

# Freight Mobility and Industry



## ECONOMIC CONTEXT

Nearly 1.5 million Indiana residents are employed at a freight producing or freight consuming business. Typically these businesses are classified by the North American Industry Classification System (NAICS) at the 2-digit level between 11 and 49. Table 5 displays employment for each of these sectors below.

While transportation and warehousing, wholesale trade, and retail each represent important segments of the State's economy, the manufacturing sector represents 13% of overall employment in the State.

**Table 5. Indiana Employment by Sector**

NAICS 2-DIGIT CODE	SECTOR DESCRIPTION	EMPLOYEES	PERCENTAGE OF WORKFORCE
11	Agriculture, Forestry, Fishing and Hunting	20,601	0.6%
21	Mining	5,670	0.2%
22	Utilities	15,494	0.4%
23	Construction	199,410	5.6%
31-33	Manufacturing	471,007	13.1%
42	Wholesale Trade	180,708	5.0%
44-45	Retail Trade	449,485	12.5%
48-49	Transportation and Warehousing	97,559	2.7%
51-99	All Other Sectors	2,144,663	59.8%
	<b>Total</b>	<b>3,584,597</b>	<b>100.0%</b>

Source: InfoUSA establishment data and Cambridge Systematics analysis, 2016.

Additional manufacturing statistics along with Indiana's rank among U.S. states are shown in Table 6. Indiana is first in percent of GSP from manufacturing and in percent of employment from manufacturing.

**Table 6. Indiana Statewide Manufacturing Summary**

MEASURE	METRIC	RANK IN U.S.
Percent of Statewide GSP from Manufacturing	29.45%	1 <sup>st</sup>
Percent of Statewide Employment from Manufacturing	17.06%	1 <sup>st</sup>
Total Statewide Manufacturing Output	\$93.6B	6 <sup>th</sup>
Total Statewide Manufacturing Export Value	\$33.1B	10 <sup>th</sup>
Total Manufacturing Firms	7,190	12 <sup>th</sup>
Average Manufacturing Annual Wage	\$72,256	17 <sup>th</sup>

Source: Harvard University, Institute for Strategy and Competitiveness; MIT Sloan School of Management; Temple University, Fox School of Business; US Economic Development Administration, Regional Innovation Acceleration Network; US Cluster Mapping Project; Global Logistics Development Partners; IHS Global Automotive; Moody's.

This section further explores the correlation between manufacturing and the freight transportation system by highlighting key sub-sectors, including: advanced materials, biomedical supplies, chemicals, fabricated metals, food production, and transportation equipment. Each of the subsectors are described in detail on the following pages.



## Advanced Materials in Indiana

### ADVANCED MATERIALS

Sector Subcategories	Interlocking Supply Chains
<ul style="list-style-type: none"> <li>• Plastics</li> <li>• Lightweighting metals</li> <li>• Glass</li> <li>• Steel</li> <li>• Composites</li> <li>• Rubber</li> <li>• Chemicals</li> </ul>	<ul style="list-style-type: none"> <li>• Construction products</li> <li>• Marine equipment</li> <li>• Aerospace and defense</li> <li>• Electronics</li> <li>• Wind energy</li> <li>• Oil and gas</li> <li>• ICT</li> </ul>
Major Concentrations in Indiana	Major U.S. Concentrations
Indianapolis, Bloomington, Fort Wayne, Evansville, Gary	Michigan, California, Utah, Washington, Arizona, Tennessee, Texas, Georgia, North Carolina, Colorado
Product Movement	Key Supply Chain Connections
<p>By truck – small and mid-sized medium-value (and some higher-value) products</p> <p>By air – outbound high-value carbon fiber products</p> <p>By ocean/truck – outbound large-dimension products, some inbound feedstocks</p> <p>By rail – inbound feedstock</p>	<p>Global: China, Japan, UK, Spain, France, Germany</p> <p>United States/Canada: Texas, California, Ohio, Louisiana, Washington, Georgia, South Carolina, Ohio, Michigan, British Columbia, Alberta</p>

The global advanced materials market is very large and expanding rapidly. Fueled by the development of new technologies, the market in the U.S. is currently being driven by the aerospace and automotive markets while the Asia Pacific region is the fastest growing market. The demand for advanced materials will continue to grow as the sector is expected to transform the overall manufacturing industry in the coming years, especially in the maritime equipment, consumer products/appliances and industrial machinery sectors.

These materials will have a profound impact on the way manufacturers make most products. Next generation materials science is becoming an essential 'tool' allowing designs to be optimized to reduce waste; products to be made as light as possible; inventories of spare

parts to be reduced; greater flexibility in the location of manufacturing; products to be personalized to consumers, and consumers to make some of their own products through 3D manufacturing.

There are opportunities for growth not just in the development and production of materials themselves but in their application and deployment. For example, new joining technologies, tools, and modeling software are often required to enable a new material to be used effectively.

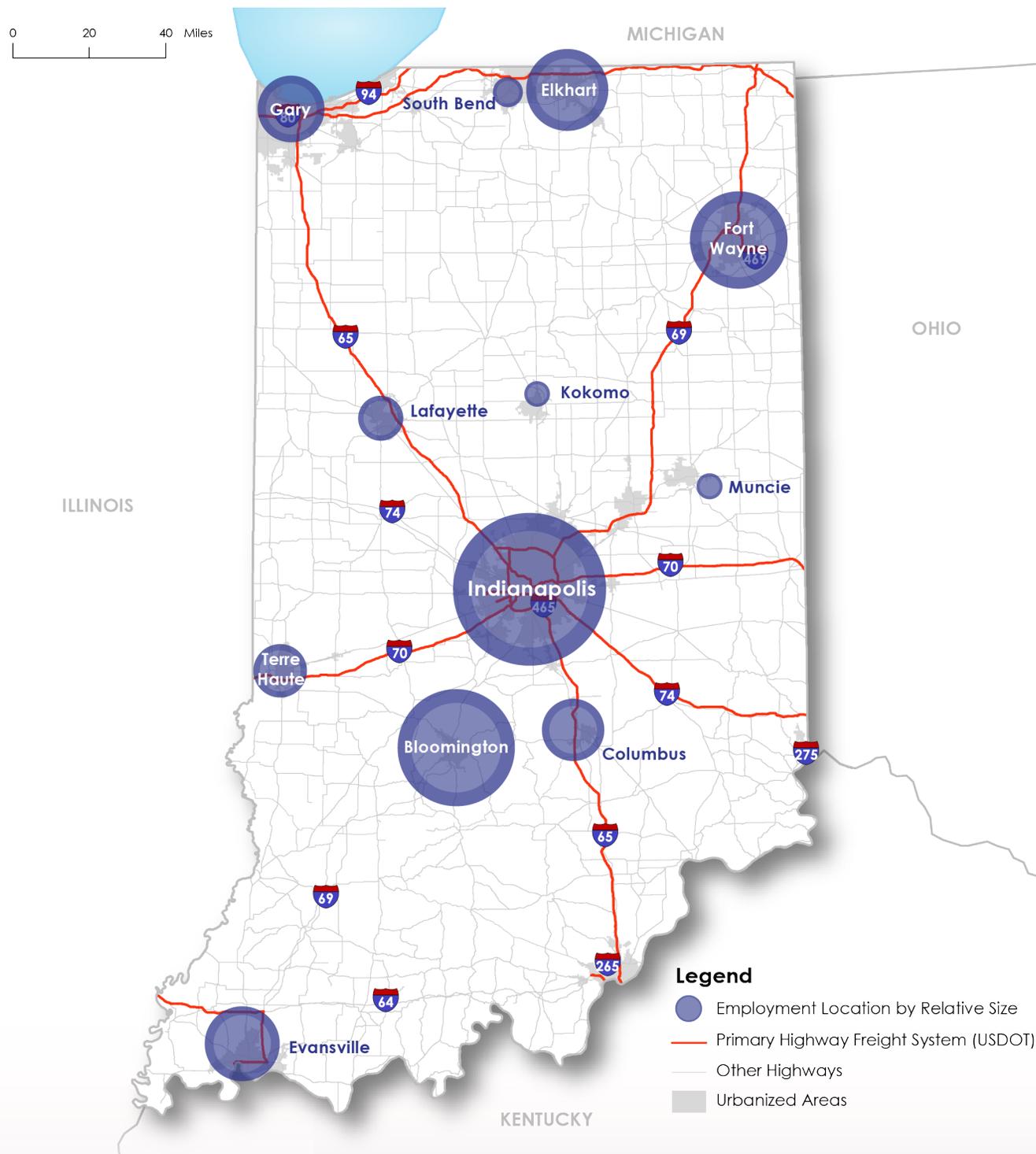
In fact, advanced materials often disrupt entire supply chains which opens up new opportunities for companies from chemical manufacturers to system integrators across whole industries. Continuously emerging technologies and advancements in product development will keep demand in this industry at a very high level.

### Key Issues

- Rapid change in materials and software.
- Possible displacement of existing industries.
- May require additional workforce training.



Figure 12 shows the relative amount of employment in the advanced materials sub-sector in Indiana.



**Figure 12. Advanced Materials Employment Centers in Indiana**



## Biomedical Sector in Indiana

BIOMEDICAL	
Sector Subcategories	Interlocking Supply Chains
<ul style="list-style-type: none"> <li>• Biopharmaceuticals</li> <li>• Medical devices and products</li> </ul>	<ul style="list-style-type: none"> <li>• Electronics</li> <li>• Precious metals</li> <li>• Plastics – advanced materials</li> <li>• Photonics</li> <li>• Biopharma</li> <li>• Chemicals</li> </ul>
Major Concentrations in Indiana	Major U.S. Concentrations
Indianapolis, Bloomington, Fort Wayne, Gary	<p>Biopharma: California, New York, New Jersey, Pennsylvania, North Carolina (Indiana #11)</p> <p>Medical Devices and Products: California, Indiana, Florida, New York, Minnesota (Indiana #2)</p>
Product Movement	Key Supply Chain Connections
<p>By truck – many input products and some finished products</p> <p>By air – finished high value-products; requires high-touch, security, temperature controls; overseas shipments require some air, some domestic</p> <p>By ocean/truck – some raw feedstock products from overseas</p>	<p>Global: India, China, France, UK, Switzerland, Germany</p> <p>United States: California, New Jersey, North Carolina, Illinois, Michigan, Texas, Pennsylvania, Massachusetts</p>

The biomedical sector covers a wide range of materials, technologies, and skills used to advance health and wellness. Products in this sector include medical applications of electronics, robotics, biochemical engineering, as well as traditional manufacturing. Important products include:

- **Medical Devices:** In order to continue its consistent market growth, the medical device industry must adapt to constant changes in the medical landscape. The demand for more advanced, more personalized treatment; increased availability of healthcare; and an aging population are pushing the market and expanding technologies. These advancements require accelerated design and production to get products to market quickly, efficiently, and cost-effectively.

» The U.S. is home to many of the world's leading medical device manufacturers employing over 400,000 people. The majority of the 7,000 U.S. medical device manufacturers are export-oriented, small to medium enterprises (SME) and the three largest markets for medical devices are the U.S., Japan, and Germany.

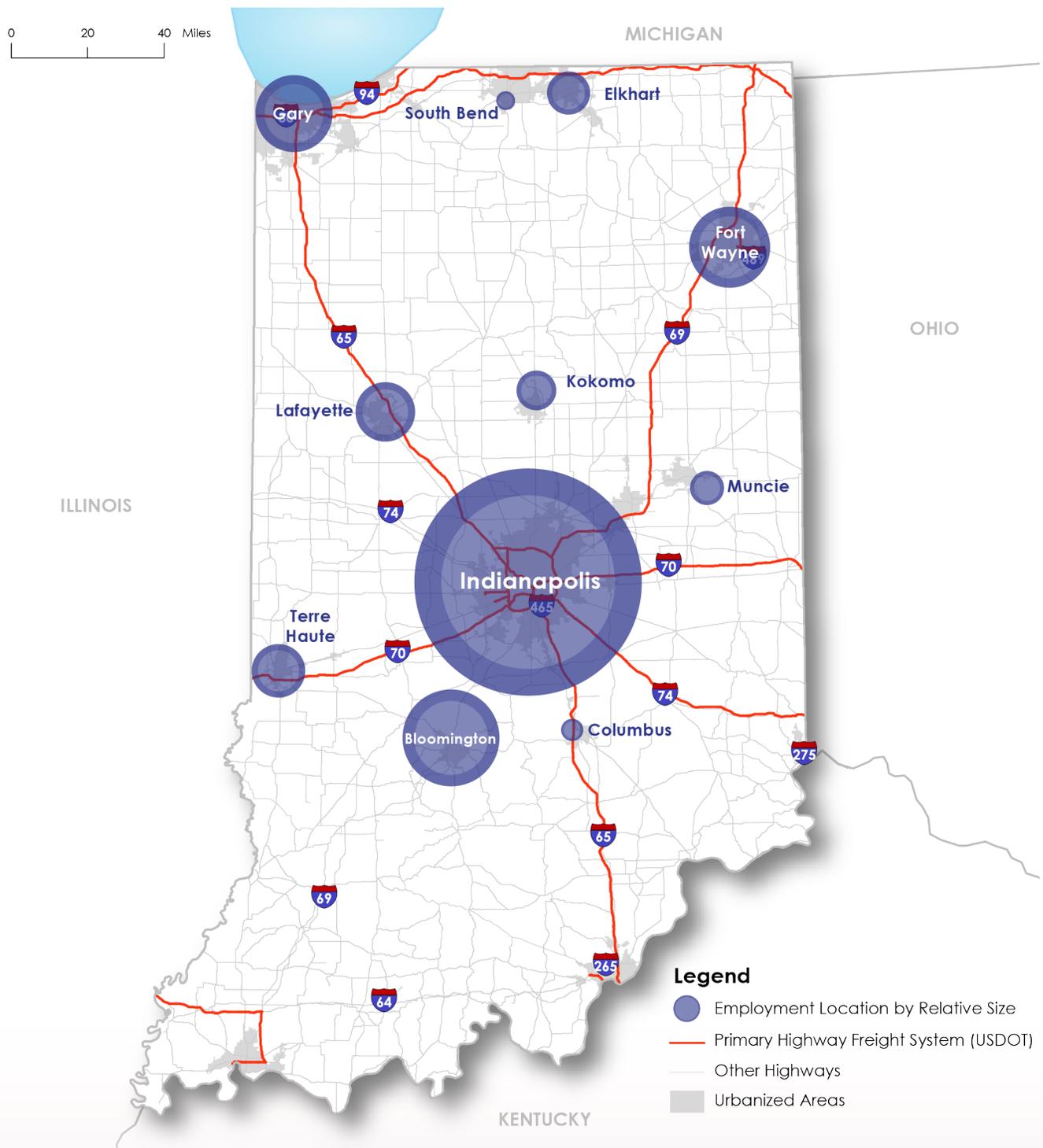
- **Pharmaceuticals:** The U.S. pharmaceutical industry is facing a challenging business environment and slowing growth. It is a mature market and the major growth drivers are the aging population and chronic diseases. At the same time, global markets are booming. Pharmaceutical firms are having to reinvent their business models to deal with the changes in the U.S. healthcare system and the constantly evolving regulatory and political landscape.
- **Biotechnology:** This is the engine of innovation in the biomedical sector. It receives the bulk of investment and research dollars and is the drug discovery pipeline.
- **Dental Products:** The dental industry was severely affected by the recession and is just recovering. Long term the market will continue to grow based on awareness of oral health issues, dental cosmetics treatment, products that reduce discomfort, and technological advances in procedures. The growing international market presents great opportunity.
- **Cosmetics:** The market will continue to grow based on demand for skin care and antiaging products. Factors such as increasing customer awareness and disposable income will contribute significantly to the growth.
- **Nutraceuticals:** The market is highly saturated and regulated. Pharmacies, drugstores, and online sales are the major distribution channels.

### Key Issues

- Products may require time- and temperature-sensitive shipping.
- On-going investment in research and development is critical.
- Workforce requires a range of educational attainment and disciplines.



Figure 13 shows the relative amount of employment in the biomedical sub-sector in Indiana.



**Figure 13. Biomedical Employment Centers in Indiana**



## Chemicals in Indiana

### CHEMICALS AND ALLIED PRODUCT MANUFACTURING

Sector Subcategories	Interlocking Supply Chains
<ul style="list-style-type: none"> <li>Basic Chemicals: organic and inorganics, plastic resins, dyes and pigments</li> <li>Specialty Chemicals: adhesives and sealants, water treatment chemicals, plastic additives, catalysts and coatings</li> <li>Agricultural Chemicals: important role in the farm economy and the food processing sector</li> <li>Consumer Products: soaps, detergents, cleaners, toiletries and cosmetics</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Electronics/Smart phones</li> <li>Medical devices and supplies</li> <li>Renewable energy and energy efficiency</li> <li>Lithium batteries</li> <li>Pharmaceuticals</li> <li>Kitchen appliances</li> </ul>
Major Concentrations in Indiana	Major U.S. Concentrations
Indianapolis, Evansville, Fort Wayne, Bloomington, Elkhart	<p>United States: Texas, California, Louisiana, Kentucky, Illinois, Ohio, Indiana 7<sup>th</sup></p> <p>Global: France, Germany, Russia, China, Japan, UK, Italy, India, Brazil</p>
Product Movement	Key Supply Chain Connections
<p>By truck - Small-volume packaged chemical products; the most common mode of transport for industrial gases and consumer products and has increasingly been used for bulk shipments of intermediate chemicals.</p> <p>By Rail - Generally shipped in tank cars (liquids and liquefied gases), hopper cars (dry commodities), and some boxcars (dry bulk or packaged chemical products).</p> <p>By air - Small volumes of consumer products are shipped via air transportation and courier service</p> <p>By ocean/truck - Primarily used for commodity chemicals, such as basic and intermediate organic chemicals, basic inorganic chemicals, and fertilizers.</p>	<p>Global: China, Japan, UK, France, Germany</p> <p>United States: Texas, California, Louisiana, Kentucky, Illinois, Ohio, Indiana</p>

The U.S. chemical industry continues to be an important global leader, accounting for 15% of the world's chemical shipments (by sales) and is positioned for growth over the next decade. Because of the abundance of energy resources in the U.S., the chemical industry has become among the lowest cost global producers of several important building block

chemicals. Since 2010, more than \$185B in new chemical investment has been announced, and half of those investments have been completed or currently under construction. A second wave of investment is expected through the early 2020s as more global companies will produce for the U.S. market. The strength of the industry and its resurgence is reflected by the fact that the sector accounted for 48% of all manufacturing construction spend in 2016, outpacing even transportation and healthcare.

As the industry expands, more high-paying chemical industry jobs will be created. The average job in the chemical industry pays nearly \$94,000, almost 50% more than the manufacturing average. In addition, the industry supports a vast supply chain and creates economic activity in the communities where they are located. For every job in chemical manufacturing, six more jobs are created elsewhere in the economy.

The U.S. chemical industry competes in a global context, and its share of international markets is increasing in unique and differentiated products, in which it enjoys distinct technological advantages. Canada represents the largest single national market for U.S. chemical exports while Mexico represents the second-largest national export market. U.S. chemical exports to Mexico have grown substantially since 1994, when the North American Free Trade Agreement (NAFTA) went into effect. Other large markets for U.S. chemical exports include Western Europe, Latin America, China, and Japan.

### Key Issues

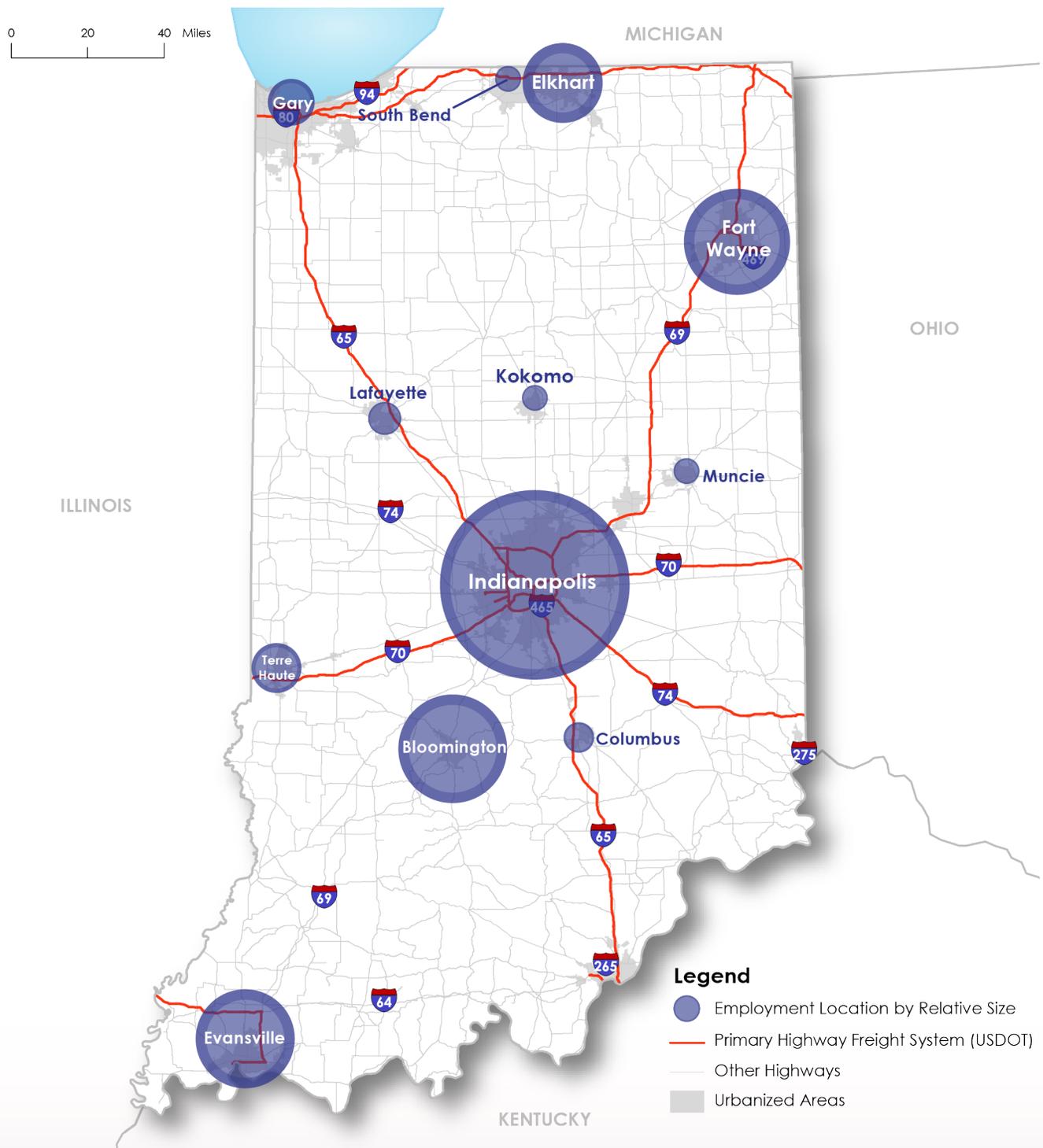
- Outlook for overall global economic growth.

### United States' policies:

- Trade agreements with key chemical consuming countries.
- Environmental regulations concerning air quality, safe operating standards, clean-up.
- Liability issues.
- Growth of the industry is outpacing the ability of the logistics/transportation industry to move the product in the U.S.



Figure 14 shows the relative amount of employment in the chemicals sub-sector in Indiana.



**Figure 14. Chemicals Employment Centers in Indiana**



## Fabricated Metals in Indiana

### METAL MANUFACTURING AND FABRICATION

Sector Subcategories	Interlocking Supply Chains
<ul style="list-style-type: none"> <li>• Cutlery and hand tools manufacturing</li> <li>• Architectural and structural metals manufacturing</li> <li>• Hardware manufacturing</li> <li>• Spring and wire manufacturing</li> <li>• Screw, nut, and bolt manufacturing</li> <li>• Forging and stamping</li> <li>• Boiler, Tank, and Shipping Container Manufacturing</li> <li>• Hardware Manufacturing</li> <li>• Coating, Engraving, Heat Treating, and Allied Activities</li> </ul>	<ul style="list-style-type: none"> <li>• Automotive</li> <li>• Aerospace</li> <li>• Construction</li> <li>• Energy</li> </ul>
Major Concentrations in Indiana	Major U.S. Concentrations
Bloomington, Indianapolis, Elkhart, and Gary	United States: Illinois, Wisconsin, Michigan, Minnesota, Tennessee, Indiana  Global: Japan, China, India, Southeast Asia, UK and France
Product Movement	Key Supply Chain Connections
By ocean/truck – raw feedstock products both domestic and international	Global: UK, France, Germany, Netherlands  United States: California, Wisconsin, New York, Georgia, Texas, Iowa, Illinois

Metal fabrication is the process of building machines and structures from raw metal materials. The process includes cutting, burning, welding, machining, forming, and assembly to create the final product. Metal fabrication projects include everything from hand railings to heavy equipment and machinery.

In 2015, the global metal fabrication market was valued at \$16.4B, and a recent report from Transparency Market Research (TMR) predicts it will expand at a compound annual growth rate of 3% to reach \$21.4B by 2024.

Since the economic rebound after the last recession, metal fabrication has become a strong and intense business that continues to recalibrate itself and flourish.

Current adjustments include a shift from relying on a few large projects to maintain a yearly profit to attempting to maintain steady sales volumes by diversifying and continuing to follow the success of previous years.

The metal fabrication industry is highly cyclical and depends on industries such as auto, aerospace, construction, and energy. The global market for metal fabrication is fueled by continued investments in electric furnace and metals processing, growing aluminum consumption, the reshoring of manufacturing practices in the automotive industry, recovery in nonresidential investments, and growing aerospace demand.

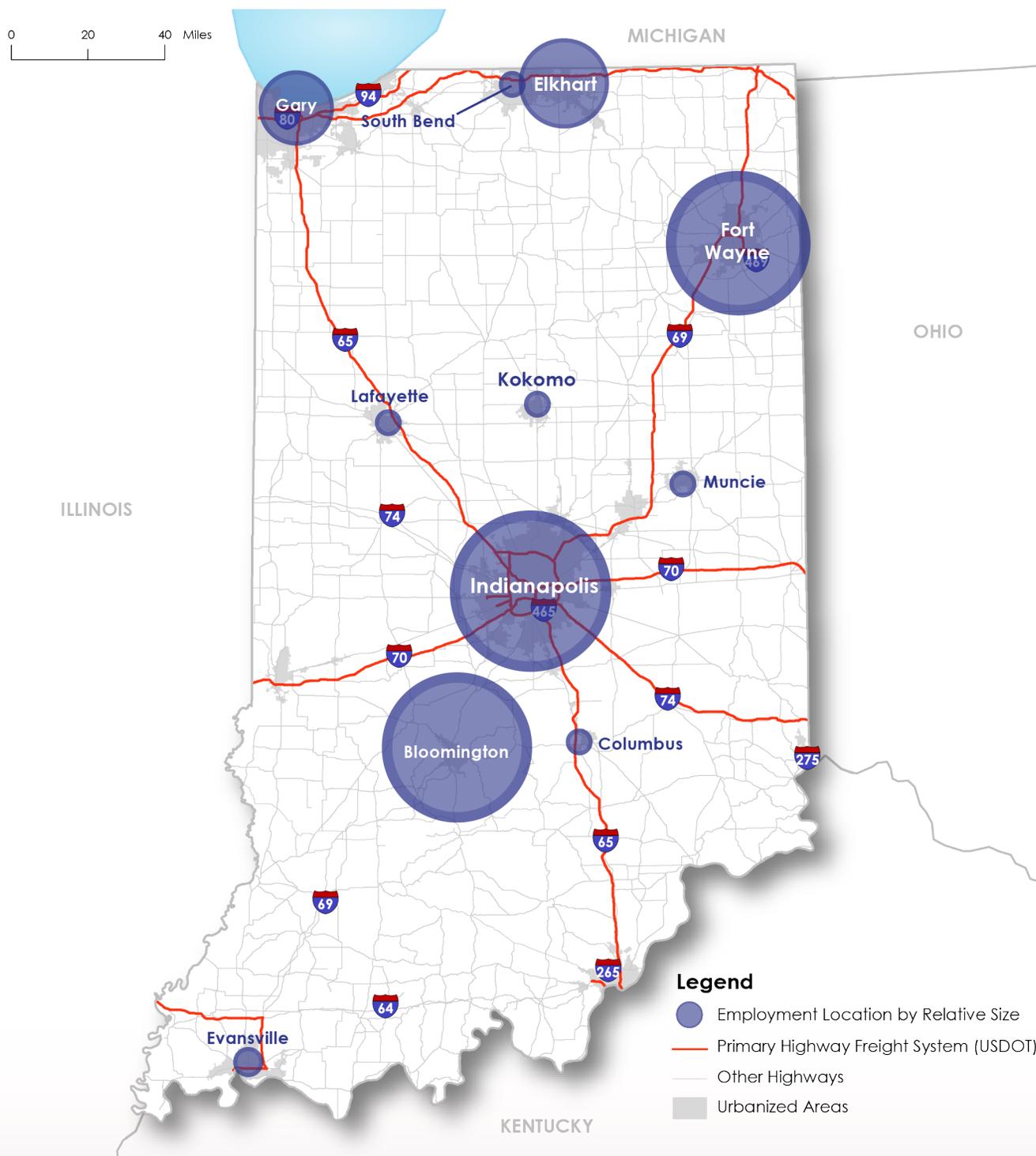
The industry is learning to balance capacity with a variety of customers who have a spectrum of demands that are driven by a changing economy. As machinery becomes more sophisticated, the ability to maintain a constant level of capital and profit is improving. Although forecasting can be difficult in a business dependent on the economic fortune of its customers, the consensus remains that those who can keep up with rapidly changing demands while still maintaining a high output capacity will elbow into a position of maximized profits. The volatility of the market has required the industry to streamline production practices and focus on the ability to reliably produce high-capacity output for many varied customer requests.

### Key Issues

- Fluctuating markets, cyclical industries and the need for sophisticated equipment define the market environment for metal fabrication companies.
- The growing popularity of 3-D metal printing poses a major threat to the development of the metal fabrication market. The technology has gained extensive usage in the aerospace, automotive, and marine sectors, which is viewed as a hindrance to the trajectory of the metal fabrication market.
- Accessing capital.
- Transportation industry supply chain is fueling the metal fabrication market in Indiana.



Figure 15 shows the relative amount of employment in the fabricated metals sub-sector in Indiana.



**Figure 15. Fabricated Metals Employment Centers in Indiana**



## Food Production in Indiana

### FOOD PROCESSING AND MANUFACTURING

Sector Subcategories	Interlocking Supply Chains
<ul style="list-style-type: none"> <li>Specialty foods, Baked Foods, Dairy Products, Packaged Fruit and Vegetables, Beverages, Candy and Chocolate, Animal Foods, Wine, Milling and Refined Cereals and Oilseeds, Coffee and Tea, Sugar</li> </ul>	<ul style="list-style-type: none"> <li>Industrial equipment, paper and packaging, biopharma/life sciences</li> </ul>
Major Concentrations in Indiana	Major U.S. Concentrations
Indianapolis, Greensburg, Richmond, Frankfort, Jefferson County	United States: California, Illinois, Texas, Pennsylvania, Ohio, Wisconsin, Minnesota  Global: Dispersed
Product Movement	Key Supply Chain Connections
By truck – truck is the primary mode from growing field, to secondary production and into national distribution system  By rail – Bulk rail in the second largest tonnage mode, both refrigerated and unrefrigerated  By air – not normally used unless highly perishable  By inland water system to ocean – inbound raw ingredients, outbound in quantity to overseas markets	Global: UK, France, Germany, Netherlands  United States: California, Wisconsin, New York, Georgia, Texas, Iowa, Illinois

The structure of the global food industry is changing and evolving as food suppliers, manufacturers, and retailers adjust to meet the needs of consumers, who increasingly demand a wider variety of higher quality products. Having first-hand knowledge of consumer preferences and purchase habits, food retailers are positioned to transmit this information upstream to other segments of the supply chain.

In the quest to meet consumer demands for variety, affordability, safety, and quality, the food retail sector is evolving and generating innovative sale formats. In addition to the popular supermarket format, hypermarkets, discounters, convenience stores, and combined gasoline and grocery outlets have emerged in recent years.

Global food retail sales are about \$4T annually, with supermarkets/hypermarkets accounting for the largest share of sales. Most of the leading global retailers are U.S. and European firms, as large multinational retailers expand their presence in developing countries and small retail firms increasingly account for a smaller share of total food sales. The top 15 global supermarket companies account for more than 30% of world supermarket sales. Similar to retailers, food manufacturers are reorienting their business strategies in response to consumer signals transmitted via retailers. Two common strategies are geographic expansion in developing countries and a greater emphasis on product category management. Together, the top 50 food manufacturers' share of global packaged food retail sales account for less than 20%.

Driven by innovation and competition from private retail brands, food manufacturers are focusing on specific product lines where they have inherent advantages. There is greater emphasis on “category management” and “focused growth” compared with the product portfolio diversification strategies of the past. Therefore, while manufacturer concentration is not the case at the global level for total packaged food sales, firm concentration may exist in specific product lines and regional markets. Firm concentration is particularly evident for those products where the manufacturer’s brands are otherwise popular, such as in soup, breakfast cereal, and baby food.

From a macro perspective, consumer spending is expected to rise very little, and some companies may face serious challenges as competition and new product introductions has the effect of market saturation in some areas. Moody’s has cited that general cost cutting and plant rationalization will improve companies’ profitability and cash flows. In 2017, product innovation has evolved toward renovation, which will include upgrading packaging, ingredients, flavoring, and labeling.



Moody's identified numerous global packaged goods companies with positive outlooks, including Proctor & Gamble and Unilever, but they have indicated concern about other mainstay firms, such as Kellogg because of no significant growth for its U.S. cereal business as performance in U.S. snacks is mixed. Some companies such as TreeHouse Foods and Private Brands, are facing operating and IT system integration challenges.

Merger and acquisition activity is likely to be sluggish in 2017 in the food sector, but a number of large players such as Tyson Foods, Kraft Heinz, Pinnacle Foods, and Mondelez International are considering strategic acquisitions.

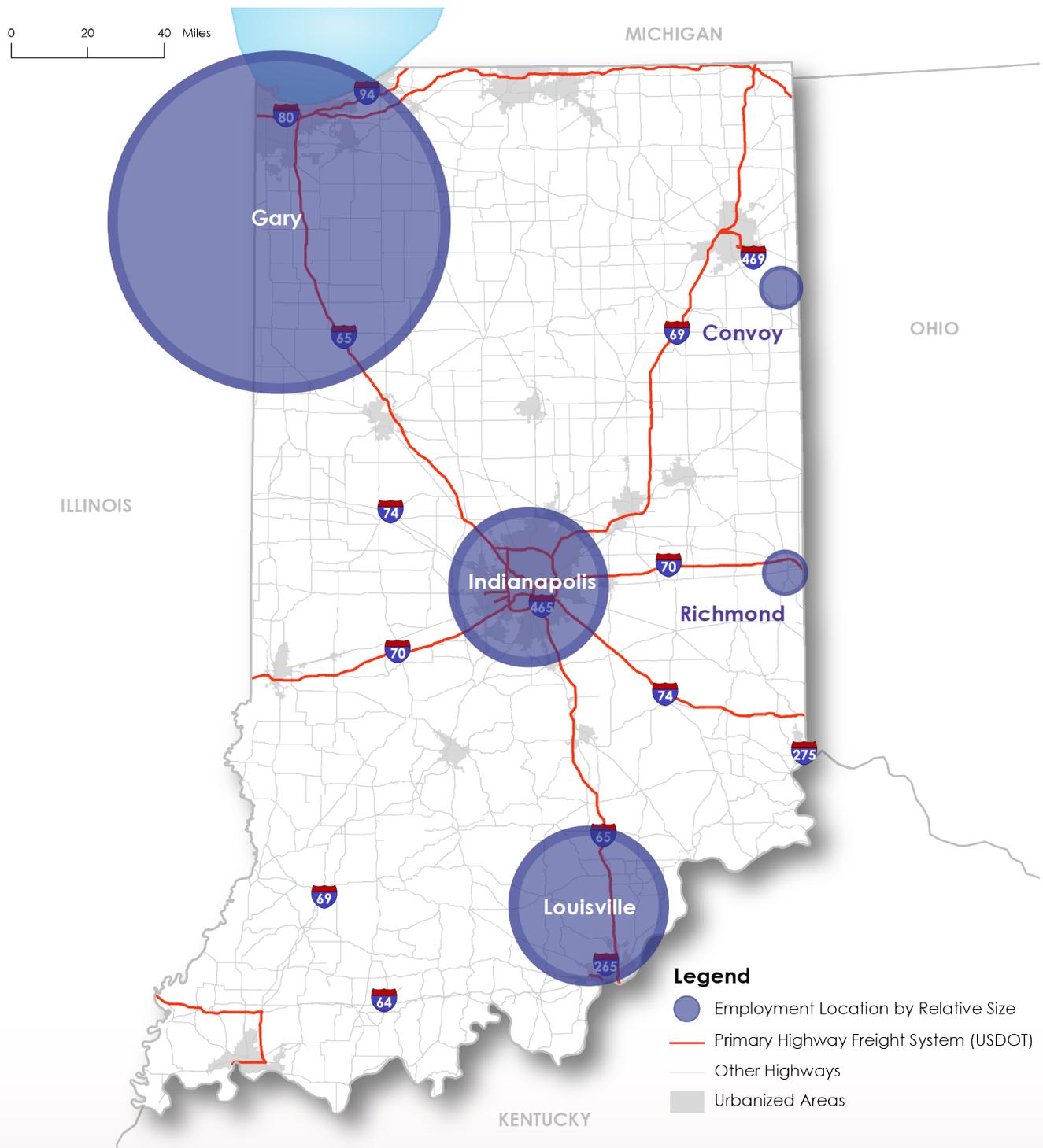
## Key Issues

In the U.S. a range of issues are weighing on the food production industry, including:

- Various regulations being targeted for repeal or significant decrease in enforcement, such as menu labeling.
- FDA and state funding for certain regulatory programs may be reduced substantially.
- Repeal of right-to-know laws such as GMO labeling.
- Accessing capital for new production facilities.



Figure 16 shows the relative amount of employment in the food production sub-sector in Indiana.



**Figure 16. Food Production Employment Centers in Indiana**



## Transportation Equipment in Indiana

TRANSPORTATION EQUIPMENT	
<b>Sector Subcategories</b>	<b>Interlocking Supply Chains</b>
<ul style="list-style-type: none"> <li>• Military vehicles and tanks</li> <li>• Motor Vehicles</li> <li>• Engine and Engine Parts</li> <li>• Automotive Parts</li> </ul>	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Electronics</li> <li>• Plastics – advanced materials</li> <li>• Glass</li> <li>• Rubber</li> </ul>
<b>Major Concentrations in Indiana</b>	<b>Major U.S. Concentrations</b>
Elkhart, Indianapolis, Fort Wayne, Bloomington	<p>United States: Michigan, Ohio, Indiana, Kentucky, Tennessee, Illinois, South Carolina, Alabama, California, Texas</p> <p>Global: Japan, Korea, China, Germany, France, UK, Poland, Czech, Spain, Italy, India, Mexico</p>
<b>Product Movement</b>	<b>Key Supply Chain Connections</b>
By truck – many input products and some finished products	Global: Japan, China, India, Germany, Mexico
By air – finished high value-products (overseas); requires high-touch, security	United States: Michigan, Ohio, Tennessee, Missouri, California, Illinois, Texas
By ocean/truck – some raw feedstock products from overseas	
By rail – Both finished products and component parts	

### Motor Vehicles and Motor Vehicle Parts

The last several years have been exceptional for the auto sector. Sales in the U.S. saw record highs in 2015 and 2016, while China and Europe sales have caught up. According to IHS Automotive, global auto sales for 2017 are estimated at around 93.5M units. Also, automakers are benefiting from an increase in sales of higher margin vehicles, such as SUVs and light trucks, due to low fuel prices. But while growth expectations will continue to increase with the world's population, the auto sector's rate of growth will begin to flatten out, and in many geographies, have reversed from the record growth of the past few years.

The auto sector is currently facing several opportunities as well as challenges. While low fuel prices, attractive financing options, and impressive vehicle launches have driven sales, slowing sales growth in the U.S., rising auto loan defaults, and high levels of safety recalls are

acting as dampeners. Another factor is the maturation of many emerging markets. The growth in these countries from families with no automobiles to having one or more has fueled the surge in sales over the last couple of decades. This same phenomenon occurred in Europe and the United States in the early 20th century.

The main innovation areas that are driving the auto industry are connectivity, autonomy, and propulsion. Each of these factors on their own would be a disruptive influence on the industry, but taken together they are transforming the industry into a technology-driven sector. This is not just affecting the original equipment manufacturers but the suppliers as well. Traditional suppliers are searching for ways to adapt, while new suppliers are rapidly entering the supply chain.

These disruptive influences will also have an effect on governments. The long term success of these new technologies is dependent upon the ability and commitment by governments to invest in the infrastructure needed to support the application of these new technologies.

### Recreational Vehicles (RV)

RVs include automobiles or trailers designed or modified for recreation or pleasure activities such as vacations and camping, both on and off highways. RVs include features such as sleeping, kitchen, and bathroom facilities for use during travel and camping. RVs are subject to the same registration and licensing as other automobiles and may have to abide by specific laws.

The RV industry had another excellent year in 2016 as wholesale shipments were reported up 15.1% over 2015 and the highest total in 10 years. This strong performance continued the longest period of sustained growth for the RV industry, which is now at seven years.

Indiana substantially benefits from the health of this industry as 81% of all recreational vehicles in North America are produced in the State and forecasts indicate that this sustained growth will continue for the next several years. Over time, the issues that are transforming the automobile space are projected to transform the RV area as well.



## Engines and Engine Parts

Over the past few years, strong growth in the commercial aerospace market has dramatically impacted the entire supply chain of the aircraft industry. However, in 2016, the market experienced softness in orders which is expected to continue through 2017. Despite this forecasted slowing, both Boeing and Airbus report significant backlogs for the next 10 years, and demand for engines will remain strong. Currently, the aerospace market is driven by demand for new and advanced aircrafts due to network expansion by the passenger airlines combined with rising demand for single-aisle (narrow body) aircrafts.

The single-aisle or narrow body aircrafts and large, wide-body aircrafts are expected to emerge as key segments which will drive the demand for commercial aircraft market. The demand for a particular aircraft type depends on the duration/length of travel which is classified as short haul or long haul. Narrow body aircrafts are preferred by low cost carriers (LCC) that operate on short routes with high traffic for budget travelers. These routes often connect domestic locations in a given country.

In 2016, regional jets propelled with turbofan engines used for short haul travel recorded the highest percentage revenue contribution of the different types of aircrafts. This was primarily due to rise in domestic travel across countries such as Canada, U.S., and Mexico.

Jet engines used to power an aircraft are classified as turbofan and turboprop engines. Of these, the market for turbofan engines that offer better efficiency and speed at higher altitudes is expected to record steady growth as compared to turboprop engines. Furthermore, development of fuel-efficient engines has resulted in replacement of currently in-use jet engines.

## Emerging Trends in the Aero Engine Market Include:

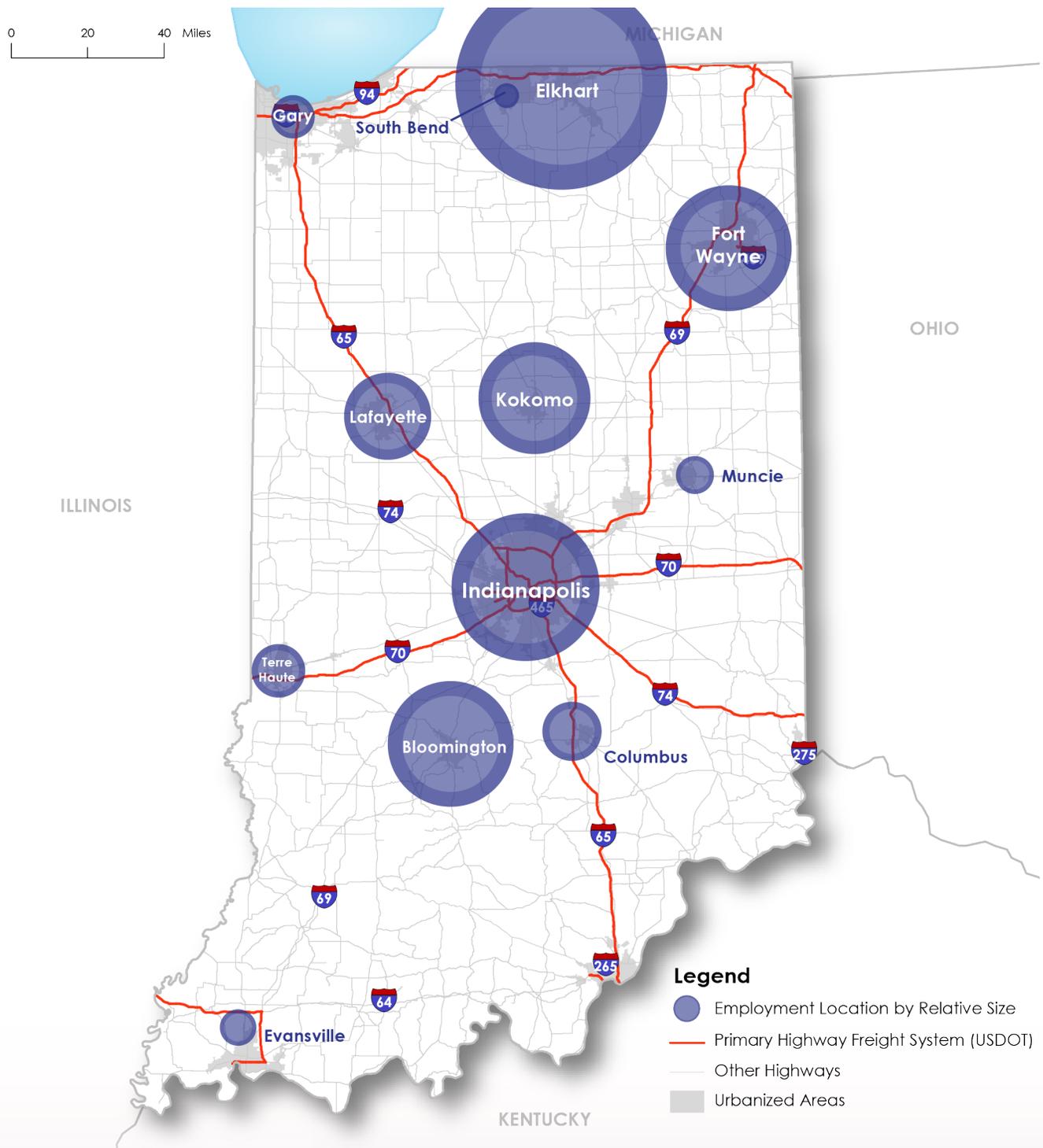
- Use of second-generation biofuels.
- Lower maintenance costs.
- Design and development of fuel-efficient and light-weight aero engines.
- Titanium, nickel, and steel materials in aero engine design with an increasing use of composites.
- The production of jet engines for the aerospace industry is concentrated in the U.S., Europe, and Canada with just a few corporate players, but production of some engine components has moved to Mexico and China.

## Key Issues

- Rising costs of manufacturing autos.
- Safety and environmental regulations.
- Cost of technology applications.
- Strong jet engine demand is good for the Indiana economy.



Figure 17 shows the relative amount of employment in the transportation equipment sub-sector in Indiana.



**Figure 17. Transportation Equipment Employment Centers in Indiana**



