
Appendix C

Industry and Economic Profile

Kansas Statewide Freight Plan Industry Profile

■ 1.0 Key Findings

- Continued population growth, especially in Kansas' urban areas, is creating new patterns of freight demand that are already becoming evident in the development of the Gardner Intermodal Terminal and the surrounding areas. This growth also has the potential to create more conflicts between passenger and freight traffic.
- Per capita income in Kansas has also risen steadily over the past several years, particularly in KDOT District 1 (Kansas City) and KDOT District 5 (Wichita). Since personal income is an indicator of the demand for goods and services, this growth indicates rising demand for freight transportation in Kansas.
- Kansas Gross State Product (GSP) reached \$93.8 billion in 2006, which was 0.8 percent of United States Gross Domestic Product (GDP). Much of this growth occurred in the service sector, reflecting Kansas' transition towards a service-based economy. However goods dependent industries, led by agriculture, meat processing, and manufacturing, still accounted for almost 43 percent of state economic output in 2006.
- Manufacturing (including transportation equipment manufacturing and food manufacturing) and wholesale and retail trade are the dominant goods dependent industries in Kansas, contributing over 30 percent to the state's total GSP in 2006. Manufacturing has displayed cyclical growth over the last several years, declining during economic downturns but then rebounding during recoveries. Wholesale and retail trade, by contrast, have generally increased along with population growth.
- Although agricultural output declined from 1997 to 2000, it expanded by almost 54 percent from 2000 to 2006, driven by increasing demand for corn (including for ethanol production), wheat, and other agricultural products. Wealth gains in developing countries have led to greater demand for basic grains both for human consumption and as feed for livestock, which has pushed up commodity prices across the board.
- Service industries in Kansas have experienced steady growth over the last 10 years, led by financial activities and government, which combined to contribute over 27 percent of total state GSP in 2006. The information sector also experienced growth, driven by a telecommunications cluster in the Kansas City area.

- Although employment growth in the service sector has consistently outpaced that in the goods dependent sector, Kansas still maintains a sizeable employment base in goods dependent industries. This trend is expected to continue into the future – by 2030, these industries will still employ about one-third of Kansas’ total labor force. Efficiency gains will likely allow these industries to produce more even with fewer employees, which will in turn lead to more freight shipments throughout Kansas.
- Agriculture (both crop and animal production) is the most freight-dependent industry in Kansas, requiring nearly \$82,000 of transportation inputs to produce \$1 million in output. Though ninety four percent of agricultural output is currently transported by truck (reflecting the heavy reliance on privately-owned transportation as well as the exclusive use of trucks in livestock production), short line rail is also an important mode used by some wheat and grain producers. Since agricultural production occurs all over Kansas, continued growth in this key industry (and related industries like ethanol production) will lead to greater demands on the freight transportation system.
- Transportation equipment manufacturing is also heavily dependent on freight transportation, particularly truck and air freight. Aircraft maintenance, repair, and overhaul (MRO) businesses often receive incoming military and civilian planes that fly in from all over the world; their parts are then shipped elsewhere for refurbishment, sent back, and reinstalled on the planes. Since these businesses utilize a just-in-time “pull” supply chain model, they are especially reliant on fast, reliable freight service.
- Food manufacturing is a very diverse industry in Kansas, ranging from meat processing in southwest Kansas to animal food manufacturing, frozen foods, and bakeries in the eastern and central parts of the state. Meat processing in particular has experienced significant growth, which is likely to continue because of Kansas’ moderate climate and quality feed grains. The industry is very reliant on truck transportation since Federal regulations require live animals to be transported by truck. This will lead to more trucks on the rural road infrastructure in southwest Kansas.

■ 2.0 Introduction

A state's economy and industry structure— its key businesses, their suppliers, the markets they serve, and their growth prospects – have a direct impact on the condition and performance of its freight transportation system. In an increasingly national and global economy, Kansas shippers, carriers, and other business/industry stakeholders rely on a safe, efficient, and reliable freight transportation system. As a result, there is a growing awareness at the Federal, state, metropolitan, and local levels of the importance of freight transportation and a corresponding push to link transportation investment, especially freight transportation investment, to economic development.

Recognizing the link between the efficiency of the statewide freight transportation system and the continued economic competitiveness of the state, the Kansas Department of Transportation (KDOT)- along with key public and private business, industry, and freight transportation stakeholders statewide- has undertaken a Statewide Multimodal Freight Study. This study will identify the key trends and issues facing the Kansas freight system both now and in the future, and develop strategies to address them. One important outcome of this Study is the development and implementation of investment strategies that are not only consistent with the KDOT long-range planning process, but also enhance the ability of Kansas to retain existing industries and attract new ones.

By summarizing the key industries that are driving the state's economic growth, this technical memorandum is a critical first step in helping KDOT better understand the link between freight transportation and economic competitiveness and provides a foundation of information on which to develop investment strategies to ensure both freight mobility and economic growth. Guided by both quantitative data analysis and in-person interviews with Kansas business and industry stakeholders, this analysis identified the industries in Kansas that contribute most significantly to the state's economy; described how the operations of these industries impact the state's freight transportation system; and assessed how socio-economic trends will affect industry development in the future. This information is presented in the following four sections:

- **Data and Methodology** explains the different quantitative data sets used to support the analysis, and describes their strengths and limitations;
- **Socioeconomic and Population Characteristics** describes the trends in statewide population growth and distribution, changes in per capita income and prosperity, and assesses how those trends impact demand on the Kansas freight system;
- **Industry Characteristics** examines the key industries in Kansas that are driving statewide economic growth both in terms of employment and contribution to the State's economic output, the sub-industries that are mostly responsible for that growth, their specific locations within the State, and their future growth prospects; and
- **Transportation Needs and Industry Logistics Patterns** profiles the economic impacts, modal dependencies, and logistics patterns of Kansas' most important industries.

■ 3.0 Data and Methodology

The industry analysis was completed in several steps. First, the main industries in Kansas were identified, and their contribution to the State's economic growth and stability, and their potential for growth, was assessed. Second, through a series of interviews with industry representatives, the freight transportation needs of key industries were identified, as well as a picture of how the operations of key industries impacts the transportation system. Interviews with local governments, professional associations, and transportation carrier representatives provided additional viewpoints and information to help to create a link between transportation investments and economic development activities. Finally, a series of maps was developed to describe how Kansas industries are utilizing the state's freight transportation system. The following sections describe in greater detail the approach to this analysis and the data used to support it.

3.1 Data Collection

Assessing the contribution of industries to the Kansas economy requires a variety of data from a number of sources. Broadly speaking, the data necessary to support this industry analysis falls into three categories, described below.

- **Socioeconomic Data** describe economic prosperity (in terms of per capita income, personal income, or other metrics) within Kansas. These data are important because changes in wealth and income affect the demand for goods (and thus freight transportation) in state, regional, and local markets. To support this analysis, we relied primarily on *U.S. Bureau of Economic Analysis Regional Economic Accounts* data, which provide personal income and per capita income by Kansas county from 1996 to 2006.
- **Population Data** describe population growth and distribution in Kansas at the statewide level and among the different regions of the State. Population shifts form the consuming market in a state or region and therefore drive changes in freight transportation demand within and among regions. To support this analysis, we relied primarily on *the Kansas Statistical Abstract*, which provides historical and current population patterns by county.
- **Industry Data** reveal employment patterns and contribution to statewide economic output by industry, and the impact of transportation on economic activity by industry. Employment and output growth or contraction are important indicators of growth in freight shipments, while data describing the impact of transportation on industrial activity allow for an identification of which industries depend on freight movement the most, and which modes are most important to them. To support this analysis, we relied primarily on the following sources:

- **U.S. Bureau of Economic Analysis Gross State Product Series:** Annual contribution to statewide economic output by industry from 1997 to 2006;
- **Moody's Economy.com Kansas Profile:** Historical (1970 to 2006) and forecast (2007 to 2038) employment by industry for all Kansas counties;
- **Kansas Department of Labor Quarterly Census of Employment and Wages (QCEW) Data:** Annual employment by industry sector for all Kansas counties in 2006;
- **Kansas Department of Agriculture:** Agriculture statistics including production volume and value for key agricultural commodities;
- **Woods and Poole Economics, Inc. Kansas Profile:** Historical (1970 to 2002) and forecast (2003 to 2030) employment data by county for all Kansas counties (used to estimate/forecast agricultural employment); and
- **U.S. Bureau of Transportation Statistics Transportation Satellite Accounts:** Estimates of the freight transportation inputs required by each industry to produce each unit of output.

Table 1 lists these data sources by category, describes them, and notes how they were used to support the analysis.

3.2 Key Industry Identification

Key industries in Kansas were divided into two broad categories: “goods dependent” industries and “service” industries. Because these two types of industries have different freight transportation needs, this division allows for an easier description of the demands on the Kansas freight transportation system posed by each. Also identified were the historical socioeconomic, employment, and industry trends for the 10-year period from 1997 to 2006, in order to better understand how these trends have influenced industry development within the state.¹

These data are presented at the six KDOT districts shown in Figure 1. The KDOT districts are a good way to present data, as the counties within each District tend to share similar socio-economic and industry characteristics. The following four steps provide additional detail about how the key industries were identified.

¹ This is due to data limitations of the Bureau of Economic Analysis (BEA) dataset used to analyze the industry contributions to Gross State Product. Prior to 1996, the BEA used Standard Industrial Classification (SIC) industry codes to group industries. In 1996, the BEA dataset switched to the North American Industry Classification System (NAICS) coding scheme. Though it is possible to convert data between the two code types, the process is not exact and categories of data tend to overlap.

Table 1. List of Data Sources

Category	Data Source	Description	Used For
<i>Population Data</i>	Kansas Statistical Abstract ^a	Historical and current population estimates by county.	Analyzing population shifts in Kansas at the KDOT district level.
<i>Socioeconomic Data</i>	U.S. Bureau of Economic Analysis Regional Economic Accounts ^b	County personal income/per capita income, 1996 to 2006.	Analyzing per capita income trends by KDOT district.
<i>Industry Data</i>	Moody's Economy.com Kansas Profile ^c	Historical (1970 to 2006) and projected (2007 to 2038) employment data by county for all Kansas counties and major metropolitan areas, at the three-digit NAICS code level.	Determining historical and future employment patterns for key existing and emerging industries.
	U.S. Bureau of Economic Analysis Regional Economic Accounts ^b	Annual Gross State Product contribution by industry, 1997 to 2006.	Identifying key industries in Kansas by their contribution to total statewide economic activity.
	Kansas Department of Labor Quarterly Census of Employment and Wages (QCEW) data ^d	Quarterly and annual employment estimates by industry sector for all Kansas counties in 2006.	Estimating agricultural employment by county, which is not included in the Moody's data.
	Woods and Poole Economics, Inc. Kansas Profile ^e	Historical (1970 to 2002) and projected (2003 to 2030) employment data by county for all Kansas counties.	Deriving growth rates to estimate past and future changes in agricultural employment by county; estimating agriculture employment for counties in which KDOL data was suppressed.
	U.S. Bureau of Transportation Statistics Transportation Satellite Accounts ^f	Estimates of the economic impact of transportation on economic activity.	Quantifying modal dependencies of key goods dependent industries.
	Kansas Department of Agriculture Agricultural Statistics ^g	Production volume and value for key agricultural commodities.	Estimating the economic impact of agriculture in Kansas.

^a <http://www.ipsr.ku.edu/ksdata/ksah/>.

^b <http://www.bea.gov/regional/index.htm#gsp>.

^c <http://www.economy.com>.

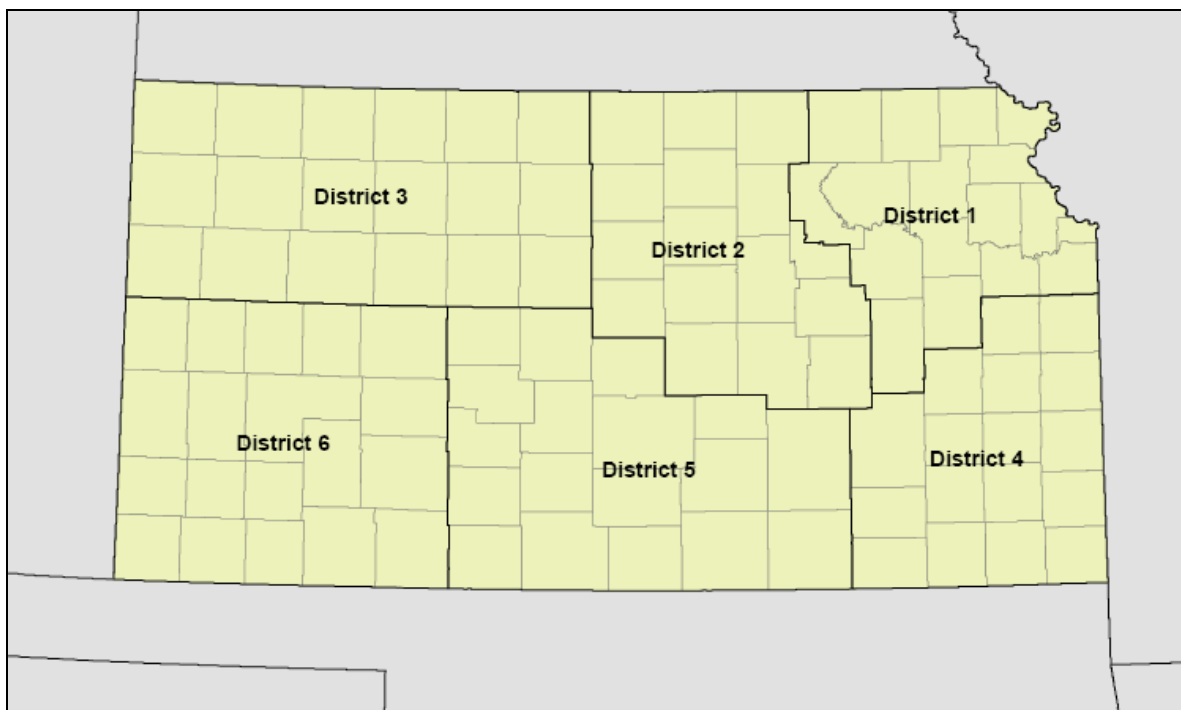
^d <http://www.dol.ks.gov/LMIS/ALMIS/qcew/industry.html>.

^e <http://www.woodsandpoole.com>.

^f http://www.bts.gov/publications/transportation_satellite_accounts/index.html.

^g http://www.nass.usda.gov/Statistics_by_State/Kansas/index.asp.

Figure 1. KDOT District Map



Step 1 - Add Agricultural Employment

There are many sources of state- and county-level employment estimates, including public data sets produced by government agencies and proprietary ones from private companies. However, no single data set provides a comprehensive picture of statewide employment, due to limitations in geographic or industry coverage, redacted data, lack of forecasts, or other reasons. Therefore, three different employment data sets were used to derive an accurate picture of current and future industry employment trends in Kansas.

Agriculture is an important industry in Kansas, but many datasets- including the Moody's dataset- do not cover it well because it is intensely seasonal and many of its workers are hard to track using conventional methods. Given the importance of this industry to the Kansas economy, we estimated agricultural employment using three additional data sources: the Kansas Department of Labor's (KDOL) Quarterly Census of Employment and Wages (QCEW), The Kansas Department of Agriculture statistical data, and data from Woods and Poole Economics, Inc. (a proprietary dataset owned by CS).

KDOL county employment estimates for 2006 were used wherever possible because they are generally more accurate and more reflective of statewide conditions; however, due to nondisclosure restrictions, agricultural employment data from this source was not available for all counties in the state. In such cases, the Woods and Poole estimate was used, factored by the ratio of the KDOL statewide agriculture employment estimate to the Woods and Poole estimate of agricultural employment. This was done because the Woods and Poole dataset includes contract employees and the self-employed, whereas the KDOL and

Moody's data do not track these individuals. This made it necessary to factor the Woods and Poole data to make it comparable to KDOL estimates.

The 2006 agricultural employment estimates thus derived were at the two-digit North American Industry Classification System (NAICS) level of detail.² To make them consistent with the Moody's data, which is at the more specific three-digit NAICS industry level, another transformation was required. The total county agriculture employment estimates were multiplied by the statewide ratios of employment in crop production, animal production, and agricultural support services to total agricultural employment to arrive at county-level estimates of these industry sub-sectors. Finally, annual growth rates derived from the Woods and Poole forecast were applied to the base year (2006) estimates to obtain historical (1970 to 2006) and forecast (2007 to 2030) agricultural industry employment at the three-digit NAICS level of detail for each county in Kansas. This data was added back into the Moody's data set to develop a comprehensive statewide employment dataset. A check against the statewide employment figures provided by KDOL showed only a two percent difference, well within acceptable tolerance.

Step 2 - Calculate Total Employment by District

Next, we aggregated the consolidated employment data to arrive at industry sector totals for each KDOL District. These aggregated data were used to identify the top industries by employment for the goods dependent and service sectors by taking the average proportions of each industry to its sector total from 1997 to 2006. The GSP data were similarly averaged to identify the top industries in Kansas according to their contribution to statewide economic activity. We also used the employment and GSP time series data to analyze trends in overall GSP contribution and employment for the goods dependent and service sectors. More specific three-digit NAICS employment and GSP data were used to identify specific sub-industries that are most significantly driving the Kansas economy.

Step 3 - Identify Key Industries

We used the Moody's employment projections to determine the industries that will grow the most through the year 2030 and will thus be impacting the State's infrastructure in the future. We conducted a geographical cluster analysis to identify locations within the State where the key industries are located, the results of which are described in section 5.3. This involved mapping the locations of industries in Kansas to show where they are concentrated within the State and therefore where they are using and impacting the transportation system the most.

² NAICS was developed jointly by the U.S., Canada, and Mexico to provide new comparability in statistics about business activity across North America

Step 4 - Describe Modal Dependencies and Logistics Patterns

Finally, we developed an analysis of the modal dependencies and logistics patterns of these critical industries using Transportation Satellite Accounts (TSA) published by the Bureau of Economic Analysis. TSA data are output multipliers that quantify the amount of transportation inputs, by mode, that are required to produce one unit of an industry's output. They are helpful in understanding what modes are most important to what industries.

This analysis is supplemented with a set of logistics diagrams that graphically depict the freight flows associated with specific sub-industries in Kansas. These diagrams were developed using data gathered from in-person interviews with business representatives. These interviews employed a standard set of questions designed to provide insight into inbound and outbound flows and modal dependencies. We used the results of these interviews to develop the logistics flow diagrams shown in Section 6.

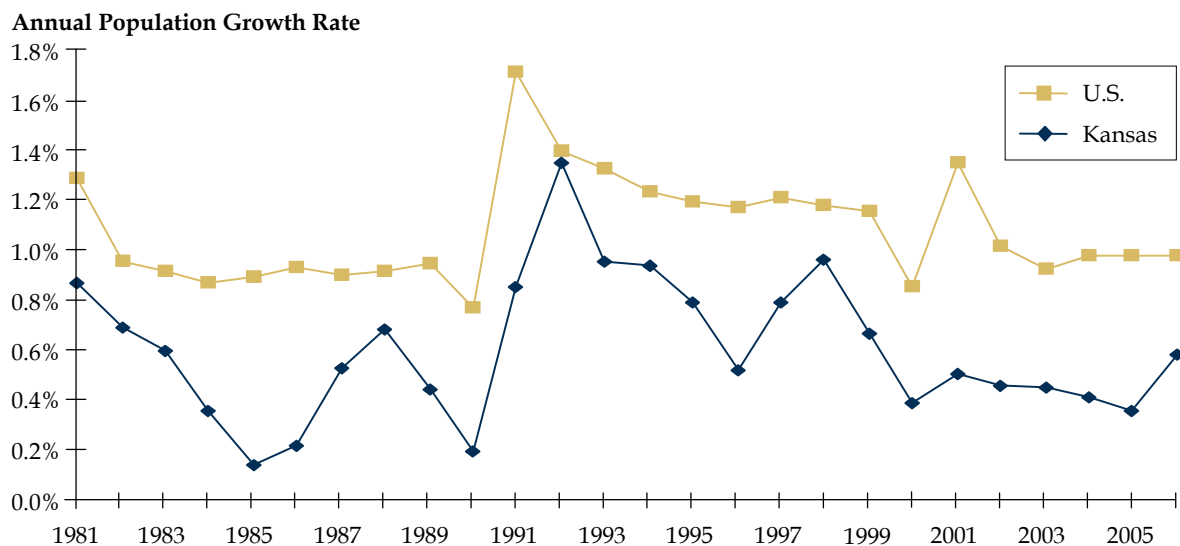
■ 4.0 Socioeconomic and Population Characteristics

Freight demand in Kansas is driven not only by industry growth or decline, but also by population growth, population distribution patterns, and income changes in the state. The following sections summarize the socioeconomic and population data and trends in Kansas and how they might influence freight demand in the future.

4.1 Population Trends

Between 1980 and 2006, the Kansas population grew by almost 17 percent to 2.76 million, representing approximately one percent of the total U.S. population. While statewide population has grown steadily since 1980, Kansas annual growth rates have been consistently lower than total U.S. population growth rates over the past 25 years (Figure 2). This is consistent with many other states in the Midwest and reflects a general shift of the U.S. population to the south and west. As a result, total Kansas population as a percentage of total U.S. population is slowly declining.

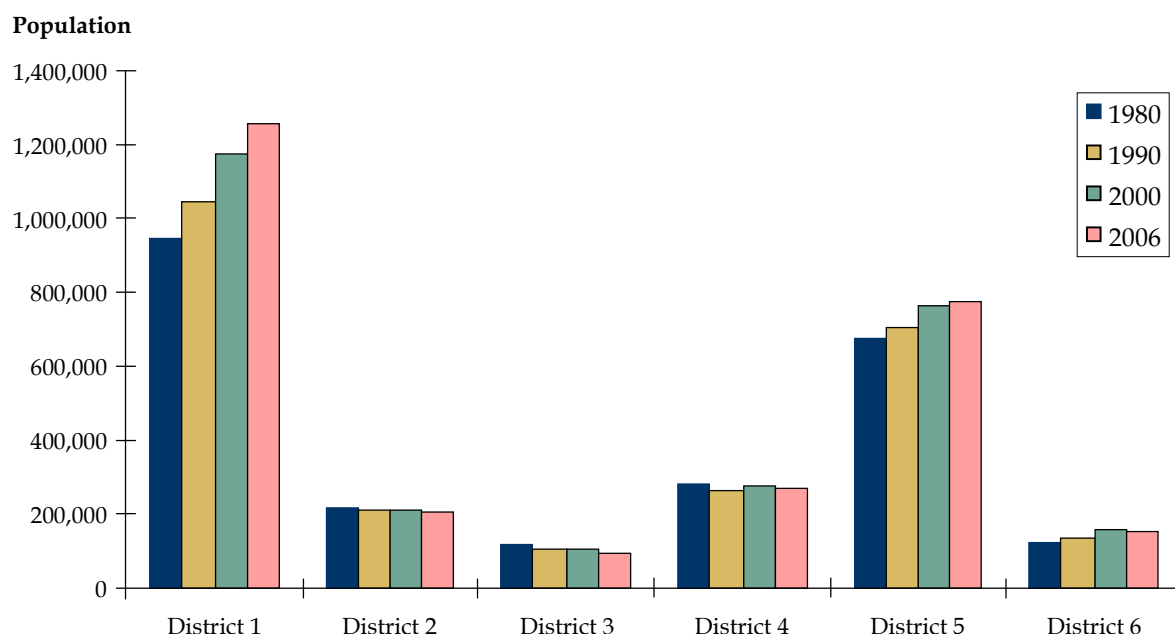
Figure 2. Kansas versus United States Annual Population Growth Rates



Source: U.S. Census Bureau.

This trend is not consistent throughout the state, however. Like many states, there are stark differences in population growth patterns between Kansas’ rural and urban areas, as shown in Figure 3. District 1 includes 11 of the 16 largest cities in Kansas (shown in Table 2) and is the most populated of the six Kansas districts. In 2006, the county populations in District 1 totaled 1.26 million, accounting for almost 46 percent of the state total. Between 1980 and 2006, District 1 was the fastest growing district, growing by over 33 percent and adding over 315,000 people. District 5, which includes Wichita – the largest city in Kansas – had the second highest population among the DOT districts and accounted for over 28 percent of the state total in 2006. It grew by almost 15 percent, adding over 100,000 people between 1980 and 2006.

Figure 3. Population Trends by District



Source: U.S. Census Bureau.

The remaining 26 percent of the Kansas population is distributed among the four other districts. Districts 2, 3, 4, and 6 are primarily rural and do not contain any cities with populations over 50,000. Unlike the fast growing populations in Districts 1 and 5, the total population in Districts 2, 3, and 4 declined between 1980 and 2006. District 3 had the sharpest decline, losing over 19 percent of its population – amounting to over 22,000 people between 1980 and 2006. Unlike the other three rural districts, population in District 6 grew by over 20 percent during the 26-year period, representing the second highest population growth rate among the districts. However, District 6 is one of the least populated districts and has experienced a population decline since 2000.

**Table 2. City Populations in Kansas
 2000 and 2006**

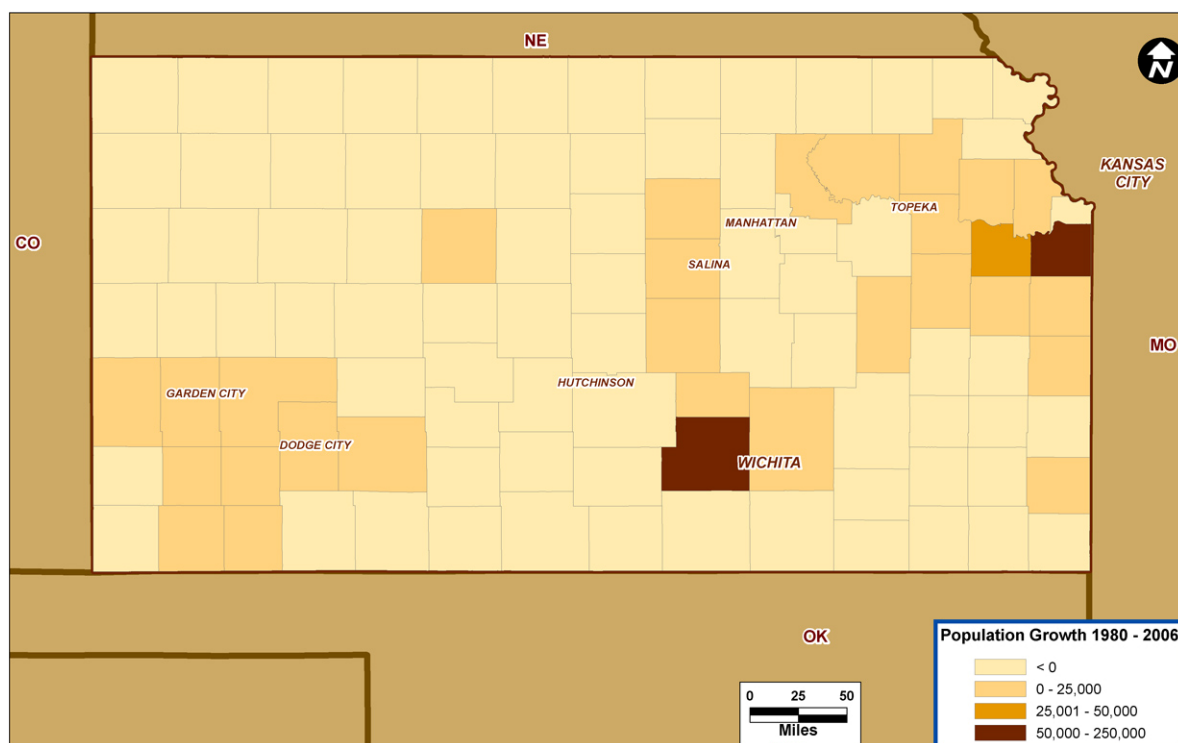
City Name	District	Population 2000	Population 2006	Percent Change (2000 to 2006)
Wichita	5	344,284	357,698	3.9%
Overland Park	1	149,080	166,722	11.8%
Kansas City, KS	1	146,866	143,801	-2.1%
Topeka	1	122,377	122,113	-0.2%
Olathe	1	92,962	114,662	23.3%
Lawrence	1	80,098	88,605	10.6%
Shawnee	1	47,996	59,252	23.5%
Manhattan	1	44,831	50,737	13.2%
Salina	2	45,679	46,140	1.0%
Lenexa	1	40,238	44,520	10.6%
Hutchinson	5	40,787	41,085	0.7%
Leavenworth	1	35,420	34,993	-1.2%
Leawood	1	27,656	30,072	8.7%
Garden City	6	28,451	27,175	-4.5%
Emporia	1	26,760	26,188	-2.1%
Dodge City	6	25,176	26,101	3.7%

Source: U.S. Census Bureau.

Figure 4 shows population growth by county from 1980 to 2006. Clearly, population within Kansas has been shifting away from rural areas and towards the urbanized parts of the State, especially Sedgwick County (Wichita) and Johnson County (Kansas City area). Each of those counties added more than 100,000 residents during that period. The counties surrounding Kansas City and, to a lesser extent, Wichita have absorbed more modest population increases, as have several counties in southwestern Kansas.

This growth is creating new patterns of demand for freight transportation services as well as conflicts between freight and passenger traffic. Continued population growth and concentration in the state's urbanized areas may continue to fuel demand for regional distribution facilities along key highway corridors. This is already happening to some degree with the development of the new BNSF Gardner Intermodal Center and other developments. Careful planning in these and other areas is critical to ensure that these new facilities have adequate access to key elements of the state's multimodal freight infrastructure while minimizing freight/passenger conflicts.

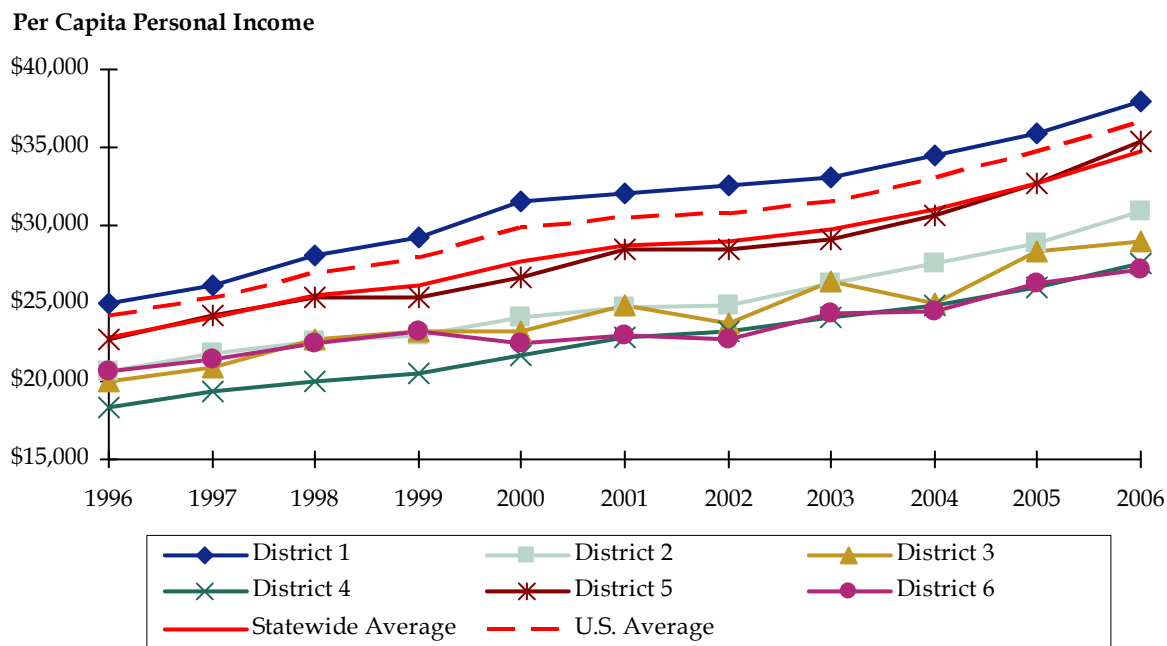
Figure 4. Population Shifts by County
 1980 to 2006



4.2 Per Capita Income Trends

As a measure of average wealth per person, per capita income reflects the relative economic well-being of the people in a region. This can translate to higher levels of health and education as well as more substantial government revenues available for infrastructure investments and other priorities. It is therefore a barometer of demand for goods and services, which in turn affects demand for freight transportation. As shown in Figure 5, per capita income has increased steadily in Kansas over the past 10 years. By 2006, statewide per capita income reached \$34,800. The Kansas statewide average, however, has been approximately six percent lower than the average U.S. per capita income over the past 10 years – the average Kansas resident currently makes approximately \$1,800 less per year than the average American.

Figure 5. Kansas per Capita Income by KDOT District
 1996 to 2006



Similar to the population trends, Districts 1 and 5 have the highest per capita income. Per capita income in Districts 1 and 5 has exceeded or been approximately equal to the state average over the last 10 years. While District 1 had the highest annual per capita income (\$37,957) in 2006 and has consistently exceeded the U.S. average, per capita income in District 5 had the largest percent increase since 1996, growing by 55.8 percent to \$35,400. Per capita income in the primarily rural districts (Districts 2, 3, 4, and 6), however, have been consistently lower than the state average. Growing by only 31.4 percent to \$27,100 between 1996 and 2006, District 6 has the lowest per capita income and has maintained the slowest growth.

■ 5.0 Industry Characteristics

Freight demand also is driven by changes in the industrial makeup of the State's economy. Industry growth and decline can be measured by two different indicators: 1) growth or decline in industry employment; and 2) growth or decline in the industry contribution to GSP. Employment growth or decline is generally proportional to economic growth or decline in that, as an industry expands or contracts, it needs to either employ additional people to accommodate the growth, or to shed jobs to try and make up for economic losses from business contraction. However, using employment figures alone to track industry trends can be deceiving, as it can mask important trends such as productivity or efficiency improvements. Therefore, we considered both indicators to evaluate industry trends.

5.1 Goods Dependent Industry versus Service Industries

Freight transportation is often described as a derived demand, because the level of demand (and the modes that are used) is driven by the characteristics of the economy. A State's goods movement system is, therefore, a reflection of the industries and businesses that make up the State's economy. Industries and businesses can be divided into two groups according to their dependence on freight transportation services:

- **Goods Dependent Industries** are businesses that rely on transportation to receive raw supplies and manufactured goods and to send their refined/finished product to market. This group includes industries such as natural resources and mining, agriculture, retail and wholesale trade, manufacturing, construction, and the transportation and warehousing sectors. Although Kansas employment and GSP growth in these industries has been modest in recent years, these activities remain the foundation for many local area economies within the state.
- **Service Industries** are not as dependent on movement of raw or manufactured materials, but do rely on shipments of materials, office products, or other small shipments of goods and supplies. This category includes industries such as government, education, health care, and other professional categories. Mirroring national trends, this sector has been growing at a faster rate in Kansas than the goods movement dependent industries over the last decade.

Tables 3 and 4 show which industries are included in the goods dependent and service categories, respectively.

Table 3. Goods Dependent Industries in Kansas

<p>Agriculture, Forestry, Fishing, and Hunting</p> <ul style="list-style-type: none"> • Crop and animal production (farms)^a • Forestry, fishing, and related activities <p>Mining</p> <ul style="list-style-type: none"> • Oil and gas extraction • Mining, except oil and gas • Support activities for mining <p>Utilities</p> <p>Construction</p> <p>Manufacturing: Durable Goods</p> <ul style="list-style-type: none"> • Wood product manufacturing • Nonmetallic mineral product manufacturing • Primary metal manufacturing • Fabricated metal product manufacturing • Machinery manufacturing • Computer and electronic product manufacturing • Electrical equipment and appliance manufacturing • Motor vehicle, body, trailer and parts manufacturing • Other transportation equipment manufacturing • Furniture and related products manufacturing • Miscellaneous manufacturing 	<p>Manufacturing: Nondurable Goods</p> <ul style="list-style-type: none"> • Food product manufacturing^b • Textile and textile product manufacturing • Apparel manufacturing • Paper manufacturing • Printing and related support activities • Petroleum and coal manufacturing • Chemical manufacturing • Plastics and rubber products manufacturing <p>Wholesale Trade</p> <p>Retail Trade</p> <p>Transportation and Warehousing (Excludes Postal Service)</p> <ul style="list-style-type: none"> • Air transportation • Rail transportation • Water transportation • Truck transportation • Transit and ground passenger transportation • Pipeline transportation • Other transportation and support activities • Warehousing and storage
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^a Includes cattle feed lots.

^b Includes beef processing.

Table 4. Service Industries in Kansas

<p>Information</p> <ul style="list-style-type: none"> • Publishing including software • Motion picture and sound recording industries • Broadcasting and telecommunications • Information and data processing services <p>Finance and insurance</p> <ul style="list-style-type: none"> • Federal Reserve banks, credit intermediation and related services • Securities, commodity contracts, investments • Insurance carriers and related activities • Funds, trusts, and other financial vehicles <p>Real estate and rental and leasing</p> <ul style="list-style-type: none"> • Real estate • Rental and leasing services and lessors of intangible assets <p>Professional and technical services</p> <ul style="list-style-type: none"> • Legal services • Computer systems design and related services • Other professional, scientific and technical services • Management of companies and enterprises 	<p>Administrative and Waste Services</p> <ul style="list-style-type: none"> • Administrative and support services • Waste management and remediation services <p>Educational services</p> <p>Health care and social assistance</p> <ul style="list-style-type: none"> • Ambulatory health care services • Hospitals and nursing and residential care facilities • Social assistance <p>Arts, entertainment, and recreation</p> <ul style="list-style-type: none"> • Performing arts, museums, and related activities • Amusement, gambling, and recreation <p>Accommodation and food services</p> <ul style="list-style-type: none"> • Accommodation • Food services and drinking places <p>Other services, except government</p> <p>Government</p> <ul style="list-style-type: none"> • Federal civilian • Federal military • State and local
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5.2 Statewide Contribution to GSP

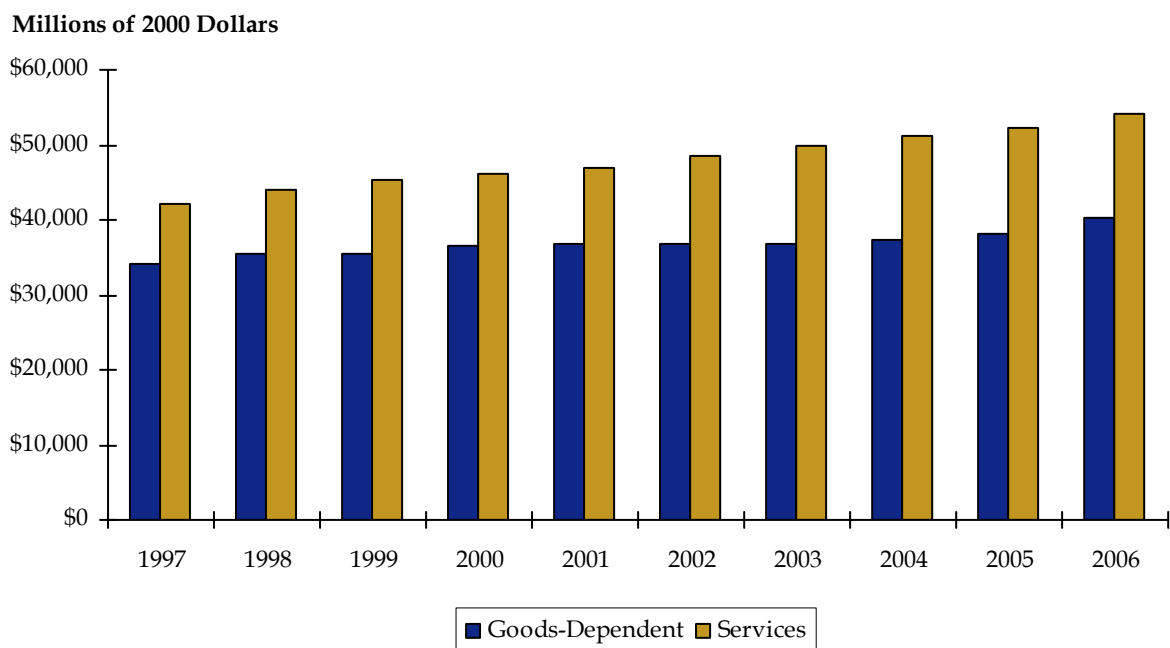
The Kansas GSP reached \$93.8 billion in 2006, up 23.3 percent from \$76.1 billion 10 years prior.³ Despite this growth, however, Kansas’ share of total U.S. GSP declined slightly from 0.9 percent to 0.8 percent. The growth of almost \$18 billion in state GSP has been driven by the growth and expansion of many industries within the goods dependent and the service industries.

Between 1997 and 2006, growth in the services sector outpaced growth among the goods dependent industries. As shown in Figure 6, while the services sector increased by 28.7 percent between 1997 and 2006, Kansas’ goods dependent industries grew by 18.0 percent.

³ All GSP figures referenced in this section are in 2000 chained dollars to remove inflation.

As a result, the service sector's percent contribution to the Kansas GSP grew from 55.2 percent in 1997 to 57.3 percent in 2006 (as compared to the goods dependent sector contribution of 44.8 percent in 1997 to 42.7 percent in 2006).

Figure 6. Goods Dependent versus Service Sector Contribution to GSP
1997 to 2006

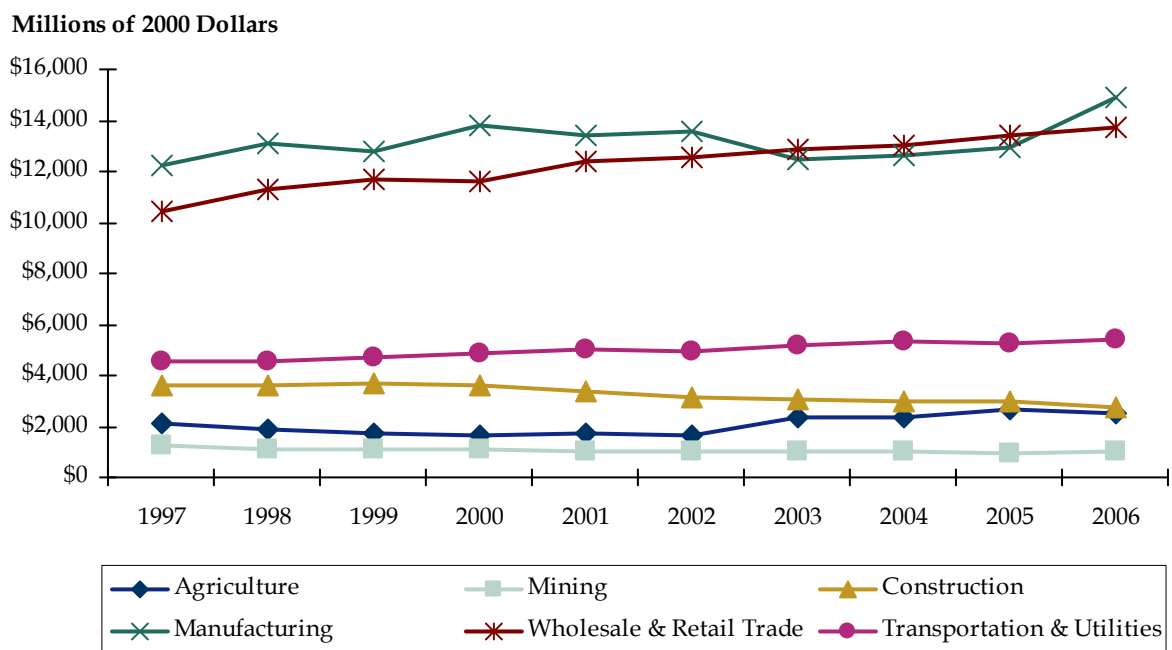


Goods Dependent Industry Trends

As shown in Figure 7, the manufacturing industry (which includes both aerospace and food manufacturing) and the wholesale and retail trade industry are the two dominant goods dependent industries in Kansas. In combination, these two industry sectors contributed over 30 percent to the State's total GSP in 2006. Much of the volatility in the manufacturing industry over the past 10 years can be attributed to fluctuations in the State's dominant manufacturing industry - transportation equipment manufacturing (excluding motor vehicle manufacturing). This industry, which includes aerospace products and parts manufacturing, vehicle and motorcycle manufacturing, and other heavy industries, contributed almost \$4 billion to the Kansas economy in 2006. While reaching a peak of almost \$4.9 billion in 2000 before dropping to a 10-year low of almost \$2.7 billion in 2005, the transportation equipment manufacturing industry rebounded to nearly \$4 billion by 2006⁴.

⁴ Current volatility in the aerospace manufacturing sector suggests that the industry has seen slightly declining fortunes since 2006, however, formal data is not yet available for this current time period.

Figure 7. Goods Dependent Industry Contribution to GSP
1997 to 2006



Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Also contributing to growth in the manufacturing industry, computer, and electronic product manufacturing in Kansas increased by 1,350 percent from \$116 million in 1997 to almost \$1.7 billion in 2006. This industry now ranks as one of the top three manufacturing industries in the State, along with transportation equipment and food product manufacturing. Food product manufacturing, which includes meat processing, grew from \$1.5 billion to more than \$2 billion during that 10-year period.

While the manufacturing industry fluctuated over the past 10 years, the wholesale and retail trade industry experienced strong and consistent growth, expanding by 31.8 percent to \$12.3 billion in 2006. In recent years, the wholesale and retail trade industry has begun to challenge the manufacturing industry as the leading goods dependent industry in the State.

The contribution of utilities to GSP remained approximately constant over the past 10 years. During the same period, the transportation industry, which includes warehousing and air, rail, truck, transit, and pipeline transport, grew by over 28 percent to contribute over \$3.6 billion to state GSP in 2006.

GSP contributions by two goods dependent industries, mining and construction, have declined in recent years. The mining industry, which also includes oil and gas extraction, declined over 20 percent from its 1997 value to contribute just over \$1 billion in 2006. The oil and gas industry, which declined 33 percent over the 10-year period, had the highest

percent decline among all goods dependent industries⁵. Similarly, the construction industry had the greatest absolute decline in GSP contribution between 1997 and 2006. The construction industry's \$3.6 billion contribution to state GSP in 1997 declined over 23 percent to almost \$2.8 billion in 2006.

The agriculture industry (which includes crop and animal production, forestry and fishing) declined by almost 23 percent between 1997 and 2000. Since 2000, however, the industry rebounded to grow by almost 54 percent by 2006. Fluctuations in crop and animal production, as well as growing demand for corn for animals and ethanol, contributed to these trends, while forestry and fishing experienced modest yet consistent growth over the 10-year period.

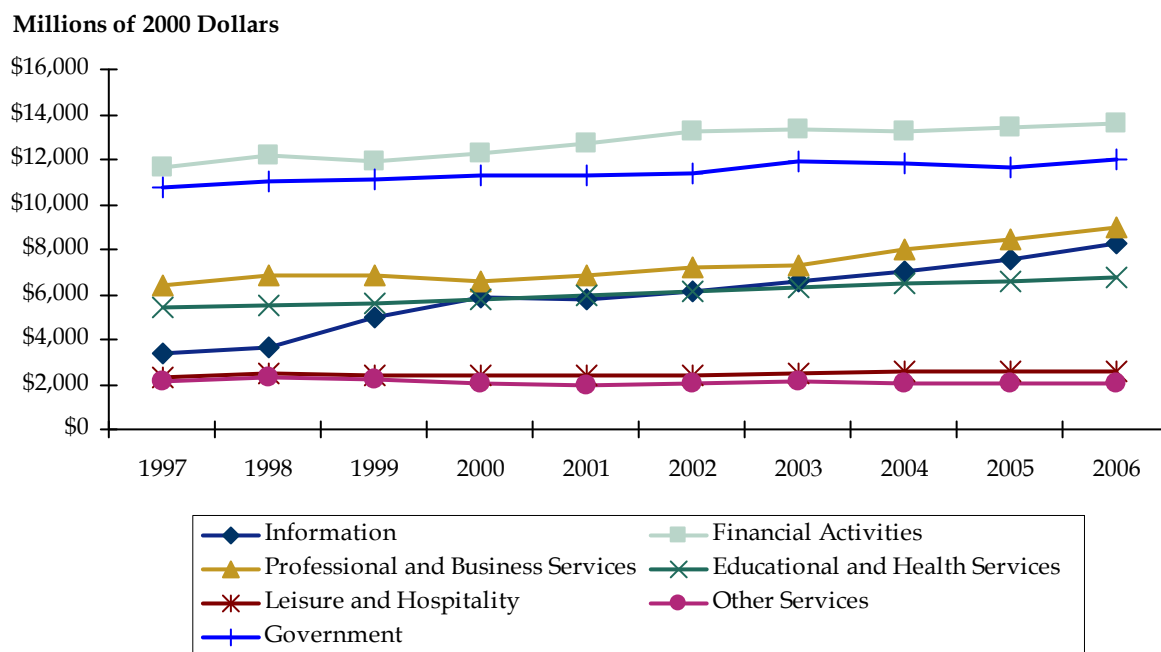
Service Industry Trends

As shown in Figure 8, all of the state's service-based industries have experienced steady growth over the past 10 years.⁶ As service industries are closely tied to population growth, the State's steady population growth over this period has contributed to the service sector's growth. Kansas' two leading service sector industries, financial activities (including finance, insurance, and real estate) and government, combined to account for 27.1 percent of the State's GSP in 2006, contributing \$13.6 billion and \$12.0 billion, respectively. The information sector, which includes publishing and telecommunications, was the fastest growing service industry between 1997 and 2006. It grew by almost 147 percent during this period, contributing \$8.3 billion in 2006. This is likely the result of a developing telecommunications cluster in the Kansas City area.

⁵ Recent global and national trends have led to a resurgence of this industry in Kansas since 2006. Evidence suggests that the industry might have grown substantially since 2006, however, formal data is not yet available for this current time period.

⁶ The "other services" industry category comprises establishments that provide services not otherwise categorized in the service classification system. These activities primarily include equipment and machinery repair, dry cleaning and laundry services, personal care services, death care services, advocacy, and promoting or administering religious activities.

Figure 8. Service Industry Contribution to GSP
 1997 to 2006

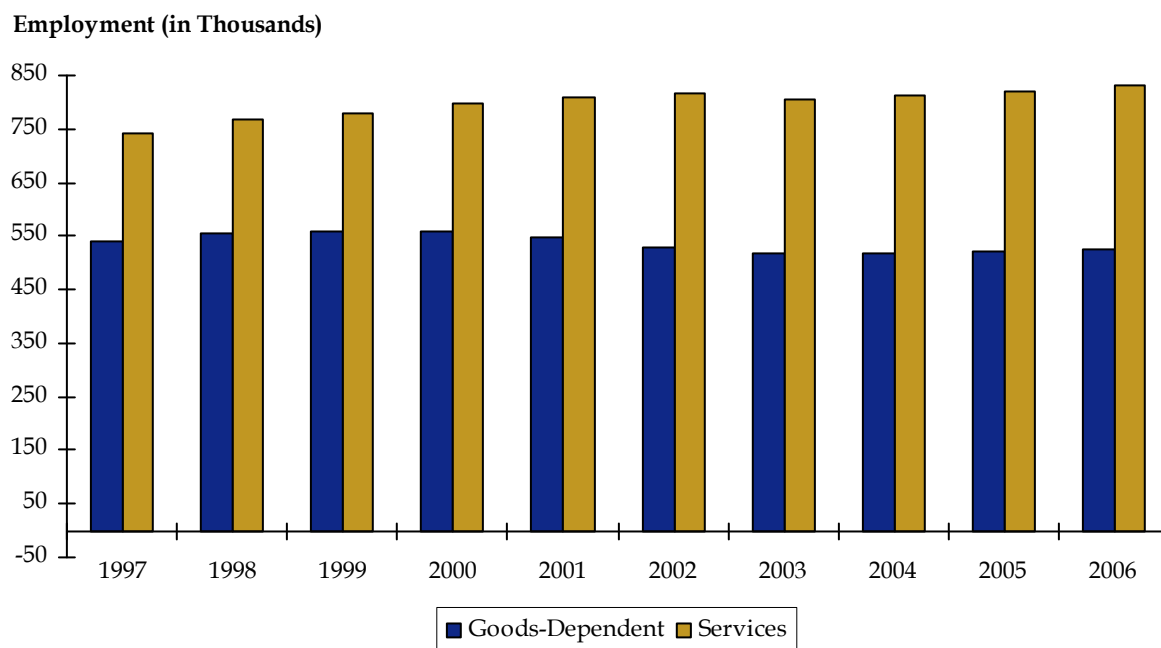


Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Statewide Employment Patterns

The average annual employment in Kansas between 1997 and 2006 was approximately 1.34 million, growing approximately 6.1 percent over that period. Service industries made up 60 percent of the state's total employment (compared to 40 percent goods dependent industry employment), increasing by 12.4 percent over the last 10 years (goods dependent employment declined 2.6 percent during the same period, see Figure 9). Employment in both industry sectors experienced a period of decline between 1997 and 2006. As shown in Figure 9, the goods dependent sector endured a four-year period of zero or negative employment growth between 1999 and 2003, while the service sector had one year of negative growth in 2003. Both industries, however, have rebounded to maintain positive growth since 2004.

Figure 9. Statewide Goods Dependent versus Service Industry Employment Trends



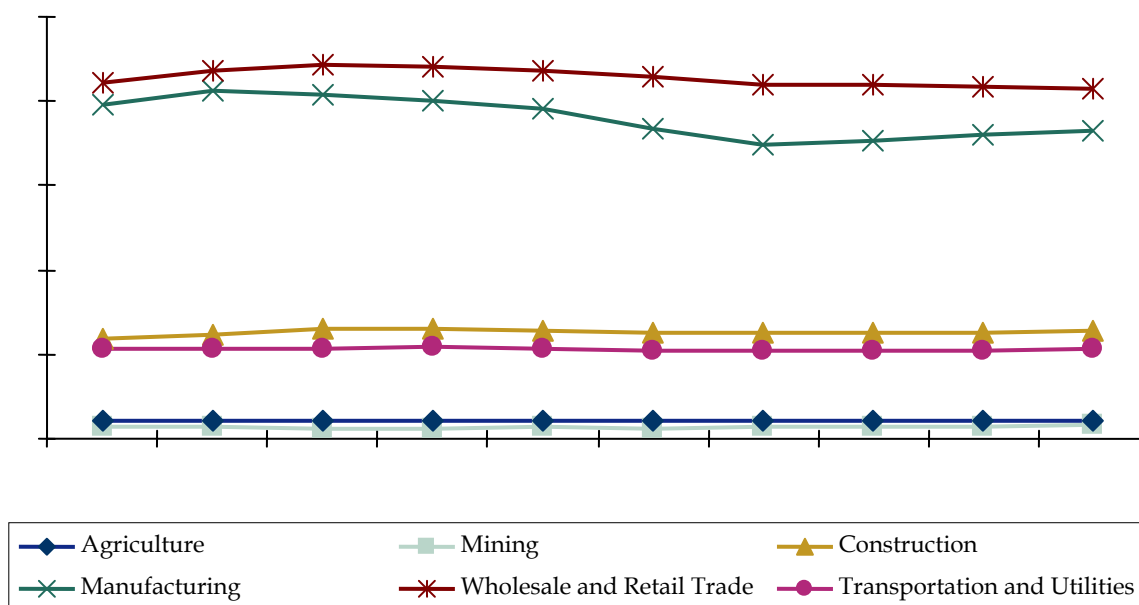
Source: Moody's Economy.com.

Goods Dependent Industry Employment Trends

As shown in Figure 10, the wholesale and retail trade and manufacturing industries have remained the two dominant goods dependent industries in terms of statewide employment over the last 10 years. Combined, these two industries accounted for almost 390,000 jobs or 74 percent of the total goods dependent industry employment in 2006. However, 2006 employment in both industries is less than 1997 levels, with manufacturing down 7.7 percent and wholesale and retail trade down almost two percent during the 10-year period. Nonetheless, as shown in Figure 7, manufacturing and wholesale and retail trade have expanded their contribution to GSP during this period.

Compared to the employment fluctuations in the wholesale and retail trade and manufacturing industries over the past 10 years, the remaining four goods dependent industries (agriculture, mining, construction, and transportation and utilities) maintained relatively constant employment. Growing by 16.1 percent between 1997 and 2006, the mining industry had the highest percent change; however, as the goods dependent industry with the smallest employment, the growth represented an increase of only 1,200 jobs. The construction industry had the highest absolute growth in employment, adding 4,800 jobs over the 10-year period.

Figure 10. Statewide Goods Dependent Industry Employment Trends
 1997 to 2006



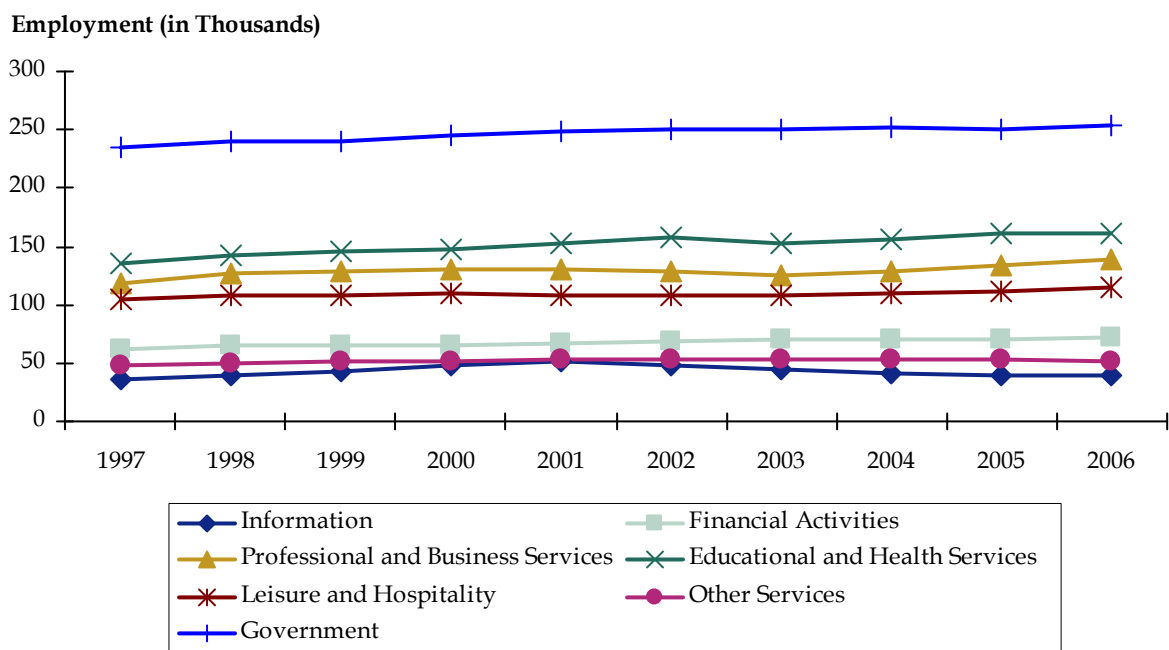
Source: Moody's Economy.com.

Service Industry Employment Trends

Whereas employment in goods dependent industries has declined across the State, growth in the service industries is clearly the driving force behind the State's overall 6.1 percent employment growth over the past 10 years. Between 1997 and 2006, Kansas' service industries added over 92,000 jobs and all service sectors experienced positive growth at the statewide level. As shown in Figure 11, government employment is the leading service industry in Kansas. Growing by 8.1 percent, the government sector added almost 19,000 jobs during the 10-year period to comprise almost 31 percent of all service sector employment in 2006. The education and health services sector had the highest percent change between 1997 and 2006, growing by 18.4 percent and adding 25,000 jobs. While the information industry, which includes publishing and telecommunications, grew by almost 38 percent between 1997 and 2001, it did not sustain that growth through 2006. Instead, the information industry grew by 8.9 percent over the 10-year period, adding a total of almost 3,300 jobs.

Two other service industries, financial activities and professional and business services, experienced strong growth between 1997 and 2006. Both industries grew by over 16 percent, combining to add nearly 30,000 jobs to the Kansas economy. The leisure and hospitality industry grew by 10.3 percent, adding 10,700 jobs statewide.

**Figure 11. Statewide Service Industry Employment Trends
 1997 to 2006**

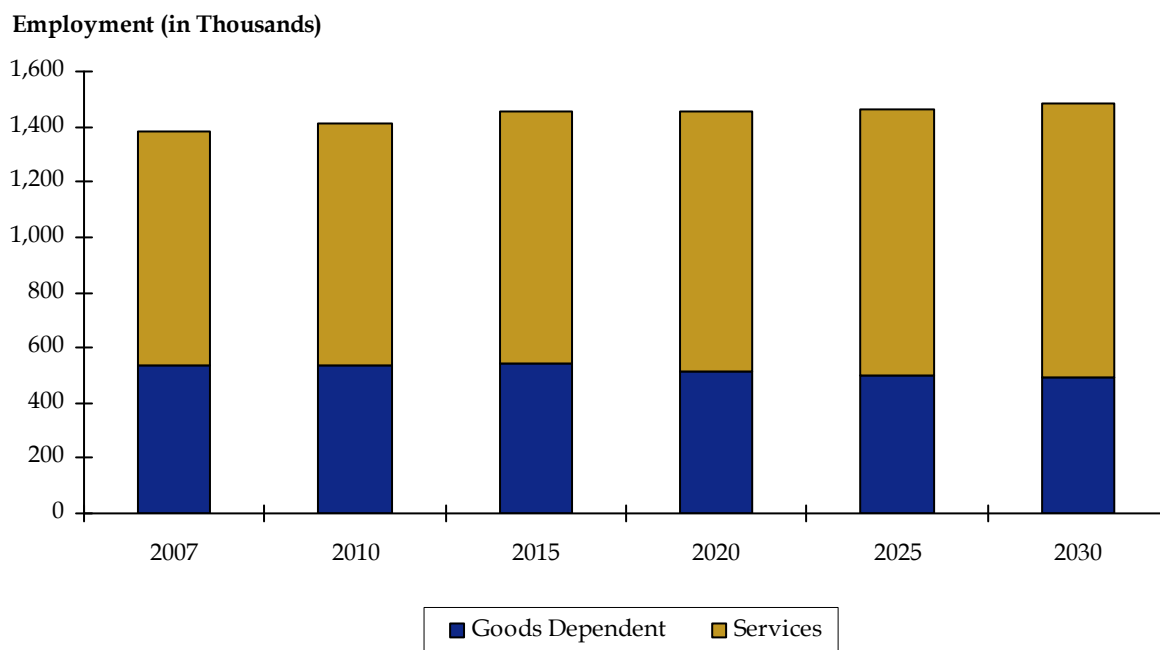


Source: Moody's Economy.com.

5.3 Statewide Employment Forecast, 2007-2030

Figure 12 presents the forecasted employment trends of goods dependent industries in Kansas compared to those for the service sector through 2030. The chart demonstrates how Kansas will continue to shift from a goods-based economy to a service-based one, mirroring a similar transition in the national economy. Overall, goods dependent industries will lose about 42,000 employees (eight percent of total sector employment), while services will add 142,000 people, a growth of 17 percent. It is important to note that productivity gains, particularly in some goods dependent industries such as agriculture, will mean that output from both sectors will remain strong despite declining employment levels. This will fuel sustained demand on the state's freight transportation system.

Figure 12. Projected Goods Dependent and Service Sector Employment
 2007 to 2030



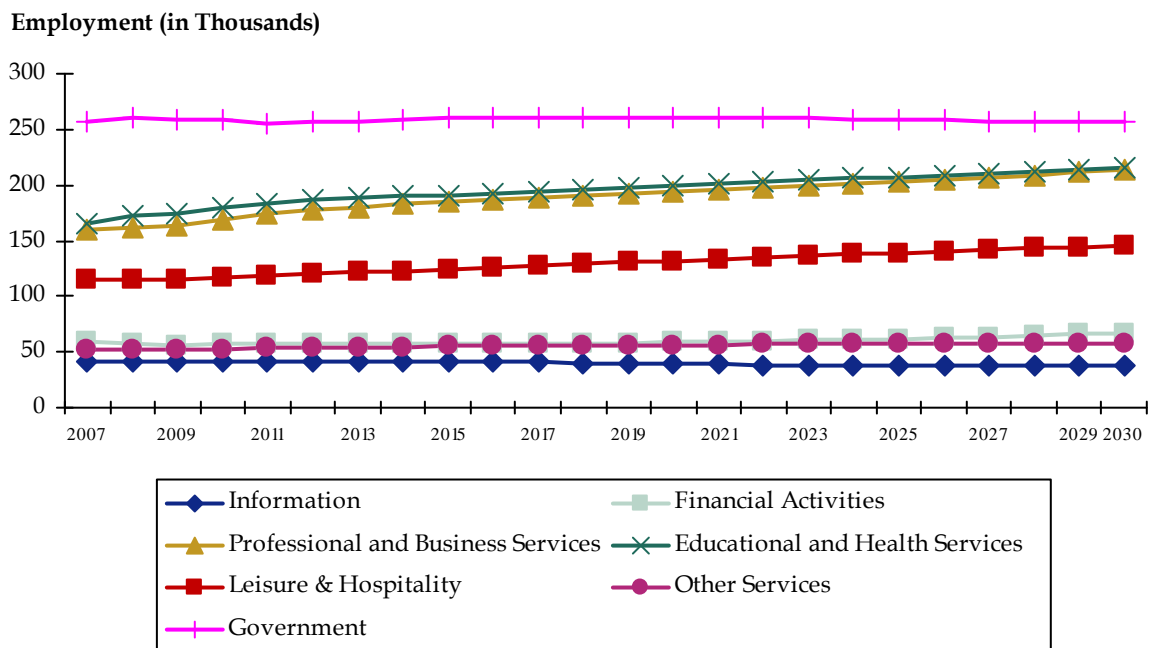
Figures 13 and 14 show trends for the industry groups that make up the goods dependent and service providing sectors, respectively. As shown in Figure 13, agriculture, mining, construction, transportation and utilities, and wholesale and retail trade will maintain a fairly stable employment base, with moderate job losses in some industries. Manufacturing is expected to absorb the bulk of the job losses within the goods dependent sector, reflecting the desire of many manufacturers to source activities in locations outside of North America.

As shown in Figure 14, employment growth in the service sector through 2030 will be concentrated in educational and health services (up 30 percent), professional and business services (33 percent growth), and leisure and hospitality services (up 26 percent). Information (which includes telecommunications) is expected to maintain a relatively stable employment base, with modest declines at the statewide level. The rapid growth of these industries again highlights the shifting base of the Kansas economy and this shift will further hasten population movements in the state’s urbanized areas.

Figure 13. Projected Goods Dependent Employment by Industry
 2007 to 2030



Figure 14. Projected Service Sector Employment by Industry
 2007 to 2030



It is important to note that while Kansas continues to shift toward a service-based economy, goods dependent industries (especially manufacturing and retail/wholesale trade) will remain a critical part of the State's economy. By 2030, these industries will still employ about one-third of the Kansas labor force. It also should be noted that looking at employment changes alone can hide productivity improvements that may allow these important industries to expand output even while shedding employees. This is especially relevant to the agriculture, cattle feeding, and beef processing industries, where productivity gains have allowed for crop and animal production to rise even as employment declines. Finally, there are pockets of goods dependent employment growth throughout the State; these will be explored further in the geographical cluster analysis below.

5.4 Summary

It is clear that although many of the key goods dependent industries in Kansas will likely shed jobs in the coming years, the State as a whole will maintain a relatively stable employment base of goods dependent industries. Likewise, the goods dependent industries also are expected to continue contributing significantly to Kansas GSP. As was shown in the analysis of historic Kansas GSP and employment trends, even though total goods dependent employment declined by 2.6 percent between 1997 and 2006, the total goods dependent industry contribution to GSP increased by 28 percent. This trend among goods dependent industries is expected to continue through 2030 as industries expand productivity and output efficiency while requiring fewer employees. As the economic activity generated by the goods dependent industries continues to rise, Kansas can expect to see greater overall freight volumes in the future.

■ 6.0 Transportation Needs and Industry Logistics Patterns

Mirroring national trends, it is increasingly clear that Kansas’ economic base is shifting from goods-oriented businesses to service-oriented ones, and that this transition is particularly pronounced in the larger urban areas. Despite this shift, however, there remain a number of goods dependent industries that are critical to the state’s economic vitality. These include transportation equipment manufacturing, crop production, and cattle production and processing. Using technological advances and other strategies, these industries have improved their productivity and are continuing to increase overall output even with fewer total employees. These and other industries will continue to be a major force in Kansas and a primary user of the state’s freight transportation system.

Within the goods dependent industry sector, three specific sub-industries stand out as being particularly important to Kansas’ future economic growth and prosperity. These three industries are transportation equipment manufacturing, agriculture (crop and animal production), and food manufacturing (which also includes cattle production and processing). These three industries are examined in the following sections, which describe their modal dependencies and transportation requirements, depicts where they are located within the State, and provides logistics examples to illustrate transportation patterns and inter-industry linkages.

6.1 Modal Dependencies

Like most industries, all three of these important industries are heavily dependent on trucks, though some also use the air and rail modes. Table 5 displays the modes on which these key industries typically depend. Agriculture, transportation equipment manufacturing, and food manufacturing all use rail to some extent. Air transportation is typically reserved for light but high-value goods, such as those produced by high-technology manufacturing industries (including aerospace manufacturing).

Table 5. Modal Dependencies of Key Industries in Kansas
















	Rail	Truck	Water	Air	Pipeline
Food Manufacturing					
Transportation Equipment Manufacturing					
Agriculture (Crop and Animal Production)					

Table 6 quantifies the modal dependencies of these industries. The table shows the dollar amount of transportation inputs by mode that is required to produce one million dollar's worth of output for each industry. The larger the amount in a cell, the more dependent the industry is on that particular mode. In-house transportation refers to transportation services provided by a non-transportation business, such as a retailer that owns the trucks it uses to distribute products to its stores. This is important because many businesses rely primarily on their own fleets to meet their freight shipping needs, rather than using the services of a common carrier. These include farms, mines, and wholesale and retail trade establishments. Most of these shipments are probably being made by privately owned truck fleets.

The far right-hand column shows the total transportation inputs required to produce \$1 million in output in each row industry. Of the industries highlighted here, agriculture is the largest user of freight transportation, requiring over \$81,000 worth of transportation to produce \$1 million in output. Most of this service is provided in-house. Nonmetallic mineral manufacturing (which includes cement manufacturing) is a close runner-up at just over \$80,000, predominantly by common carrier trucks, in-house trucks, and rail. Mining (including aggregate extraction) is also heavily dependent on in-house truck transportation, as well as rail and common carriers.

Food manufacturing primarily relies on common carrier trucking services, as well as in-house truck fleets. However, rail and air freight also are important to this industry. Transportation equipment manufacturers (including aerospace manufacturers) are the most reliant upon air transportation. Transportation equipment manufacturers rely on air freight almost as much as they do on common carrier trucking firms to meet their freight needs.⁷ Chemical manufacturers, including ethanol distillers, are primarily dependent on the truck and rail modes.

⁷ For aircraft maintenance, repair, and overhaul facilities, the commodities being flown in are the planes themselves, which therefore must fly in. This may create a minor distortion in the degree to which these businesses truly rely on air freight. However, other sub-industries within this sector (such as aircraft component manufacturing) still rely on timely air cargo shipments.

Table 6. Modal Dependencies of Goods Dependent Industries
Value of Transportation Inputs Required to Produce \$1 Million in Output

	Rail	Truck	Water	Air	Pipeline	In-House (All Modes)	Total
Food Manufacturing (including meat processing)	\$6,320	\$17,164	\$369	\$3,452	\$37	\$9,673	\$37,015
Transportation Equipment Manufacturing (including aerospace)	\$1,419	\$6,799	\$52	\$6,686	\$46	\$4,632	\$19,633
Agriculture (crop and animal production)	\$2,954	\$9,855	\$361	\$830	\$131	\$67,486	\$81,618
Nonmetallic Mineral Manufacturing (including cement)	\$11,303	\$48,093	\$2,243	\$2,770	\$74	\$15,570	\$80,054
Chemical Manufacturing (including ethanol)	\$6,903	\$17,408	\$663	\$3,465	\$460	\$2,193	\$31,092
Mining (including aggregates)	\$6,093	\$7,207	\$537	\$2,507	\$114	\$23,057	\$39,514

Source: Bureau of Economic Analysis, Transportation Satellite Accounts.

The following sections present maps showing the location of these key industries within the State to show specific regions where the industries are concentrated. The analysis also shows the contribution to GSP and employment for each industry. Employment projections also are presented by KDOT District for each industry through 2030 (GSP forecasts are not available by industry). Finally, logistics diagrams are provided that graphically depict the supply chains of these industries.

6.2 Agriculture – Crop and Animal Production

Agriculture is one of the most important industries in Kansas. In 2007, the value of production for all field and miscellaneous crops harvested in the State was about \$6.3 billion.⁸ Key crops include wheat, corn, sorghum, soybeans, and hay. Cattle (which is included in both agriculture and food manufacturing data) generated \$6.32 billion in cash receipts in

⁸ Kansas Department of Agriculture and U.S. Department of Agriculture, *Kansas State Agriculture Overview, 2007*.

2007.⁹ Approximately 10,000 Kansans are employed, full time, in agriculture production or agricultural services¹⁰. Although this is relatively small compared to other industries, technological improvements over the years have allowed farms and ranches to expand production a great deal without necessarily adding a lot of employees. That is why employment in agriculture was basically flat from 1997 to 2006, but industry output (as measured by its contribution to GSP) increased by 19 percent during that period.

Geographic Clustering

Figures 15 and 16 show the clustering of wheat production by county in Kansas. Figure 15 presents data for one year (2006), while Figure 16 shows a 10-year average from 1998 to 2007, which helps to level out variations due to drought, bumper crops, or other factors. As the maps demonstrate, wheat is produced all over Kansas but is especially concentrated in Districts 2 and 5. In fact, Kansas is the number one wheat producing state in the country, with over 291 million bushels produced in 2006.¹¹

Corn is another major Kansas crop. Kansas was the eighth largest producer of corn for grain in the United States in 2007 with about 518 million bushels produced in the state.¹² Figures 17 and 18 show grain corn production by county in 2006 and average production from 1998 to 2007, respectively. Like wheat, corn is grown all over the state but is especially concentrated in a few areas, primarily Districts 1, 3, and 6. Corn produced in District 6 is a key input to the cattle feedlots in the region, which in turn support the meat processing industry. Corn from all over the state is also supplying the growing ethanol industry.

In terms of employment, KDOT District 6 in southwest Kansas has the most employees in agriculture. Nearly 4,300 people are employed in agricultural industries in District 6, representing six percent of total District employment. Of those, over 2,600 (3.5 percent of the total District employment base) are employed in animal production, reflecting the presence of a significant cluster of cattle feedlots in the region. There is also a large and growing dairy industry in this part of Kansas; some feedlots operate dairy farms in addition to feeding cattle for slaughter.

⁹ Kansas Livestock Association.

¹⁰This figure represents regular salaried or payroll employees; it does not include sole proprietors, contract employees, or seasonal workers. When those workers are included, total statewide agricultural employment was estimated at nearly 78,000 employees in 2006, according to Woods and Poole, Inc.

¹¹United States Department of Agriculture, National Agricultural Statistics Service.

¹²Kansas Department of Agriculture and U.S. Department of Agriculture, *Kansas Farm Facts 2008*.

Figure 15. Wheat Production by County
2006

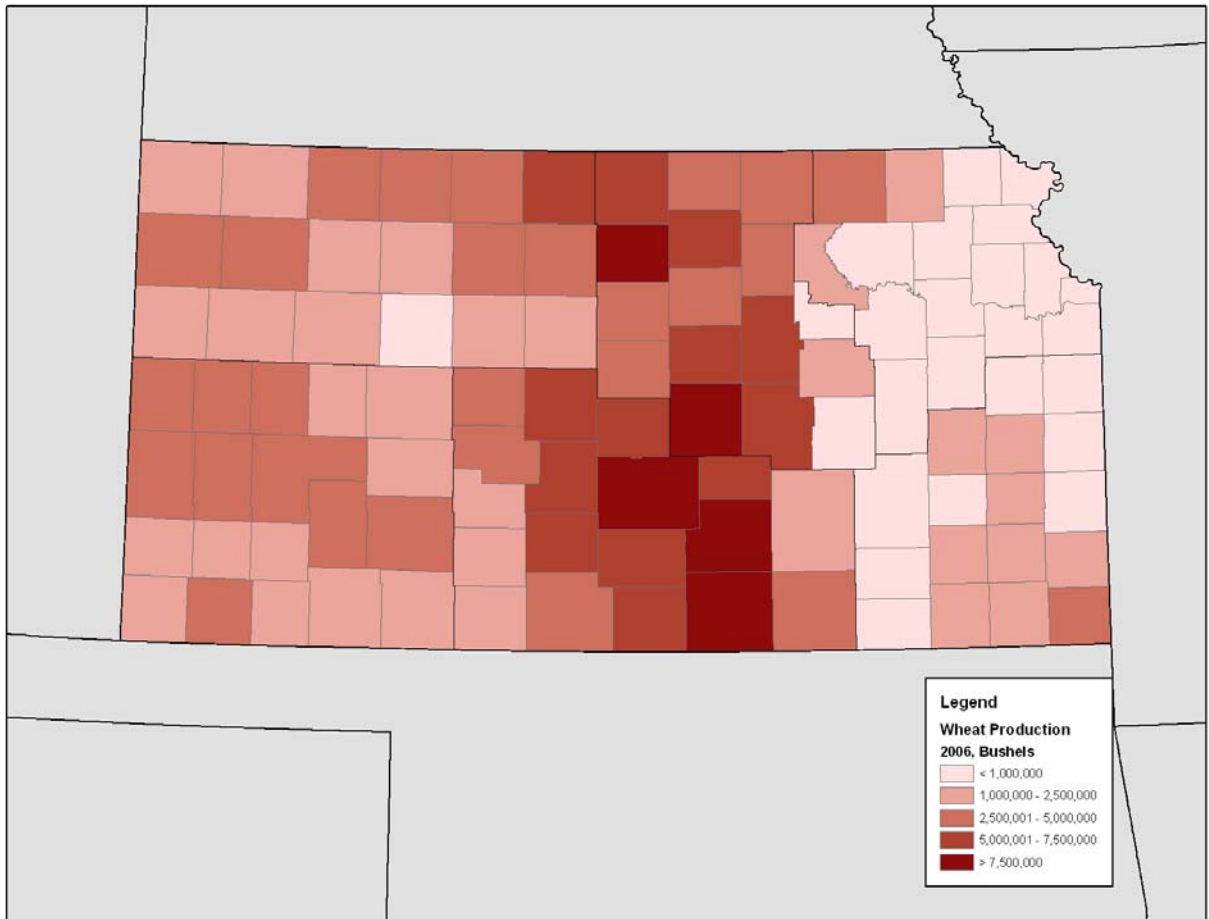


Figure 16. Average Wheat Production by County
1998-2007

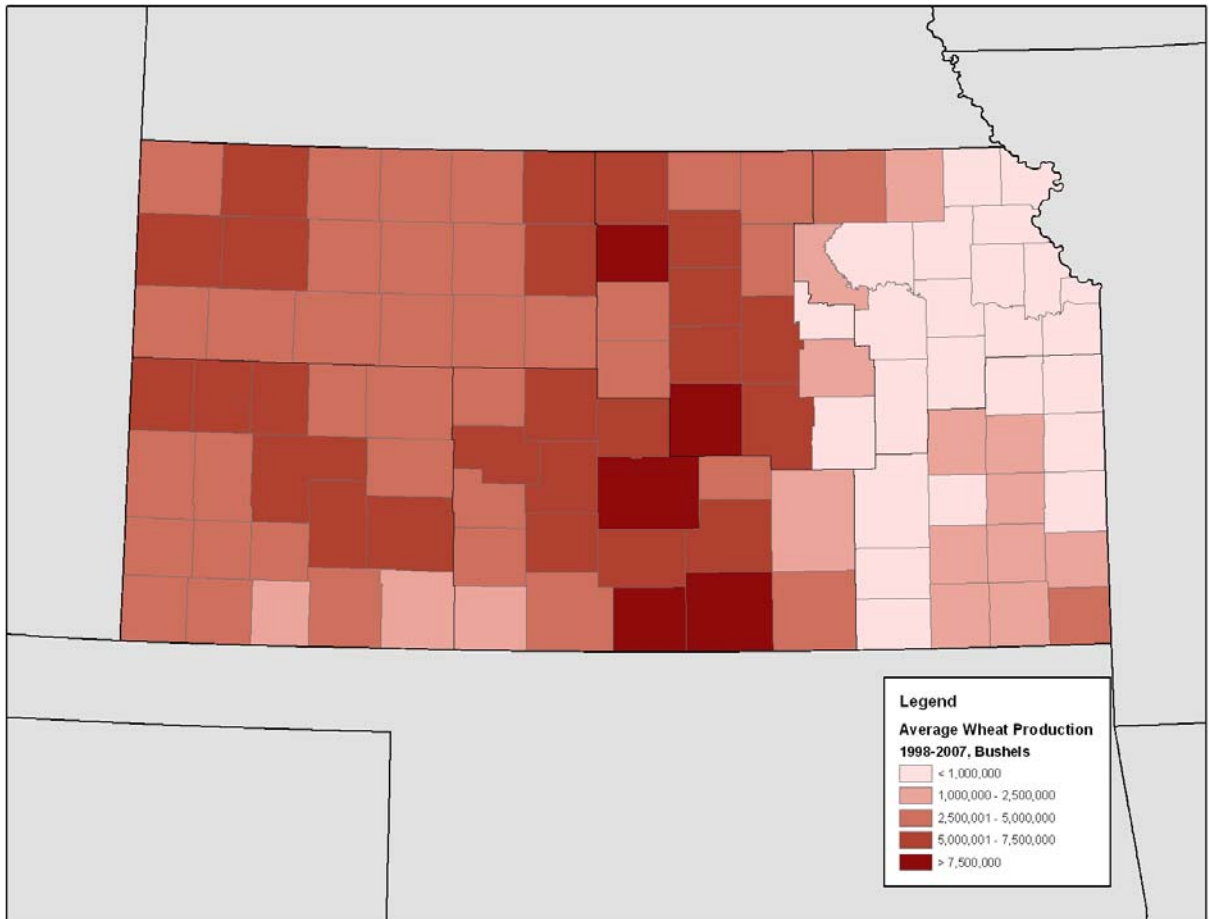


Figure 17. Corn Production by County
2006

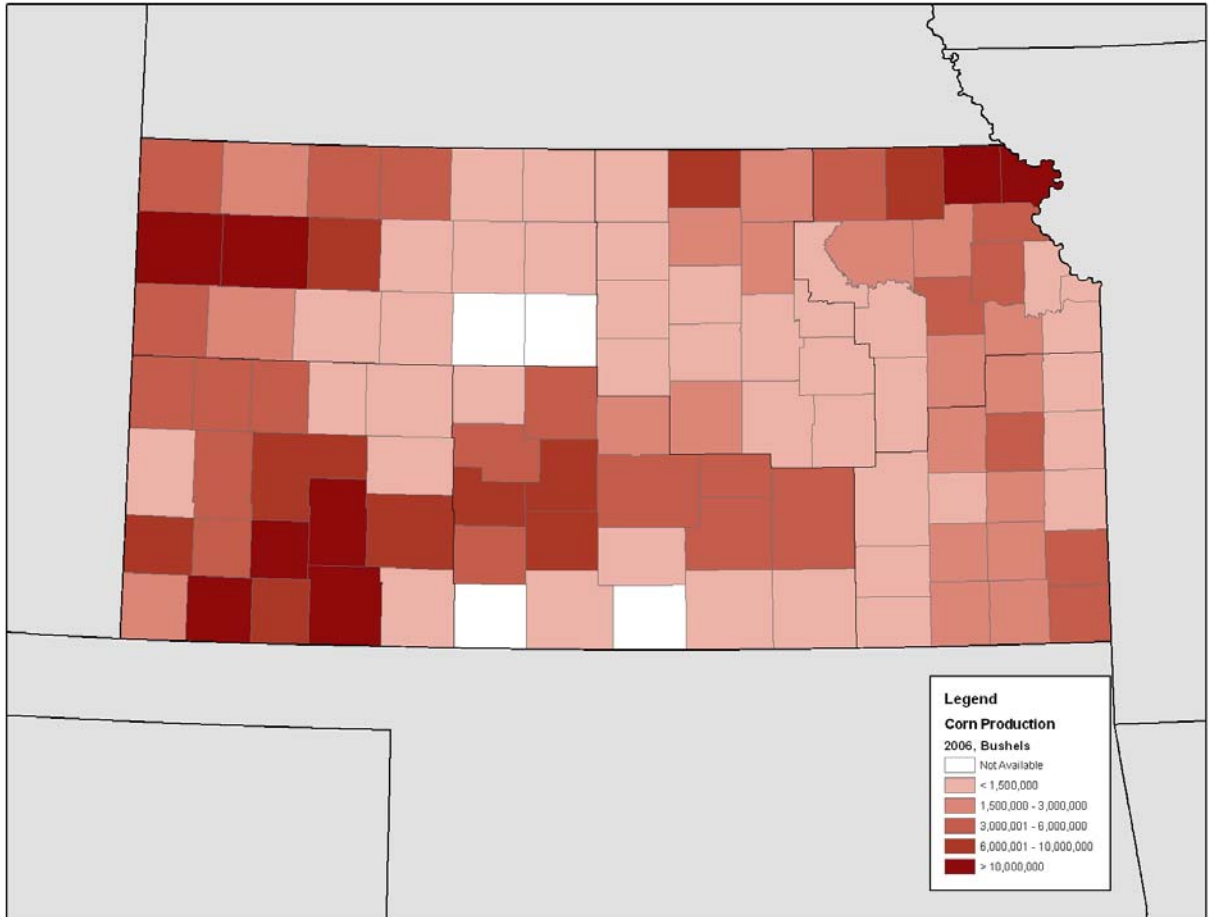
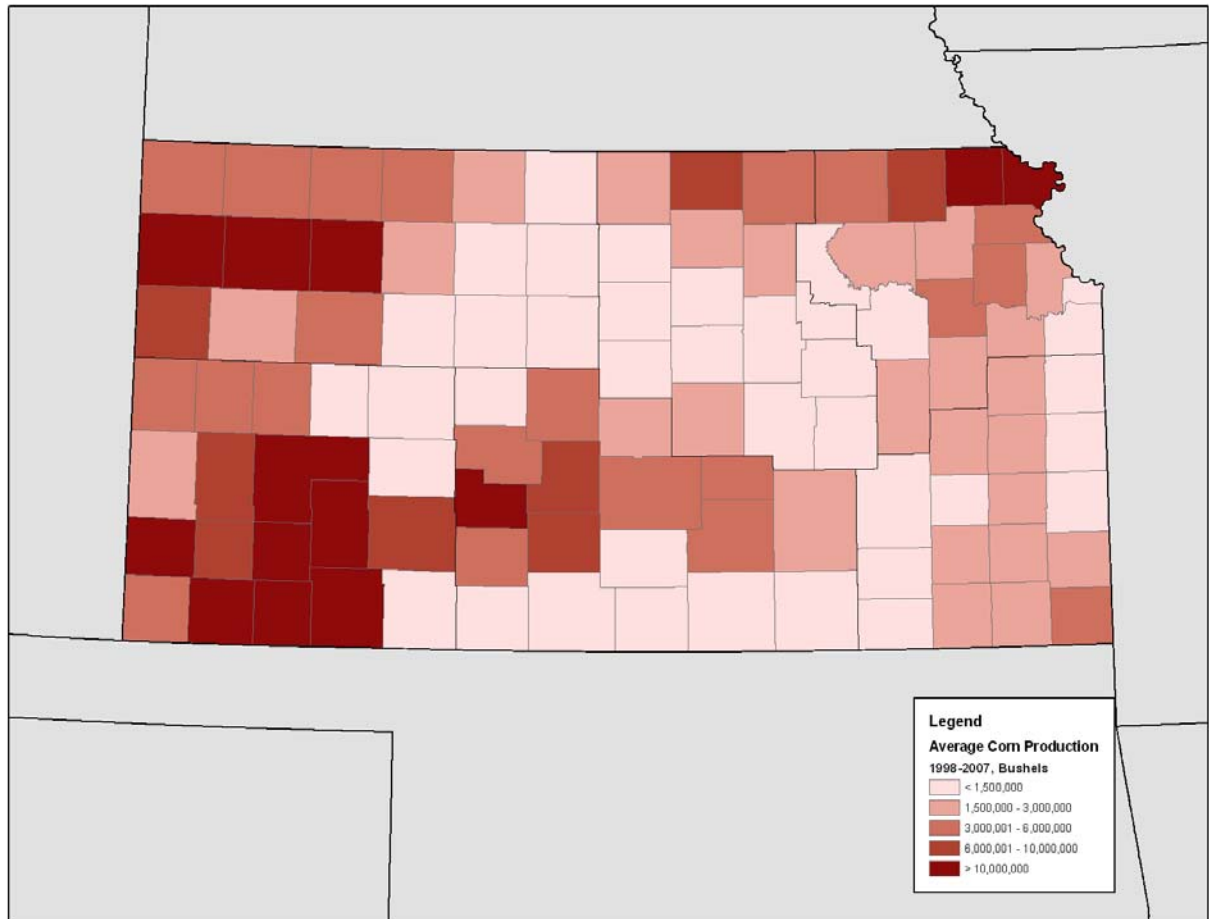


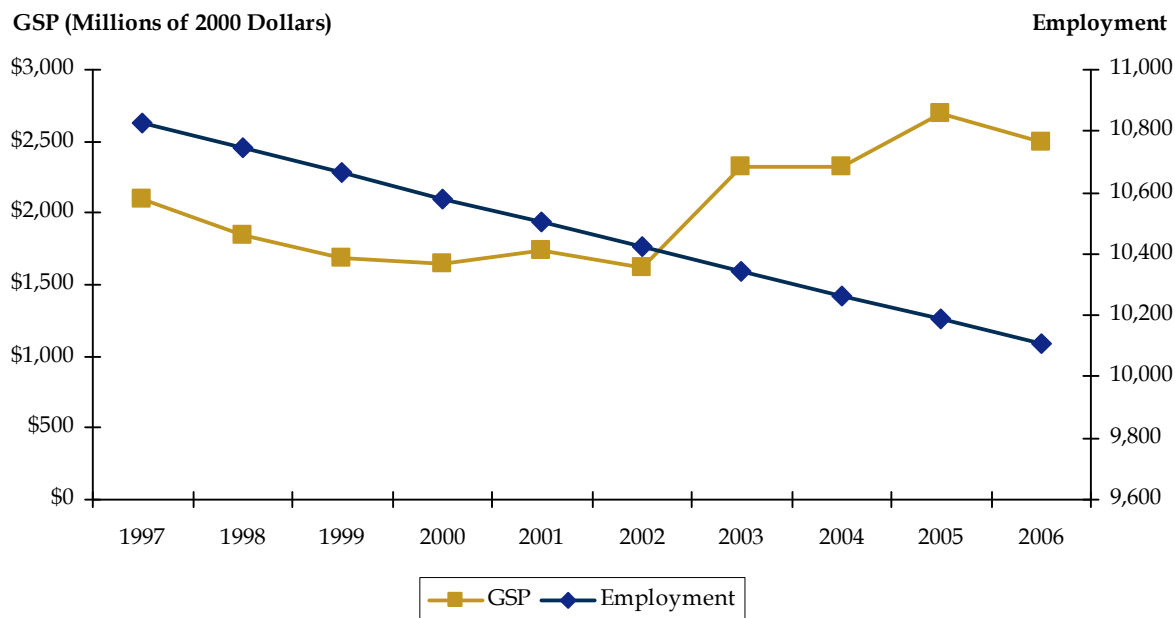
Figure 18. Average Corn Production by County
1998-2007



Employment and GSP Growth

As shown in Figure 19, employment in agricultural activities has been steadily declining over the past decade while output as measured by contribution to GSP has fluctuated. Since 2002, agriculture has enjoyed relatively robust GSP growth of 54 percent, likely driven by industrialization and wealth gains in developing countries that have increased the global demand for agricultural products.

Figure 19. GSP and Employment Growth in Agriculture
 1997 to 2006



^a Employment in the graphic only includes regular salaried or payroll employees; it does not include sole proprietors, contract employees, or seasonal workers. When those workers are included, total statewide agricultural employment was estimated at nearly 78,000 employees in 2006, according to Woods and Poole, Inc.

^b GSP is calculated from an income perspective (wages and profits) that does not include intermediate inputs to production. When calculated on a gross output basis (i.e., value of sales), the value is much higher. For example, the total value of Kansas agricultural products sold in 2002 was \$8.7 billion, according to the Kansas Agricultural Statistics Service.

Figures 20 and 21 show the expected employment growth by KDOT District in crop and animal production, respectively. Employment levels in both industries will be essentially flat, with District 6 remaining the largest producing region by employment. In particular, District 6 is expected to remain the primary animal production center in Kansas, with 43 percent of animal production employment by 2030.¹³

¹³Note that as in Figure 18, Figures 19 and 20 do not include sole proprietors, contract employees, or seasonal workers.

Figure 20. Projected Employment Growth in Crop Production by District
2007 to 2030

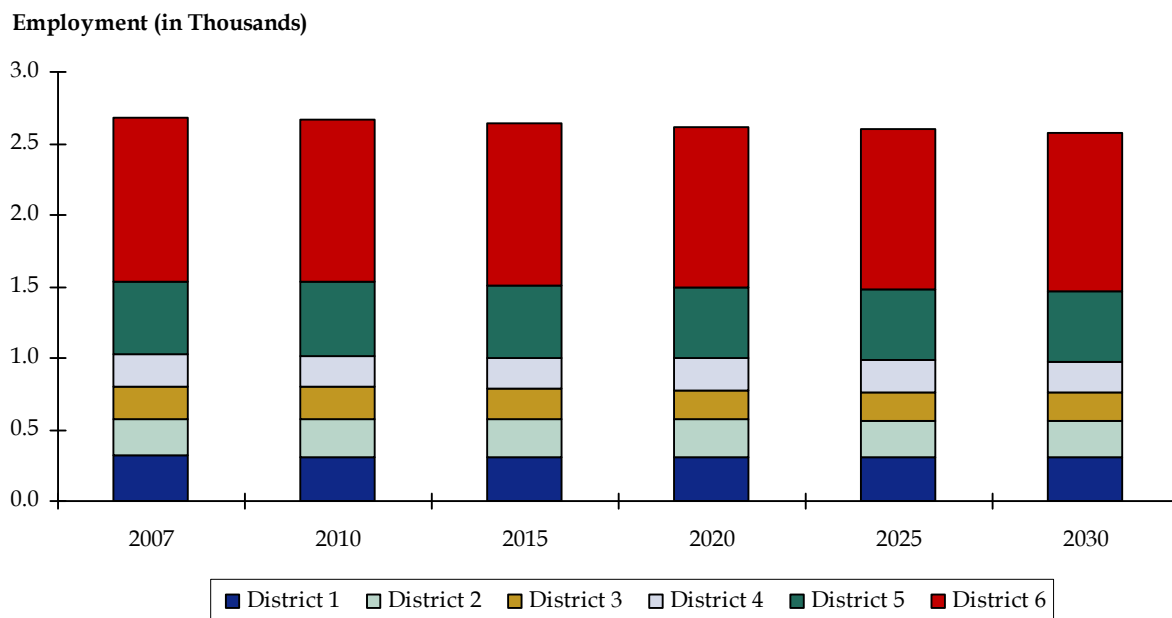
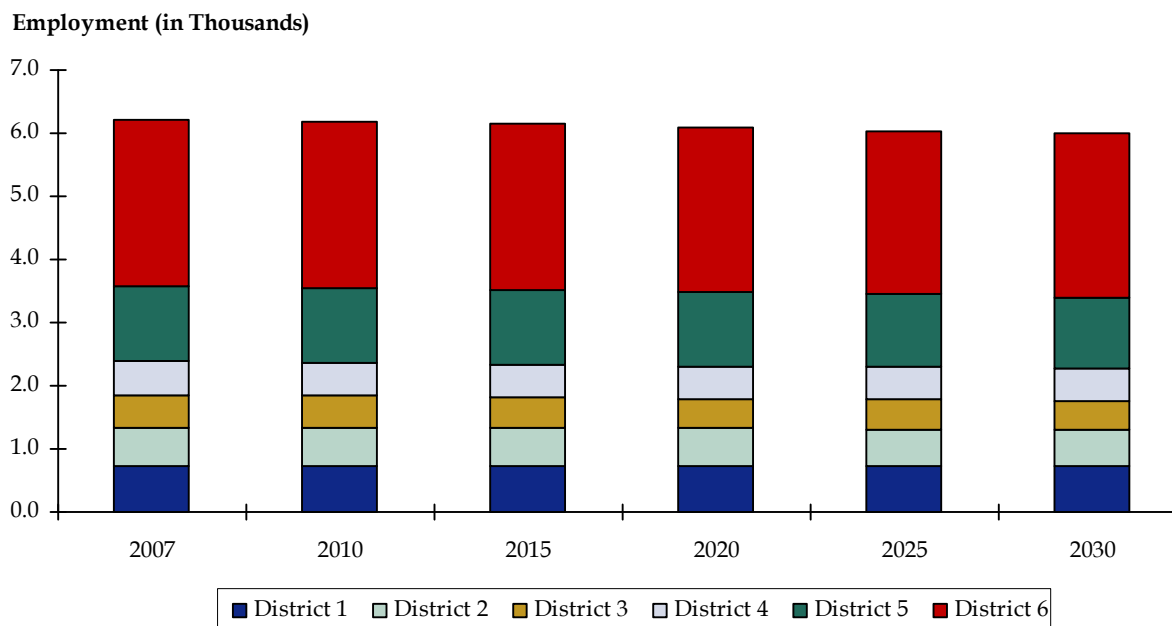


Figure 21. Projected Employment Growth in Animal Production by District
2007 to 2030



Modal Dependencies and Transportation Needs

As mentioned before, agriculture is highly dependent on freight transportation for its business operations, requiring slightly more than eight cents of transportation inputs for every dollar of output. Of that, the vast majority goes to truck transportation. As Figure 22 demonstrates, 94 percent of the transportation inputs to agricultural production are either truck transportation (12 percent) or in-house transportation (82 percent), which mostly represents truck fleets owned by individual farms and ranches.¹⁴ Rail transport makes up four percent, while water, air, and pipeline combined only account for two percent of the total.

It is important to note that wheat and other crops are more reliant on rail transportation than Figure 22 would suggest. The Transportation Satellite Accounts data combines crop and animal production into one category. This limitation in industry coverage skews the data towards truck transportation since cattle and other livestock are nearly always moved by truck. Qualitative information from the stakeholder interview process indicates that short line and Class I rail transportation is critical to the Kansas grain industry. The recent spike in fuel prices has also led to a mode shift from truck to rail. Grain is also increasingly being shipped in 40-foot intermodal containers; the development of the Gardner Terminal will likely accelerate this trend.

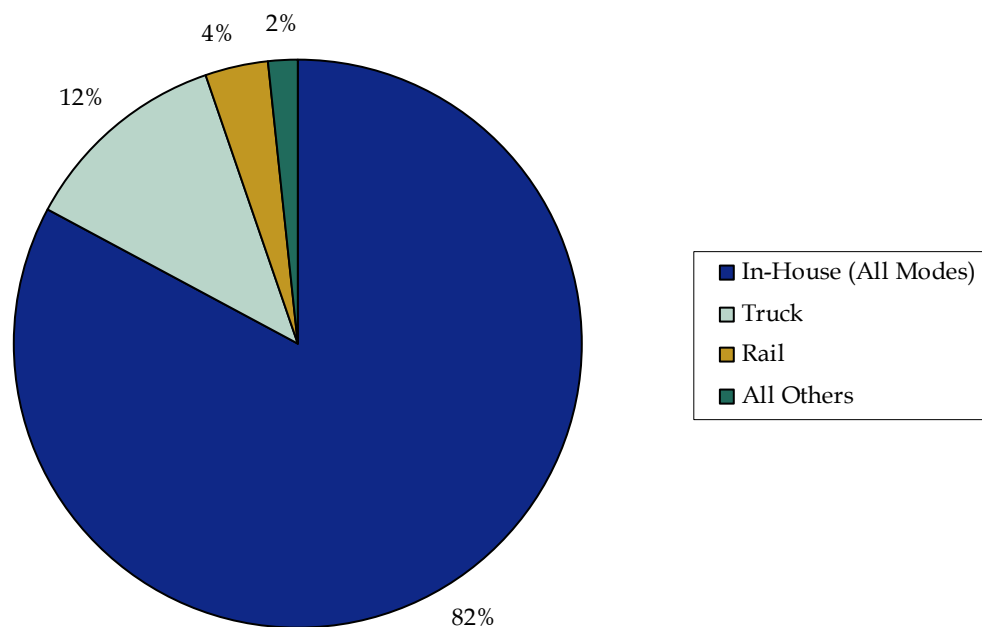
The agriculture industry's heavy reliance on truck transportation makes it particularly sensitive to changing conditions on the State's rural road infrastructure. Rural road and bridge upkeep has become more difficult as Kansas farms have grown larger and their transportation needs greater. Frequent bridge closures, especially on local and County-owned infrastructure, can make it difficult or impossible for farmers and ranchers to reach their fields. It also is becoming increasingly difficult to transport large farm equipment over inadequate bridges. Efficient access to freight transportation corridors is important to farmers, since the consolidation of grain elevators in the State sometimes forces them to drive farther to get their crops to market.

There also is unmet rail demand in certain areas as the closure of spurs and sidings serving grain elevators has reduced or eliminated rail access. This is compounded by a shortage of short-line rail service to rural farming regions of Kansas, which prevents businesses from shipping more goods by rail despite the recent spike in fuel prices.

Although agricultural transportation needs tend to be cyclical (spiking during harvest season, then falling back to normal levels), cattle move by truck throughout the year. Grass-fed cattle are moved to pasture in the summer and then on to processing plants in the fall; conventionally raised cattle move to feed yards and processing plants year-round.

¹⁴Although the data suggest that overall agricultural activities rely heavily on in-house transportation, qualitative information from stakeholder interviews indicates that cattle haulers rely mostly on common carriers. This is not captured in the chart since it combines crop and animal production due to a lack of industry detail.

Figure 22. Modal Dependence of Crop and Animal Production
Percent of Total Transportation Inputs to Production



Source: Bureau of Economic Analysis, Transportation Satellite Accounts.

Typical Logistics Patterns

It is helpful to highlight on particular business operation to describe how the agriculture industry depends on different elements of the state’s freight system. The ethanol production industry is closely tied to crop production in Kansas, since grain is the major input to ethanol manufacturing. The logistics patterns of an ethanol plant are diagrammed in Figure 23. The map describes the supply chain of an ethanol plant located in southwest Kansas. Ethanol is a fuel source made from biomass resources such as corn and grain sorghum. One bushel of corn produces about 2.8 gallons of ethanol and one acre of corn can produce 400 to 450 gallons of ethanol per year.

The corn used to produce the ethanol tends to originate within a 90-mile radius of the plant, though it is occasionally brought in from Nebraska or other neighboring states depending on quantity and quality of local crops.¹⁵ It is delivered by truck typically five days a week during non-harvest season and seven days a week during harvest. To support the plant’s level of production, the plant requires over 100 truck shipments per day.¹⁶

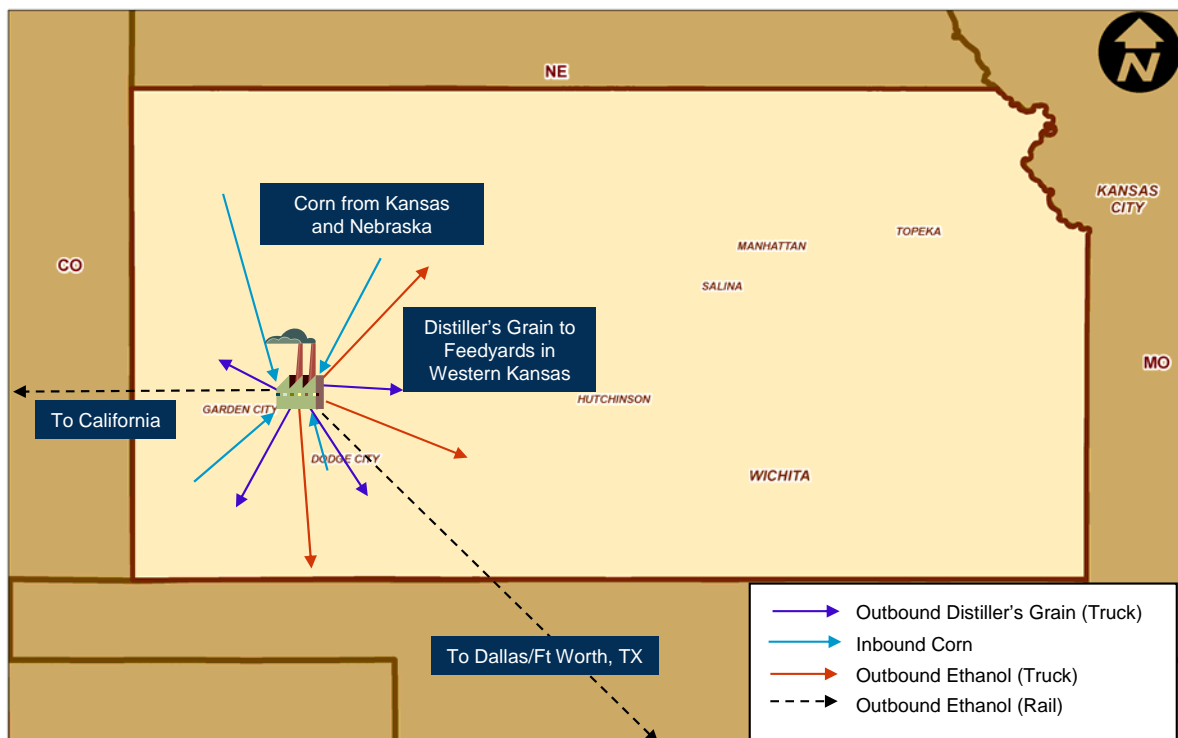
¹⁵Corn from Nebraska is often imported to cattle feedlots in southwest Kansas, particularly when the region is in a corn deficit.

¹⁶Other ethanol plants throughout Kansas are serviced by shortline rail services, and can use rail for a portion of the inbound goods shipment.

Used as an additive to gasoline, the ethanol is sold to petroleum marketers for further distribution. The purchasers transport the ethanol from the plant themselves, relying mostly on trucks. Rail is used if the ethanol is being shipped farther away, usually either to California or Texas. Ethanol shipments are made 24 hours per day. Although pipeline would be an economical method of ethanol delivery, the decentralized locations of ethanol production facilities, insufficient volumes, and its unique viscosity characteristics, makes ethanol transport by pipeline logistically unfavorable.

Ethanol production also yields two by-products: distillers grains and carbon dioxide. The distillers grains are sold to nearby feed lots to be used as livestock feed, since they are a good source of energy and protein for animals. Distillers grains are transported from the plant by truck.

Figure 23. Logistics Patterns of an Ethanol Plant



6.3 Transportation Equipment Manufacturing - Aerospace and Automobile/Motorcycle Manufacturing

Transportation equipment manufacturing is another important industry in Kansas. This industry primarily composed of aerospace manufacturing, though there are also some clusters of automobile and motorcycle manufacturing near the Kansas City Metropolitan Area. The Gross State Product contribution of this industry was nearly \$4 billion in 2006.

Most of this activity is concentrated in Wichita, which is home to several defense contractors and maintenance, repair, and overhaul (MRO) facilities.

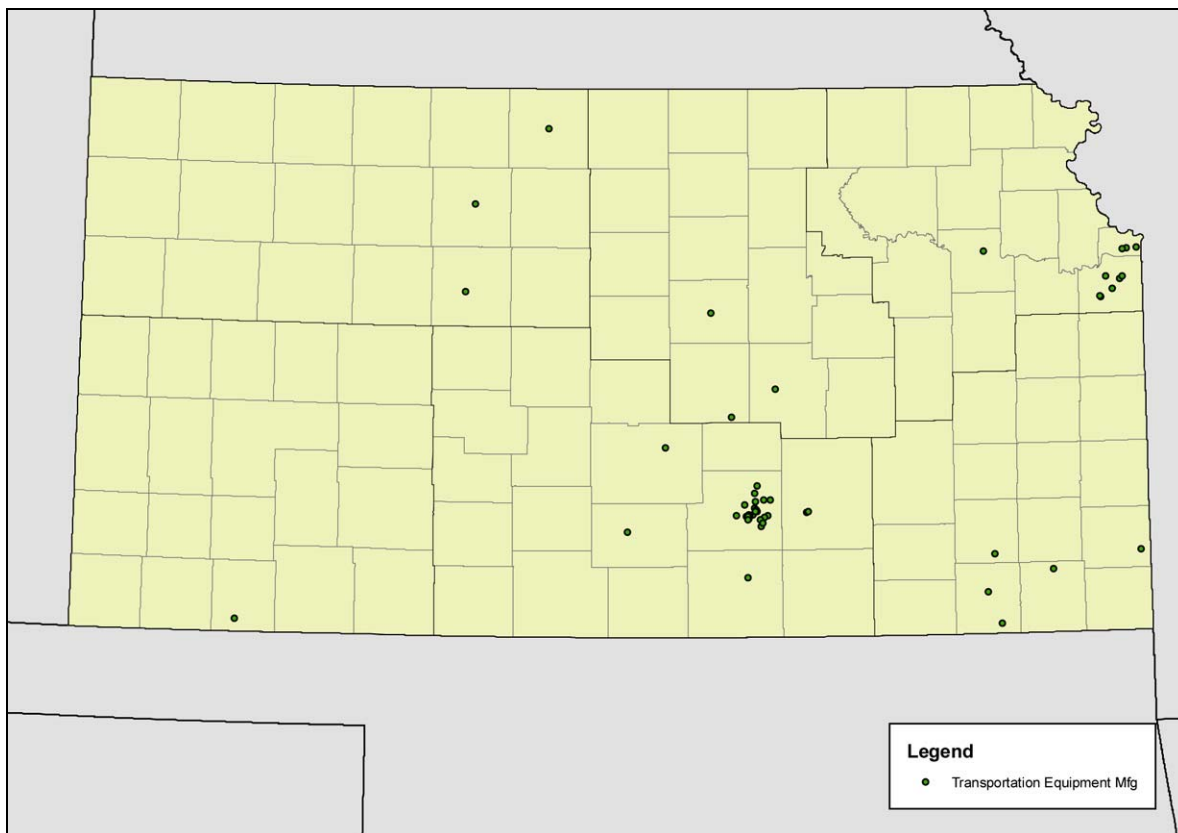
Geographic Clustering

Figure 24 shows the geographic clustering of transportation equipment manufacturing in Kansas. The largest cluster of establishments in this industry by far is in Sedgwick County (Wichita), where more than 36,000 people are employed in transportation equipment manufacturing. This reflects the presence of a large concentration of aircraft parts manufacturers in the area, which employed over 28,000 people in Sedgwick County in 2006.¹⁷ Raytheon, Spirit, and Cessna all have major operations in the area; Boeing, which recently sold most of its manufacturing to Spirit, still engages in military aircraft integration in Wichita.

The map reveals another cluster of transportation equipment manufacturing in District 1, centered around Kansas City (Wyandotte and Johnson Counties). This is explained by the presence of several auto and motorcycle manufacturers in the area. General Motors produces the Chevrolet Malibu on the Kansas side of the state line, while Ford builds the F-150, Escape, and Mazda Tribute on the Missouri side. Harley-Davidson also builds motorcycles on the Missouri side.

¹⁷U.S. Census Bureau County Business Patterns.

Figure 24. Clustering of Transportation Equipment Manufacturing Employment in Kansas (More Than 50 Employees) 2008



Employment and GSP Growth

Figure 25 displays historical GSP and employment growth in transportation equipment manufacturing over the last ten years. Employment has generally tracked with output growth, except for a period in the late 1990s when output expanded while employment contracted slightly. Overall, however, the two indicators have moved in tandem, with employment showing slightly less volatility. The industry shed nearly 7,000 jobs between 1997 and 2006, with losses particularly pronounced during and after the 2001 recession (which disproportionately affected the aircraft industry in the aftermath of the September 11 terrorist attacks). Employment began to recover in 2003, while economic output spiked by 50 percent in 2006 to nearly \$4 billion, finally rising above the mark set in 1997.

Figure 25. GSP and Employment Growth in Transportation and Equipment Manufacturing
 1997 to 2006

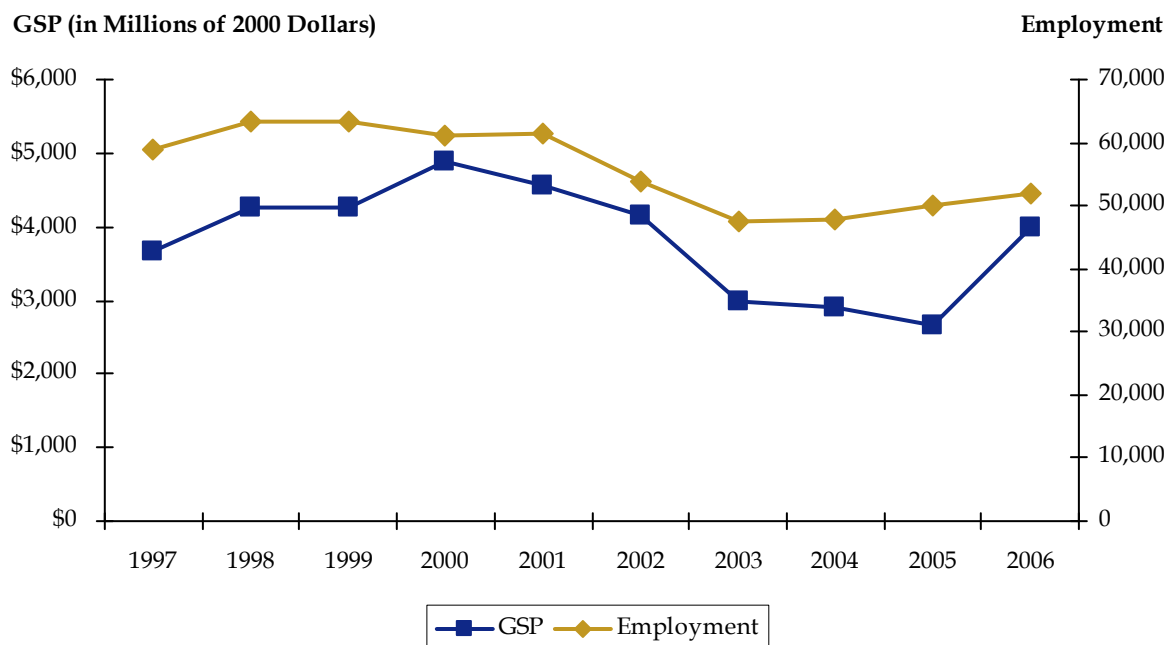
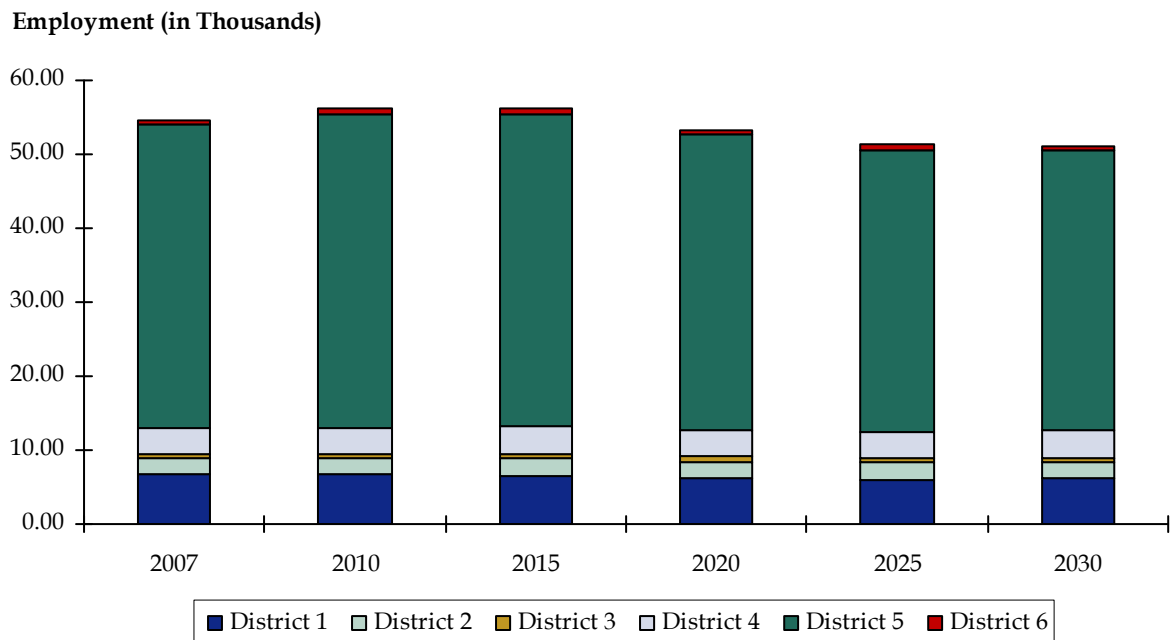


Figure 26 shows forecast employment growth in the transportation equipment manufacturing industry by District. District 5 will continue to dominate this industry. Although employment in Sedgwick County is projected to decline, adjacent counties (such as Reno) are expected to gain employees, perhaps as new manufacturing operations or suppliers to existing ones choose to locate outside of Wichita to avoid congestion or minimize land acquisition and operating costs. Likewise, employment is expected to contract in Leavenworth and Wyandotte Counties but expand in nearby Johnson, Pottawatomie, and Atchison Counties. The largest expansion of employment in this industry is expected to occur in Saline County (District 2), which is expected to experience more than eight percent job growth through 2030, or about 200 jobs. This growth will likely be focused around the Salina Airport Aviation Service Center, which offers space for aviation services companies as well as maintenance, repair, and overhaul (MRO) operations.

Figure 26. Projected Employment Growth in Transportation Equipment Manufacturing by District
 2007 to 2030

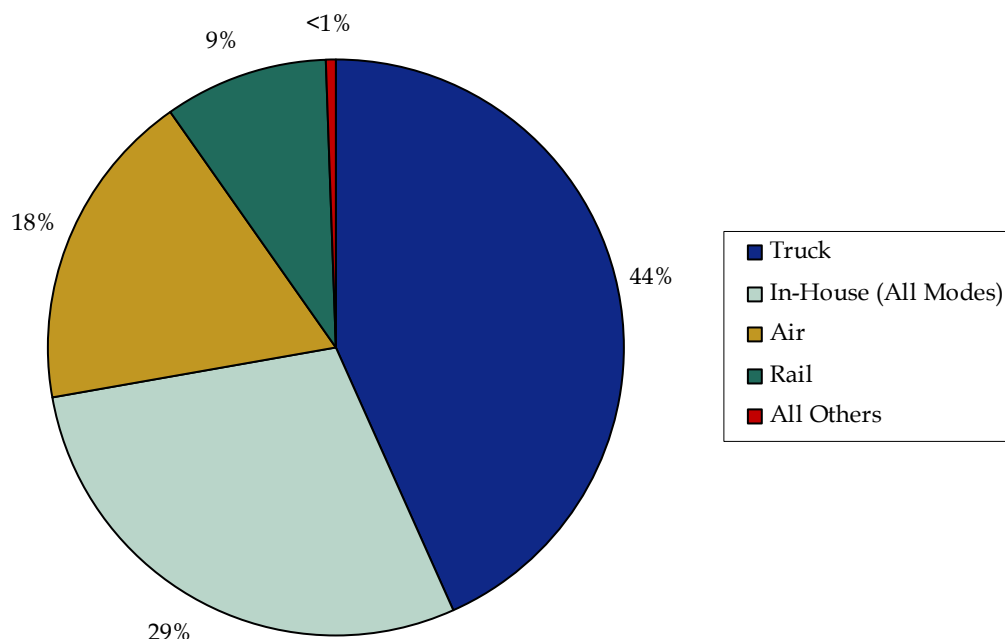


Modal Dependencies and Transportation Needs

Transportation equipment manufacturers and related industries use the truck, rail, and air modes extensively. Air and truck freight are especially important to these firms since they rely on just-in-time delivery for their operations and thus maintain little or no inventory on-site. They also rely heavily on rail shipments for both inputs and finished products.

Figure 27 shows the modal dependencies of the motor vehicle manufacturing industry as a percent of total transportation inputs to production. Overall, this industry requires slightly more than three cents' worth of transportation services to produce one dollar of output. The largest chunk of this - 44 percent - goes to truck transportation (common carriers). In-house services make up the next largest chunk (29 percent); as with agriculture, this is primarily composed of privately owned trucks. Unlike agriculture, air freight also is important to motor vehicle manufacturing, making up 18 percent of the total. Rail makes up nine percent; pipeline and marine combined comprise less than one percent.

Figure 27. Modal Dependence of Motor Vehicle Manufacturing
Percent of Total Transportation Inputs to Production

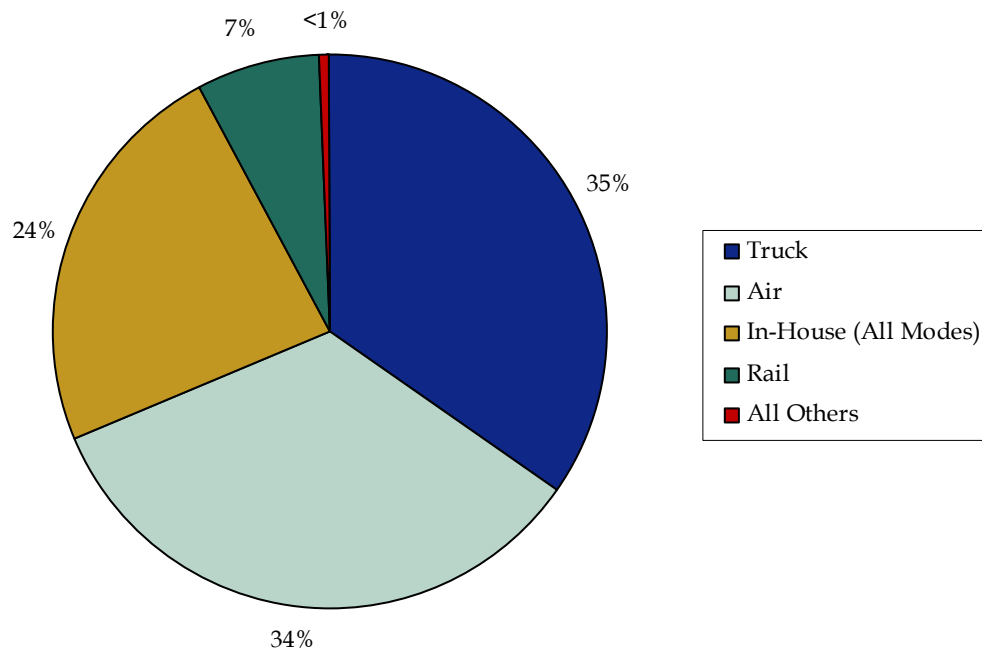


Source: Bureau of Economic Analysis, Transportation Satellite Accounts.

Figure 28 presents the modal dependencies of transportation equipment manufacturing industries other than motor vehicles. Common carrier trucking firms are once again the most important transportation supplier, making up 35 percent of total transportation inputs. In contrast to automobile production, air freight is the next most important mode. Aircraft parts manufacturers and MRO businesses rely heavily on air transportation. This very high dependence on air freight can be explained by the high-value nature of their products. This industry includes manufacturers of very sophisticated electronic components for use in automobiles as well as aerospace and defense applications. Many of these products are light and very high in value. They are also time-sensitive, since many of these firms operate using just-in-time, replenishment-based supply chains. These factors make their shipments particularly well-suited to air transportation.

In-house transportation comprises nearly a quarter of the total, followed by rail at seven percent. Marine and pipeline combined are less than one percent.

Figure 28. Modal Dependence of Transportation Equipment Manufacturing (Except Motor Vehicles)
Percent of Total Transportation Inputs to Production



Source: Bureau of Economic Analysis, Transportation Satellite Accounts.

Given the importance of timely freight shipments to these firms, the transportation equipment manufacturing industry will respond well to freight system improvements that increase the reliability and mobility of truck, rail, and air freight.

Typical Logistics Patterns

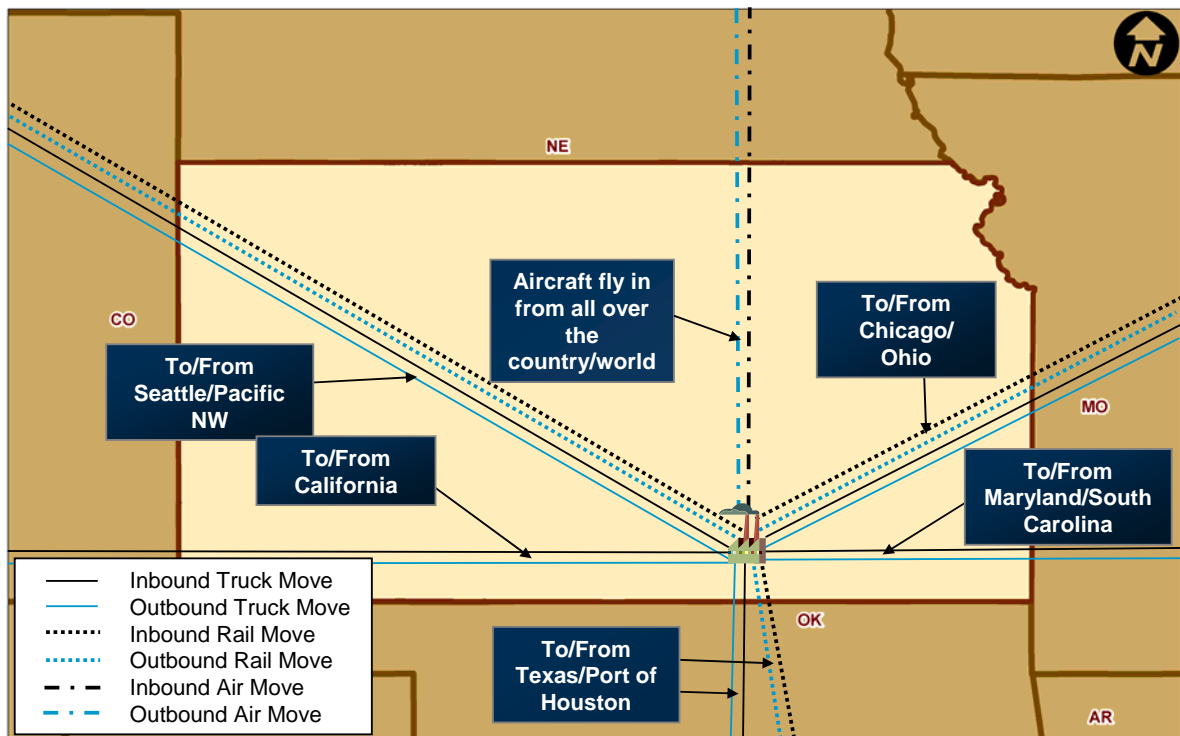
The logistics example below describes the multimodal supply chain of an aircraft maintenance, repair, and overhaul (MRO) facility in Wichita. Operations at the MRO facility involve several different supply chains, the most simple of which include modifications to military aircraft that fly in from all over the world (Figure 29). Once the on-site modifications, such as tanker reinforcement, are complete, the aircraft then fly out again from Wichita.

Other supply chains involve the disassembly/reassembly of aircraft components at the MRO facility from aircraft that fly into Wichita. The components are overhauled or rehabilitated at an off-site location, but ultimately return to Wichita for reinstallation. The following examples describe the supply chains of several aircraft components, all beginning with aircraft flying into Wichita:

- Engines are removed from the plane at the MRO facility, trucked to Ohio or California for overhaul, and then trucked back to the MRO facility for reinstallation.
- Couches and seats are removed at the MRO facility, trucked to Texas or Seattle for rehabilitation and then trucked back to Wichita for reinstallation at the MRO facility.
- Carpet removed from the aircraft at the MRO facility is trucked to South Carolina, California, or Maryland and then trucked back to the MRO facility for reinstallation.
- Tanker parts are removed from the aircraft at the MRO facility, sent via air (Chicago) or marine (Houston) to Italy, are transported back to Wichita via air or marine through the same ports of entry, and reinstalled onto the aircraft at the MRO facility.

The MRO facility does not maintain any inventory. Instead, it relies on just-in-time delivery served by truck shipments. The MRO facility in this example owns a small truck fleet and employs three full-time drivers. While it would like to take advantage of the cost efficiencies provided by rail transport, the service times provided by rail are not currently competitive with truck.

Figure 29. Logistics Patterns of an Aircraft Manufacturer



6.4 Food Manufacturing

Food manufacturing is an important industry in many parts of Kansas, both urban and rural. In 2006, industry output as measured by GSP reached slightly over \$1.9 billion. It is also a very diverse industry, as shown below.

Geographic Clustering

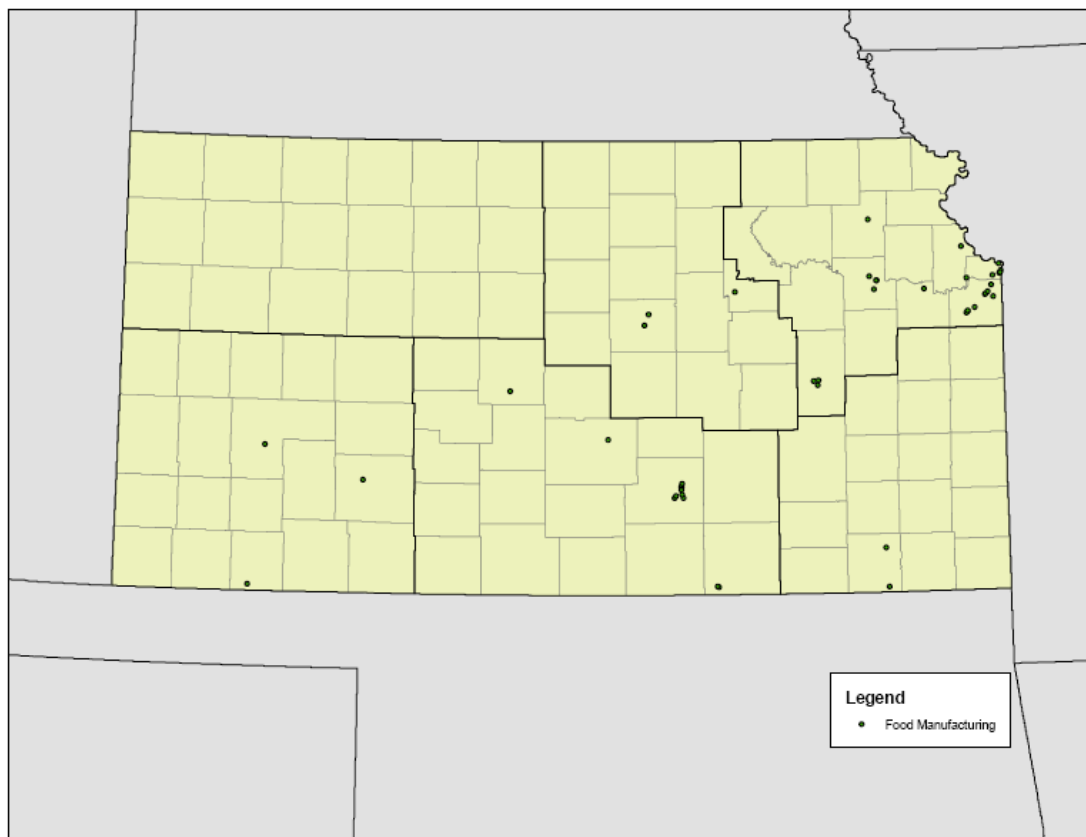
The heaviest concentrations of food manufacturing employment are in Districts 1, 5, and 6, as shown in Figure 30. Districts 1 and 6 contain the most activity in this industry; over 9,000 people in each district are employed in food manufacturing. These industry clusters are composed of several sub-industries, which differ by District:

- The southwest Kansas region (District 6) contains a well-developed cluster of meat processing plants and related industries, primarily located in Finney, Ford, and Seward Counties. The area is home to more than 300 feed yards and four meat packing plants.¹⁸ These include National Beef Packing Company (Dodge City and Liberal), Excel Corporation (Dodge City), and Beef Products Inc. (Garden City), among others. This industry is closely linked to the animal production industry, which is its chief supplier. In 2006, Kansas was second only to Texas in the number of cattle and calves on farms.¹⁹ As noted above, most of this activity is located in southwest Kansas. However, significant numbers of cattle are raised in east Kansas and then trucked to southwest Kansas to be finished on feedlots and eventually slaughtered. In addition, cattle from all over the country are finished and processed in Kansas.
- Food manufacturing is more diverse in District 1. Animal slaughtering and processing is still important here – Triumph Foods, located in the Elwood, Kansas/St. Joseph, Missouri bi-state area, is the largest pork processing plant in the world. However, there also are significant concentrations of animal food manufacturing (Cargill Animal Nutrition, Del Monte Pet Products, Hill’s Pet Nutrition), bakeries (Dolly Madison Foods, Kellogg’s Snacks), and grain and oilseed milling (Archer Daniels Midland, Bunge Grain, Cargill, Inc., MGP Ingredients).
- District 5, in addition to having a large concentration of employment in meat processing (Great Bend Packing Company, Farmland Foods, Dold Foods LLC), also has smaller clusters of employment in dairy product manufacturing (Hiland-Steffen Dairy Foods Company), and grain and oilseed milling (Archer Daniels Midland, Cargill, Inc., Cereal Food Processors, Inc.), all primarily located in Sedgwick County.
- There is a cluster of frozen food product manufacturing in District 2 (Tony’s Pizza).

¹⁸University of Kansas (KU) Transportation Research Institute, *Transportation Logistics and Economics of the Processed Meat and Related Industries in Southwest Kansas*, July 2007.

¹⁹United States Department of Agriculture, National Agricultural Statistics Service.

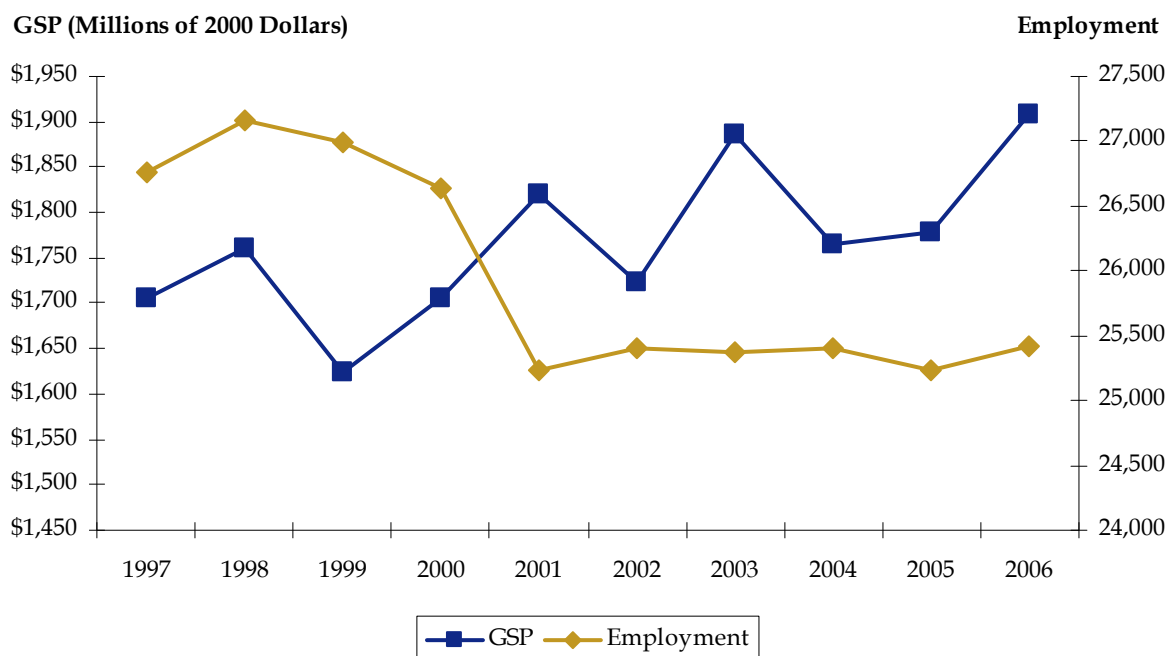
**Figure 30. Clustering of Food Manufacturing Establishments in Kansas
(More Than 50 Employees) 2008**



Employment and GSP Growth

Figure 31 shows the ten-year trends in Gross State Product contribution and employment for the food manufacturing industry. While employment dropped sharply in the 2001 recession and never recovered to pre-recession levels, output has generally displayed an upward trend, implying that these manufacturers have become more lean and efficient in their operations.

**Figure 31. GSP and Employment Growth in Food Manufacturing
 1997 to 2006**

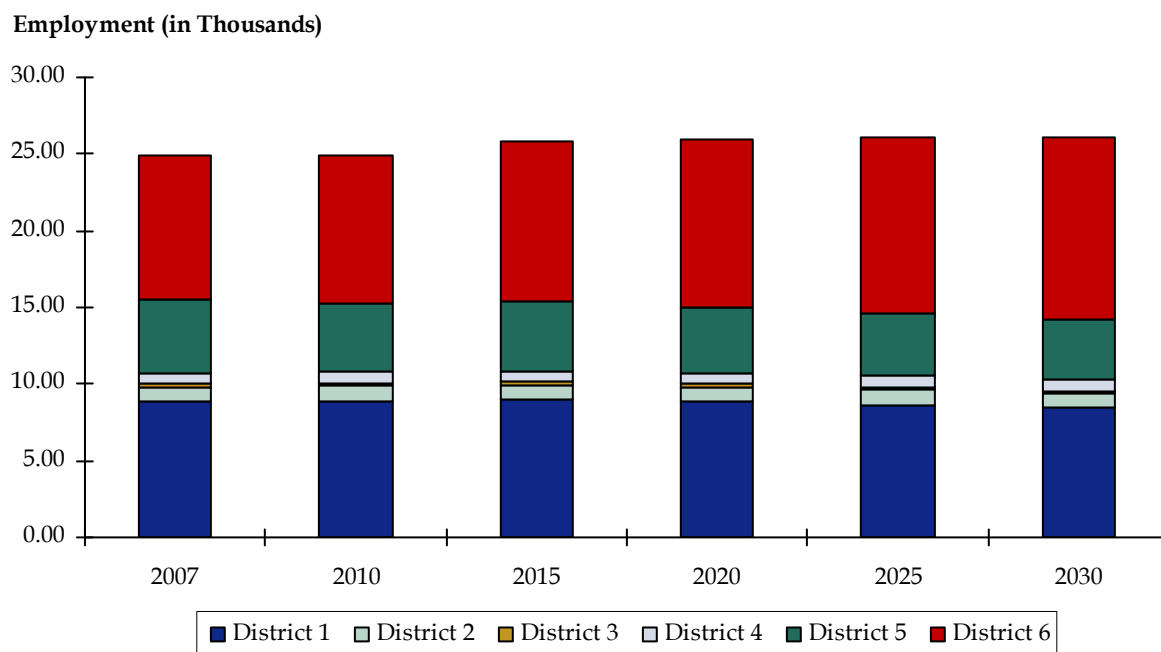


As shown in Figure 32, food manufacturing will continue to grow rapidly in District 6, expanding by 26 percent to nearly 12,000 employees by 2030. This growth will be centered around the meat packing industry. Other districts will maintain a relatively stable employment base in this industry, with slightly more pronounced job losses in Districts 1 and 5 as the local economies in those regions become more service-based. Nonetheless, Districts 1, 5, and 6 will still contain 93 percent of the statewide employment in food manufacturing by 2030.

Continued growth in the meat processing industry is likely because Kansas' moderate climate and the quality of its feed grains make the state an ideal place to raise cattle and other livestock. In addition, southwest Kansas has established itself as a cattle feeding and processing center for a large multi-state region including Texas, Oklahoma, Nebraska, and Missouri as well as eastern Kansas.²⁰ This will lead to more trucks using the rural infrastructure in District 6, much of which was not designed to accommodate the heavy loads typically generated by this industry. Industry growth in District 1 (mostly driven by meat processing but also including other food manufacturing) will exacerbate existing capacity and maintenance concerns.

²⁰University of Kansas (KU) Transportation Research Institute, *Transportation Logistics and Economics of the Processed Meat and Related Industries in Southwest Kansas*, July 2007.

Figure 32. Projected Employment Growth in Food Manufacturing by District
 2007 to 2030

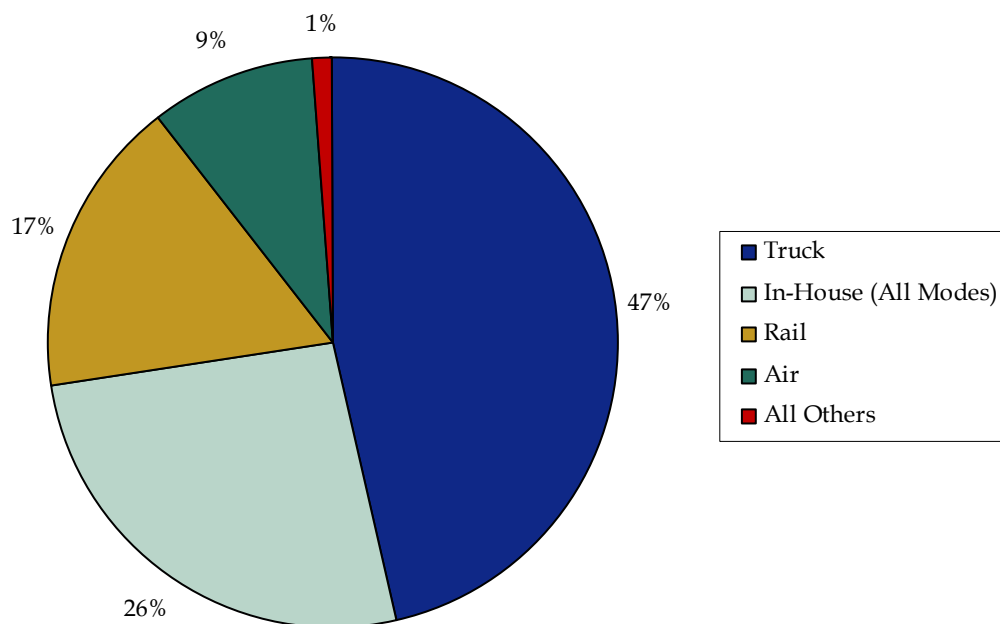


Modal Dependencies and Transportation Needs

Food manufacturing requires almost four cents of freight transportation inputs to produce one dollar of output.²¹ The food manufacturing industry is heavily dependent on truck transportation both for delivery of inputs and for distribution of finished product. Combined, truck and in-house transportation (which is mostly trucks) make up nearly three quarters of total transportation inputs to production (Figure 33). Rail transportation accounts for the next largest share at 17 percent, followed by air freight at nine percent. All other modes (marine and pipeline) comprise one percent.

²¹U.S. Bureau of Economic Analysis, Transportation Satellite Accounts.

Figure 33. Modal Dependence of Food Manufacturing
Percent of Total Transportation Inputs to Production



Source: Bureau of Economic Analysis, Transportation Satellite Accounts.

Federal regulations require live animals to be transported by truck. As a result, there are no alternate modes for livestock moving from ranches to feed yards and then on to processing plants. Growth in the meat processing industry will therefore lead to increased truck shipments and infrastructure deterioration in District 6 and throughout the State, since cattle are raised nearly everywhere in Kansas and trucked in from other states. In addition, some meat products are shipped overseas by plane. These producers are therefore dependent upon reliable air freight service.