66	24	144
Waiters'/Waitresses' Assist.	1306	1469	43	71	1552	716	102	139	208	165	248	265
Miscellaneous Food Prep. Occupations	3054	5407	149	311	2453	2428	320	150	260	341	480	809
Dental Assistants	25	1670	0	11	31	895	0	49	6	179	0	322
Health Aides, ex. Nursing	377	2794	9	56	211	1420	6	97	88	183	53	505
Nursing Aides, Orderlies, & Attendants	1624	18118	31	192	864	6933	94	263	428	1608	171	2650
Supervisors, Cleaning & Building Service Workers	1020	512	18	7	522	212	43	21	66	37	159	102
Maids & Housemen	631	5248	20	161	898	2892	4	104	103	412	127	766
Janitors & Cleaners	17024	5932	452	158	11321	2727	657	156	1651	421	2701	966
Elevator Operators	268	44	8	0	71	66	0	0	9	0	26	13
Pest Control Occupations	458	37	14	1	189	0	12	0	45	6	102	4
Supervisors, Personal Service Occupations	193	87	7	0	131	62	2	7	24	0	6	21
Barbers	1078	87	30	0	667	64	24	7	104	16	197	42
Hairdressers & Cosmetol.	475	6171	0	95	485	3054	11	115	39	418	57	1214
Attendants, Amusement & Recreation Facilities	304	156	23	3	255	143	14	0	15	28	62	11
Guides	41	150	6	6	33	56	0	25	5	21	0	30
Ushers	106	2	20	0	98	30	0	0	0	0	21	0
Public Transportation Attendants	23	236	0	0	71	550	0	1	0	10	0	22
Baggage Porters & Bellhops	83	4	0	0	223	2	0	0	24	0	36	0
Welfare Service Aides	52	515	9	17	20	155	7	25	0	28	6	65
Child Care Workers, ex. Private Household	337	7107	9	273	223	3730	36	306	57	829	50	1305
Personal Service Occup., N.E.C.	251	867	20	18	141	618	18	50	27	101	52	151
AGRICULTURAL, FORESTRY & FISHING OCCUPATIONS	60727	7116	903	150	5977	1209	701	144	2097	279	2506	461
Farmers, ex. Horticultural	40405	3171	417	61	2224	222	335	60	1305	119	1285	136
Horticultural Spec. Farmers	55	25	0	6	39	5	0	0	0	0	6	0
Mgrs., Farms, ex. Hort.	3143	156	61	7	259	60	27	9	60	3	150	18
Mgrs., Hort. Specialty Farms	37	5	0	0	40	0	0	0	0	0	11	0
Supervisors, Farm Workers	419	28	2	0	66	23	0	2	16	2	20	5
Farm Workers	12866	2726	267	53	1157	386	155	24	371	108	491	123
Marine Life Cultivation Workers	2	7	0	0	0	0	0	0	0	0	0	0
Nursery Workers: Hort.	79	138	6	0	85	69	25	1	6	2	5	17
Supervisors, Related Agri. Occupations	204	25	0	0	121	6	9	0	18	0	16	8
Groundkeepers & Gardeners, ex. Farm	2799	322	105	0	1760	130	134	23	269	23	435	69
Animal Caretakers, ex. Farm	382	491	27	17	122	280	2	25	28	22	9	80
Graders & Sorters, Agri. Products	0	9	0	0	0	17	0	0	0	0	0	0
Inspectors, Agri. Products	12	0	0	0	0	0	0	0	0	0	0	0
Supervisors, Forestry & Logging Workers	9	0	0	0	4	0	0	0	0	0	5	0
Forestry Workers, ex. Log.	78	5	18	0	4	4	0	0	5	0	19	5
Timber Cutting & Log. Occup.	186	0	0	0	68	0	10	0	19	0	14	0
Captains & Other Officers, Fishing Vessels	5	0	0	0	6	0	0	0	0	0	0	0
Fishers	41	8	0	6	22	7	0	0	0	0	40	0
Hunters & Trappers	5	0	0	0	0	0	4	0	0	0	0	0

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
MECHANICS & REPAIRERS	59909	1632	858	36	31171	915	1179	22	3980	69	9250	735
Supervisors, Mechanics & Repairers	1908	81	8	0	1091	53	37	8	170	9	431	20
Automobile Mechanics, ex. Apprentices	10183	89	145	0	5903	73	189	2	854	0	1660	11
Automobile Mechanic Appr.	48	0	0	0	41	0	0	0	14	0	7	0
Bus, Truck, & Stationary Engine Mechanics	2433	0	31	0	863	0	20	0	126	0	436	0
Aircraft Engine Mechanics	1967	27	0	0	2039	18	0	0	32	0	1216	17
Small Engine Repairers	391	18	11	0	240	0	15	0	22	8	69	8
Automobile Body & Related Repairers	2075	23	74	7	1193	22	17	0	140	0	290	0
Aircraft Mechanics, ex. Engine	684	21	0	0	179	7	8	0	10	0	472	19
Heavy Equipment Mechanics	2214	10	17	0	1342	16	20	0	370	5	258	0
Farm Equipment Mechanics	1684	16	2	0	85	0	25	0	71	2	107	7
Industrial Machinery Rep.	2628	93	9	0	2250	78	90	12	266	8	361	0
Machinery Maintenance Occup.	453	34	0	0	190	49	7	0	59	3	54	8
Electronic Repairers, Comm. & Industrial Equipment	1861	137	19	0	949	129	51	2	130	2	455	34
Data Processing Equip. Rep.	436	31	11	0	388	29	21	0	74	10	113	14
Household Appliance & Power Tool Repairers	833	38	8	0	423	20	15	0	81	0	151	24
Telephone Line Installers & Repairers	486	43	13	0	302	23	5	0	45	2	56	5
Telephone Installers & Rep.	2432	319	36	14	1575	199	46	0	195	21	343	95
Miscellaneous Electrical & Electronic Equip. Rep.	444	126	0	0	283	7	6	0	28	18	161	72
Heating, Air Conditioning & Refrigeration Mechanics	1551	14	45	0	779	0	64	0	158	2	331	7
Camera, Watch, & Musical Instrument Repairers	478	25	11	0	307	13	30	0	49	0	128	13
Locksmiths & Safe Repairers	151	18	2	0	148	18	2	0	22	0	10	5
Office Machine Repairers	447	6	18	0	322	14	0	0	47	0	131	0
Mechanical Controls & Valve Repairers	423	13	13	0	138	7	0	0	33	0	53	0
Elevator Installers & Rep.	136	0	0	0	162	8	0	0	8	0	26	0
Millwrights	763	37	0	0	891	52	27	0	29	0	104	8
Specified Mechanics & Repairers, N.E.C.	2818	101	82	0	1524	57	59	0	202	3	568	22
Not Specified Mechanics & Repairers	2854	57	49	0	828	17	81	8	299	2	527	7
CONSTRUCTION & EXTRACTIVE WORKERS	54337	1808	843	18	26493	614	1430	22	3980	69	9250	735
Supervisors, Brickmasons, Stonemasons, & Tile Set.	31	0	0	0	9	0	0	0	10	0	3	0
Supervisors, Carpenters & Related Workers	450	0	26	0	197	0	10	0	51	0	43	0
Supervisors, Electricians & Power Transmission Install.	284	6	6	0	199	0	0	0	32	0	34	3
Supervisors, Painters, Paperhangers & Plasterers	61	1	0	0	40	0	8	0	4	0	15	0
Supervisors, Plumbers, Pipefitters, & Steamfitters	245	0	0	0	75	0	10	0	9	0	44	0
Supervisors, N.E.C.	8111	112	0	0	4087	125	181	7	616	11	1526	31
Brickmasons & Stonemasons, ex. Apprentices	1661	93	41	0	881	0	104	0	95	0	336	70
Brickmason & Stonemason Appr.	21	0	0	0	11	0	3	0	0	0	0	0
Tile Setters, Hard & Soft	204	0	0	0	172	0	1	0	19	0	68	0
Carpet Installers	1036	28	10	0	506	9	34	0	87	0	231	6
Carpenters, ex. Appr.	12871	236	313	3	5855	49	353	2	878	1	2016	36
Carpenter Apprentices	9	16	0	0	7	20	0	0	0	0	0	0
Drywall Installers	781	27	16	0	774	0	25	0	59	6	111	13
Electricians, ex. Appr.	5734	394	71	0	3383	75	186	0	540	5	1221	230
Electrician Apprentices	140	6	2	0	56	0	6	0	32	0	5	6
Electrical Power Install. & Repairers	1557	18	20	0	582	29	46	0	93	0	112	0
Painters, Construction & Maintenance	3772	552	82	0	2732	169	119	7	403	36	832	141
Paperhangers	147	62	2	0	115	34	0	0	23	0	36	14
Plasterers	94	2	0	0	76	0	0	0	6	0	52	0

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Plumbers, ex. Apprentices	4861	64	73	2	2745	41	118	0	477	7	863	141
Plumber, Pipefitter, & Steamfitter Apprentices	149	0	0	0	77	7	20	0	15	0	9	0
Concrete & Terrazzo Fin.	895	6	21	0	677	6	40	0	88	0	161	0
Glaziers	300	17	13	13	131	0	16	0	22	0	53	2
Insulation Workers	584	18	12	0	390	12	21	0	11	0	203	7
Paving, Surfacing & Tamp. Equipment Operators	60	3	0	0	15	0	8	0	2	0	.10	0
Roofers	1405	6	54	0	729	0	35	0	120	0	290	0
Sheetmetal Duct Installers	295	12	19	0	182	6	14	0	18	0	96	0
Structural Metal Workers	843	15	7	0	736	5	15	0	117	0	184	11
Drillers, Earth	274	0	7	0	92	0	0	0	14	0	10	0
Construction Trades, N.E.C.	1849	50	41	0	727	0	45	6	87	3	329	2
Supervisors, Extractive Occup.	1466	26	0	0	49	22	0	0	15	0	141	14
Drillers, Oil Well	2961	12	7	0	43	0	10	0	11	0	148	0
Explosive Workers	125	1	0	0	47	0	0	0	0	0	12	0
Mining Machine Operators	279	6	0	0	74	5	0	0	7	0	8	6
Mining Occupations, N.E.C.	782	19	0	0	22	0	2	0	19	0	48	2
PRECISION PRODUCTION WORKERS	40718	10879	298	119	18822	4919	683	243	2597	583	13310	3919
Supervisors, Production Occ.	18398	2992	131	40	8967	1572	423	107	1298	293	5102	602
Tool & Die Makers, ex. Appr.	1906	49	0	0	732	0	19	8	7	0	1288	38
Tool & Die Maker Appr.	15	0	0	0	38	0	0	0	5	0	4	0
Precision Assemblers, Metal	528	301	0	0	69	20	1	0	0	0	338	245
Machinists, ex. Apprentices	5891	504	30	0	2772	163	51	0	468	7	1743	182
Machinist Apprentices	14	8	0	0	22	7	0	0	0	7	0	0
Boilermakers	272	12	0	0	150	0	7	0	50	10	23	0
Precision Grinders, Fitters & Tool Sharpeners	198	49	0	0	38	4	0	0	0	0	98	19
Patternmekers & Model Makers, Metal	149	2	0	0	69	0	0	0	0	0	66	2
Lay-Out Workers, Precision Metal Working	113	19	0	0	39	113	0	0	0	2	18	17
Precious Stones & Metals Workers (Jewelers)	179	55	6	0	84	51	8	5	0	5	45	6
Engravers, Metal	85	35	0	6	100	49	0	0	2	7	12	9
Sheet Metal Workers, ex. Apprentices	3676	1948	22	0	1159	27	15	0	193	0	2165	1473
Sheet Metal Worker Appr.	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous Precision Metal Workers	41	14	0	0	11	5	0	0	0	2	35	2
Patternmakers & Model Makers, Wood	25	0	0	0	20	0	0	0	0	0	0	0
Cabinet Makers & Bench Carpenters	712	113	4	2	356	7	26	0	29	6	176	20
Furniture & Wood Finishers	161	69	8	4	94	5	5	11	9	0	35	15
Miscellaneous Precision Woodworkers	6	3	2	0	18	0	0	0	0	3	4	0
Dressmakers	57	928	0	25	8	712	6	13	1	34	11	256
Tailors	86	188	0	0	152	165	0	0	0	5	20	41
Upholsterers	590	388	26	0	357	53	16	9	29	16	235	153
Shoe Repairers	154	31	0	0	137	8	0	0	17	6	17	6
Apparel & Fabric Pattern-makers	8	14	0	0	12	40	0	0	0	0	0	7
Miscellaneous Precision Apparel & Fabric Workers	8	32	0	5	0	10	0	6	0	0	8	15
Hand Molders & Shapers, ex. Jewelers	272	38	4	0	118	32	0	0	19	0	28	0
Patternmekers, Lay-Out Workers, & Cutters	298	28	0	0	18	9	5	0	4	0	175	0
Optical Goods Workers	249	160	0	8	176	155	0	4	28	22	58	12
Dental Lab. & Medical Appl. Technicians	243	144	2	0	192	122	0	11	55	9	78	69
Bookbinders	111	244	6	6	142	290	4	13	11	64	18	55
Electrical & Electronic Equipment Assemblers	209	564	7	0	219	705	8	19	0	3	49	233
Miscellaneous Precision Workers, N.E.C.	242	41	0	0	143	23	5	0	11	0	69	0
Butchers & Meat Cutters	4314	1000	40	8	1275	117	64	16	219	41	999	221
Bakers	364	614	7	15	324	251	11	21	50	41	71	147
Food Batchmakers	99	97	0	0	13	21	0	0	15	0	14	12
Precision Inspectors, Testers, & Graders	1044	195	3	0	791	183	9	0	76	0	308	62

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Precision Adjusters & Calibrators	1	0	0	0	7	0	0	0	1	0	0	0
PLANT & SYSTEM OPERATORS	71604	38859	551	362	43826	23648	1671	1460	6426	2650	15527	8446
Water & Sewage Treatment Plant Operators	363	31	15	0	168	10	9	17	29	0	17	0
Power Plant Operators	687	16	2	0	182	0	17	0	124	2	35	0
Stationary Engineers	1953	96	20	0	768	42	52	0	82	16	180	13
Miscellaneous Plant & System Operators	1020	43	0	0	253	46	6	0	37	2	186	14
Lathe & Turning Machine Set-Up Operators	201	34	0	0	59	24	0	0	0	0	69	15
Lathe & Turning Machine Operators	993	179	0	4	274	46	5	0	37	3	437	64
Milling & Planing Machine Operators	228	8	0	0	23	13	0	0	0	0	132	6
Punching & Stamping Press Machine Operators	959	381	0	0	343	152	3	5	41	2	432	158
Rolling Machine Operators	20	8	0	0	67	22	0	0	3	6	10	0
Drilling & Boring Machine Operators	450	263	0	0	131	38	0	0	29	0	100	143
Grinding, Abrading, Buffing & Polishing Machine Oper.	1608	782	8	2	926	177	16	3	46	18	430	246
Forging Machine Operators	116	13	0	0	26	0	0	0	0	0	66	0
Numerical Control Machine Operators	57	7	0	0	12	0	0	0	0	0	35	0
Miscellaneous Metal, Plastic, Stone, & Glass Working Machine Operators	103	22	0	0	49	6	0	0	17	3	21	15
Fabricating Machine Oper., N.E.C.	274	204	2	0	192	98	6	0	9	13	127	112
Molding & Casting Machine Operators	556	368	6	0	487	256	15	15	36	31	127	74
Metal Plating Machine Oper.	149	71	0	0	327	74	0	0	0	7	51	19
Heat Treating Equipment Operators	174	10	0	0	105	9	0	0	2	0	89	5
Miscellaneous Metal & Plastic Processing Mach. Operators	189	13	0	0	43	0	7	0	3	0	72	2
Wood Lathe, Routing, & Planing Machine Oper.	2	5	0	0	5	0	0	0	0	0	2	0
Sawing Machine Operators	668	189	7	2	245	43	2	2	46	2	174	29
Shaping & Joining Machine Operators	37	35	0	0	17	9	0	2	0	0	16	0
Nailing & Tacking Machine Operators	31	3	0	0	22	5	0	0	0	0	7	0
Miscellaneous Woodworking Machine Operators	147	20	4	0	20	15	4	0	20	5	26	7
Printing Machine Operators	2880	918	44	3	2319	617	161	71	481	166	430	154
Photoengravers & Lithographers	161	118	5	0	175	80	13	0	44	51	30	18
Typesetters & Compositors	257	508	10	0	230	345	15	23	36	49	25	66
Miscellaneous Printing Machine Operators	289	421	0	10	194	196	17	11	43	132	37	77
Winding & Twisting Machine Operators	26	9	0	0	11	2	0	0	0	0	0	7
Knitting, Looping, Taping & Weaving Machine Oper.	10	9	2	0	0	17	0	0	0	0	3	0
Textile Cutting Machine Op.	12	10	0	0	8	13	0	0	0	0	6	6
Textile Sewing Machine Oper.	118	2830	0	29	72	1653	4	22	0	161	14	397
Shoe Machine Operators	27	29	0	0	28	38	0	2	0	0	4	6
Pressing Machine Operators	88	601	18	12	97	387	0	14	0	14	19	82
Laundering & Dry Cleaning Machine Operators	518	1875	16	60	471	635	3	30	77	78	132	343
Miscellaneous Textile Machine Operators	127	100	0	0	49	49	0	15	12	4	14	28
Cementing & Gluing Machine Operators	221	359	0	0	85	98	6	15	32	18	83	203
Packaging & Filling Machine Operators	448	612	0	0	317	243	27	57	63	23	84	77
Extruding & Forming Machine Operators	249	85	0	0	76	19	19	9	49	7	18	7

Table A - 6
(continued)

OCCUPATION	KANSAS M	KANSAS F	RILEY CO. M	RILEY CO. F	K.C. M	K.C. F	LAWRENCE M	LAWRENCE F	TOPEKA M	TOPEKA F	WICHITA M	WICHITA F
Mixing & Blending Machine Operators	869	103	0	0	571	223	29	0	119	1	99	13
Separating, Filtering & Clarifying Machine Oper.	385	32	6	0	191	5	2	0	30	6	109	7
Compressing & Compacting Machine Operators	82	103	0	0	118	43	0	0	14	17	13	19
Painting & Paint Spraying Machine Operators	1847	300	4	2	954	185	17	9	85	0	636	140
Raosting & Baking Machine Operators, Food	55	3	3	0	61	0	0	0	0	0	6	0
Washing, Cleaning & Pickling Machine Oper.	20	16	0	0	30	0	0	0	6	0	0	2
Folding Machine Operators	130	251	6	41	60	98	19	10	32	16	18	5
Furnace, Kiln, & Oven Oper. ex. Food	1199	42	8	0	579	59	48	0	78	0	226	0
Crushing & Grinding Machine Operators	701	38	5	0	172	21	10	0	44	6	131	0
Slicing & Cutting Machine Operators	1382	494	17	0	718	225	32	9	185	38	280	103
Motion Picture Projectionists	167	24	7	0	64	4	21	2	5	0	31	7
Photographic Process Machine Operators	292	695	10	0	260	621	45	11	57	144	51	112
Miscellaneous Machine Oper., N.E.C.	5071	2745	27	37	1970	1212	128	137	825	224	941	542
Machine Oper., Not Specified	6640	3433	62	28	4973	2855	248	175	680	331	1251	584
Machine Operators Manufacturing Nondurable Goods	4844	2957	10	15	2365	1759	273	291	1246	459	531	262
Machine Operators Manufacturing Durable Goods	5078	2515	58	28	3291	1722	34	17	166	20	1455	723
Machine Operators: Nonmanufacturing Industries	1789	706	21	22	1287	586	69	4	93	76	206	141
Welders & Cutters	10394	465	84	0	4232	250	131	5	762	13	1619	79
Solderers & Brazers	16	319	0	0	80	119	2	42	0	10	0	101
Assemblers	9303	9012	35	36	9876	5494	116	280	273	218	2731	2573
Hand Cutting & Trimming Occupations	212	64	2	0	21	20	0	11	2	0	38	15
Hand Molding, Casting & Forming Occupations	105	44	0	7	22	29	1	2	7	0	18	2
Hand Painting, Coating & Decorating Occupations	178	103	2	0	145	63	0	0	16	16	45	41
Hand Engraving & Printing Occupations	8	8	0	0	6	4	0	0	0	7	0	0
Hand Grinding & Polishing Occupations	11	0	0	0	0	5	0	0	0	0	11	0
Miscellaneous Hand Working Occupations	82	109	0	2	64	67	0	0	8	17	15	7
Production Inspectors, Checkers & Examiners	3618	2424	5	16	2568	2071	35	111	241	178	1219	520
Production Testers	359	230	0	0	109	137	2	12	1	9	71	29
Production Samplers & Weighers	60	2	0	0	42	8	2	0	0	0	0	0
Graders & Sorters, ex. Agricultural	291	337	20	6	121	286	0	19	53	31	36	26
TRANSPORTATION & MATERIAL MOVING WORKERS	47488	4387	485	68	28302	2402	1060	107	3483	322	6259	858
Supervisors, Motor Vehicle Operators	366	29	8	0	240	30	2	0	18	9	100	0
Truck Drivers, Heavy	19698	703	179	10	12122	289	351	15	1342	45	2778	154
Truck Drivers, Light	5210	493	65	19	3147	309	200	17	447	22	829	148
Driver-Sales Workers	1676	126	49	3	908	64	35	0	131	12	338	79
Bus Drivers	1291	2025	40	20	1083	1011	52	39	88	152	251	353
Taxicab Drivers & Chauff.	878	181	19	0	1027	176	65	0	64	9	164	18
Parking Lot Attendants	154	22	0	0	202	12	0	0	18	7	55	0
Motor Transportation Occupations, N.E.C	22	0	0	0	23	0	0	0	0	0	0	0
Railroad Conductors & Yardmasters	887	27	0	0	399	37	7	0	61	0	14	0
Locomotive Operating Occupations	1342	34	2	0	906	15	39	0	47	0	58	9
Railroad Brake, Signal, & Switch Operators	2680	54	0	0	1939	24	12	0	96	0	97	10

Table A - 6
(continued)

OCCUPATION	KANSAS		RILEY CO.		K.C.		LAWRENCE		TOPEKA		WICHITA	
	M	F	M	F	M	F	M	F	M	F	M	F
Rail Vehicle Operators, N.E.C.	145	7	0	0	101	7	0	0	29	0	14	0
Ship Captains & Mates, ex. Fishing Boats	32	0	0	0	20	0	0	0	2	0	1	0
Sailors & Deckhands	38	0	0	0	20	0	0	0	0	0	6	0
Marine Engineers	0	4	0	0	0	0	0	0	0	2	0	0
Bridge, Lock & Lighthouse Tenders	10	0	0	0	8	0	0	0	0	0	0	0
Supervisors, Material Moving Equipment Oper.	302	8	2	0	157	39	0	0	51	4	30	2
Material Moving Equipment Oper.: Operating Engrs.	3556	48	59	0	1396	27	80	0	392	2	468	8
Longshore Equipment Oper.	3	0	0	0	27	0	0	0	0	0	0	0
Hoist & Winch Operators	542	2	0	0	54	0	11	0	30	0	25	0
Crane & Tower Operators	730	15	0	0	667	19	0	0	47	0	100	0
Excavating & Loading Machine Operators	1071	42	24	0	295	14	11	0	80	5	116	12
Grader, Dozer, & Scraper Operators	1645	33	5	0	236	15	13	0	81	0	111	6
Industrial Truck & Tractor Equipment Operators	3421	332	28	0	2737	185	130	24	380	35	516	38
Miscellaneous Material Moving Equipment Oper.	1789	202	5	16	588	129	52	12	79	18	188	21
HANDLERS, EQUIPMENT CLEANERS, HELPERS & LABORERS	55523	13876	875	394	37375	10211	1569	396	4538	947	8469	2142
Supervisors, Handlers, Equip. Cleaners, & Laborers, N.E.C.	26	2	0	0	24	0	0	0	0	0	7	0
Helpers, Mechanics & Repairers	267	15	0	0	118	3	5	0	28	0	49	5
Helpers, Construction Trades	895	88	22	0	360	0	42	0	88	10	185	24
Helpers, Surveyor	41	8	0	0	39	0	0	0	3	0	0	8
Helpers, Extractive Occup.	68	14	0	0	58	7	0	0	0	0	0	10
Construction Laborers	9080	361	172	7	4586	79	319	10	841	41	1221	76
Production Helpers	650	175	14	0	398	84	14	13	55	12	129	20
Garbage Collectors	684	28	5	8	269	41	12	0	94	0	98	7
Stevedores	2	0	0	0	0	0	0	0	0	0	0	0
Stock Handlers & Baggers	5802	1456	148	36	3411	704	211	27	476	74	1154	254
Machine Feeders & Offbearers	385	210	6	2	232	106	48	14	37	2	18	37
Freight, Stock & Material Handlers, N.E.C.	4980	314	99	0	3655	218	86	4	381	18	829	43
Garage & Service Station Related Occupations	4368	499	56	15	1937	156	105	22	332	31	503	63
Vehicle Washers & Equipment Cleaners	1365	256	34	2	922	100	28	2	75	13	275	45
Hand Packers & Packagers	1874	3700	52	20	1310	2406	52	94	105	333	375	477
Laborers, ex. Construction	11922	2372	130	89	9483	2393	318	88	953	149	1712	388
Laborers, ex. Construction Manufacturing Nondurable Goods	2149	650	12	40	1299	623	82	20	211	47	359	46
Laborers, ex. Construction Manufacturing Durable Goods	2119	607	4	8	1749	503	12	0	99	2	344	171
Trans., Commun., & Other Public Utilities Laborers	2090	111	15	0	1772	112	39	2	175	14	237	25
Wholesale & Retail Trade Laborers	3577	635	27	8	3572	902	122	44	260	75	538	90
Laborers, All Other Indust.	1987	369	72	33	1091	253	63	22	208	11	234	56
Unemployed, No Civilian Work Experience Since 1975	1192	2006	7	126	1090	1521	11	34	117	115	202	297

TABLE A-7

PROJECTED BACHELORS DEGREES BY TYPE FOR SELECTED KANSAS UNIVERSITIES: 1983-87

(Percentage distribution of degree type is based on 80-81 school year)

	Total	Business	Education	Hard Sciences	Mathmatics	Health Fields	Engineering	Social Sciences
Emporia State University								
Percent of Total Degrees by Field:		27.0	33.8	9.2	1.1	1.2	—	6.0
Projected number of Degrees								
1983	749	202	253	69	8	9	—	45
1984	755	204	255	69	8	9	—	45
1985	711	192	240	65	8	9	—	43
1986	581	157	196	53	6	7	—	35
1987	562	152	190	52	6	7	—	34
Fort Hayes State University								
		33.4	24.4	5.6	1.2	4.7	—	6.0
1983	709	237	173	40	9	33	—	43
1984	763	255	186	43	10	36	—	46
1985	667	223	163	37	8	31	—	40
1986	658	220	161	37	8	31	—	40
1987	637	213	155	36	8	30	—	38
Kansas State University								
		16.0	12.8	5.5	0.3	2.3	12.7	6.3
1983	3108	497	398	171	9	71	395	196
1984	2493	399	319	137	7	57	316	157
1985	2930	469	375	161	9	67	372	185
1986	2593	415	332	143	8	60	329	163
1987	2504	401	321	138	8	58	318	158
Pittsburgh State University								
		12.4	19.2	6.1	0.8	12.3	22.3	4.5
1983	801	99	154	49	6	99	179	36
1984	755	94	145	46	6	93	168	34
1985	752	93	144	46	6	92	168	34
1986	768	95	147	47	6	94	171	35
1987	743	92	143	45	6	91	166	33
University of Kansas								
		19.3	12.3	6.3	0.5	12.6	10.1	6.5
1983	3012	581	370	190	15	380	304	196
1984	2957	571	364	186	15	373	299	192
1985	2654	512	326	167	13	334	368	172
1986	3181	614	391	200	16	401	321	207
1987	3002	579	369	189	15	378	303	195
Wichita State University								
		23.2	12.7	4.9	0.9	16.6	9.5	4.7
1983	1399	325	178	69	13	232	133	66
1984	1511	351	192	74	14	251	144	71
1985	1369	318	174	67	12	227	130	64
1986	1389	322	176	68	13	231	132	65
1987	1374	319	174	67	12	228	131	65

TABLE A-7 cont.

PROJECTED BACHELORS DEGREES BY TYPE FOR SELECTED KANSAS UNIVERSITIES: 1983-87

(Percentage distribution of degree type is based on 80-81 school year)

	Total	Business	Education	Hard Sciences	Mathmatics	Health Fields	Engineering	Social Sciences
				Washburn University				
		25.3	13.0	5.6	1.1	9.3	---	13.4
1983	451	114	59	25	5	42	---	60
1984	573	146	75	32	6	54	---	77
1985	519	131	67	29	6	48	---	70
1986	503	127	65	28	6	47	---	67
1987	537	136	70	30	6	50	---	72
				Totals for Four-Year Independent Colleges				
		23.3	19.6	12.0	1.6	11.6	0.1	8.0
1983	2239	522	439	269	20	260	2	179
1984	2379	554	466	285	21	276	2	190
1985	1900	443	372	228	17	220	2	152
1986	2002	466	392	240	18	232	2	160
1987	2130	496	417	256	19	247	2	170

Table A-8

Projected Two-Year Degrees by Type Awarded From Selected Kansas Institutions: 1983-1987

(Breakdown by degree type is based on distribution for 1980-81)

Community Colleges

	Total	Business	Liberal Studies	Health	Engineering
% of Total Degrees by Field	100%	5.0%	57.9%	10.1%	2.5%
Projected # of Degrees					
1983	4,300	215	2,490	434	108
1984	4,381	219	2,537	442	110
1985	4,462	223	2,584	451	112
1986	4,544	227	2,631	459	114
1987	4,625	231	2,678	467	116

Private Two-Year Colleges[1]

	Total	Business	Liberal Studies	Health	Engineering
% of Total Degrees by Field	100%	6.4%	68.2%	11.1%	3.1%
Projected annual # of Degrees by Field: 1983-87	362	25	264	43	12

Kansas Technical Institute

	Total	Business	Liberal Studies	Health	Engineering
% of Total Degrees by Field	100%	23.6%	-	58.1%	18.3%
Projected # of Degrees					
1983	137	32	-	80	25
1984	152	36	-	88	28
1985	182	43	-	106	33
1986	197	46	-	114	37
1987	212	50	-	123	39

[1] Includes Central College, Donnelly College, and Hesston College.

Projections by Institute for Economic and Business Research.
Data Sources: Kansas Legislative Research Department, Kansas Postsecondary Education Profile, Second Edition, 1983 and Kansas Higher Education Enrollment Report, Fall, 1982.