



# MISSOURI State Freight & Rail Plan

ECONOMIC IMPACT OF FREIGHT TRANSPORTATION



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# 1.0 Freight Transportation and the Missouri Economy

## 1.1 Introduction

The state of Missouri has two primary advantages that make transportation infrastructure integral to its economy. Geographically, it is a mid-continental state. Missouri is at the geographic crossroads of domestic transportation lanes by air, sea, or land (highway, rail, pipeline), and lies at the center of north-south and east-west international transportation lanes by rail and truck. The number of airlines, trucking firms, pipeline companies and railroads with significant operations in Missouri, including headquarters, illustrates these advantages. In addition, Missouri has an abundance of natural resources and agricultural commodities that are sold around the world. Demand to move these goods to market drives the development of a highly capable and robust transportation system that is vital to important industries in the state.

The mid-continental physical location of Missouri and the high level of demand for moving goods and commodities produced in the state collectively position Missouri as a multi-modal transportation hub serving local, national and global markets. Not only are these transportation capabilities and expertise key to fully realizing the economic potential of Missouri business opportunities, but they also offer further economic opportunity due to the significant amount of employment and operations of these sectors. Transportation enables all goods producing and consuming sectors of the economy while also being a leading economic sector itself.

This technical memorandum is a supplement to the Freight Profiles developed as part of the Missouri State Freight and Rail Plan, and its purpose is to quantify the total economic impact of industries that move and/or handle freight in Missouri. The modes considered are trucking, railroads, ports and waterways, pipelines and freight handling facilities such as inland ports, warehouses and distribution centers. The impact of industries that rely on freight transportation are not included in this analysis.

## 1.2 Overview of Methodology

The total economic contribution of freight transportation in Missouri is measured by the direct freight transportation jobs, labor income, value-added (i.e., Gross State Product or GSP), output and tax revenues, plus the broader impacts to the economy resulting from the initial freight activity. These broader impacts (induced and indirect) result from the expenditures on goods and services from suppliers and from the expenditure of disposable income of freight transportation employees. The total economic impacts include:

- **Direct Impact:** Employment, income, value-added and output generated by the direct operations of the freight transportation sector.
- **Indirect Impact:** Employment, income, value-added and output generated as part of the intermediate consumption of the freight transportation sector, for example, spending on vehicles, fuel, supplies, maintenance parts and real estate costs.



- **Induced Impact:** Impact measured in terms of additional jobs, income, value-added and output because of the consumption patterns of freight transportation employees (due to their labor income), for example, spending on education and health, entertainment, groceries and real estate.

This section describes the general framework that was used to quantify the role that different freight-related activities play in Missouri's economy. These activities include the movement of freight on and through the highways, railroads, water ports, airports and pipelines and the handling of freight at transload, fulfillment, warehousing and distribution facilities. The general framework is comprised of the following core steps:

- **Step 1. Define the Scope:** The scope of the analysis will be defined by:
  - » Type and Volume of Activity: All freight modes (trucking, rail, waterways and ports, air, pipelines) e-commerce, and warehouse and distribution facilities.
  - » Employment: Identification of freight generating industries and the direct jobs which are supported by freight transportation.
- **Step 2. Estimate the Enterprise Impacts:** This step will estimate the economic impacts of employment and spending generated by the freight transportation and handling industry. An economic input-output modeling application (IMPLAN), will be used to calculate:
  - » Total (direct, indirect, and induced) employment, personal income, GSP and gross regional product (GRP), generated by employment in the analyzed freight activity.
- **Step 3. Estimate Economic Importance of Freight Generating Industries:** This step estimates the economic importance of industries that generate freight transportation, as measured by the commodity flows associated with the industries that produce or consume them. Also estimated is the percentage of total cost represented by the cost of transporting the freight produced or consumed by their business activities. A make-use table, along with the freight databases for Missouri, was used to identify which industries produce or consume the freight being moved. This allows for correlation of the estimated volume of freight with employment in specific industries.<sup>1</sup>

This analysis relies on the 2019 IMPLAN model for Missouri to estimate the direct, indirect and induced economic impacts of the freight transportation sectors in Missouri. IMPLAN is an input-output modeling application that estimates economic impacts by region and by industry. Economic impacts are measured in terms of employment (number of jobs supported by an industry), labor income (compensation of employees), value-added or GSP (economic output minus intermediate inputs, accounting for the additional output create at that stage of production), industry output (total sales) and tax revenue.

In addition to IMPLAN, other key data sources include:

- U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2019

<sup>1</sup> To avoid double counting, transportation costs and the resulting modal benefits are attributed to single modes even where they could be representative of multiple modes. Therefore, the total benefits are accurate, but the modal numbers individually may not reflect exact numbers.

- IHS Markit TRANSEARCH commodity flow data, 2018
- U.S. Bureau of Economic Analysis



## 2.0 Freight Transportation Impacts

Economic contributions made by the freight transportation industry include more than just businesses providing for-hire services. To estimate the economic contribution of transportation and logistics activities in Missouri, this analysis uses a wider definition of the freight transportation sectors. In addition to activities generated by specific modes (freight truck, rail, air, water and pipeline transportation), this assessment takes into account other included activities such as in-house truck transportation carried out by businesses in which transportation is not the main economic activity (such as grocery stores or waste collection), self-employed individuals in the trucking and courier activities, United States Postal Service (USPS), for-hire warehousing and storage, wholesale and other cargo handling activities. The economic impact analysis for freight transportation in Missouri uses detailed employment data for each economic activity as inputs into the 2019 IMPLAN model for Missouri. Total employment by industry identifies the magnitude of each freight transportation activity.

### 2.1 Direct Employment in the Freight Transportation and Handling Sectors

Table 2.1 shows the number of jobs generated by the freight transportation sector in Missouri in 2019. Trucking is the largest employer within the freight industry with a total of approximately 40,619 jobs, or 43% of the total. Relatively speaking, these are smaller operations compared to other industries due to prevalence of self-employed drivers. Warehousing and storage is the second largest industry with nearly 17,000 jobs, or 18% of the total. This occupation focuses on the distribution of goods which can range from general household goods to farm products. Notably, the USPS plays a large role in Missouri's freight supply chain, supporting more than 14,900 jobs or 16% of the statewide freight employment. The USPS employs more public sector jobs than most of these other industries. It also contracts with for-hire trucking firms to support their operations

Rail transportation supports 1,413 jobs, followed by water (779 jobs)<sup>2</sup>, air (425 jobs) and pipeline (346 jobs). These modes tend to have a higher labor productivity (as measured by freight tonnage or value per employee) compared with truck, which explains why the employment numbers for these modes appear relatively low. Trucks are also typically needed for first and last mile deliveries which drives demand for this industry. Various activities that support all modes of freight transportation, such as port labor, freight arrangers, road service occupations and other related occupations account for another 5,667 direct jobs or 6% of total freight transportation jobs.

<sup>2</sup> The water transportation employment figures in this study do not directly align with the study "Economic Impact Study for Public Ports" (released in February 2018) due to differences in methodology. This study examines the direct employment for freight as opposed to all inland water employment. Additionally, water freight transportation support activities are accounted for in a broader category of "Support Activities to Transportation and Warehousing" and not included in the direct modal numbers as done in the Port study.

TABLE 2.1 FREIGHT TRANSPORTATION EMPLOYMENT IN MISSOURI, 2019

Industry	Employment	Share of Employment	Establishments	Share of Establishments
Truck Transportation	40,619	43%	3,330	60%
Warehousing and Storage	16,979	18%	418	8%
U.S. Postal Service	14,911	16%	880	16%
Couriers and Messengers	12,318	13%	381	7%
Support Activities to Transportation and Warehousing	5,667	6%	417	7%
Rail Transportation	1,413	2%	55	1%
Water Transportation	779	1%	36	1%
Air Transportation	425	<1%	7	<1%
Pipeline Transportation	346	<1%	45	1%
<b>Total</b>	<b>93,457</b>	<b>100%</b>	<b>5,569</b>	<b>100%</b>

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages, 2019.

## 2.2 Economic Impacts of the Freight Transportation Sector

The more than 93,000 jobs directly supported by the freight transportation sector have secondary and tertiary impacts on other employment types. As shown in Table 2.2, nearly 169,000 direct, indirect, and induced jobs are supported by the industry. This amounts to more than \$9 billion in labor income while generating more than \$13 billion in GSP and more than \$24 billion in output. Table 2.3 further demonstrates these impacts with total tax revenues associated with this income exceeding \$2.8 billion, nearly \$1 billion of which is in state and local taxes.

Of the nearly 169,000 jobs generated by the freight transportation sector in Missouri, more than 93,000 are direct job impacts (55% of total employment impact) from the firms and industries that provide transport services, use transportation to ship and receive goods or provide support activities to transportation and warehousing. The multiplier impacts associated with the suppliers providing intermediate goods and services to the directly impacted industries, as well as the induced impacts associated with the re-spending of earned income, created more than 75,000 additional jobs (45% of total employment impacts).

The multiplier impact of freight jobs demonstrates how freight activity benefits other non-freight industries (see Table 2.2). Every 100 direct freight jobs create another 80 local jobs in industry suppliers and industries related to the consumption of goods and services by those direct employees in Missouri.

Freight transportation links nearly all other local economic activities and therefore facilitates industrial output and GSP in the state. For every dollar of value-added in freight transportation (i.e., what industries pay to move freight), an additional \$0.91 is added locally through suppliers to the freight industry and the expenditures of wages by transportation employees.

**TABLE 2.2 CONTRIBUTION OF THE FREIGHT TRANSPORTATION SECTORS IN MISSOURI, 2019**

Impact Type	Employment	Labor Income (in millions of 2019\$)	GSP (in millions of 2019\$)	Output (in millions of 2019\$)
Direct	93,457	\$5,470	\$6,944	\$12,675
Indirect	34,610	\$1,860	\$2,907	\$5,494
Induced	40,570	\$1,932	\$3,424	\$6,083
<b>Total</b>	<b>168,637</b>	<b>\$9,262</b>	<b>\$13,275</b>	<b>\$24,252</b>
<i>Multiplier</i>	1.8x	1.7x	1.9x	1.9x

Source: 2019 IMPLAN model for Missouri. Employment numbers provided by the U.S. Bureau of Labor Statistics (Table 2.1) were used to determine the remaining economic factors.

**TABLE 2.3 TAX REVENUE FROM FREIGHT TRANSPORTATION SECTORS IN MISSOURI, 2019**

Impact Type	Federal Taxes (\$millions)	State/Local Taxes (\$millions)	Total Taxes (\$millions)
Direct	\$1,041	\$316	\$1,357
Indirect	\$381	\$359	\$740
Induced	\$408	\$315	\$723
<b>Total</b>	<b>\$1,830</b>	<b>\$990</b>	<b>\$2,820</b>

Source: 2019 IMPLAN model for Missouri. Employment numbers provided by the U.S. Bureau of Labor Statistics (Table 2.1) were used to determine the remaining economic factors.

Table 2.4 shows the top 10 industries that benefit most from the indirect and induced effects on employment from freight transportation in Missouri. Indirect jobs are created through support activities for transportation, couriers and messengers and warehousing and storage and in employment services and real estate. These industries directly support the freight industries. The largest expenditures of freight transportation workers include healthcare, food, retail, housing and entertainment. Employment in these types of industries are the induced impacts of the direct freight employment.

**TABLE 2.4 MISSOURI INDUSTRIES BENEFITING FROM INDIRECT AND INDUCED IMPACTS OF FREIGHT TRANSPORTATION SECTORS, 2019**

Rank	Indirect Industry	Indirect Jobs	Rank	Induced Industry	Induced Jobs
1	Support activities for transportation	3,450	1	Hospitals	2,220
2	Employment services	2,900	2	Full-service restaurants	2,130
3	Other real estate	2,320	3	Limited-service restaurants	2,110
4	Couriers and messengers	2,310	4	Individual and family services	1,290
5	Automotive repair and maintenance, except car washes	2,040	5	Other real estate	1,260
6	Warehousing and storage	1,990	6	Offices of physicians	1,220
7	Retail - Gasoline stores	1,600	7	Retail - General merchandise stores	1,150
8	Management of companies and enterprises	1,010	8	Retail - Food and beverage stores	920
9	Truck transportation	920	9	All other food and drinking places	900
10	All other food and drinking places	820	10	Nursing and community care facilities	870
	<i>Sub Total</i>	19,360		<i>Sub Total</i>	14,070
	All Others	15,260		All Others	26,500
	<b>Total</b>	<b>34,620</b>		<b>Total</b>	<b>40,570</b>

Source: 2019 IMPLAN model for Missouri. Employment numbers provided by the U.S. Bureau of Labor Statistics (Table 2.1) were used to determine the remaining economic factors.

Table 2.5 shows the total economic impacts by freight transportation sector. These impacts are in line with the ranking of the direct impacts shown in Table 2.1. Truck transportation continues to be the dominant freight industry with impacts representing 47% of all jobs, labor income and GSP. Warehousing and storage is the second largest industry representing 16% of jobs, 13% of labor income and 12% of GSP. The USPS has the third-highest impact in the state with 13% of jobs, 18% of labor income and 15% of GSP.

TABLE 2.5 TOTAL ECONOMIC IMPACT BY FREIGHT TRANSPORTATION SECTOR, 2019

Sector	Employment	Labor Income (\$millions)	GSP (\$millions)	Total Taxes (\$millions)
Truck Transportation	78,910	\$4,350	\$6,278	\$1,375
Warehousing and Storage	27,020	\$1,164	\$1,632	\$325
U.S. Postal Service	22,740	\$1,677	\$1,963	\$411
Couriers and Messengers	17,480	\$634	\$987	\$195
Support Activities to Transportation and Warehousing	11,670	\$624	\$921	\$177
Water Transportation	4,500	\$313	\$487	\$117
Rail Transportation	4,350	\$347	\$687	\$119
Air Transportation	1,120	\$73	\$164	\$49
Pipeline Transportation	850	\$70	\$144	\$49
<b>Total</b>	<b>168,640</b>	<b>\$9,252</b>	<b>\$13,263</b>	<b>\$2,817</b>

Source: 2019 IMPLAN model for Missouri. Employment numbers provided by the U.S. Bureau of Labor Statistics (Table 2.1) were used to determine the remaining economic factors. All modelled employment outputs are rounded to the nearest 10 jobs.

## 3.0 Freight Generating Industry Impacts

The previous section presented the economic contributions made by the freight transportation industry. The direct, indirect and induced impacts of transportation and logistics in Missouri ripple through the state's economy, creating jobs, wages and economic activity nearly twice that of the businesses moving freight. Transportation and warehousing are part of the larger production and supply chains that drive Missouri's economy.

To understand the full impacts of logistics in the state, this analysis examines the industries that generate significant volumes of freight. Without the freight network supporting these businesses, they would be unable to move their products to market. Because they are moving large volumes, the cost associated with freight transportation factors into their location decisions. The following sections identify the key freight generating industries in Missouri and estimate their economic impacts.

There is significant freight that flows into the state, often as raw materials for production or goods supporting wholesale and retail trade or other non-production industries within Missouri. These were excluded from this analysis for the following reasons:

1. The freight moving into the state is produced in other jurisdictions and therefore, the economic impacts of the production of the goods accrues outside of Missouri.
2. The impacts of freight that is not produced in Missouri, but supports Missouri's wholesale and retail trade, construction, utilities, service and other industries are accounted for by the transportation industries detailed in Section 0.

Therefore, the analysis in this section focuses on those industries that are significant generators of freight in Missouri.

### 3.1 Identifying Key Freight Generating Industries

Based on analysis of commodity flows for the state, which is documented in the Commodity Flow Analysis technical report as part of the State Freight and Rail Plan, the key freight generating industries in Missouri are:

- Agriculture, Forestry, Fishing and Hunting (NAICS 11);
- Mining, Quarrying, and Oil and Gas Extraction (NAICS 21);
- Manufacturing (NAICS 31 – 33);
- Publishing, not including internet (NAICS 511); and
- Waste Management and Remediation (NAICS 562).



The analysis examined the commodities by Standard Transportation Commodity Code (STCC) originating in Missouri and assigned to industries generating them by North American Industry Classification System (NAICS) code. The proportion of the output, or value of the commodities, that is spent on transporting the goods is derived from the U.S. Bureau of Economic Analysis Make and Use Tables.

Table 3.1 presents the value freight flows by commodity in Missouri as well as associated industries. The table also presents the estimated amounts that key freight generating industries pay freight transportation firms to move their products to market. The value of the freight generated in 2019 was \$159 billion. Freight generating firms alone paid an estimated \$3.9 billion in freight costs or 2.4% of the value of the goods moved.

**TABLE 3.1 KEY FREIGHT GENERATING INDUSTRIES AND COMMODITIES TRANSPORTED IN MISSOURI, 2019**

STCC	Commodity	NAICS	Industry	Value (\$M)	Transportation Cost as a Percent of Output	Freight Cost (\$M)
01	Farm	111, 112	Agriculture, Forestry, Fishing and Hunting (NAICS 11)	\$15,841	2.72%	\$743
08	Forest	113	Agriculture, Forestry, Fishing and Hunting (NAICS 11)	\$4	2.11%	\$2
09	Fish/Marine	114	Agriculture, Forestry, Fishing and Hunting (NAICS 11)	\$0.1	4.04%	\$20
10	Metallic Ores	212	Mining, Quarrying, and Oil & Gas Extraction (NAICS 21)	\$198	4.47%	\$431
11	Coal	212	Mining, Quarrying, and Oil & Gas Extraction (NAICS 21)	\$108	4.47%	\$0.1
13	Crude Petro/ Natural Gas	211	Mining, Quarrying, and Oil & Gas Extraction (NAICS 21)	\$49	0.60%	\$0.004
14	Non-metallic Minerals	212	Mining, Quarrying, and Oil & Gas Extraction (NAICS 21)	\$1,355	4.47%	\$9
19	Ordinance/ Accessories	332	Manufacturing (NAICS 31 –33)	\$632	1.72%	\$5
20	Food/ Kindred	311	Manufacturing (NAICS 31 – 33)	\$19,654	4.47%	\$0.3
21	Tobacco	312	Manufacturing (NAICS 31 – 33)	\$8	1.58%	\$61
22	Textile Mill	313	Manufacturing (NAICS 31 – 33)	\$105	2.35%	\$11
23	Apparel	315	Manufacturing (NAICS 31 – 33)	\$974	1.73%	\$879

STCC	Commodity	NAICS	Industry	Value (\$M)	Transportation Cost as a Percent of Output	Freight Cost (\$M)
24	Lumber/Wood	321	Manufacturing (NAICS 31 – 33)	\$1,096	3.98%	\$0.1
25	Furniture/ Fixtures	321	Manufacturing (NAICS 31 – 33)	\$985	3.98%	\$2
26	Pulp/Paper/Allied	322	Manufacturing (NAICS 31 – 33)	\$705	3.16%	\$17
27	Printed Matter	511	Publishing, except Internet (NAICS 51)	\$2,043	2.34%	\$44
28	Chemicals/Allied	325	Manufacturing (NAICS 31 – 33)	\$17,992	2.66%	\$39
29	Petroleum/Coal	324	Manufacturing (NAICS 31 – 33)	\$8,797	2.95%	\$22
30	Rubber/Plastics	326	Manufacturing (NAICS 31 – 33)	\$4,280	1.99%	\$48
31	Leather	316	Manufacturing (NAICS 31 – 33)	\$91	1.83%	\$479
32	Clay/Concrete/ Glass/Stone	327	Manufacturing (NAICS 31 – 33)	\$2,209	5.84%	\$260
33	Primary Metal	331	Manufacturing (NAICS 31 – 33)	\$4,454	3.33%	\$85
34	Fabricated Metal	332	Manufacturing (NAICS 31 – 33)	\$6,433	1.72%	\$2
35	Machinery Excl. Electrical	333	Manufacturing (NAICS 31 – 33)	\$7,863	1.48%	\$129
36	Electrical Mach/ Equip /Supp	335	Manufacturing (NAICS 31 – 33)	\$8,186	1.33%	\$148
37	Transportation Equipment	336	Manufacturing (NAICS 31 – 33)	\$47,214	1.44%	\$111
38	Instruments/ Optical/ Watches/ Clocks	339	Manufacturing (NAICS 31 – 33)	\$2,010	2.13%	\$116
39	Miscellaneous Manufacturing	339	Manufacturing (NAICS 31 – 33)	\$3,830	2.13%	\$109
40	Waste/Scrap Materials	423	Used: Waste Management and Remediation Services (NAICS 562)	\$2,368	3.19%	\$680
<b>Total</b>	-	-	-	<b>\$159,484</b>	<b>2.44%</b>	<b>\$3,885</b>

Source: IHS Markit TRANSEARCH commodity flow data, U.S. Bureau of Economic Analysis, IMPLAN Missouri 2019 Economic Model

## 3.2 Direct Impacts of Freight Generating Industries

This analysis uses the IMPLAN model for Missouri to determine the direct employment, wages, value-added (or GSP) and tax revenues associated with the freight generating industries. Table 3.2 shows the direct economic impacts of the industries in Missouri in 2019.

**TABLE 3.2 DIRECT ECONOMIC IMPACTS OF FREIGHT GENERATING INDUSTRIES IN MISSOURI, 2019**

Industry	Employment	Labor Income (\$Millions)	GSP (\$Millions)	Total Taxes (\$Millions)
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	106,290	\$895	\$3,317	-\$472
Mining, Quarrying, and Oil and Gas Extraction (NAICS 21)	8,280	\$341	\$1,024	\$184
Manufacturing (NAICS 31 – 33)	183,640	\$14,538	\$22,502	\$4,104
Publishing, not including internet (NAICS 511)	8,280	\$341	\$1,024	\$263
Management and Remediation Services (NAICS 562)	7,470	\$495	\$827	\$138
<b>Total</b>	<b>313,960</b>	<b>\$16,610</b>	<b>\$28,694</b>	<b>\$4,217</b>

Sources: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages, 2019 and 2019 IMPLAN Model.

The freight generating industries in Missouri created nearly 314,000 direct jobs worth more than \$16.6 billion in wages. These industries employed 8% of all employees and paid 9% of wages in Missouri. Manufacturing and agricultural sectors were the predominant generators of freight and collectively accounted for 92% of freight generating employment and 93% of wages.

Although the agriculture sector comprises a high proportion of freight generating employment and labor income, businesses within this sector receive \$472 million in tax benefits from state, local, and federal governments. These funds are likely tied to heavy farm subsidies in the form of direct payments, Counter-Cyclical Payments (CCPs), disaster payments, crop insurance, and other subsidy programs, which is common in states with an extensive agricultural sector.

The freight generating industries added nearly \$28.7 billion to Missouri’s GSP and generated more than \$4.2 billion in tax revenues. In terms of direct economic impact, the manufacturing sector accounted for 78% of GSP and 97% of tax revenues created by the freight generating industries.

## 3.3 Total Impacts of Freight in Missouri

Section 0 presented the impacts to the Missouri economy of the freight transportation industry. These include the impacts of freight transportation as it ripples through the Missouri economy and impacting households and other industries. The preceding information in Section 3.0 presented the direct impacts of the freight generating industries

in Missouri. The total impacts of freight to the Missouri economy are the total impacts of freight transportation firms plus the direct impacts of the freight generating industries. Table 3.3 presents the total transportation industry and freight generating industry impacts to the Missouri economy.

Freight transportation supports every household and business sector in the Missouri economy. All the raw materials for goods production and finished goods were distributed by freight transportation firms. The economic activity resulting from freight transportation in 2019 created a total of 482,600 jobs valued at nearly \$25.9 billion in wages. The contribution to the Missouri economy in 2019 was nearly \$42 billion in GSP and more than \$7 billion in total tax revenue.

**TABLE 3.3 TOTAL ECONOMIC IMPACTS OF FREIGHT TRANSPORTATION AND FREIGHT GENERATING INDUSTRIES IN MISSOURI, 2019**

Industry	Employment	Labor Income (\$Millions)	GSP (\$Millions)	Total Taxes (\$Millions)
Total Impacts of Freight Transportation Firms	168,640	\$9,252	\$13,263	\$2,817
Direct Impacts of Freight Generating Industries	313,960	\$16,610	\$28,694	\$4,217
<b>Total</b>	<b>482,600</b>	<b>25,862</b>	<b>41,957</b>	<b>7,034</b>

Source: Cambridge Systematics