Chapter 6 - Economic Context of Freight

KEY POINTS

- The amount and value of freight are critical components of the overall economic health of Missouri. Missouri's multimodal freight system supports the movement of trucks, planes, barges, and trains as they transport over one billion tons of freight valued at more than $1.2 trillion per year.
- Every resident in the State spends a significant portion of their disposable income ($4,500 per year) on transportation, whether directly or indirectly, in the goods they purchase.
- Truck freight will continue to grow in importance based on both value and tonnage. While at a slower rate, the freight moved by air, water, and rail will also continue to grow.

Introduction

Approximately half of Missouri's economy is highly dependent on freight and everyone is affected by freight on a daily basis. Freight is integral to job growth and economic development. Most of the time, Missouri's freight system accommodates the movement of a significant amount of valuable freight with ease. However, congestion, safety concerns, issues with first and last mile connectors, and challenges with overall system operations can sometimes substantially cost haulers and shippers who rely on the freight system. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace through reliable connections to customers and links to a multitude of markets to ensure timely deliveries of goods and services.

Importance of Freight to Missouri's Economy

Missouri's freight system and the State's economy are closely connected. Freight movement and the Missouri freight system support the State's economy by:

- Allowing Missouri manufacturers to bring in raw materials and parts, and transport products to and from other parts of the State, across the country, and around the world.
- Allowing Missouri farmers and agricultural producers to get their products to market and bring feed, seed, and equipment to their farms.

- Ensuring that the goods Missouri residents need are available in local stores or can be delivered to their homes.
- Directly employing approximately 83,500MIssourians in transportation and warehousing industries[1] and those in numerous other industries indirectly.

Statewide Importance and Trade

Missouri's strategic position in the heartland of the country and access to diverse freight transportation modes mean that a lot of goods are shipped into, out of, within, and through the State. This also means that manufacturers and shippers choose Missouri to facilitate the shipment of freight to consumers and markets. Chapters 2 and 4 of this plan discuss this freight movement by transportation mode in detail. **Table 6-1** has removed the through freight traffic and summarizes only the economically relevant data for Missouri freight movements in 2011.

Table 6-1: Summary of Missouri Freight Movement by Tonnage and Value per Mode

Direction	Air	Pipe	Rail	Truck	Water	Total
Tons						
Outbound	34,313	#N/A	21,510,433	75,301,621	19,973,291	116,819,658
Inbound	38,249	932,258	92,326,793	89,250,507	5,093,847	187,641,654
Intrastate	370	#N/A	2,436,087	105,627,915	4,941,503	113,005,875
Through	71	7,412,827	341,805,597	230,212,488	19,850,043	599,281,026
Total	73,003	8,345,085	458,078,910	500,392,531	49,858,684	1,016,748,213
Value, in millions						
Outbound	$7,620	#N/A	$40,364	$95,005	$3,479	$146,468
Inbound	$3,656	$643	$39,647	$119,731	$3,083	$166,760
Intrastate	$100	#N/A	$1,616	$62,346	$117	$64,179
Through	$10	$5,117	$383,409	$433,794	$5,870	$828,200
Total	$11,387	$5,761	$465,035	$710,876	$12,549	$1,205,607

Source: Prepared by CDM Smith, based on TRANSEARCH® data for 2011

Missouri has several key domestic trading partners, listed in **Table 6-2.** Between 2011 and 2030, outbound freight shipped from Missouri to other states and internationally is expected to grow by 45.3 percent.

[1] 2013 Data Produced by the Missouri Economic Research and Information Center (MERIC) in cooperation with U.S. Department of Labor, Bureau of Labor Statistics.

Table 6-2: Missouri's Major Domestic Trading Partners

Outbound Freight 2011	Inbound Freight 2011
Illinois	Wyoming
Texas	Illinois
Kansas	Kansas
California	Iowa
Arkansas	Arkansas
Iowa	Texas
Oklahoma	North Dakota
Arizona	California

Source: Prepared by CDM Smith based on TRANSEARCH® data for 2011

Not surprisingly, Missouri's major trading partners include neighboring states, energy supplying states (Wyoming coal and Texas and North Dakota petroleum), and large coastal population centers (Texas and California).

Missouri exported approximately $13 billion in goods to other countries in 2013. The State's largest trading partners include North American Free Trade Agreement (NAFTA) countries of Canada and Mexico and also China[2]. While domestic exports to other U.S. states are significantly higher than international exports, international freight is still important to the Missouri economy.

Supply Chains and Goods Movement Competitiveness

Efficient freight transportation in Missouri is essential for the supply chains of the State's industries. Supply chains are the pathways that raw materials and products move from their original source, through the production process, eventually reaching the end consumer. Supply chains have grown more sophisticated as businesses look to minimize supply chain costs and maximize profits.

[2] U.S. Census Bureau Foreign Trade Division and WISERTrade.

For example, Missouri is a major producer of beef. Feed grain and feeder cattle are imported to the feed yards. Finished cattle are then shipped to a meat processing plant to be processed, and then the meat is shipped to grocery stores or another final destination as a finished product. Every product Missouri residents buy is created and delivered through these complex supply chains and each step uses the freight transportation network to deliver inputs and finished goods in a timely manner. If the freight network breaks down, so do these supply chains. The efficiency of these chains has a significant impact on how various companies compete.

Freight transportation is a key competitiveness factor for Missouri businesses. Some industries are highly dependent on transportation, as measured by the amount spent on transportation as a share of the total output. Based upon the most recent analysis by the U.S. Department of Transportation (USDOT) Research and Innovative Technology Administration, the average agriculture or forestry business spends 14 percent of each dollar of product output for transportation. The average manufacturing business spends 8.5 percent, and the average transportation equipment and parts business spends 12.5 percent.[3]

As part of this Freight Plan, the Missouri Department of Transportation (MoDOT) developed a performance measure to track the effectiveness of the transportation of goods in Missouri that are involved in trade to other states and countries. The measure tracks annual trends in the cost of transporting three key commodities (soybeans, crop production products, and motor vehicles) in Missouri compared to the costs of transporting these commodities in other Midwest states. There is much more to economic competitiveness than just the costs associated with transporting these commodities. However, this performance measure offers some insight into the costs for moving goods using different modes and to different destinations. More details can be found in Appendix F.

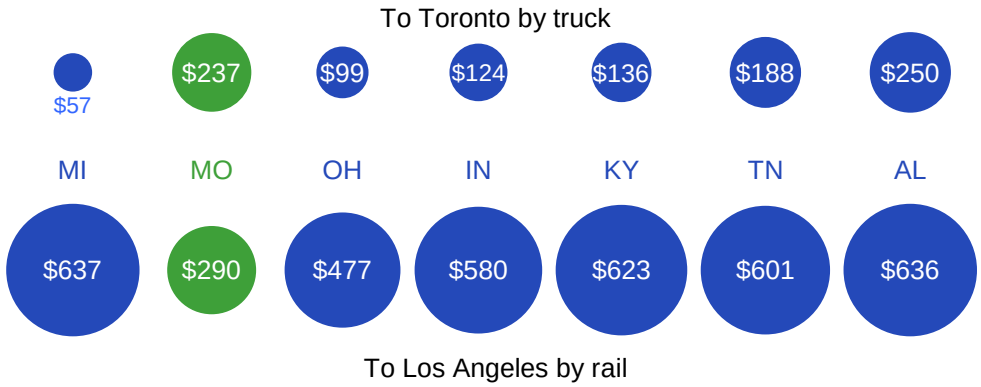
Figures 6-1, **6-2**, and **6-3** show the current relative costs for transporting these three key commodities. As the figures illustrate, Missouri is highly competitive for some goods and less competitive for others.

[3] "Transportation Satellite Accounts: A Look at Transportation's Role in the Economy, 2012

*Figure 6-1: Cost of Shipping One Ton of Soybeans from Key States to New Orleans **(largely by barge)**, 2014*

*Figure 6-2: Cost of Shipping One Ton of Crop Protection from Key States to Mexico **(largely by rail)**, 2014*

*Figure 6-3: Cost of Shipping One Motor Vehicle from Key States to Toronto **(by truck)** and Los Angeles **(by rail)**, 2014*



Economic Impacts of Freight in Missouri

What is the value and economic impact of freight on Missouri's economy? How much of Missouri's economy is affected by or relies on freight? In this Freight Plan, specific data sources and economic models are used to address these questions. The TRANSEARCH® freight database is used to analyze Missouri goods movements, commodity volumes, and values. The IMPLAN® economic model is used to determine how freight movements generate economic impacts in Missouri.

Gross State Product (GSP)

The monetary value of all the finished goods and services produced within a state's borders in a specific time period, though GSP is usually calculated on an annual basis. It includes all private and public consumption, government spending, investments, and exports less imports.

Economic impacts can be grouped into direct, indirect, and induced impacts:

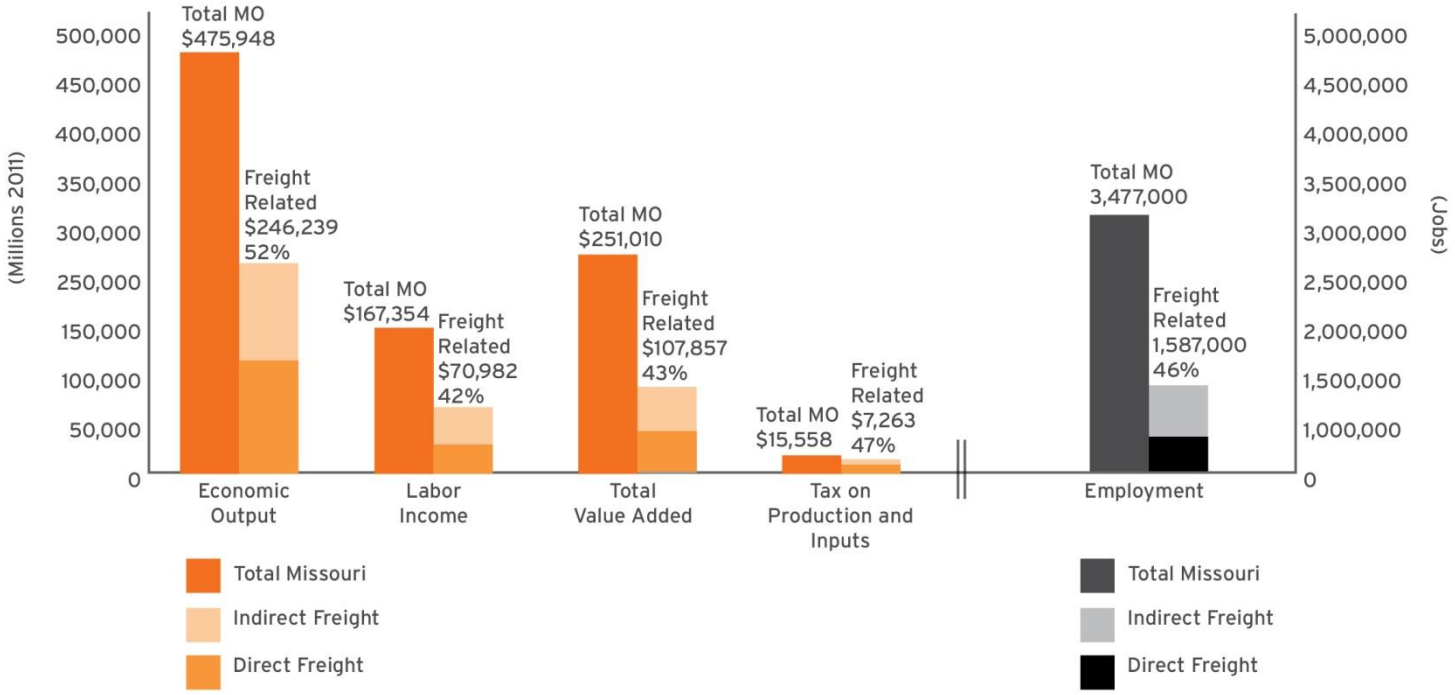
- **Direct** – Impacts from transportation providers delivering transportation services as well impacts from transportation users shipping and receiving goods.
- **Indirect** – Impacts associated with the suppliers that provide intermediate goods and services to the directly impacted industries.
- **Induced** – Impacts associated with re-spending earned income from both the direct and indirect impacts in the study area.

Direct, indirect, and induced impacts combined are used to estimate the total economic impact of freight. Each impact is measured in terms of employment, income, value-added (i.e., GSP), output, and taxes. The industries that use transportation services, such as manufacturing and production industries are much larger than transportation service provider industries and thus generate the greater economic impacts.

Total Impacts as Percentage of State Economy

An understanding of the overall size of the State's economy provides context for the estimated impacts specifically from freight. The economic impacts of freight are best compared with the existing economic composition of Missouri in 2011. **Figure 6-4** shows 2011 freight-related economic data compared to the economic data for Missouri as a whole.

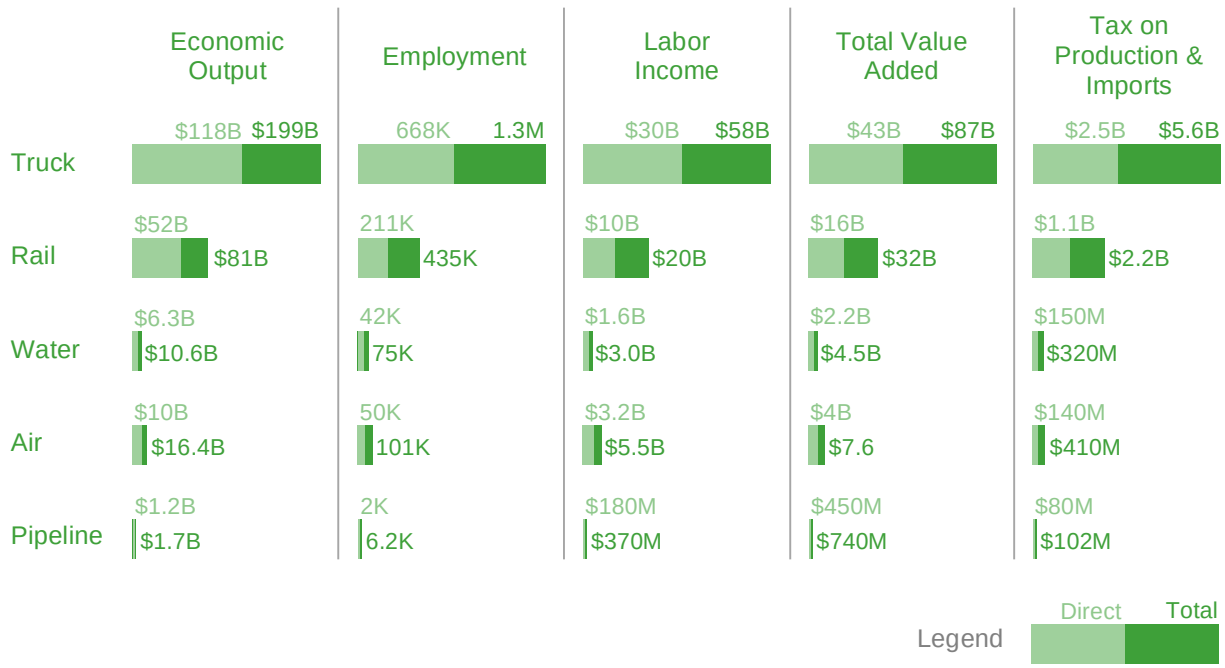
Figure 6-4: 2011 Missouri Economic Data Compared with Freight Economic Data (in Millions of Dollars)



Source: TRANSEARCH Data modeled with IMPLAN®

Total economic impacts related to freight movements in Missouri range from 42 percent (labor income) to 52 percent (economic output) of the statewide economy, depending on the measure. Freight transportation service providers directly comprise between 0.7 percent and 2.2 percent of the Missouri economy; including the multiplier impacts. The total impact ranges between 2.6 percent and 3.8 percent. For users of freight, the total (direct and multiplier) impacts are between 38.6 percent and 47.9 percent of the State's economy. This is reflective of industries specifically reliant on freight; in reality every person or business that buys goods or receives a package uses the freight system. **Figure 6-5** presents the impacts categorized by mode.

Figure 6-5: Estimated Economic Impacts of Freight in Missouri by Mode



Source: TRANSEARCH Data modeled with IMPLAN®

As **Figure 6-5** shows, truck and rail freight have the greatest economic impact of freight in Missouri, which is expected since they lead the State in tonnage and value of freight carried. Note that the estimates for waterborne freight may be conservative because the data do not include non-NAFTA country (countries other than Canada and Mexico) freight movements by water. In other words, if freight moves out of a Missouri port by barge and is then loaded on a ship to Asia, it is not captured in the data. The reason it is not captured in the data is that the tracking data used for that freight is not reliable.

The totals in **Figure 6-4** do not add to the totals in **Figure 6-5** due to intermodal overlap. As shippers and receivers in Missouri use various transportation modes in combinations, such as truck and rail, to move the same product, a simple sum of the totals would overestimate the impact estimates. As a result, the analysis removes this potential double-counting of impacts when developing the statewide totals.

In conclusion, the data suggests that approximately half of Missouri's economy is substantially affected by freight, either directly or indirectly. Almost everyone relies on freight in some form on a daily basis.

Freight, Jobs, and Economic Development

Missouri's economy is significantly affected by and dependent on freight movements. Effective movement of freight is directly linked to job growth and economic development.

Jobs

Freight-related jobs are directly tied to key Missouri industries. The North American Industry Classification System (NAICS) defines industry sectors. **Table 6-3** lists the most economically important NAICS-defined industry sectors for various freight transportation modes. As shown in the table, more than 50 percent of the total truck and rail freight-related employment is concentrated within the top industry sectors for the State—manufacturing; transportation and warehousing; retail trade; agriculture, forestry, fishing, and hunting; health and social services; and accommodation and food services. Almost 50 percent of the total employment impacts stemming from water-related freight movements are concentrated within the top four Missouri industry sectors—agriculture, forestry, fishing, and hunting; manufacturing; transportation and warehousing; and retail trade. Over 50 percent of the total employment impacts stemming from air-related freight movements are concentrated within the top three Missouri NAICS-defined industry sectors—manufacturing, retail trade, and health and social services.

Table 6-3: Top Industries with Highest Employment Impacts Due to Freight

Mode	Industries
Truck	• Manufacturing • Transportation and Warehousing • Retail Trade • Agriculture, Forestry, Fishing and Hunting • Health and Social Services • Accommodation and Food Services
Rail	• Manufacturing • Transportation and Warehousing • Retail Trade • Agriculture, Forestry, Fishing and Hunting • Health and Social Services • Accommodation and Food Services
Water	• Agriculture, Forestry, Fishing and Hunting • Manufacturing • Transportation and Warehousing • Retail Trade
Air	• Manufacturing • Retail Trade • Health and Social Services

For three key transportation-reliant sectors—agriculture, manufacturing, and transportation and logistics — 10-year trends for Missouri jobs and economic performance (as measured by gross domestic product, or GDP) are presented in **Figures 6-6, 6-7,** and **6-8**.

Figure 6-6: Jobs and Economic Growth (GPD) in the Agriculture Industry in Missouri

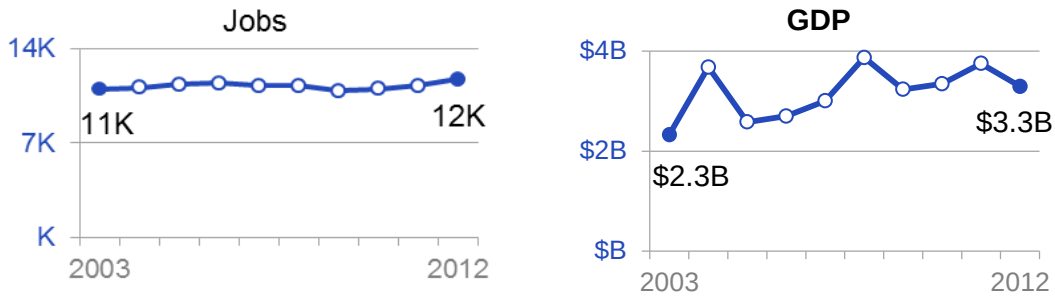


Figure 6-7: Jobs and Economic Growth in the Manufacturing Industry in Missouri

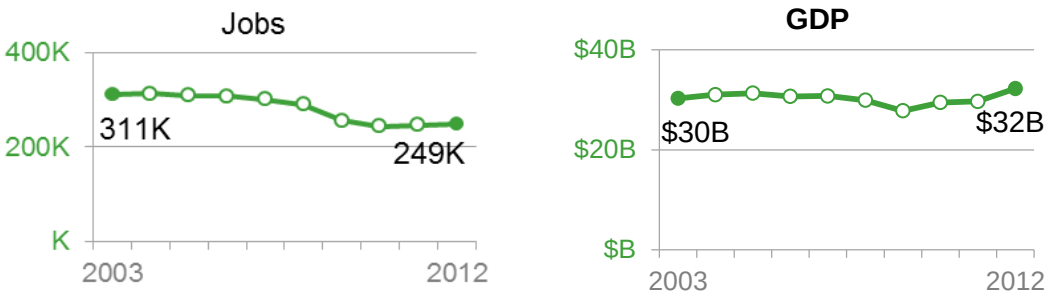
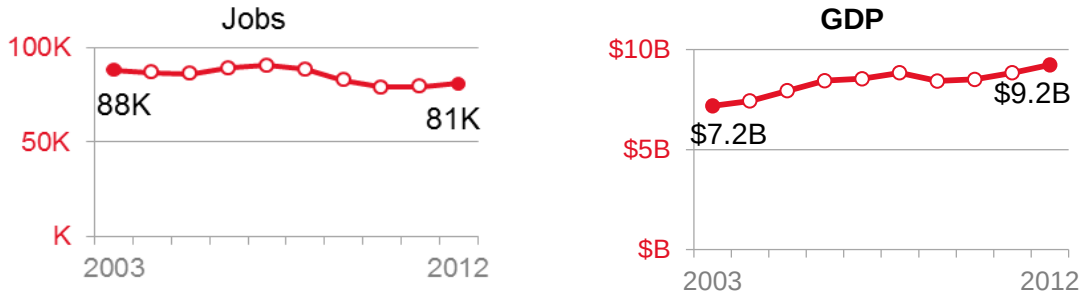


Figure 6-8: Jobs and Economic Growth in the Transportation/Logistics Industry in Missouri



Source: Missouri Department of Economic Development

The connection between freight and the key transportation-reliant industries identified above relates directly to the implementation of the Missouri Strategic Initiative for Economic Growth. MoDOT is partnered with the Missouri Department of Economic Development, Missouri Department of Agriculture, and other organizations to implement economic strategies focused on certain industries, including advanced manufacturing, transportation and logistics, and biosciences (which include plant and agriculture technology and companion and feed animal sciences). This Freight Plan directly addresses the Initiative's strategy, "Missouri will provide the infrastructure necessary for companies and communities to be successful."

Economic Development and District Freight

Missouri's freight system is also important for economic development and the District economies in the State (see **Figure 6-9**). Global trade and new technologies continue to transform the economy, redefining the way businesses operate, challenging supply chains and transportation networks, and creating new customer opportunities for Missouri businesses. Businesses and their employees are more dependent than ever on integrated, agile, and efficient transportation networks to sustain economic competitiveness and connections to markets.

Figure 6-9: Missouri Freight Districts

To compete in this global marketplace, businesses must optimize every asset—workforce skills, competitively priced products, and reliable transportation systems—to ensure their customers receive quality goods and services when they expect them. As the importance of trade and the demands of customers continue to evolve, Missouri companies often find freight an increasingly important factor in sustaining and enhancing their competitive position in the marketplace. Freight supports the domestic and international trade of Missouri businesses, and supports State and local economic development and job growth.

Freight transportation represents a key competitiveness factor for businesses in every region of Missouri as they compete not only on product quality and cost, but also on the reliability and timeliness of product deliveries. Each of the regions in Missouri has specific attributes related to freight movement:

- **Kansas City District** – The Kansas City region is the second largest rail hub in the nation. It is the second largest export market in the State. Of the top 100 freight generators, 23 are located in the region. Kansas City also has the 45th busiest freight airport in the nation and the greatest concentration of intermodal facilities in the State.
- **St. Louis District** – The St. Louis region is the third largest rail hub in the nation. It is the largest export market in the State. Of the top 100 freight generators, 35 are located in the region. St. Louis also has the 53rd busiest freight airport in the nation and is the largest inland port.
- **Central District** – Central Missouri has 7 of the top 100 freight generators in the State. As a central location for the State's two longest interstates, it also includes several truck facilities. The region has the only ports on the Missouri River between St. Louis and Kansas City. The region provides critical freight support for agricultural industries and for excavation industries such as sand and gravel.
- **Northeast District** – Northeast Missouri has 4 of the top 100 freight generators in the State. It also has the northernmost port in Missouri on the Mississippi River at Lewis County. This region would benefit from improvements to the lock and dam system on the Mississippi River. Notable industries that rely on freight include chemical manufacturing, agriculture, and food processing.
- **Northwest District** – Northwest Missouri has 7 of the top 100 freight generators in the State. The emerging port at St. Joseph would be the northernmost Missouri port on the Missouri River. This region provides critical freight support for agricultural industries.
- **Southeast District** – Southeast Missouri has 5 of the top 100 freight generators in the State. With four active Mississippi River ports, it provides critical water freight opportunities, particularly for container-on-vessel and with the Panama Canal expansion. Energy-related industry concentrations in the region are dependent on freight.
- **Southwest District** – Southwest Missouri has 19 of the top 100 freight generators in the State as well as the 104th busiest freight airport in the nation. The region's proximity to major freight operations in Northwest Arkansas presents unique opportunities. Advanced manufacturing is a fast-growing regional sector, along with warehousing and distribution and food processing.

System Weaknesses and Economic Costs

Since approximately half of Missouri's economy is directly or indirectly affected by freight, the current and emerging weaknesses in Missouri's freight system can affect approximately half of the Missouri economy. The effects of congestion, safety concerns, issues with first and last mile connectors, and the performance of system operations/intermodal facilities can be correlated with economic impacts.

Congestion

Congestion costs freight transportation service providers and transportation users in several ways, including:

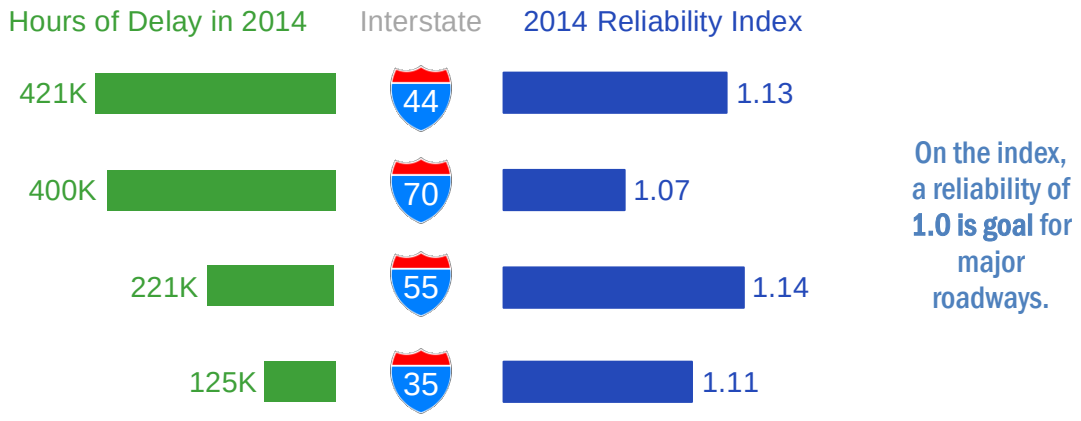
- It can cause lost hours by drivers and equipment stuck in congestion. This includes costs for hourly wages, wasted fuel, and idle equipment, and these costs are then passed on to shippers and consumers.
- Inability to meet delivery and production schedules results in costly delays of production. Congestion disrupts industry supply chains. Some industries measure in minutes the downtime costs due to lack of products and inputs—time matters.
- Congestion creates costs due to lack of system reliability, which is the ability of shippers to accurately predict the length of time to ship and receive goods and inputs. All freight modes and supply chains can have reliability issues, often related to congestion. As a result, additional inventory must be stored to address potential shortages and shippers must account for extra time in planning production and delivery schedules.

MoDOT is tracking truck congestion by measuring annual hours of truck delay and a truck reliability index. Annual hours of truck delay and a truck reliability index are measures proposed in the *Moving Ahead for Progress in the 21st Century Act* (MAP-21) and finalized in the *Fixing America's Surface Transportation (FAST) Act* to measure national freight performance.

Delay is measured anytime trucks experience congestion, defined in this case as when speeds drop to below five miles per hour below the posted speed limit. These delays impact the cost of goods and reduce business's ability to compete on a global scale.

The reliability index is a measure of how consistent truck travel times are on a corridor. The closer the index is to 1.0, the more reliable the corridor. Shippers and freight carriers require predictable travel times to control transportation costs and remain competitive. **Figure 6-10** Illustrates hours of delay and reliability index on key Missouri interstate routes.

Figure 6-10: Hours of Truck Delay and Truck Reliability Index



Safety

As identified in Chapter 5, Missouri has shown strong improvements related to freight safety in recent years. However, funding constraints may hamper this progress. Freight safety affects the economy in several ways:

- Crashes resulting in injury or loss of life are immensely costly for individuals and to the overall economy due to medical costs and the loss of productivity of the individuals involved and their families.
- Freight-related crashes result in damaged equipment and damaged loads, costing shippers and haulers.
- Crashes often result in short-term congestion and bottlenecks that affect the reliability of the freight network.

First and Last Mile Connectors

The Missouri Freight Network identified in Chapter 3 includes several National Highway System intermodal connectors and first and last mile connectors that are crucial to Missouri's freight system. These connectors are the last roads that join the highway system to intermodal facilities, terminals, ports, airports, and major freight generator sites. Often, these connectors include local roads and interchanges between highways and local roads. If these connections aren't efficient due to lack of capacity, traffic conflicts, poor intersections, safety issues, or poor maintenance, then the connections can have an adverse economic impact.

System Operations and Intermodal Facilities

Chapter 5 identified several potential issues with freight system maintenance and connectivity that could affect the economic performance of the system and/or result in missed economic opportunities. A poorly maintained system results in greater delays, rerouting, and even equipment damage that cost freight haulers and shippers. Similarly, opportunities may be missed to take advantage of growing trade conditions, Panama Canal expansion, and container-on-vessel (COV.) if Missouri does not have strong intermodal connections, particularly to ports and rail lines.