TRACKING THE POWER OF RAIL SUPPLY

THE ECONOMIC IMPACT OF RAILWAY SUPPLIERS IN THE U.S.

September 2018



RAILWAY SUPPLY INSTITUTE

REMSA
THE RAILWAY ENGINEERING-MAINTENANCE SUPPLIERS ASSOCIATION

RSSI
Railway Systems Suppliers, Inc.

RTA Railway Tie Association

ABOUT RSI

The Railway Supply Institute (RSI) is a trade association for railway suppliers and manufacturers representing over 200 companies. RSI members are suppliers to North American freight and passenger railroads and their industry segments include mechanical, communications & signaling, maintenance of way and passenger industries. RSI acts on behalf of suppliers to North American freight and passenger railroads and their 100,000 employees to assist members in the global marketplace and represents the industry during the regulatory and legislative process. The U.S. economy depends on the railroads to move freight, and the railroad companies depend on the railway supply industry to facilitate transport. RSI provides strong data-driven advocacy and informed regulatory and legislative support serve critical strategic purposes within the industry.

ABOUT REMSA

Railway Engineering-Maintenance Suppliers Association (REMSA) was created in 1965 by the merger of the Association of Track and Structure Suppliers and the National Railway Appliances Association, two long-standing organizations in the railroad maintenance-of-way industry. The association represents companies and individuals who manufacture or sell maintenance-of-way equipment, products, and services, or are engineers, contractors and consultants working in construction and/or maintenance of railroad transportation facilities. REMSA members constitute a large part of the maintenance-of-way industry. The association sponsors the largest exhibit of maintenance-of-way equipment, products and services in the United States. REMSA members exhibit rail and track products, track maintenance equipment and services, safety devices and software that enables the railroad industry to work smarter.

ABOUT RSSI

Railway Systems Suppliers, Inc. (RSSI) is a trade association serving the communication and signal segment of the rail transportation industry. RSSI's primary effort each year is to organize and manage a trade show for our members to exhibit their products and services. The association was incorporated in 1966 as the Railway Signal and Communication Suppliers Association Inc. Previous to that time it existed as two separate entities, one for the signal area and one dealing in the communications area of the railroad industry. Although records are vague for the years previous to 1966, there are indications that one or both of these entities were in existence as far back as 1906. In 1972 the corporate name was changed to Railway Systems Suppliers, Inc.

ABOUT RTA

The Railway Tie Association (RTA) was organized in 1919. Predecessor groups, dating back to the late 1800s, that included The National Association of Railroad Tie Producers, were formed to support the railroad tie industry and to preserve the forest through conservation. The purpose of the RTA is to promote the economical and environmentally sound use of wood crossties. The Association is involved in research into all aspects of the crosstie industry and ongoing activities dealing with sound forest management, conservation of timber resources, timber processing, wood preservation, industry economics and statistics, and safety of industry workers.

OXFORD ECONOMICS

ABOUT OXFORD ECONOMICS

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modeling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts, and analytical tools on 200+ countries, 250 industrial sectors, and over 4,000 regions. Our best-of-class global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social, and business impact.

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September 2018

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The modeling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

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EXECUTIVE SUMMARY

$74.2 billion

Total contribution of the railway supply industry to U.S. GDP in 2017.

Some $54.3 billion of this came from supply chain and consumer spending activities in the wider U.S. economy.

650,000 jobs

Supported in 2017.

This includes the 125,100 jobs that are directly provided in the railway supply industry in the U.S.

$16.9 billion

Railway supply sector's total tax contribution in 2017

This was made up of $10.7 billion in federal taxes and $6.2 billion in state and local taxes.

From rail cars and tracks to signals and switches, the railway supply industry has been a vital and dynamic part of the U.S. economy for over 200 years. Railway suppliers play an essential role in supporting the rail system here in the U.S. and have done so since the origin of railroads in the U.S. in the early 1800's. In 2017, the North American railroad system comprised more than 1.6 million railcars powered by more than 38,000 locomotives over more than 140,000 miles of rail. Nearly every piece of this intricate puzzle was shaped and put into place by railroad suppliers for their railroad customers.

Today, the rail industry is leading the transportation world in technological advancements and has embraced digitization and the Internet of Things (IoT). Such technology has generated significant improvements in operational safety and network efficiency and much of it was developed and driven by the railway supply community.

Beyond this support of the railroad system, the railway supply and manufacturing industry is essential to the national economy—generating value for the economy, stimulating jobs, and contributing taxes. These economic effects can be measured using a standard technique known as economic impact analysis. This kind of analysis measures not just the direct (operational) contribution of the railway supply industry but also the impact that is felt as its activities ripple out across the economy. This includes the impact generated as railway suppliers make purchases from a wider supply chain, known as the indirect impact. It also measures the effects that are felt in the wider consumer economy as employees in the railway supply industry and their supply chains spend their wages on housing, transportation, medical care, and entertainment (known as the induced impact). This report quantifies all three channels of impact in terms of their contribution to national GDP, jobs, income, and of tax revenue that is generated for all levels of government.

The economic contribution of the railway supply industry in 2017 amounted to more than $74.2 billion in GDP, as well as $16.9 billion in taxes to local, state and federal governments. Workers in the industry are highly productive, and wages reflect this at $78,800 annual income on average, placing them well above the median income earners in most states.[1]

In total, the railway supply industry supported more than 650,000 jobs in 2017. Railway suppliers directly employ more than 125,000 employees in

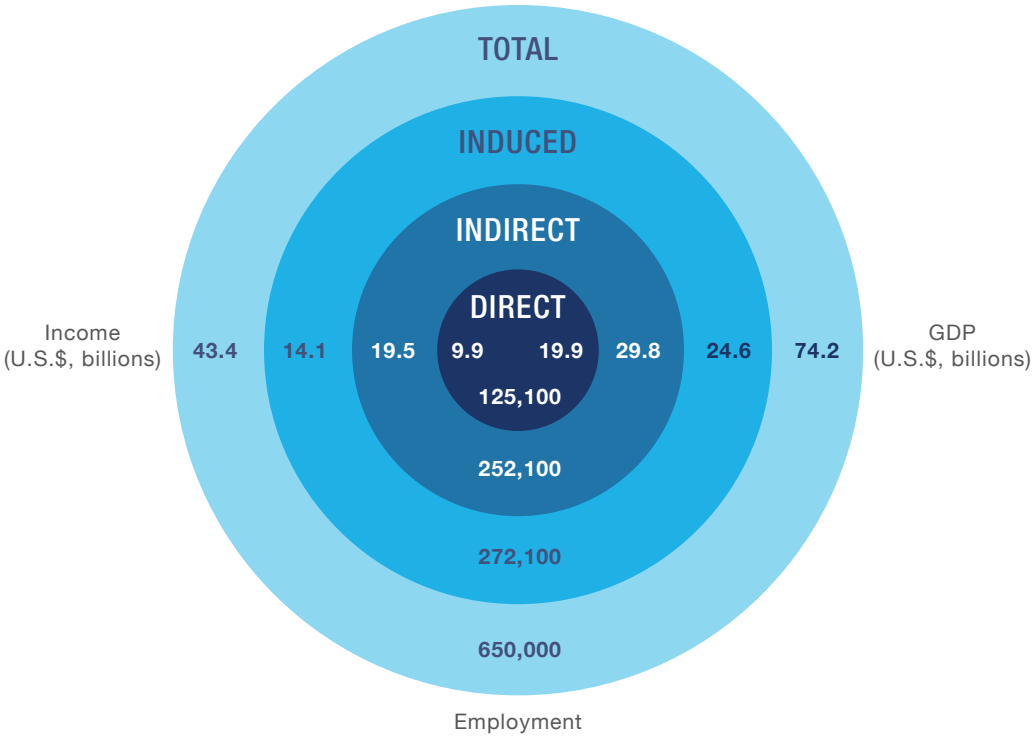
1 By comparison, according to BLS' QCEW, the average income in the United States is approximately $55,400 in 2017.

manufacturing, repair, maintenance, and leasing, among others. In addition, for each worker directly employed by the railway supply industry, a further 4.2 jobs are supported in the wider economy, either in the supply chains of railway suppliers or through the wage spending of those employed by the firms themselves or their supply chains. On average, these indirect and induced jobs pay an average annual salary of $63,980.

The railway supply industry makes a widespread contribution throughout the U.S. economy. Of the $74.2 billion total contribution to GDP, some $54.3 billion results from supply chain and consumer spending activities. This spreads the benefits of the industry to other parts of the U.S. economy, including, for example, $10.4 billion in trade, transportation, and utilities; $7.3 billion in professional and business services; and $8.2 billion in natural resources and mining.

While the railway supply industry has a substantial impact in every U.S. state, the largest impact is felt in the Southwest states ($18.1 billion), followed closely by the Southeast region ($15.9 billion), and the Great Lakes region ($12.3 billion). The states where railway supply firms made the greatest total contribution to the economy in 2017, include Texas ($15.1 billion), California ($6.1 billion), Illinois ($5.0 billion), Pennsylvania ($3.7 billion), and New York ($3.1 billion).

Fig. 1. Economic impact of railway supply on the U.S., 2017



GLOSSARY OF TERMS

American Community Survey (ACS): An annual household survey conducted by the U.S. Census Bureau that samples about 3.5 million addresses across the U.S. It provides information on individual socioeconomic and demographic characteristics.

County Business Patterns (CBP): A U.S. Census program that measures subnational economic data by industry. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll.

Gross Domestic Product (GDP): Produced by the Bureau of Economic Analysis (BEA), GDP is the official economic measure of output in the U.S. economy.

Gross Value Added (GVA): A measure of output less intermediate consumption (contribution to GDP), it is the measure of the value of goods and services produced in a specified region.

IMPLAN: Economic impact software that uses Input-Output tables showing the relationships between industries to evaluate the full economic contribution of one industry throughout the economy.

Metropolitan Statistical Area (MSA): A geographic region in the U.S., defined by the Office of Management and Budget, to identify a single set of geographic delineations for the Nation's largest centers of population and activity (i.e., cities).

NAICS: The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

Occupational Employment Statistics (OES): A Bureau of Labor Statistics (BLS) program that produces employment and wage estimates annually for over 800 occupations.

Quarterly Census of Employment and Wages (QCEW): A Bureau of Labor Statistics (BLS) program that publishes a quarterly count of employment and wages reported by employers covering 98 percent of U.S. jobs.

Standard Occupational Classification (SOC): A system used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 840 detailed occupations according to their occupational definition.

1. INTRODUCTION

140,000
Miles of rail in North America.

Source: AAR Railroad Facts, 2017 Edition

38,000
Locomotives moving passengers and freight throughout the continent.

Railroads originated in the United States in the early 1800's. Since the first locomotive was manufactured and the first tracks laid, railway suppliers have been hard at work helping the U.S. to grow its geographic footprint and its economy. Today, the North American railroad system comprises more than 1.6 million railcars powered by more than 38,000 locomotives over more than 140,000 miles of rail. Nearly every piece of this intricate puzzle was shaped and put into place by railroad suppliers for their railroad partners. We depend on our railroads to move most of our freight most efficiently, and our railroads depend on the railway supply industry.

With the help of the railway supply industry, U.S. railroads moved 1,500 tons of goods and 2.5 million passengers in 2017. The railroads success has helped drive growth in the railway supply industry. The railway supply industry is substantial, directly contributing $19.9 billion towards GDP and supporting over 125,100 jobs in 2017. However, the economic contribution of the railway supply industry extends far beyond the plants where their products are manufactured. The large demand for all types of rail products facilitates the need for additional support services including leasing services; distribution and logistics; and maintenance and repair services. These support activities generate additional economic value throughout the U.S. economy.

Despite this extensive economic activity, no comprehensive economic analysis has ever been developed to document the overarching impact of the railway supply industry on the U.S. economy. Until now, we have lacked comprehensive economic data representing the diverse field of suppliers. To address this, RSI, RSSI, RTA, and REMSA, representing nearly 4,000 corporate member companies in the industry, commissioned Oxford Economics to conduct research, analysis, and impact modeling to clearly quantify the economic contribution of railway suppliers in the U.S.

The membership, and the industry more generally, as defined in this study, comprises a diverse group of organizations. It includes manufacturers, component suppliers, leasing companies, logistics providers, and financial institutions.

For this study, Oxford Economics has quantified the economic contribution of the railway supply industry using an economic impact analysis at the national level and by state, as set out in following the page. This technique highlights the importance of the railway supply industry to the U.S. economy in terms of jobs, wages, tax revenue, and GDP.

AN INTRODUCTION TO ECONOMIC IMPACT ANALYSIS

A standard economic impact assessment identifies three channels of impact that stem from an activity:

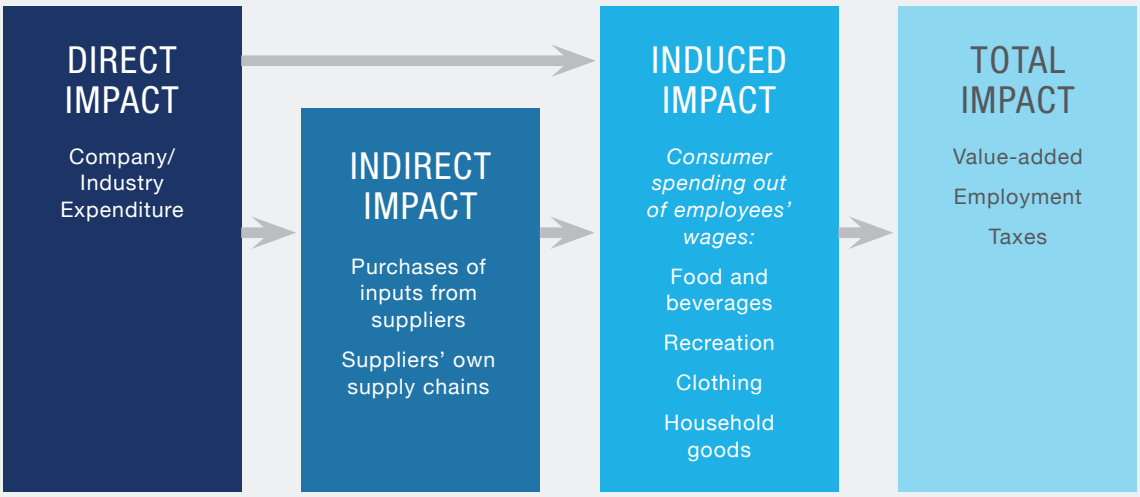
- **Direct effect,** which measures the economic benefit of railway supply operations and activities in the U.S.
- **Indirect effect,** which encapsulates the activity driven by the supply chain as a result of the procurement of goods and services from other businesses.
- **Induced effect,** which captures the impact of workers spending their wages on locally produced goods and services. This supports activity across the spectrum of consumer goods and services, and their supply chains. An example of this is the purchases a worker makes spending his wages on groceries, clothing, transportation, and utilities.

In accordance with standard economic impact assessments, the scale of the railway supply industry is measured using four key metrics:

- **GVA**—the gross value added (GVA) contribution to GDP.
- **Employment**—employment is measured in terms of headcount of workers.
- **Wages**—the compensation paid to workers within the industry, the industry's supply chain and induced wages paid to workers in consumer industries.
- **Taxes**—gross tax receipts paid at federal, state and local levels.

All monetary impacts in this report are presented in current 2017 (i.e. non-inflation adjusted) US$.

Fig. 2: The channels of economic impact



2. THE GDP IMPACT OF RAILWAY SUPPLIERS

$74.2 billion
GDP contribution in 2017.

This is made up of direct, indirect and induced effects as the impact of railway suppliers spreads through the U.S. economy.

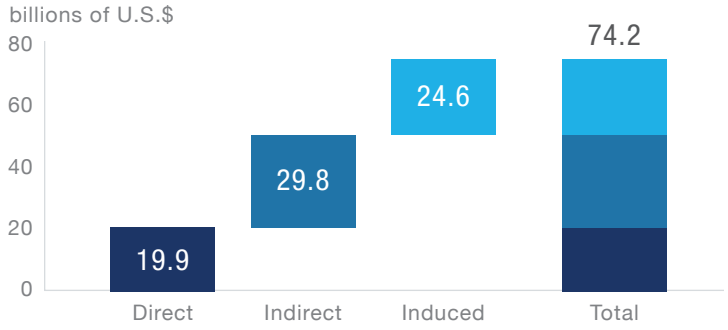
Railway suppliers have a considerable economic footprint in the U.S. More than 125,000 people work in the industry, designing, manufacturing, distributing, servicing, and operating equipment for railways throughout all states in the U.S. The purchases made by the railway supply industry from suppliers during the manufacturing process (i.e. the indirect effects) enable further activity throughout the U.S., sustaining thousands of additional jobs across the country. Finally, wages paid to employees, and those employed in the supply chain, fund consumer spending (i.e. the induced effects), for example in retail and leisure establishments, and deliver additional economic benefit to the U.S.

In the following section, we quantify the industry's economic footprint in terms of its contribution to GDP, the employment it supports and the tax revenues it generates at the federal, state and local level. In this section, we explore the three core channels of impact, starting with the direct contribution of the railway supply industry.

2.1 GDP IMPACT OF THE RAILWAY SUPPLY INDUSTRY

Combining all the channels of impact—direct, indirect (supply chain) and induced (wage spending)—the total impact of the railway supply industry on the U.S. economy amounted to $74.2 billion in 2017, equivalent to about 0.4 percent of the total U.S. economy (note: U.S. nominal GDP was approximately $18 trillion in 2017). The chart below shows the breakdown of this impact across the three core channels, in terms of GVA contribution to GDP.

Fig. 3. The total GVA contribution of railway suppliers, 2017



Source: Oxford Economics, IMPLAN

47th

If the railway supply industry were represented as a U.S. city, the industry would rank as the 47th largest MSA.

It ranks alongside Louisville, KY and Jacksonville, FL in terms of in GDP.

For scalability and comparison, if the railway supply industry were represented as a U.S. city, the industry would rank as the 47th largest MSA in terms of GDP. It would fall between Louisville, KY and Jacksonville, FL. Fig. 4 illustrates this comparison, along with similar sized MSAs in terms of GDP. We subsequently explore each channel of impact in turn.

Fig. 4. MSA comparison of the railway supply GDP contribution

MSA	GDP
GDP, in billions of U.S.$	
Providence, RI	80.2
Raleigh, NC	79.8
New Orleans, LA	77.2
Louisville, KY	75.0
Railway supply industry	74.2
Jacksonville, FL	71.5
Memphis, TN	71.5
Oklahoma City, OK	70.2
Honolulu, HI	64.8

Source: BEA, Oxford Economics

2.2 DIRECT GDP IMPACT

The direct impact of railway suppliers comprises the value-added output generated by the industry; those employed directly by railway suppliers, the wages these railway suppliers pay, their operational expenditures, and the taxes that they pay. We estimate railway suppliers directly accounted for $19.9 billion in GDP, of which $8.4 billion was employee compensation.

A comparison of the total impact with the direct impact reveals how, for every $100 of value-added output created by the railway supply industry, a further $270 of value added is created in other industries of the U.S. economy as a result of supply chain and employee expenditure impacts. This means that the industry has a value-add multiplier impact of 3.7, which is equivalent to that of the aluminum rolling, drawing and extruding industry, and just below that for Federal electric utilities, and far exceeds that for legal services, for example.

$29.8 billion
Contribution to GDP from supply chain purchases (indirect) in 2017.

$24.6 billion
Contribution to GDP from consumer spending (induced) in 2017.

2.3 INDIRECT GDP IMPACT

The indirect impact of the railway supply industry reflects the employment and GDP contribution made by the suppliers of those establishments (e.g. steel manufacturers, loggers, and IT services) and, in turn, within the supply chains of those suppliers. In 2017, the GDP contribution of these suppliers was $29.8 billion, of which $14.6 billion was employee compensation.

2.4 INDUCED GDP IMPACT

The induced impact of the railway supply industry represents the economic activity supported by the consumer spending of wages by those employed directly by railway suppliers or in their supply chains. As a result of the railway supply firms and their suppliers' employees spending their wages in the economy, we estimate the induced impact that is attributable to railway supply firms' operations to be a $24.6 billion contribution to GDP in 2017. This includes $12.1 billion in employee compensation.

2.5 GDP IMPACT BY INDUSTRY

The economic impact of railway suppliers' activities is spread throughout the economy as the employees and suppliers of the railway supply industry spend their incomes purchasing goods and services from all types of other businesses including restaurants, power companies, health care services, etc. The impact at the industry level is calculated using an input-output modeling framework. These inter-industry relationships are used to calculate the multipliers, or the ripple effects of railway suppliers' activities, which, in turn, support activity in other industries of the economy.

The total GDP impact (direct + indirect + induced) of the railway supply industry is displayed in Fig. 5. It is broken down into the major industries of the U.S. economy. Railway suppliers' direct impact is concentrated in the manufacturing and the finance, insurance, and real estate sector (sales and leasing activities). Not surprisingly, these two industries (manufacturing and finance, insurance, and real estate) are the industries where railway suppliers have the greatest overall national impact of $33.7 billion in 2017. In total, 45 percent of the railway supply industry's overall gross value added (GVA) impact is captured in these two sectors alone.

Still, the remaining 55 percent of railway suppliers' GVA impact is generated in a diverse set of industries outside of manufacturing and finance. Outside of those mentioned already, there are three industries where railway suppliers have a significant impact: trade, transportation, and utilities (14 percent); professional and business services (12 percent); and natural resources and mining (11 percent). To provide some examples, the top inputs (i.e. indirect impacts) for railway suppliers' operations include:

- $537.3 million spent on commercial logging (part of natural resources and mining);
- $3.2 billion spent on wholesale trade (part of trade, transportation, and utilities);
- $805.9 million spent on real estate (part of finance, insurance, and real estate); and
- $458.9 million spent on plate work manufacturing (part of manufacturing).

These supply chain purchases demonstrate the sheer size and purchasing power of the railway supply industry. In fact, the railway supply industry ranks as the 12th largest purchaser of iron and steel forgings in the U.S. Similarly, some of the top expenditures for consumers (i.e. induced impacts) include:

- $2.4 billion spent on housing (part of finance, insurance, and real estate);
- $839.5 million spent at restaurants (part of finance, insurance, and real estate); and
- $971.2 million spent on hospital care (part of education and health services).

Fig. 5. Railway Suppliers' GVA impact by industry, 2017

Industry	Direct	Indirect	Induced	Total
	$ in billions			
Natural Resources and Mining	0.0	7.6	0.5	8.2
Construction	2.3	0.4	0.2	2.9
Manufacturing	13.4	5.7	2.1	21.2
Trade, Transportation, and Utilities	0.3	5.9	4.5	10.7
Information	0.0	0.9	1.2	2.2
Finance, Insurance, and Real Estate	2.3	3.3	7.0	12.6
Professional and Business Services	1.5	4.7	2.6	8.8
Education and Health Services	0.0	0.0	3.4	3.4
Leisure and Hospitality	0.0	0.6	1.6	2.2
Other Services	0.0	0.4	1.1	1.5
Government	-	0.3	0.3	0.6
Total	19.9	29.8	24.6	74.2

Source: IMPLAN, Oxford Economics

CASE STUDY 1:
POSITIVE TRAIN CONTROL IMPLEMENTATION

The Rail Safety Improvement Act of 2008 mandated the implementation of Positive Train Control (PTC) as a safety system for the rail sector in order to "prevent train-to-train collisions, over-speed derailments, incursions into established work zone limits, and the movement of a train through a switch left in the wrong position."[2] PTC is an intricate system of systems encompassing four major areas: on-board locomotive, wayside signal, back-office software, and communications. Railway suppliers have been heavily involved in the design, manufacturing, and installation of PTC equipment across the country.

In total, 41 railroads are required to install PTC systems and data reported to the U.S. Department of Transportation (DOT) indicates that PTC systems are in operation on 65 percent (37,705 route miles) of the required route miles of track, as of June 30, 2018.[3] Congress has set an installation deadline of December 31, 2018, and an additional 2 years for railroads to fully implement PTC, and the railway supply industry is fully committed to meeting this mandate and customer requirement.

INCREASING SAFETY

PTC technology will help avoid future train accidents and provide a platform for other technology enhancements for both freight and passenger railroads alike. When it is fully implemented, the PTC system will have information on the location, speed, and direction for trains across much of the country's railroad system. Using real-time data, the PTC system will be able to automatically slow a train if, for example, an engineer misses a signal and does not reduce a train's speed around a sharp curve. In order to accomplish this safely, PTC must account for several factors including: train size, locomotive and rail car mix, speed, terrain, and signal aspects to determine safe stopping distances.

INVESTING IN RESEARCH AND DEVELOPMENT

Railway suppliers are working with railroads to explore new ways that PTC systems can be leveraged to develop new products and services that enhance safety or efficiency of railroad operations in new ways. With the support of DOT and FRA, a PTC testbed was constructed in Pueblo, Colorado, where rail suppliers can review designs, witness testing, monitor performance and evaluate PTC systems for type approval.[4] Additional PTC supported technologies could drive increased fuel efficiency or improved diagnostics for rail equipment, thereby decreasing maintenance and repair costs.

CREATING VALUE AND JOBS

Railroads have invested approximately $10 billion over the last decade to develop and implement positive train control technology. There are more than 400,000 components in the entire PTC system that need to be designed, built, tested, and installed across 140,000 miles of rail in the U.S. As a result, railway supply employees across the country are working every day to help railroads meet the PTC mandate, which requires the installation of hardware and initiation of line-of-road testing by the end of 2018 unless an alternative schedule is granted, and full PTC implementation and interoperability by the end of 2020.

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2 110th Congress. (Oct. 16, 2008). Federal Rail Safety Improvements Public Law 110–432. Federal Railroad Administration.

3 See https://railroads.dot.gov/newsroom/fra-publishes-railroads-quarter-2-ptc-data.

4 See https://www.transportation.gov/briefing-room/background-positive-train-control-enforcement-and-implementation-act-2015.

3. THE EMPLOYMENT IMPACT OF THE RAILWAY SUPPLIERS

5.2
Jobs multiplier of the railway supply industry.

For every direct job in the industry, an additional 4.2 jobs are supported elsewhere in the economy.

In addition to its GDP impact, the railway supply industry directly employed 125,100 workers in 2017. The railway supply industry also indirectly supported an additional 252,768 jobs through supply-chain purchases. We estimate that a further 272,152 induced jobs were sustained as employees of the railway supply industry and its supply chain spent their wages on consumer goods. In total, therefore, we find that the economic activity of the railway supply industry supported more than 650,000 jobs throughout the U.S. economy in 2017.

Different industries affect the U.S. economy in different ways. The best way to compare is by evaluating jobs and value-add multipliers. The railway supply industry has a jobs multiplier of 5.2. This means that for every direct job in the industry, an additional 4.2 jobs are supported elsewhere in the economy. This is higher than many other industries. The Fig. 6 displays the job and value-add multiplier of different industries in the U.S.

Fig. 6. Multipliers of railway suppliers compared to other industries

Industry	Jobs Multiplier	Value-Add Multiplier
Plastics material and resin manufacturing	6.9	4.3
Cable and other subscription programming	5.7	1.9
Aluminum sheet, plate, and foil manufacturing	5.2	4.3
Railway supply industry	5.2	3.7
Water transportation	4.8	2.8
Surgical and medical instrument manufacturing	2.7	1.9
Legal services	1.5	1.3
Home health care services	1.1	1.3

Source: IMPLAN, Oxford Economics

3.1 JOBS IMPACT BY INDUSTRY

The total employment impact (direct + indirect + induced) of the railway supply industry is displayed in Fig. 7 and Fig. 8 (below). Similar to the GVA impact, the industry's employment impact is concentrated in the manufacturing industry,

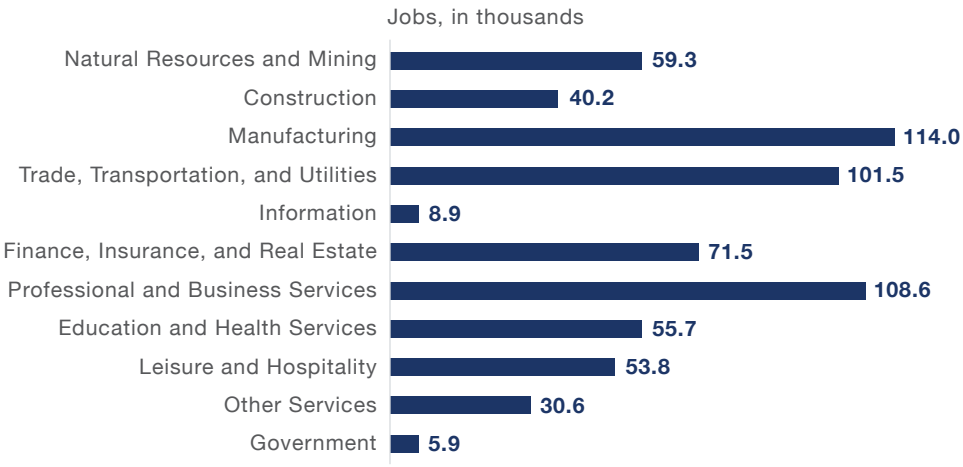
Diverse Job Creation:

82%

of all jobs supported by the railway supply industry are in industries other than manufacturing.

which accounts for 18 percent of the total employment impact. This is followed by professional and business services (17 percent); trade, transportation, and utilities (16 percent); and finance, insurance, and real estate (11 percent).

Fig. 7. Total railway supply jobs impact by industry



Source: Oxford Economics, IMPLAN

Fig. 8. Detail railway suppliers' jobs impact by industry

Industry	Direct	Indirect	Induced	Total
Jobs, in thousands				
Natural Resources and Mining	0.0	52.8	6.4	59.3
Construction	31.1	5.8	3.3	40.2
Manufacturing	54.5	46.4	13.1	114.0
Trade, Transportation, and Utilities	3.5	43.5	54.5	101.5
Information	0.2	4.1	4.7	8.9
Finance, Insurance, and Real Estate	18.0	21.2	32.3	71.5
Professional and Business Services	17.1	57.3	34.1	108.6
Education and Health Services	0.1	0.1	55.6	55.7
Leisure and Hospitality	0.3	13.8	39.7	53.8
Other Services	0.2	5.0	25.4	30.6
Government	-	2.8	3.1	5.9
Total	125.1	252.8	272.2	650.0

Source: Oxford Economics, IMPLAN

3.2 OCCUPATIONAL PROFILE

24%
Share of production workers in the railway supply industry.

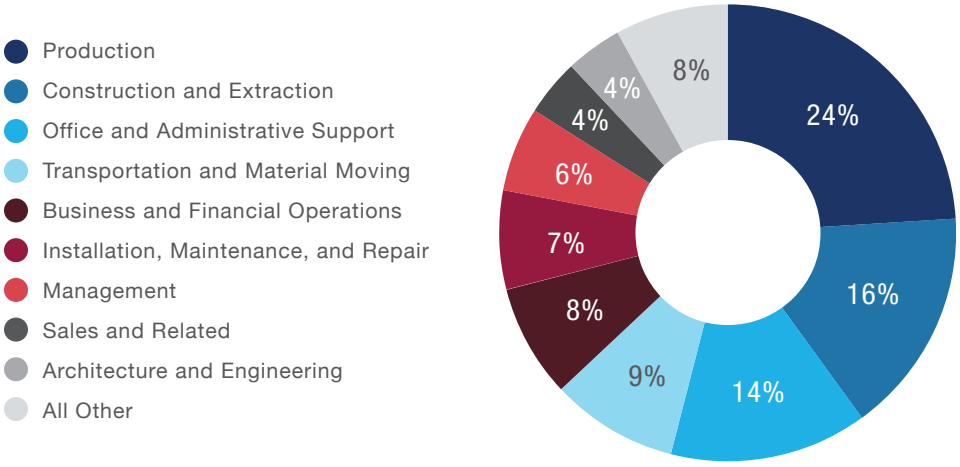
Top employing occupations in the railway supply industry include assemblers and fabricators, maintenance and repair workers, electricians, and industrial machinery mechanics, among others.

Workers in the railway supply industry are highly productive, and wages reflect this at $78,800 annual income on average, placing them well above the median income earners in most states.[5] In this section we examine the occupation profile of the industry to get a better sense of the types of skills and knowledge that workers need to be employed in the railway supply industry.

The occupation profile of the railway supply industry describes the types of jobs that make up the industry.[6] The roles and responsibilities of railway supply industry employees are many and varied. They are assemblers and fabricators, maintenance and repair workers, metal and plastic workers, logisticians, management analysts, software developers, engineers, electricians, procurement clerks, stock clerks and order fillers, and industrial machinery mechanics, among others. The major occupation group that has the largest share of employment within the industry is production occupations, which accounts for about 24 percent of workers in the industry (see Fig. 9).

Beyond the production capacity the railway supply industry provides, several other functions are essential to the operations of railway suppliers, including construction and extraction occupations that comprise about 16 percent of workers, office and administrative support occupations that make up about 14 percent, as well as transportation and material moving occupations, which account for about 9 percent of workers in the railway supply industry.

Fig. 9. Occupation profile of railway suppliers



Source: Oxford Economics, BLS OES

5 By comparison, according to BLS' QCEW, the average income in the United States is approximately $55,400 in 2017.

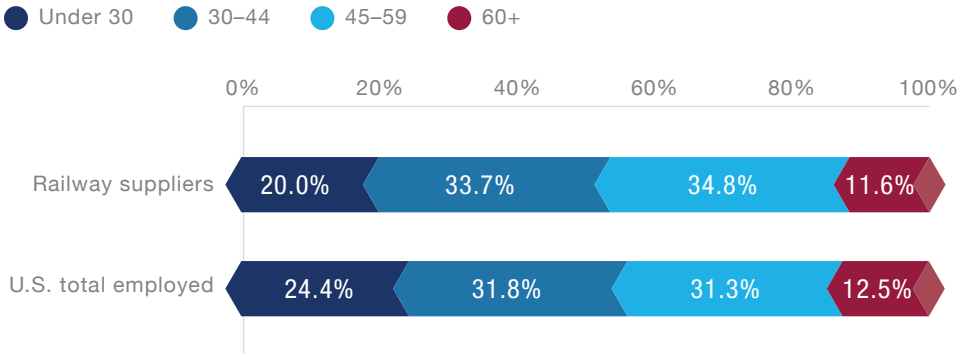
6 This profile represents the occupation staffing patterns of the respective industries that comprise the railway supply industry. For more detail, see https://www.bls.gov/oes/current/oessrci.htm.

3.3 PEOPLE WHO WORK IN THE RAILWAY SUPPLY INDUSTRY

This section considers the socioeconomic characteristics of the railway supply industry. The data come from the 2016 American Community Survey (ACS), the most recently available data. It includes all workers currently employed in the railway supply industry as well as a comparison to all employed workers in the U.S.

Workers in the railway supply industry are likely to be older compared to the U.S. workforce overall. Indeed, 46 percent of the railway supply workforce was over the age of 45, reflecting length of tenure within the industry as well as industry knowledge. But as the older cohort approaches retirement age, the railway supply industry will need to prepare and recruit for the future workforce.

Fig. 10. Age profile of the railway supply industry

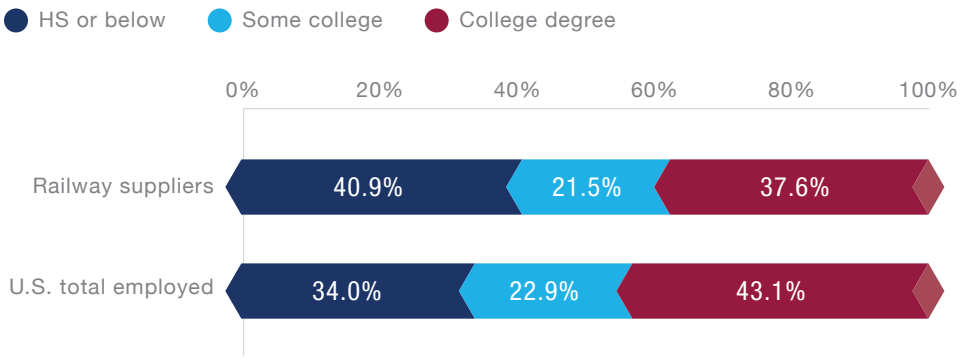


The railway supply industry shows fewer college degrees compared to all other industries. This, however, highlights how the railway supply industry is an increasingly rare example of a thriving blue-collar industry, in which opportunities exist for workers to gain skills and earn family-sustaining wages.

38%
degree educated

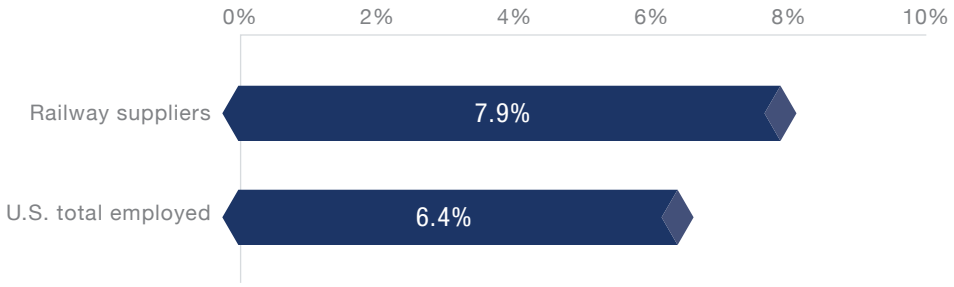
62% of railway supply workers do not have a college degree.

Fig. 11. Educational attainment in the railway supply industry



The railway supply industry workforce has a greater share of veterans compared to the U.S. workforce overall. This indicates that there may be a strong alignment between the skills veterans learn during military services and the skills required to work in the industry, such as teamwork and problem solving, or operating in a busy manufacturing environment or warehouse space while using highly technical equipment. As the railway supply industry workforce ages, this could provide a useful pool of talent to recruit and replace the retiring workforce.

Fig. 12. Veteran status in the railway supply industry



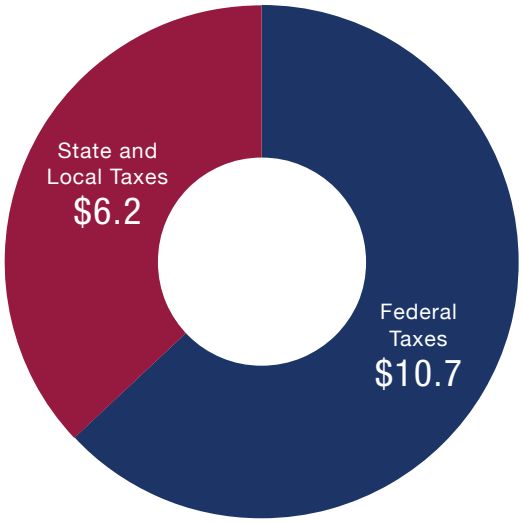
4. TAX IMPACT OF RAILWAY SUPPLIERS

$16.9 billion
Fiscal contribution in 2017.

This was made up of $10.7 billion in federal taxes and $6.2 billion in state and local taxes.

The direct, indirect, and induced economic activity supported by the railway supply industry generated $10.7 billion in federal tax revenue in 2017 and an additional $6.2 billion in state and local tax revenue. In total, the economic activity that the railway supply industry generated was worth over $16.9 billion in taxes for all levels of government. In total, each job created by the industry's activity results in approximately $26,000 in additional tax revenue (from all sources).

Fig. 13. Railway supplier tax impact, in billions of U.S.$, 2017



Source: IMPLAN, Oxford Economics

4.1 COMPARING THE TAX IMPACTS OF OTHER INDUSTRIES

Different industries impact the U.S. economy in different ways as we detailed in our discussion of multipliers in Section 3. Similarly, the tax contributions of different industries can vary depending upon many factors such as geographic concentration (i.e. state sales tax), tax policies (i.e. urban enterprise or free trade zones), and depreciation rates across different types equipment. Using industries with similarly sized output as the railway supply industry, we highlight the tax contributions in Fig. 14 below.

Fig. 14. Tax contributions of similarly sized industries in the U.S.

Industry	Direct GVA (in billions)	Tax contribution (in billions)
Railway suppliers	$19.9	$16.9
Support activities for oil and gas operations	$39.3	$5.2
Nonalcoholic beverage manufacturing	$13.4	$14.8
Surgical and medical instrument manufacturing	$18.6	$6.5
Water transportation	$18.7	$11.8
Home health care services	$59.0	$5.2

Source: IMPLAN, Oxford Economics

CASE STUDY 2:
PRESERVING FAIR AND FREE MARKETS

Since the North American Free Trade Agreement (NAFTA) between Canada, Mexico, and the United States was put in place on January 1, 1994, trade and investment have increased between each country. One of the key drivers for this success has been the ability of companies and industries to integrate their supply chains across the continent to maximize efficiencies, costs, and access to resources – and railroads and rail suppliers have played an important role in this.

Railroad networks are highly integrated, and customers across nearly every industry rely on rail service to meet their logistics and supply chain needs. Meanwhile the production of goods has become so circuitous that the lines of "American made", "Canadian made", or "Mexican made" are blurred in highly integrated continental supply chains. Even basic inputs, such as oil imported from Mexico, have wide-reaching value-added activities beyond the energy sector – as expressed by Christopher Wilson in a report for the Wilson Center:

"Mexican oil, for example, might be sent to the United States to be refined and turned into raw plastic in Louisiana, before being sent to an injection molder in the U.S. Midwest that creates the components for a car's dashboard. Those parts might return to Mexico for assembly at a factory along the border and then used in the final production of a car in the Bajío."

RAIL SUPPLIERS HAVE INTEGRATED SUPPLY CHAINS

As noted above, NAFTA has facilitated an extensively integrated supply chain in Canada, Mexico, and the U.S. For example, 40% of U.S. imports from Mexico and about 75% of U.S. exports to Mexico are in intermediate goods. Manufacturers of railway supply products – locomotives, railcars, maintenance of way equipment – often source components from all three NAFTA nations, sustaining thousands of job across the continent.

RAIL TRANSPORTATION SUPPORTS TRADE

Since NAFTA was approved in the mid-90s, trade has grown dramatically (Canada and Mexico accounted for nearly 26 percent of total US imported goods in 2016), making rail networks even more integral to the smooth flow of goods and services among the three NAFTA nations. The Association for American Railroads (AAR) estimates that international trade accounted for $26.4 billion of rail revenue in 2014; that is a result of freight cars moving nearly 511 million tons of goods. In March of 2017, at least 42 percent of rail carloads and intermodal units, and more than 35 percent of annual revenue, are derived from international trade.[7]

REGIONAL IMPACTS

The most important country for the supply of Mexican production is the United States. This illustrates the two-way nature of supply chains and suggests trade protection has the potential to come back to bite U.S. producers. The supply chains of rail suppliers, notably in manufacturing, would be dramatically impacted if the ongoing NAFTA negotiations were to fail. Among the states whose economies rely most heavily on trade with Canada and Mexico, four of the top five—Texas, North Dakota, Kentucky, and Indiana—have a high reliance on the railway supply industry, as indicated by their respective location quotients.[8]

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7 https://www.aar.org/wp-content/uploads/2017/12/AAR-Freight-Railroads-International-Trade-Report-March-2017.pdf

8 The exception is Michigan. See Section 5.2 of this report for more detail on location quotients.

5. STATE-LEVEL DETAIL

There are two ways to evaluate state-level detail. One is measuring the magnitude of the total GVA impact in each state. The other considers the relative contribution of the railway supply industry to each state's economy, using a measure called location quotient. Each measure is detailed in the following sections.

5.1 GVA IMPACTS BY STATE

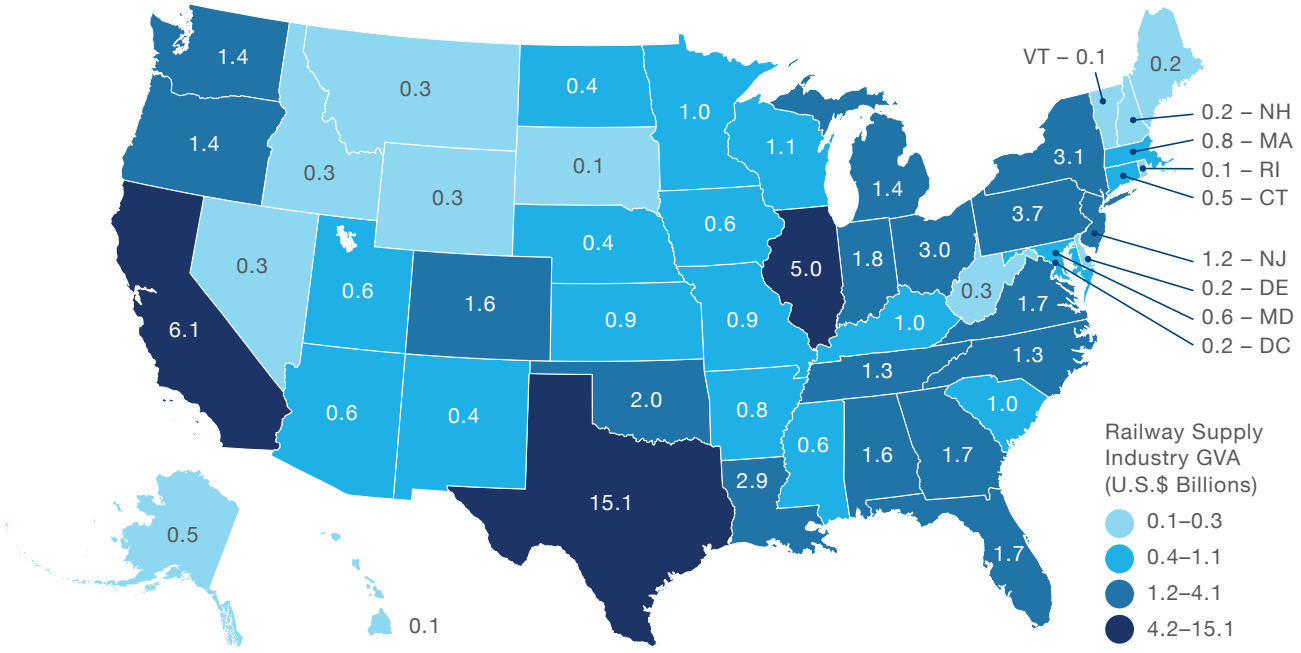
Railway suppliers have the largest impact in the Southwest states.

The top 5 states, in terms of GVA, account for 45% of railway supply economic impact nationwide.

Railway supply firms have operations in all 50 states throughout the U.S. and are represented by manufacturers, leasing firms, maintenance companies, and many other industry segments. These firms have a substantial concentration in Southwest states, as indicated by the region's location quotient of 2.0. As a result, railway suppliers make a disproportionately large impact in this region. Overall, the largest impact is felt in the Southwest states ($18.1 billion), followed closely by the Southeast region ($15.9 billion), and the Great Lakes region ($12.3 billion).[9]

9 Regions, as determined by the Bureau of Economic Analysis (BEA). For a detailed list of states by region, see https://www.bea.gov/regional/docs/regions.cfm.

Fig. 15. Railway supply industry GVA impacts by state



Source: Oxford Economics, IMPLAN

$18.1 billion

Contribution to GDP from railway supply activity in the Southwest region.

2.0 LQ

The Southwest region has double the concentration of railway supply impacts compared to the U.S. economy overall.

In 2017, the states where the railway supply industry generated the highest economic impact, in terms of GVA, include Texas ($15.1 billion), California ($6.1 billion), Illinois ($5.0 billion), Pennsylvania ($3.7 billion), and New York ($3.1 billion). These five states account for nearly 45 percent of railway suppliers' economic impact nationwide. Fig. 15 presents a map that shows, in absolute dollar terms, how the railway supply industry's economic impact differs by state.

5.2 LOCATION QUOTIENTS

A location quotient (LQ) for an industry helps to illustrate how concentrated it is in one state by comparison to others. A location quotient that is equal to one indicates that the state's industry concentration is equal to the national concentration of the same industry. States with higher location quotients (usually greater than 1.2) indicate that a region has a higher concentration in the production of that good or service, relative to the rest of the nation.

A value of 1.5 indicates that industry output within the region is 1.5 times more concentrated than the U.S. average. A location quotient below one indicates that industry output within the region is less concentrated compared to the U.S. average.

Fig. 16. Top 10 states by GVA impacts and location quotients (LQ)

Top GVA States				Top LQ States			
Rank	State	GVA (in billions)	LQ	Rank	State	GVA (in billions)	LQ
1	Texas	$15.1	2.3	1	Louisiana	$2.9	2.9
2	California	$6.1	0.6	2	Oklahoma	$2.0	2.6
3	Illinois	$5.0	1.6	3	Alaska	$0.5	2.4
4	Pennsylvania	$3.7	1.3	4	Texas	$15.1	2.3
5	New York	$3.1	0.5	5	Wyoming	$0.3	2.0
6	Ohio	$3.0	1.2	6	Alabama	$1.6	1.8
7	Louisiana	$2.9	2.9	7	Oregon	$1.4	1.6
8	Oklahoma	$2.0	2.6	8	Illinois	$5.0	1.6
9	Indiana	$1.8	1.3	9	North Dakota	$0.4	1.6
10	Florida	$1.7	0.5	10	Montana	$0.3	1.5

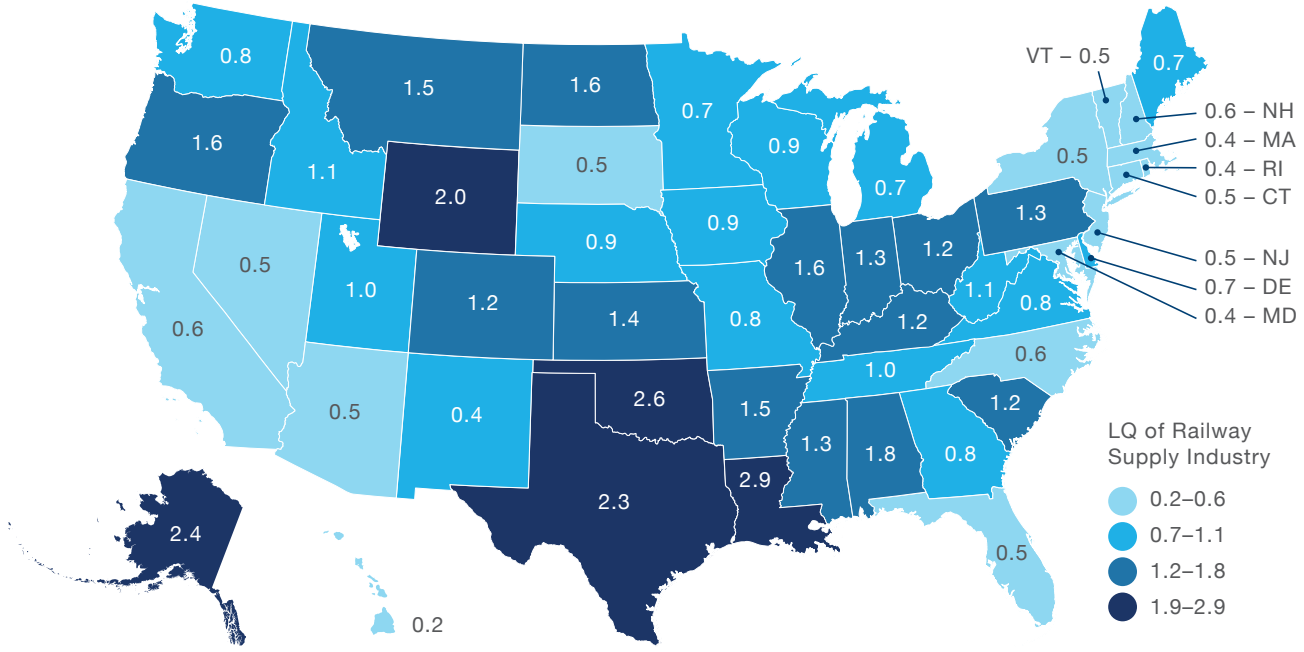
Source: Oxford Economics, IMPLAN

Note: States with high GVA do not necessarily result in high location quotients, as this statistic is relative to national output. For example, if the railway supply industry makes up 0.52 percent of Pennsylvania's economy and only 0.41 percent of the U.S. economy, then Pennsylvania's LQ for the railway supply industry would be 1.3 (0.52% / 0.41%).

As noted above, the GVA impacts of the railway supply industry are largest in states such as Texas, California, and Illinois. However, only Texas, from the top five states in terms of GVA, ranks in the top five LQ values, meaning the scale of the impact does not indicate a particular concentration. The states with high LQ values include Louisiana, Oklahoma, Alaska, and Wyoming. This indicates, for example, that the economy of Louisiana is more reliant on the railway supply industry compared to California, even though California has a higher output produced by the railway supply industry.

Fig. 17 presents a map that shows, in relative terms (LQ), how railway suppliers' economic impact differs by state.

Fig. 17. Railway supply location quotient (LQ) by state



Source: Oxford Economics, IMPLAN

6. CONCLUSION

The railway supply industry is a vital and growing industry in the U.S. The industry's ability to offer a variety of products and services is evidenced by the geographic distribution and economic contribution to all 50 states. In 2017, we estimate that the railway supply industry directly employed 125,100 workers across all 50 states and DC.

In total, the railway supply industry supports employment of nearly 650,000 workers in the U.S. and generates over $74.2 billion in economic activity. This economic activity is greatest in the Southwest states and will continue to grow and support employment and economic activity throughout the country.

The use of railroads is essential to virtually all supply chains in every industry, making them indispensable to the economy. Not only do railway suppliers produce vital pieces of equipment to support that economic activity; they also provide additional support services such as leasing operations; distribution and logistics; as well as maintenance and repair services that generate additional economic value throughout the economy.

Fig. 18. Summary of the railway supply industry's economic impact

	Direct	Indirect	Induced	Total
Income, GVA, Federal, State and Local Taxes in billions of US $				
Employment	125,100	252,800	272,200	650,000
Income	9.9	19.5	14.1	43.4
GVA	19.9	29.8	24.6	74.2
Federal, State and Local Taxes				16.9

Source: Oxford Economics, IMPLAN

Appendix B provides a detailed summary of the economic impact of the railway supply industry in each of the U.S. states.

APPENDIX A

CREATING THE DATABASE

To conduct the impact assessment and analysis, Oxford Economics constructed a state-level database using information gathered from various sources. Use of multiple data sources increases accuracy in the database and mitigates chances of error and outliers in the estimation process. The sources of data include:

1. BLS Quarterly Census of Employment and Wages (QCEW): 2017 annual data.
2. BLS Occupational Employment Statistics (OES): May 2017 data.
3. Census American Community Survey (ACS): 2016 annual data.
4. BEA Gross Domestic Product (GDP): 2017 GDP by metro area.
5. IMPLAN (IMpact analysis for PLANning): 2017 annual data.
6. Census County Business Patterns (CBP): 2016 annual data.
7. Proprietary databases: Including data provided by a member survey.

Oxford Economics would like to thank the members of RSI, RSSI, REMSA, and RTA for their support in completing detailed surveys that allowed us to complete this analysis. Without this input, the analysis would not have been possible.

ABOUT IMPLAN

This analysis utilized IMPLAN economic impact software. IMPLAN is an input-output modeling system used to build models at various levels of geography, including national, state, county, and congressional district. It allows for adjustable assumptions of supply-chain connections and leakages from survey input data and improved accuracy of assumptions. All data are presented in 2016 values.

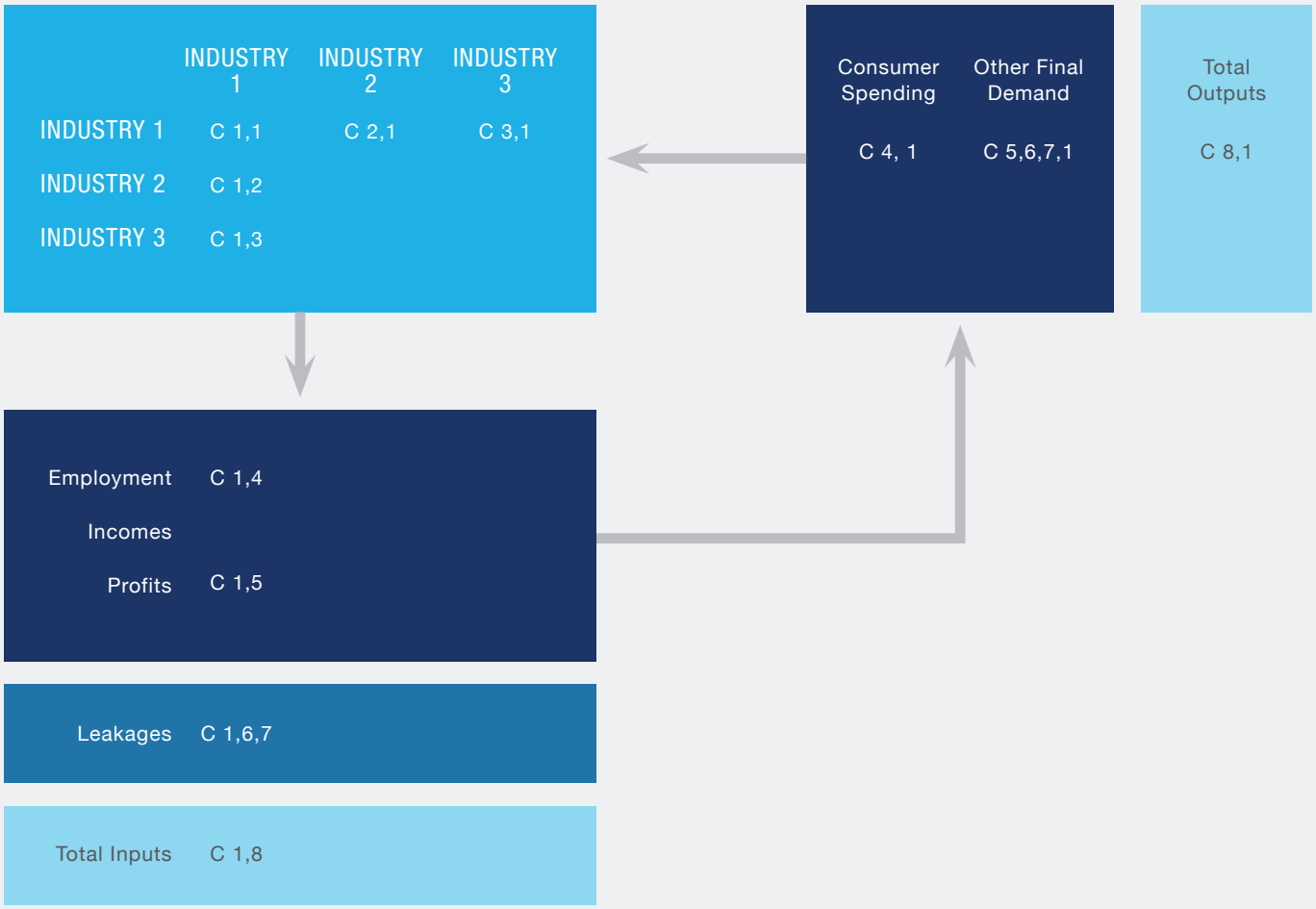
IMPLAN is widely used and recognized by government organizations, non-profits, economic development organizations, workforce planners, education institutions, and consultants across the U.S. and Canada.

IMPACT MODEL STRUCTURE

The model is designed to capture the inter-industry relationships, consumer spending, and ripple effects that result from direct economic activity generated by railway suppliers. The impacts are measured across four channels:

- **Direct Impact:** direct employment and spending by the industry's business operations
- **Indirect Impact:** supply-chain effects, stemming from industry's operations (e.g. legal services, utilities, etc.)
- **Induced Impact:** describes impact resulting from employees spending their incomes in state/national economy
- **Taxes:** Gross tax receipts paid at the federal, state and local level.

Input-output modeling characterizes and follows the flow of spending through an economy, thereby capturing and quantifying effects on supply chains, consumer/payroll spending, economic leakages and even taxes paid to governments. The following figure depicts the overarching structure of the model.



APPENDIX B

This table displays the full impact results for railway suppliers in each state and the U.S.

Income, GVA, and State & Local Taxes in US$					
United States	**LQ = 1.0**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		125,104	252,768	272,152	650,024
Income		9,859,616,562	19,524,217,481	14,061,629,584	43,445,463,627
GVA		19,883,199,352	29,775,153,692	24,570,304,786	74,228,657,830
Taxes, all sources					16,931,648,274
Alabama	**LQ = 1.8**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		4,202	7,333	5,476	17,069
Income		272,629,001	425,448,545	234,510,017	934,950,117
GVA		432,307,360	673,501,853	431,648,768	1,555,603,779
Taxes, all sources					343,565,508
Alaska	**LQ = 2.4**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		121	666	801	1,567
Income		10,635,768	84,325,789	42,305,099	136,155,976
GVA		41,295,721	404,865,418	86,092,606	534,779,793
Taxes, all sources					394,309,175
Arizona	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,603	2,407	2,753	6,775
Income		99,377,619	131,192,265	134,586,818	367,288,528
GVA		119,087,776	214,250,548	232,621,380	570,658,617
Taxes, all sources					132,224,598
Arkansas	**LQ = 1.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,604	3,920	2,664	8,249
Income		87,031,278	215,841,889	110,946,828	417,190,036
GVA		189,306,340	357,931,201	210,192,179	766,264,244
Taxes, all sources					174,907,307

California	LQ = 0.6	Direct	Indirect	Induced	Total
Employment		10,259	15,745	20,412	46,176
Income		930,921,949	1,224,224,417	1,219,846,759	3,352,243,388
GVA		2,107,701,686	1,901,096,396	2,141,433,329	6,089,416,521
Taxes, all sources					1,459,316,542
Colorado	**LQ = 1.2**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		2,316	5,202	7,104	14,477
Income		164,944,608	552,727,700	364,037,944	1,075,239,782
GVA		259,053,202	736,529,633	628,265,049	1,608,128,239
Taxes, all sources					445,369,991
Connecticut	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		754	1,471	1,955	4,201
Income		72,527,756	131,569,557	137,586,900	343,936,459
GVA		79,676,047	200,962,642	232,594,167	518,590,464
Taxes, all sources					134,561,458
Delaware	**LQ = 0.7**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		224	369	521	1,110
Income		22,201,228	30,002,765	31,258,531	82,740,911
GVA		57,715,799	61,491,457	66,137,037	184,112,460
Taxes, all sources					35,124,200
District of Columbia	**LQ = 0.3**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		359	402	397	1,168
Income		41,286,994	49,650,516	40,425,406	132,873,452
GVA		50,318,680	62,301,834	51,329,817	165,929,409
Taxes, all sources					31,116,562
Florida	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		5,465	7,393	7,940	20,823
Income		317,756,318	396,549,239	362,589,651	1,079,541,225
GVA		439,644,929	625,924,132	639,604,878	1,715,852,381
Taxes, all sources					419,241,837

Georgia	LQ = 0.8	Direct	Indirect	Induced	Total
Employment		4,056	6,692	6,975	17,715
Income		255,017,860	409,412,553	334,988,764	1,000,091,590
GVA		376,671,259	652,234,371	614,645,674	1,650,197,654
Taxes, all sources					368,408,101
Hawaii	**LQ = 0.2**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		52	246	295	593
Income		3,438,612	12,732,305	13,857,020	30,073,876
GVA		4,033,856	23,487,443	26,768,820	54,427,251
Taxes, all sources					13,836,546
Idaho	**LQ = 1.1**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		977	1,655	1,365	3,982
Income		56,329,939	81,120,065	55,436,390	190,811,952
GVA		87,082,782	118,529,599	93,195,066	298,463,061
Taxes, all sources					69,211,296
Illinois	**LQ = 1.6**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		9,418	15,107	16,627	41,270
Income		811,470,957	1,112,357,754	897,005,564	2,832,486,367
GVA		1,685,965,202	1,702,887,083	1,582,559,757	5,018,322,999
Taxes, all sources					1,140,990,374
Indiana	**LQ = 1.3**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		3,338	6,694	6,215	16,360
Income		243,763,945	413,723,641	283,470,547	948,792,522
GVA		544,196,816	685,541,220	531,175,019	1,778,509,999
Taxes, all sources					369,325,801
Iowa	**LQ = 0.9**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,628	2,591	2,741	6,950
Income		134,657,615	155,608,641	127,192,385	414,602,946
GVA		169,611,374	242,570,497	232,339,392	644,612,544
Taxes, all sources					144,602,109

Kansas	LQ = 1.4	Direct	Indirect	Induced	Total
Employment		1,584	4,157	3,344	9,083
Income		146,401,184	235,455,816	147,386,183	524,795,876
GVA		286,841,382	311,668,862	260,690,084	852,939,493
Taxes, all sources					204,347,726
Kentucky	**LQ = 1.2**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		3,510	4,683	3,850	12,050
Income		194,691,009	241,798,359	168,949,772	605,891,092
GVA		321,313,800	384,740,343	302,255,593	1,011,217,467
Taxes, all sources					225,373,617
Louisiana	**LQ = 2.9**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		2,820	7,318	6,720	16,871
Income		266,143,663	537,590,077	295,745,308	1,095,153,677
GVA		1,538,462,361	891,349,723	553,985,766	2,941,928,381
Taxes, all sources					567,074,863
Maine	**LQ = 0.7**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		572	1,205	897	2,675
Income		29,628,831	54,451,091	37,493,718	121,476,914
GVA		37,885,570	72,791,768	65,678,184	176,621,721
Taxes, all sources					44,674,553
Maryland	**LQ = 0.4**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,910	2,111	2,483	6,497
Income		145,058,554	140,749,957	135,861,246	421,610,060
GVA		179,232,913	211,966,614	242,594,743	633,499,761
Taxes, all sources					154,844,537
Massachusetts	**LQ = 0.4**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,545	2,160	3,161	6,864
Income		129,588,178	186,804,897	216,939,018	533,363,158
GVA		153,267,889	262,403,692	336,719,893	754,592,821
Taxes, all sources					182,394,534

Michigan	LQ = 0.7	Direct	Indirect	Induced	Total
Employment		2,941	6,048	6,187	15,266
Income		202,520,591	391,889,004	302,171,762	905,863,200
GVA		291,040,274	577,335,240	517,980,906	1,404,701,277
Taxes, all sources					329,173,767
Minnesota	**LQ = 0.7**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,636	3,033	3,869	8,518
Income		139,282,556	214,958,385	213,198,834	565,036,066
GVA		351,984,642	333,617,737	365,297,789	1,042,345,379
Taxes, all sources					230,051,480
Mississippi	**LQ = 1.3**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,375	3,209	2,222	6,838
Income		87,546,627	167,142,620	83,673,885	338,927,555
GVA		189,975,608	238,430,996	159,792,469	590,732,300
Taxes, all sources					144,328,166
Missouri	**LQ = 0.8**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		2,324	4,364	4,307	11,034
Income		155,627,408	261,210,682	203,884,039	622,374,975
GVA		177,987,159	387,288,639	355,994,207	927,461,181
Taxes, all sources					208,020,278
Montana	**LQ = 1.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		507	1,224	984	2,713
Income		34,906,140	63,914,472	38,529,198	136,528,214
GVA		124,860,674	104,345,038	66,858,318	292,804,592
Taxes, all sources					73,337,680
Nebraska	**LQ = 0.9**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		932	1,637	1,732	4,298
Income		58,227,863	120,678,228	85,418,432	264,136,066
GVA		73,024,054	182,791,745	155,034,666	411,739,594
Taxes, all sources					90,463,060

Nevada	LQ = 0.5	Direct	Indirect	Induced	Total
Employment		720	1,322	1,202	3,273
Income		43,594,200	72,684,695	57,114,473	174,916,352
GVA		61,480,498	123,637,848	106,809,489	294,924,918
Taxes, all sources					70,698,265
New Hampshire	**LQ = 0.6**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		374	840	794	2,026
Income		24,212,400	52,787,714	42,832,710	121,221,605
GVA		25,700,559	70,924,292	68,630,971	167,693,019
Taxes, all sources					40,054,739
New Jersey	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,934	3,331	4,385	9,653
Income		175,318,669	285,274,433	283,999,395	744,194,375
GVA		311,027,930	406,756,410	475,937,459	1,190,661,012
Taxes, all sources					309,829,786
New Mexico	**LQ = 1.0**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		399	1,537	1,223	3,155
Income		24,533,107	99,422,994	49,762,570	172,622,744
GVA		73,706,739	219,261,133	96,534,941	386,771,775
Taxes, all sources					129,791,396
New York	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		5,097	8,308	11,175	24,608
Income		483,529,801	816,628,948	838,934,171	2,140,534,107
GVA		573,388,848	1,178,870,353	1,378,742,997	3,144,495,323
Taxes, all sources					806,608,077
North Carolina	**LQ = 0.6**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		3,114	5,101	5,414	13,629
Income		209,211,010	297,745,980	255,347,377	763,103,690
GVA		345,442,109	489,771,466	478,824,362	1,316,179,251
Taxes, all sources					283,980,748

North Dakota	LQ = 1.6	Direct	Indirect	Induced	Total
Employment		254	1,042	902	2,193
Income		23,693,546	85,537,955	43,803,254	152,105,707
GVA		87,929,715	192,129,344	79,105,048	355,884,390
Taxes, all sources					135,873,250
Ohio	**LQ = 1.2**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		4,616	10,219	9,886	24,896
Income		312,627,806	651,821,747	473,288,098	1,450,843,681
GVA		1,012,522,720	1,071,403,063	862,668,308	2,956,530,693
Taxes, all sources					604,179,585
Oklahoma	**LQ = 2.6**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,188	8,514	8,635	18,232
Income		89,060,727	862,775,196	391,098,897	1,338,821,046
GVA		188,825,317	1,177,979,111	673,382,078	2,027,547,983
Taxes, all sources					597,863,150
Oregon	**LQ = 1.6**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		3,532	7,010	5,894	16,484
Income		239,262,691	446,026,014	271,625,253	959,805,714
GVA		254,439,528	650,178,268	477,194,852	1,398,314,700
Taxes, all sources					348,214,255
Pennsylvania	**LQ = 1.3**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		5,723	13,944	14,062	34,001
Income		477,122,191	1,104,961,443	763,588,492	2,367,738,331
GVA		715,403,572	1,629,540,586	1,267,900,635	3,657,390,486
Taxes, all sources					875,562,190
Rhode Island	**LQ = 0.4**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		202	363	428	998
Income		13,279,904	25,538,361	23,830,140	63,177,116
GVA		16,997,168	36,395,619	40,155,504	94,329,631
Taxes, all sources					23,076,612

South Carolina	LQ = 1.2	Direct	Indirect	Induced	Total
Employment		2,679	4,803	3,940	11,508
Income		176,784,152	269,240,393	167,044,855	619,187,760
GVA		256,058,703	420,352,621	308,572,554	1,005,271,374
Taxes, all sources					236,835,060
South Dakota	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		283	499	502	1,276
Income		14,960,842	24,763,715	23,662,792	62,652,195
GVA		18,664,108	42,194,708	43,488,340	103,691,704
Taxes, all sources					21,558,456
Tennessee	**LQ = 1.0**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		2,738	5,092	5,860	13,680
Income		299,693,569	304,099,216	299,153,344	894,070,209
GVA		393,569,840	459,170,084	488,358,358	1,339,886,912
Taxes, all sources					283,258,973
Texas	**LQ = 2.3**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		12,119	40,636	54,125	106,139
Income		1,266,176,023	4,683,639,296	2,786,471,954	8,691,918,615
GVA		3,679,455,321	6,807,056,321	4,796,475,140	15,148,298,565
Taxes, all sources					2,703,523,778
Utah	**LQ = 1.0**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		1,146	1,918	2,108	5,184
Income		81,068,292	115,777,641	93,280,180	290,817,226
GVA		213,768,076	203,173,371	168,945,014	586,060,382
Taxes, all sources					127,912,490
Vermont	**LQ = 0.5**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		199	426	292	919
Income		9,270,938	16,769,562	13,183,774	39,290,514
GVA		11,621,376	24,020,090	21,932,264	57,876,089
Taxes, all sources					14,837,771

Virginia	LQ = 0.8	Direct	Indirect	Induced	Total
Employment		4,393	6,505	6,326	17,254
Income		320,986,619	472,182,403	325,474,534	1,126,541,636
GVA		411,881,817	677,881,738	572,019,488	1,676,687,480
Taxes, all sources					396,448,696
Washington	**LQ = 0.8**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		3,039	4,314	4,259	11,579
Income		248,071,326	297,172,202	226,915,274	769,920,956
GVA		516,660,283	449,980,905	409,272,828	1,374,397,765
Taxes, all sources					318,757,648
West Virginia	**LQ = 1.1**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		648	2,047	1,234	3,949
Income		33,863,097	99,819,244	52,795,732	187,183,828
GVA		59,631,529	175,776,068	98,274,338	334,548,270
Taxes, all sources					87,297,142
Wisconsin	**LQ = 0.9**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		2,428	4,851	4,744	12,085
Income		157,947,604	302,969,026	226,623,471	693,386,624
GVA		221,196,037	458,056,692	405,787,690	1,098,925,231
Taxes, all sources					257,832,134
Wyoming	**LQ = 2.0**	**Direct**	**Indirect**	**Induced**	**Total**
Employment		249	1,102	761	2,111
Income		21,733,999	93,448,078	32,502,823	147,233,613
GVA		64,282,403	187,807,876	67,806,574	317,837,495
Taxes, all sources					127,458,406



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