

**The U.S. Tire Manufacturing  
Economic Impact Study**

**Methodology and Documentation  
Prepared for:**



**U.S. Tire Manufacturers Association**

**By**

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## Executive Summary

The 2022 U.S. Tire Manufacturing Economic Impact Study estimates the economic contributions made by the tire industry to the U.S. economy in 2022. John Dunham & Associates (JDA) conducted this research, which was funded by the U.S. Tire Manufacturers Association. This work used standard econometric models first developed by the U.S. Forest Service, and now maintained by IMPLAN Inc. Data came from industry sources, government publications and Data Axe.

The study defines the US tire industry as tire manufacturing and retread services in the US that includes all motor vehicle tire manufacturers<sup>1</sup>, tire wholesalers, and tire retail establishments. Rubber manufacturers' other revenue streams (i.e. blimps, non-tire), bicycle tires and other non-vehicle tires, auto manufacturers were not included in the study.

The study measures the number of jobs in this sector, the wages paid to employees, and total economic output. In addition, it measures the economic impact of the suppliers that support the tire industry, as well as those industries supported by the induced spending of direct and supplier industries.

Industries are linked to each other when one industry buys from another to produce its own products. Each industry in turn makes purchases from a different mix of other industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started by the tire industry generates output (and jobs) in hundreds of other industries, often in states far removed from the original economic activity. The impact of supplier firms, and the “induced impact” of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of the US. The study calculates the impact on a national basis, by state, and by congressional district.

The study also estimates taxes paid by the industry and its employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. Direct retail taxes include license fees and applicable gross receipt taxes. The tire industry pays real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality. All entities engaged in business activity generated by the industry pay similar taxes

The tire industry is a dynamic part of the U.S. economy, accounting for about \$170.59 billion in total economic output or about 0.79 percent of GDP.<sup>2</sup> Tire manufacturers, tire wholesalers, and tire retailers directly employ approximately 291,623 Americans in 2022. These workers earned over \$21.15 billion in wages and benefits. When supplier and induced impacts are taken into account, the industry is responsible for 801,665 jobs in the United States and \$54.47 billion in wages; as well as \$18.80 billion in federal, state and local taxes. This does not include state and local sales taxes or excise taxes that may apply for specific retail services.

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<sup>1</sup> For purposes of the 2022 USTMA Economic Impact Study tire manufacturers include all motor vehicle tire manufacturers in the US, tire shops and service centers owned by tire manufacturers, foreign companies that manufacture in the U.S. and their offices, US offices of foreign companies that do not manufacture in the US. To avoid double calculation, tire shops and service centers owned by tire manufacturers were excluded from the retail segment while calculating the segment's employment, wages, and output.

<sup>2</sup> Based on GDP of \$21,542.54 billion. See: Table 3, Gross Domestic Product, Fourth Quarter and Year 2021 (Advance Estimate), News Release, US Department of Commerce, Bureau of Economic Analysis, January 27, 2022, online at: <https://www.bea.gov/news/2022/gross-domestic-product-fourth-quarter-and-year-2021-advance-estimate>

## **Summary Results**

The 2022 U.S. Tire Manufacturing Economic Impact Study measures the impact of the tire industry, as defined by the tire manufacturing, tire wholesaling, retail establishments on the entire economy of the United States. The industry contributes about \$170.59 billion in economic output equal to about 0.79 percent of GDP and, through its production and distribution linkages, impacts firms in 524 sectors of the US economy.

Manufacturers include companies that produce all motor vehicle tires, tire shops and service centers owned by tire manufacturers, foreign companies that manufacture in the U.S. and their offices, U.S. offices of foreign companies that do not manufacture in the U.S. Approximately 99,724 people employed in tire manufacturing operations.

Once tires have been produced, they must be distributed to stores throughout the country by distributors and wholesalers. All told, approximately 29,363 individuals are employed in tire wholesaling sector of the economy.

Finally, the tire industry includes thousands of retailers that directly sell products to the consumer. These include a wide range of retailers including tire dealers, tire stores, warehouse clubs and supercenters, car dealers, and repair shops. For the retail stores segment, only the percentage of employees involved in the sale of tires are included. JDA estimates that there are 162,536 people employed in the retail establishments.

Other firms are related to the tire industry are suppliers. These firms produce and sell a broad range of items including rubber, steel, nylon, and other chemical compounds. In addition, supplier firms provide a broad range of services, including personnel services, financial services, advertising services, consulting services or transportation services. JDA estimates that the industry is responsible for 238,482 supplier jobs. These firms generate about \$51.56 billion in economic activity.

An economic analysis of the tire industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the industry's indirect firms are part of the industry being analyzed,<sup>3</sup> the spending by employees of the industry, and that of indirect firms whose jobs are directly dependent on the tire industry, should be included. This spending - on everything from housing, to food, to education and medical care - comprises what is traditionally called the "induced impact," or multiplier effect, of the tire industry. For 2022, the induced impact of the industry generates 271,560 jobs and \$50.65 billion in economic impact, for a multiplier of 0.74.<sup>4</sup>

An important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the country. In the case of the tire industry, the direct taxes paid by firms and their employees provide \$12 billion to the federal government and \$6.81 billion to state and local governments.

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<sup>3</sup> These firms would more appropriately be considered as part of the indirect firm's industries.

<sup>4</sup> Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the induced industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation only to the effect of spending by direct and indirect employees.

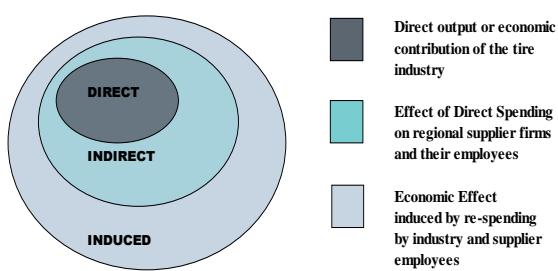
**Table 1 – Economic Contribution of the Tire Industry**

	Direct	Indirect	Induced	Total
Jobs	291,623	238,482	271,560	801,665
Wages	\$21,145,671,400	\$16,494,560,900	\$16,830,697,800	\$54,470,930,100
Economic Impact	\$68,380,224,600	\$51,560,749,200	\$50,648,371,700	\$170,589,345,500
State and Local Taxes				\$6,806,100,300
Federal Taxes				\$11,996,853,200

Table 1 above presents a summary of the total economic impact of the tire industry in the United States. Summary tables for the United States, individual states, and congressional districts are included in the Output Model, which is discussed in the following section.

### Economic Impact Modeling – Summary

The economic impact study begins with an accounting of the direct employment in the tire industry. The data comes from a variety of government and private sources.



It is sometimes mistakenly thought that initial spending accounts for all of the impact of an economic activity or a product. For example, at first glance it may appear that consumer expenditures for a product are the sum total of the impact on the local economy. However, a single economic activity leads to a ripple effect wherein other sectors and industries benefit from this initial spending. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.

The economic activities of events are linked to other industries in the state and national economies. Activities related to the tire industry represent the direct effects on the economy. Indirect impacts occur when these activities require purchases of goods and services such as advertising services or merchandising material from local or regional indirect firms. Additional induced impacts occur when workers involved in direct and indirect activities spend their wages. The ratio between induced output and direct output is termed the multiplier.

This method of analysis allows the impact of local production activities to be quantified in terms of final demand, earnings, and employment in the states and the nation as a whole.

Once the direct impact of the industry has been calculated, the input-output methodology discussed below is used to calculate the contribution of the indirect sector and of the re-spending in the economy by employees in the industry and its indirect firms. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the USTMA model, only the most conservative estimate of the induced impact has been used.

## Model Description and Data

This economic impact analysis was developed by JDA based on data provided U.S. Tire Manufacturers Association, Data Axle, and other industry sources. The analysis utilizes the IMPLAN, Inc Model in order to quantify the economic impact of the tire industry on the economy of the United States, as well as individual states and congressional districts.<sup>5</sup> The model adopts an accounting framework through which the relationships between different inputs and outputs across industries and sectors are computed. This model can show the impact of a given economic decision – such as a factory opening or operating a sports facility – on a pre-defined, geographic region. It is based on the national income accounts generated by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).<sup>6</sup>

Every economic impact analysis begins with a description of the industry being examined. In the case of the tire industry it is defined as the three components of the United States' tire industry.

This will incorporate firms in the following economic sectors:

- ❖ Manufacturers: includes all motor vehicle tire manufacturers in the US, tire shops and service centers owned by tire manufacturers foreign companies that manufacture in the U.S. and their offices, U.S. offices of foreign companies that do not manufacture in the U.S.
- ❖ Wholesalers: includes firms involved in the distribution and storage of tires
- ❖ Retailers: includes firms involved in the sale of tires. This sector includes retail establishments (e.g. tire dealers and tire shops, auto departments in discount department stores, warehouse clubs and supercenters, and various other automotive repair shops). For purposes of this study, the retail sector does not include tire shops and service centers owned by tire manufacturers.<sup>7</sup>

The IMPLAN, Inc model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see IMPLAN Methodology section) to generate estimates of the other direct impacts, tax impacts and supplier and induced impacts based on these entries. In the case of the USTMA model, direct employment in the packaging industry is a base starting point for the analysis. Direct employment is based on data provided to JDA by Data Axle as of January 2022, data from USTMA, and United States census data. Data Axle data is recognized nationally as a premier source of micro industry data. Their database contains information on over 15 million businesses in the United States.<sup>8</sup> It is used extensively for credit reporting, and according to the vendor, encompasses about 98 percent of all business enterprises in the country. This data is gathered at the facility level; therefore, a company with a manufacturing plant, warehouse and sales office would have three facilities, each with separate employment counts. Since the Data Axle data are adjusted on a continual basis, staff from JDA scanned the data for discrepancies.

<sup>5</sup> The model uses 2020 input/output accounts.

<sup>6</sup> RIMS II is a product developed by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool. IMPLAN was originally developed by the US Forest Service, the Federal Emergency Management Agency and the Bureau of Land Management. It was converted to a user-friendly model by IMPLAN Inc. in 1993.

<sup>7</sup> Rubber manufacturers' other revenue streams (i.e. blimps, non-tire), bicycle tires and other non-vehicle tires like toy tires, wagon tires, tires for wheelbarrows etc., auto manufacturers are not included in the study.

<sup>8</sup> Data Axle is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Data Axle gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Data Axle verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

Once the initial direct employment figures have been established, they are entered into a model linked to the IMPLAN database. The IMPLAN data are used to generate estimates of direct wages and output. Wages are derived from data from the U.S. Department of Labor's ES-202 reports that are used by IMPLAN to provide annual average wage and salary establishment counts, employment counts and payrolls at the county level. Since this data only covers payroll employees, it is modified to add information on independent workers, agricultural employees, construction workers, and certain government employees. Data are then adjusted to account for counties where non-disclosure rules apply. Wage data include not only cash wages, but health and life insurance payments, retirement payments and other non-cash compensation. It includes all income paid to workers by employers.

Total output is the value of production by industry in a given state. It is estimated by IMPLAN from sources similar to those used by the BEA in its RIMS II series. Where no Census or government surveys are available, IMPLAN uses models such as the Bureau of Labor Statistics Growth model to estimate the missing output.

The model also includes information on income received by the federal, state, and local governments, and produces estimates for the following taxes at the federal level: corporate income, payroll, personal income, estate and gift, excise taxes, customs duties, and fines, fees, etc. State and local tax revenues include estimates of corporate profits, property, sales, severance, estate and gift and personal income taxes, licenses and fees and certain payroll taxes.

While IMPLAN is used to calculate the state level impacts, Data Axle data provide the basis for legislative district level estimates. Publicly available data at the county and congressional district level is limited by disclosure restrictions, especially for smaller sectors of the economy. Our model therefore uses actual physical location data provided by Data Axle in order to allocate jobs – and the resulting economic activity – by physical address or when that is not available, zip code. For zip codes entirely contained in a single congressional district, jobs are allocated based on the percentage of total sector jobs in each zip. For zips that are broken by congressional districts, allocations are based on the percentage of total jobs physically located in each segment of the zip. Physical locations are based on either actual address of the facility, or the zip code of the facility, with facilities placed randomly throughout the zip code area. All supplier and indirect jobs are allocated based on the percentage of a state's employment in that sector in each of the districts. Again, these percentages are based on Data Axle data.

## **Data and Modeling Considerations When Comparing 2022 with Earlier Studies**

This is the second economic impact study that JDA has conducted for the US tire industry. An earlier study was completed in 2017. While the methodology is similar, the 2022 study categorizes direct jobs differently than the 2017 study. In the 2017 study, the economic impact of tire shops and service centers owned by tire manufacturers were estimated under the retail segment, while in the 2022 study, the economic impact of the category was moved to the manufacturer segment. These differences should be kept in mind when comparing the two studies as outlined in Table 2 on the next page.

**Table 2 – Top Line Comparison, 2017 and 2022 Models**

	Jobs		Wages		Output	
	2017	2022	2017	2022	2017	2022
Manufacturing	62,013	99,724	4,955,084,300	\$8,146,174,500	\$27,559,833,600	\$33,945,481,200
Wholesaling	31,668	29,363	2,825,005,000	\$2,334,266,600	\$7,878,542,600	\$11,920,358,900
Retailing	190,553	162,536	11,783,958,000	\$10,665,230,300	\$23,891,468,100	\$22,514,384,500
Total Direct	284,234	291,623	19,564,047,300	\$21,145,671,400	\$59,329,844,300	\$68,380,224,600
Total Supplier	183,715	238,482	\$11,749,768,200	\$16,494,560,900	\$43,336,481,300	\$51,560,749,200
Total Induced	269,061	271,560	\$14,189,374,200	\$16,830,697,800	\$45,697,168,700	\$50,648,371,700

### IMPLAN Methodology<sup>9</sup>

Francoise Quesnay one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy. It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios, or as estimates. The Minnesota IMPLAN, Inc gathers this data, converts it into a consistent format, and estimates the missing components.

There are three different levels of data generally available in the United States: Federal, state and county. Most of the detailed data are available at the county level, but there are many issues with disclosure – especially in the case of smaller industries. IMPLAN overcomes these disclosure problems by combining a large number of datasets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the US Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one.

<sup>9</sup> This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The 224 sector BLS model is mapped to the 546 sectors of the IMPLAN model. Where data are missing, deflators from BEA's Survey of Current Businesses are used.

Finally, one of the most important parts of the IMPLAN model, the Regional Purchase Coefficients (RPCs) must be derived. IMPLAN is derived from a national model, which represents the “average” condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 546 sector IMPLAN model.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final datasets and matrices are not released before extensive testing takes place.