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AFPM

THE ECONOMIC CONTRIBUTION OF U.S. PETROLEUM REFINERIES

A REPORT FOR THE AMERICAN FUEL & PETROCHEMICAL MANUFACTURERS

JULY 2024

OXFORD ECONOMICS

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EXECUTIVE SUMMARY

This report, commissioned by the American Fuel & Petrochemical Manufacturers (AFPM) and prepared by Oxford Economics, examines the contribution of the petroleum refining industry to the U.S. economy in 2022.

By the end of 2022,[1] the United States had 129 operable petroleum refineries with combined crude oil distillation capacity of 18.1 million barrels per day. These facilities directly employed 64,500 workers to produce $826 billion worth of the petroleum products that are essential for the U.S. economy and society, including:

- petroleum-based transportation fuels like gasoline, diesel, and aviation fuels, as well as space heating fuels like heating oil and kerosene;
- feedstocks for petrochemical manufacturing that are used to make the basic building blocks for plastics; and
- additional important petroleum-based products like asphalt and specialty products such as waxes and lubricants.

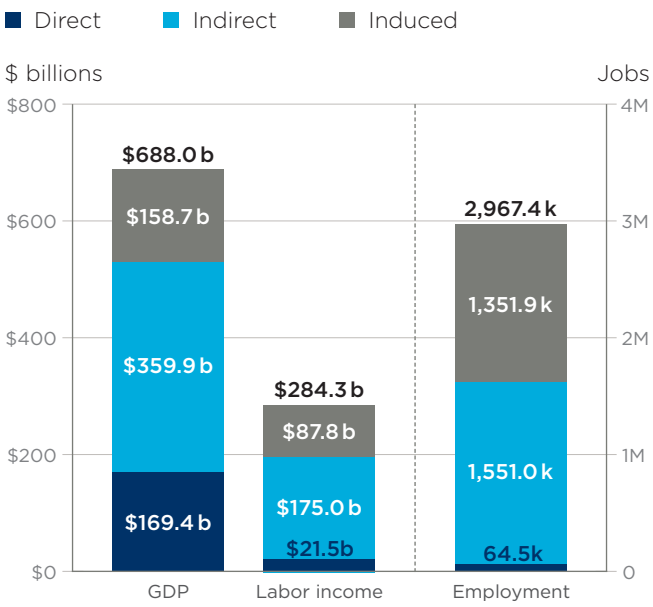
THE ECONOMIC CONTRIBUTION OF THE U.S. PETROLEUM REFINING INDUSTRY

In 2022, activities at petroleum refineries contributed $688 billion of economic output or gross domestic product (GDP) across the United States and supported nearly 3 million jobs providing $284 billion in labor income (Fig. 1).[2] This economic activity generated $162 billion in federal, state, and local tax revenues.

This economic footprint included the economic activity at refineries, which is referred to as the **direct** contribution; the activity that resulted from refinery purchases of materials and services from suppliers, referred to as the **indirect** or supply chain contribution; and the spending out of wages by workers employed directly by refineries as well as those employed by suppliers, the **induced** contribution.

The refining industry's jobs multiplier—a measure of how direct employment in the refining industry translates into employment in the wider economy—is 46,[3] the highest of any industry. This means that for every worker

Fig. 1. Summary of petroleum refineries' economic impacts, 2022



Source: Oxford Economics

1 The economic contribution results are calculated for 2022, which is the most recent year available for the data required. To maintain consistency, other statistics presented in the report are benchmarked to 2022 where possible.

2 Labor income represents the total value of all forms of employment compensation, e.g., wages and salaries, benefits, payroll taxes, and includes earnings by the self-employed.

3 The jobs multiplier is calculated as the ratio of total jobs (direct, indirect, and induced) to direct jobs.

46x

The refining industry's jobs multiplier of 46 is the highest of any industry.

$334,000

At $334,000 per direct worker, compensation in the U.S. refining industry is among the highest of any industry.

employed at a petroleum refinery, 45 other jobs are supported throughout the economy. The refining industry's high jobs multiplier reflects the industry's exceptionally high labor productivity and large economic footprint. In the refining industry, worker compensation, which includes wages/salaries and benefits, is among the highest of any industry, on average $334,000 per direct worker.[4]

The refining industry makes a significant contribution to U.S. GDP with relatively few workers. In 2022 refineries directly contributed $169 billion with 64,500 workers, an average contribution of $2.6 million per worker, about 16 times higher than labor productivity in the U.S. economy as a whole.

The refining industry's GDP multiplier, which measures how the economic activity of the refining industry translates into economic activity in the wider economy, is 4.1 and reflects the high productivity of the industry. For every $1 of GDP the industry generated directly, an additional $3.10 of economic activity was supported elsewhere in the economy.

The indirect or supply chain contribution of the industry totaled $360 billion and was most significant in the oil and gas extraction industry and in business services, which includes professional, scientific, administrative, support, and management services. Supply chain spending was also significant in the wholesale and retail trade and transport sectors, which include companies whose primary purpose is to move and store goods and connect buyers and sellers.

Wage-induced spending by those employed either directly or indirectly (through the supply chain) contributed an additional $159 billion nationally in 2022.

All of the economic activity supported by the industry generated $162 billion in federal, state, and local taxes: $77 billion at the federal level; $47 billion at the state level; and $38 billion at the local level.[5]

All 50 states and Washington, D.C. benefit from the refining industry's contributions to GDP, jobs, and tax revenues. The economic impact is greatest in Texas, California, and Louisiana.

Fig. 2. Top state-level economic contributions of the petroleum refining industry, 2022

State	GDP contribution ($ billions)	Jobs contribution
Texas	$274.5	1,108,900
California	$79.7	257,200
Louisiana	$44.5	180,900

4 Please note that the $334,000 refers to compensation of employees at refineries and excludes compensation of employees that work elsewhere (for example, at corporate offices).

5 These tax totals exclude excise or sales taxes on the refining industry's output, such as gasoline taxes.

WIDER CONTRIBUTION

10%

The U.S. refining industry has the highest capital investment share of GDP of any major manufacturing industry.

37%

Petroleum-derived products supplied 37 percent of U.S. energy demand in 2022.

$102 billion

Exports of refined petroleum products contributed $102 billion to the U.S. balance of trade in 2022.

Petroleum refining is a capital-intensive industry. In 2019–2021, U.S. refineries invested on average $9 billion per year, equivalent to 10 percent of the industry's direct GDP, to maintain, upgrade and expand refinery operations.[6] This was the highest capital investment share of GDP of any major manufacturing industry. U.S. refiners have continued to invest, completing capital projects that had been delayed due to the COVID-19 pandemic and increasing U.S. refining capacity.

This high level of capital investment reflects and reinforces the complexity or sophistication of the U.S. refining industry. Complex petroleum refineries have specialized process units to produce more products of higher value, like gasoline and diesel fuel, and have greater flexibility in the choice of feedstocks. U.S. refineries are among the most complex and as a result among the most competitive in the world.

Petroleum-derived products are essential for meeting U.S. energy demand and in 2022 supplied 37 percent of that demand, more than that supplied by any other single source of energy.

In addition to supplying U.S. demand for transportation fuels and other products, U.S. refineries are major suppliers of refined products to the growing global market. Since 2011, the United States has been a net exporter of refined petroleum products, and in 2022, the U.S. exported 91 billion gallons of gasoline, diesel, jet fuel, and other refined products to 150 countries, contributing $102 billion to the U.S. balance of trade.

While petroleum products are primarily transportation fuels, like gasoline, diesel, and jet fuel, they also include other petroleum products that are used in the residential, commercial, and industrial sectors, like fuel oils used for power generation and space heating, and asphalt, lubricants, and waxes.

CONCLUSION

This report demonstrates the integral role of the petroleum refining industry in the U.S. economy. The U.S. has one of the most efficient and competitive refining systems in the world and the sector makes a significant economic contribution to U.S. GDP, employment, and generation of tax revenues at all levels of government. The U.S. refining industry also makes a sizable positive contribution to the U.S. trade balance. Its employees are among the most productive and best compensated in the U.S. economy. Its products help power the U.S and global economy, supplying over a third of U.S. energy demand, and supplying product to meet growing global energy demand as well.

6 This is the most recent data available as the Annual Survey of Manufacturers (ASM) was discontinued after the 2021 survey year.

1. INTRODUCTION

Petroleum refineries are large industrial facilities where crude oil is converted into high value petroleum products. These products are essential for the economy, whether as fuels for personal and business transportation, ingredients for an array of manufacturing processes, or chemical products that contribute to a wide range of consumer products.

At the end of 2022,[7] the United States had 129 operable petroleum refineries[8] directly employing 64,500 workers to produce $826 billion worth of petroleum products.[9]

This report evaluates the full economic contribution of the U.S. refining industry in terms of GDP, employment and taxes generated. This full economic contribution includes not just the activity that takes place at refineries, but also the economic activity of the businesses that make up the refineries' supply chain and that provide goods and services to the industry's employees.

The balance of the report is organized as follows:

- **Chapter 2** presents the results of the economic contribution analysis described above.
- **Chapter 3** considers the wider contribution of the petroleum refining industry and covers a number of additional topics related to the economics of petroleum refineries, including: the end use of petroleum products, the prices of the industry's inputs and outputs, capital investment in refineries, and petroleum refineries' contribution to U.S. trade.
- **Chapter 4** offers concluding thoughts.
- The **Appendix** provides detailed state-level economic impact results.

7 To maintain consistency, this report will present 2022 data throughout unless otherwise stated.

8 See https://www.eia.gov/tools/faqs/faq.php?id=29&t=10.

9 Unless otherwise stated, economic data in this report are from IMPLAN, which is the economic impact software used to calculate the industry's economic contribution (see https://implan.com/). IMPLAN data integrate multiple government sources of data into a consistent framework, including data from the Bureau of Economic Analysis' (BEA) Input-Output tables, the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages, and the Census Bureau's Annual Survey of Manufactures. Because IMPLAN data adjust multiple data sources to be consistent with one another, specific values may not match those reported in the original government data, although they will be close.

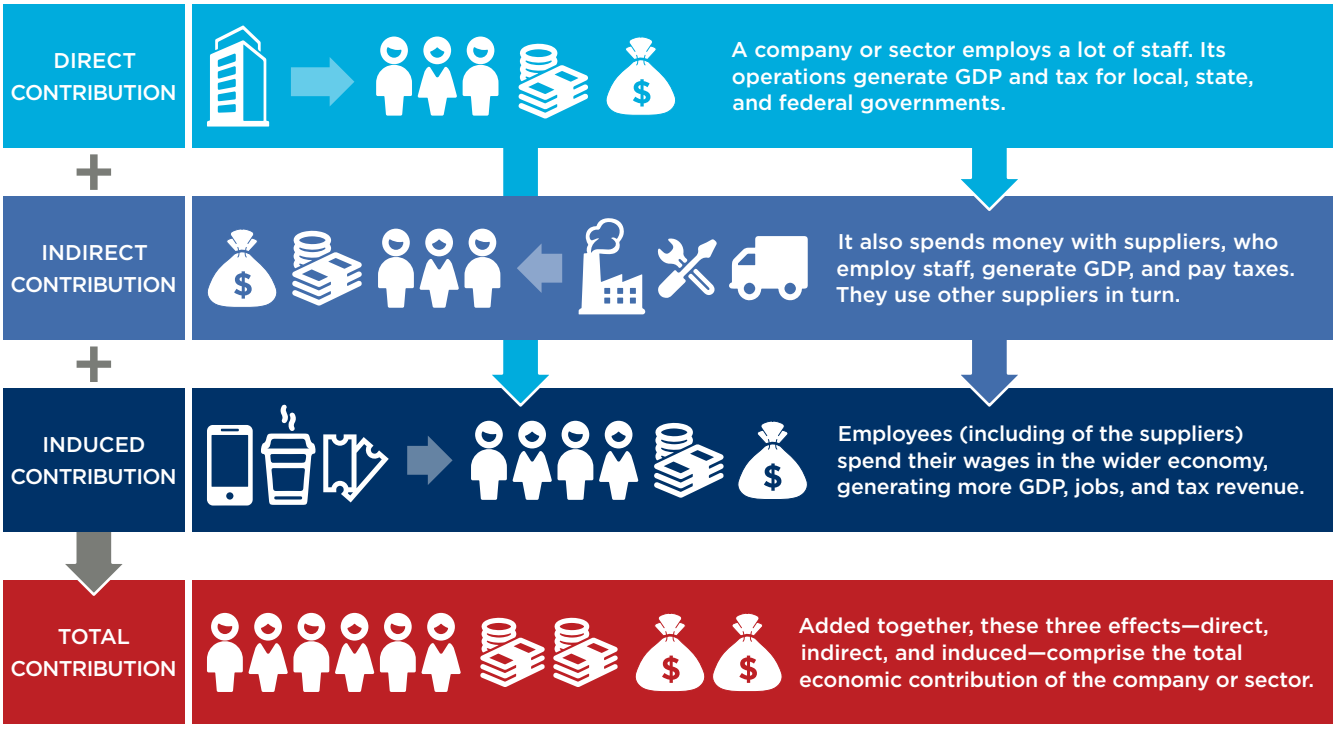
2. ECONOMIC CONTRIBUTION

In this chapter, we analyze the economic footprint of the petroleum refining industry using a standard method of analysis called an economic contribution assessment.[10] This involves quantifying the sector's contribution across three channels:

- **Direct contribution**, which relates to the refining industry's own activities. It encompasses the economic activity and employment at refineries themselves.
- **Indirect contribution**, which encapsulates the economic activity and employment supported in the U.S. supply chain of petroleum refineries as a result of their procurement of goods and services as production inputs.
- **Induced contribution**, which comprises the wider economic benefits that arise when employees at refineries, or in their supply chain, spend their earnings—for example, in local retail and leisure establishments.

The sum of these channels makes up the refining industry's total economic contribution.

Fig. 3. Overview of economic contribution analysis



10 Economic contribution analysis is similar to economic impact analysis. The difference between the two is that impact analysis quantifies the full economic footprint of a company or an establishment, while economic contribution analysis considers the footprint of an entire industry. Because in an economic contribution analysis the entire industry is part of the direct channel, supply chain purchases that one petroleum refinery (or its suppliers) make from other refineries are suppressed to avoid double-counting. Because of the close association between the refining and petrochemical industries this report also excludes supply chain purchases of petrochemical manufacturing inputs.

Three metrics are used to evaluate the sector's economic contribution:

- employment, measured on a headcount basis;
- GDP, value-added economic output; and
- taxes, generated by the economic activity.

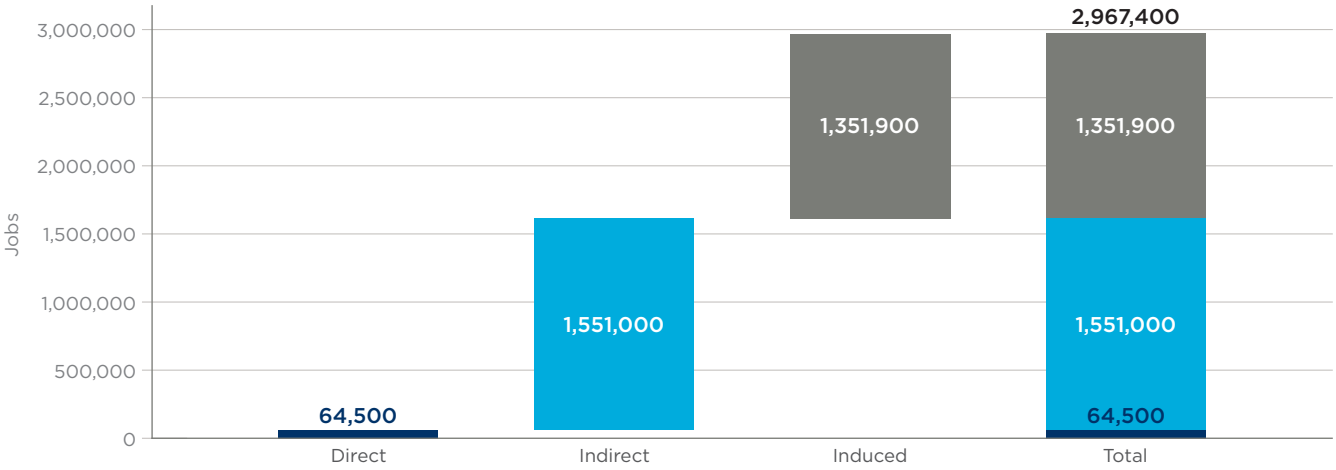
The modeling is conducted using an Input-Output (I-O) model of the U.S. economy, produced by IMPLAN.[11]

It is important to note that the economic statistics underlying this work are "establishment-based." That is, the direct economic contribution of refineries refers to activity and employment at refineries themselves and excludes the activities at establishments associated with refining companies that are not refineries, such as corporate offices. Corporate offices are included, however, as part of refineries' indirect contribution.

2.1 EMPLOYMENT CONTRIBUTION

In 2022, the full economic contribution of the petroleum refining industry measured in terms of employment was nearly 3 million jobs. The industry directly employed 64,500 workers at refineries around the country, and the industry's indirect employment contribution, which represents its full U.S. supply chain, totaled 1.6 million jobs. Finally, the industry's induced contribution, representing economic activity supported by the spending out of wages of those employed directly and indirectly, totaled 1.4 million workers. This large induced contribution reflects, in part, the high compensation received by refinery workers.[12]

Fig. 4. Employment contribution of the petroleum refining industry, 2022[13]



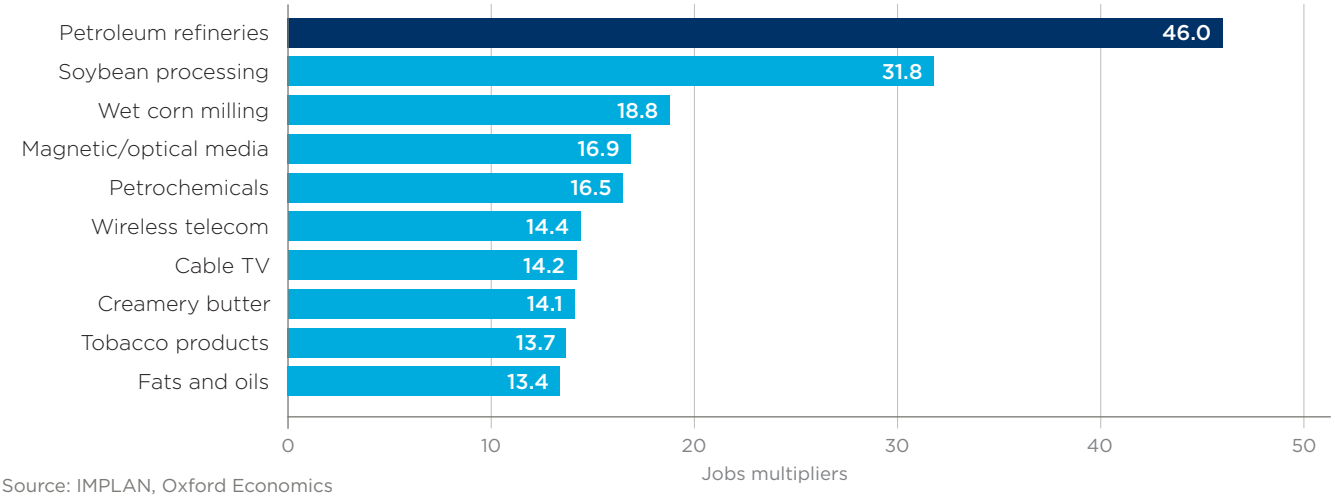
Source: IMPLAN, Oxford Economics

11 IMPLAN is a leading provider of IO economic impact software in the U.S. See www.implan.com.

12 Note that employment in each channel includes both headcount of wage and salaried employees, as well as the self-employed (proprietors and partners).

13 Throughout, totals may not match the sum of the parts due to rounding.

Fig. 5. Industries with top contribution jobs multipliers, 2022



Source: IMPLAN, Oxford Economics

The large indirect and induced employment contributions of the refining industry relative to its direct employment result in the refining industry having an extremely large employment multiplier, which is defined as the total (direct, indirect, and induced) employment contribution divided by the direct employment contribution—or the number of total jobs supported by each direct job. **The employment multiplier for the petroleum refining industry was 46 in 2022, meaning that for every one job at a petroleum refinery, an additional 45 jobs were supported elsewhere in the economy.**

In 2022, petroleum refining had the highest jobs multiplier of any U.S. industry.[14] Definitionally, industries with a high employment multiplier are those with a large employment footprint through their indirect (supply chain) and induced contributions, but with comparatively lower direct employment. Fig. 5 presents the 10 industries with the highest employment multipliers, which fall roughly into three categories: food, agricultural product and tobacco manufacturing (soybean processing, wet corn milling, creamery butter manufacturing, tobacco product manufacturing, fats and oils refining), other manufacturing which is highly capital-intensive (petroleum refineries, petrochemical manufacturing, and magnetic/optical device manufacturing), and telecommunications (wireless telecommunication carriers, and cable TV).

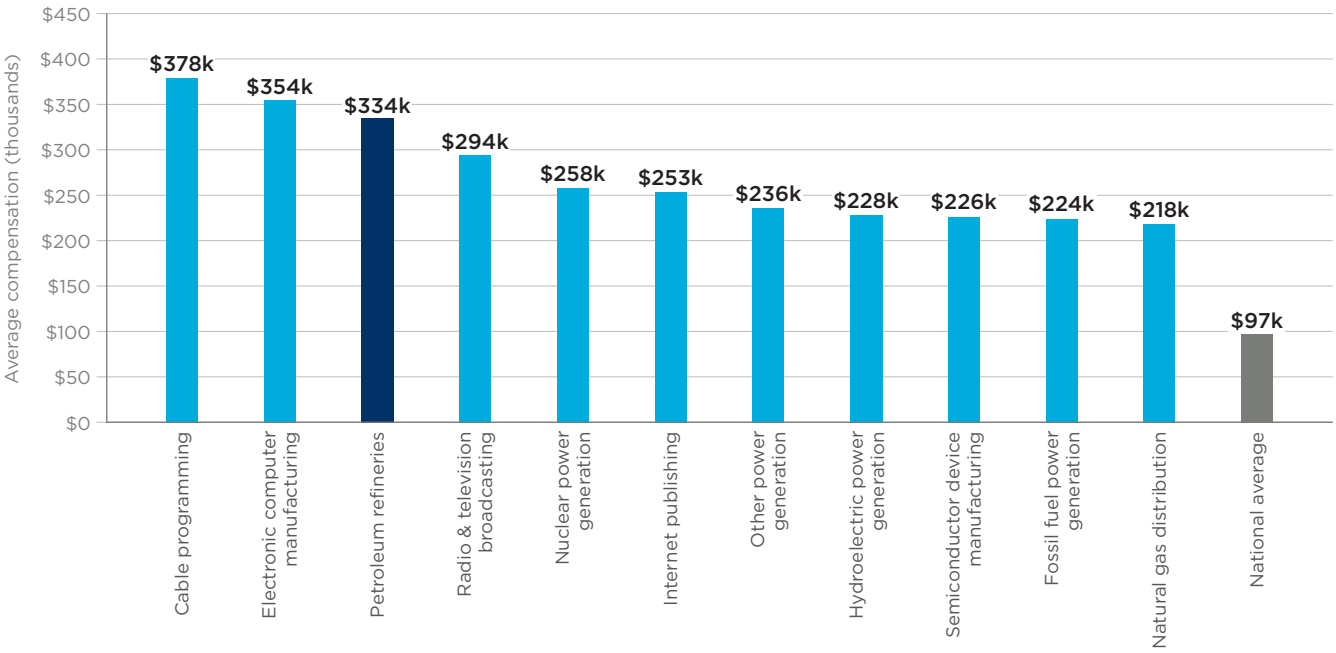
2.1.1 Employee compensation

With an average compensation of $334,000 per year, the 64,500 direct employees of the petroleum refining industry are among the highest compensated of any U.S. industry. Among the 546 industries in the IMPLAN data, petroleum refining has the third highest employee compensation. Note that "compensation" here includes not just wages and salaries, but also the value of benefits like health insurance, retirement savings plans, employer-paid social security taxes, and proprietor income.[15]

14 Based on the 546 industries in IMPLAN, which largely correspond with the North American Industrial Classification System (NAICS) codes. For industry definitions, see https://support.implan.com/hc/en-us/articles/115009674428-IMPLAN-Industries-NAICS-Correspondences.

15 Proprietor income consists of payments to self-employed individuals and unincorporated business owners. With an average proprietor income of $21 million per proprietor, the pipeline transportation industry was excluded from the compensation analysis in Fig. 6 as an outlier. This high level of proprietor income reflets the structure of many pipeline companies and the way in which income is distributed.

Fig. 6. Industries with highest average employee compensation, 2022



Source: IMPLAN, Oxford Economics

Petroleum refining's high level of employee compensation reflects both the industry's capital-intensity as well as its highly skilled workforce. Capital-intensive industries, such as those represented in Fig. 6, typically require workers with the skills and training to manage and operate the advanced technology and complex machinery and equipment the industry uses. As a result, capital-intensive industries hire disproportionately more high-skilled labor and pay higher wages on average than less capital-intensive industries.

2.1.2 Occupational profile

Using data from the Occupational Employment and Wage Statistics (OEWS),[16] we can profile the occupations of the petroleum refining industry's 64,500 direct employees.[17]

Fig. 7 shows that 39 percent of those employed directly at petroleum refineries were in production occupations. The most common occupation within the production occupations was petroleum pump system and refinery operators (14 percent of total employment), followed by mixing and blending machine operators (5 percent). The next most common occupation group was transportation (9 percent), which includes heavy and tractor-trailer truck drivers; followed by installation, maintenance and repair occupations (8 percent); and management occupations (8 percent).

16 The OEWS (https://www.bls.gov/oes/) is the government's primary source of data regarding the occupational structure of the U.S. economy, as well as of regions and industries.

17 The occupational analysis presented here is based on the petroleum and coal sector, which consists of the petroleum refinery industry (58 percent of its employment), the asphalt paving, roofing, and saturated materials manufacturing industry, and the other petroleum coal products manufacturing industry. This is the most representative indicator of the occupational makeup of the petroleum refining industry available in OEWS data.

Fig. 7. Top occupations in the Petroleum and Coal Products Manufacturing industry, May 2022[18]

Occupation group	Group share	Top occupations	Occupation share
Production	38.8%	Petroleum pump system & refinery operators	13.9%
		Mixing & blending machine operators	5.4%
		Supervisors of production & operating workers	5.3%
		Inspectors, testers, sorters, samplers, & weighers	2.0%
		Chemical plant & system operators	1.8%
		Production workers, all other	1.7%
		Machine operators	1.4%
		Plant & system operators, all other	1.4%
Transportation	9.2%	Heavy & tractor-trailer truck drivers	3.1%
		Laborers & freight, stock, & material movers, hand	2.6%
		Industrial truck & tractor operators	1.5%
Installation, maintenance, & repair	8.3%	Industrial machinery mechanics	4.1%
		Supervisors of mechanics, installers, & repairers	1.4%
		General maintenance & repair workers	1.0%
Management	7.9%	Industrial production managers	1.7%
		Architectural & engineering managers	0.7%
Architecture & engineering	7.7%	Industrial engineers	1.6%
		Petroleum engineers	1.3%
Construction & extraction	7.1%	Construction equipment operators	1.6%
		Construction laborers	1.6%
		Electricians	1.2%
Business & financial operations	6.4%	Project management specialists, accountants, auditors	1.8%
Administrative support	6.3%	Production, planning, & expediting clerks	0.9%
Life, physical, & social science	3.8%	Chemical technicians	1.1%
Other	4.5%	Sales representatives, wholesale & manufacturing	1.5%

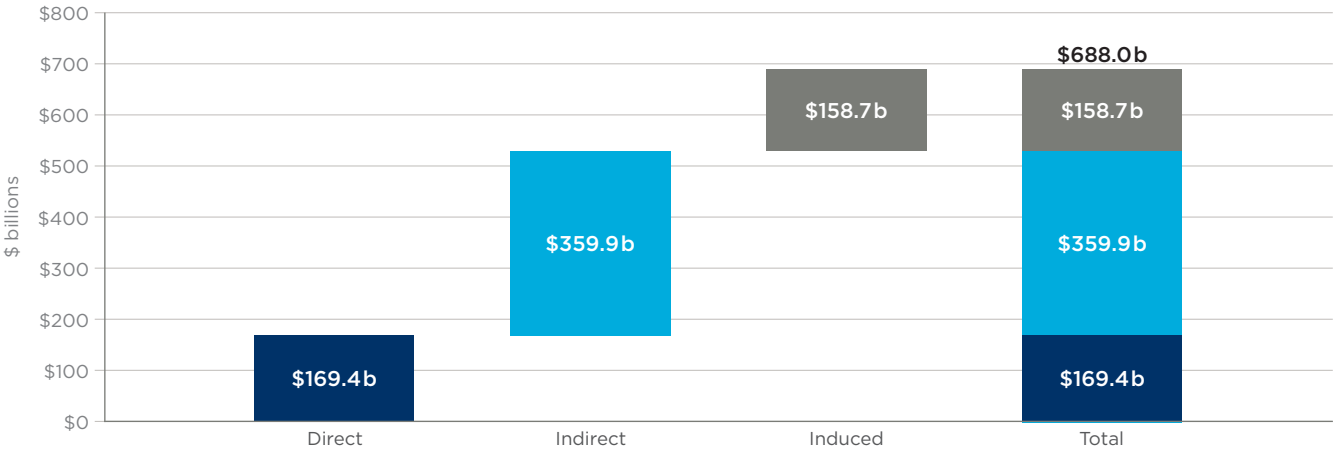
Source: OES, Oxford Economics

2.2 GDP CONTRIBUTION

In 2022, the GDP contribution of the petroleum refining industry across all three channels, direct, indirect and induced, totaled $688 billion. This included a direct GDP contribution of $169 billion, representing the value-added economic activity that took place at refineries. This direct contribution is also equal to the total value of the economic output from petroleum refineries (i.e., their revenue) minus the total value of all the intermediate inputs used in production (which are shown in Fig. 12).

18 Figure shows the top occupations in each major category.

Fig. 8. GDP contribution of the petroleum refining industry, 2022

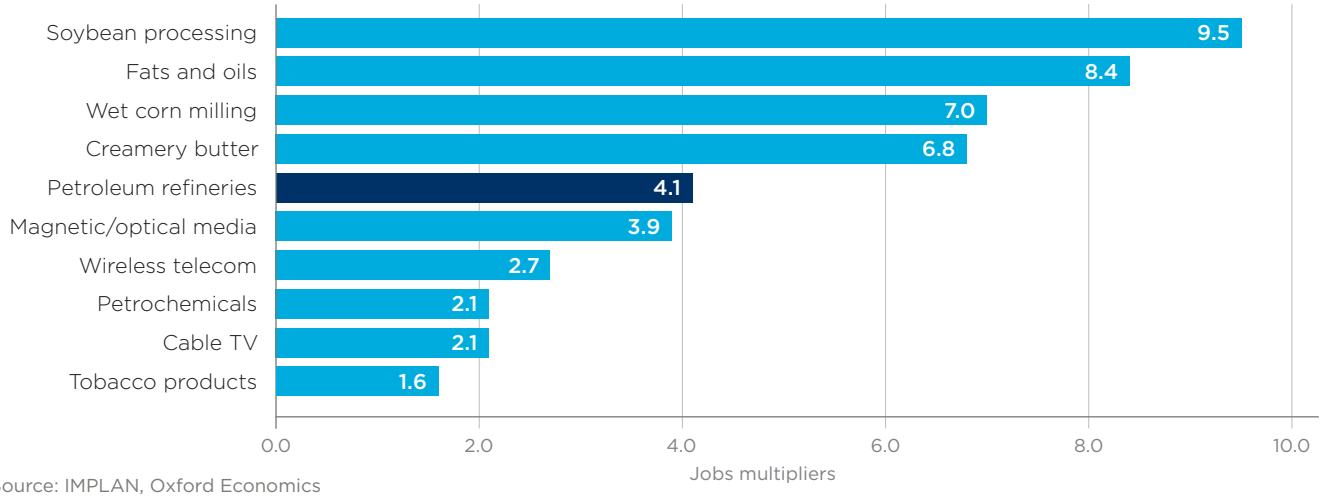


Source: IMPLAN, Oxford Economics

The indirect GDP contribution of the refining industry, which represents the value-added economic activity of the refining industry's full U.S. supply chain, was $360 billion in 2022. The induced GDP contribution, which represents the value-added economic activity supported by the spending of workers employed directly or indirectly, was $159 billion.

In 2022, the refining industry's GDP multiplier, defined as its total GDP contribution ($688 billion) divided by its direct GDP contribution ($169 billion), was 4.1. This means that for every $1 of GDP the industry generated directly an additional $3.10 of economic activity was supported elsewhere in the economy.

Fig. 9. GDP multipliers of industries with highest jobs multipliers, 2022



Source: IMPLAN, Oxford Economics

Fig. 9 shows the GDP multipliers of the industries with the highest employment multipliers from Fig. 5. Petroleum refining's GDP multiplier is roughly in the middle of this group.

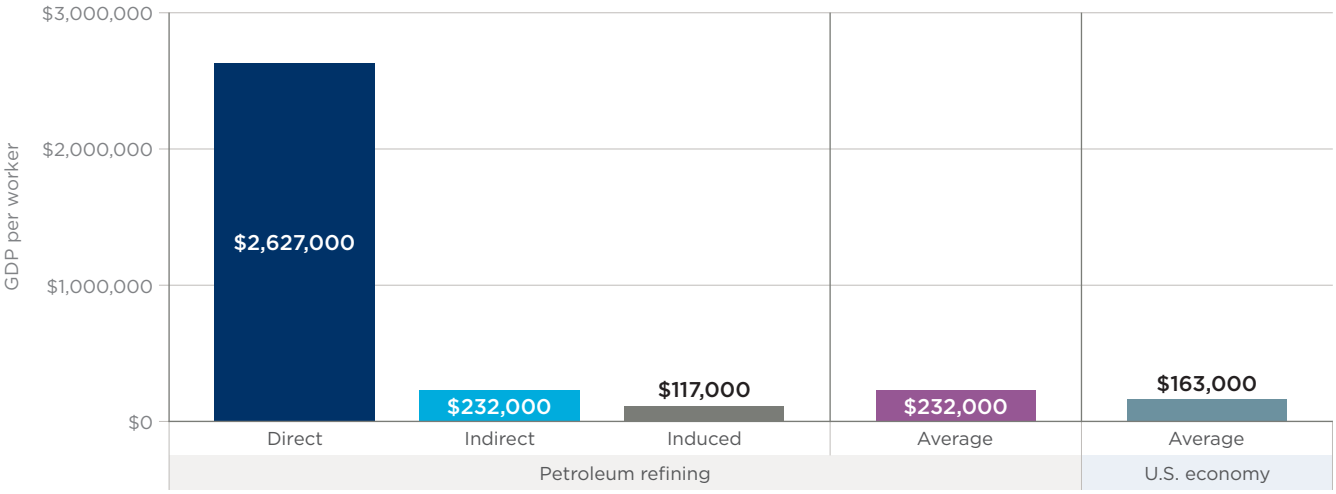
A high GDP multiplier reflects a large supply chain (indirect) contribution relative to the industry's direct value-add. Put another way, industries with high GDP multipliers are typically those for which the value of their inputs represents a large share of the value of their final outputs. This is the case for the commodity processing industries at the top of Fig. 9 whose inputs represent a large share of the value of their outputs.

The petroleum industry's large GDP multiplier also reflects its large induced GDP impact (activity supported by employee spending), driven by its very high direct employee compensation (see section 2.1.1).

Overall, the petroleum refining industry's exceptionally large employment multiplier, together with its still large GDP multiplier, reflect the industry's very high labor productivity—petroleum refining adds a lot of economic value (its direct GDP contribution of $169 billion) with relatively few workers (its direct employment of 64,500).

A comparison of the GDP per worker (total GDP contribution divided by number of jobs) of the three channels of economic contribution (direct, indirect, and induced) demonstrates the relative worker productivity of the refining industry and its supply chain. The direct contribution channel has labor productivity (measured in GDP per worker) of $2,630,000, about 16 times that of the U.S. economy as a whole (or 1,500 percent higher). The indirect contribution channel, representing the full supply chain of the refining industry, has a GDP per worker of $232,000, or 40 percent higher than worker productivity for the U.S. economy as a whole. The induced contribution channel, which represents the consumer-focused industries supported by worker spending, has a GDP per worker of $117,000, 30 percent below that of the U.S. economy as a whole.[19]

Fig. 10. GDP per worker by channel of petroleum refining contribution, compared to the U.S. economy, 2022



Source: IMPLAN, Oxford Economics

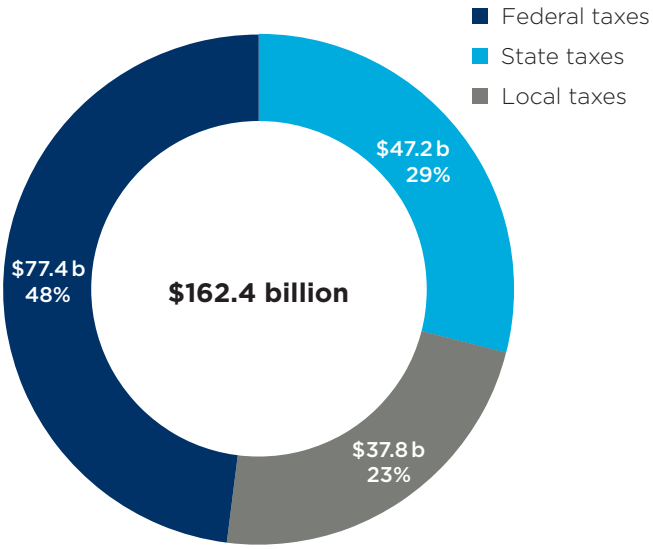
[19] Note that the induced contribution represents the activity supported by the spending of workers out of wages, and so its characteristics, for the most part, are not specific to the petroleum refining industry. That is, the contribution analysis for any industry would have a similar GDP per worker for the induced contribution, while the direct and indirect contribution's GDP per worker would be quite different. The induced contribution has a lower GDP per capita than the U.S. economy as a whole because the consumer-facing industries that predominate in the induced impact have a lower worker labor productivity than the economy as a whole.

2.3 TAX CONTRIBUTION

The $688 billion of economic activity—direct, indirect, and induced—supported by petroleum refining generated tax revenue of $162 billion. Federal taxes made up nearly half of the total tax contribution at 48 percent (or $77 billion). State governments received 29 percent or $47 billion of the total industry tax contribution, while local governments received the remainder (23 percent or $38 billion).

Taxes paid on the economic activity supported by petroleum refining include personal income and payroll taxes of those employed in the direct, indirect, and induced channels, as well as corporate income taxes in these channels. A category of directly paid taxes referred to as taxes on production and imports is also included, and includes, for example, tariffs on imports used in the industry's supply chain. Excluded altogether from these tax contributions, however, are excise or sales taxes on the refining industry's output, such as gasoline taxes.

Fig. 11. Tax contribution of the petroleum refining industry



Source: IMPLAN, Oxford Economics

2.4 ECONOMIC CONTRIBUTION BY INDUSTRY

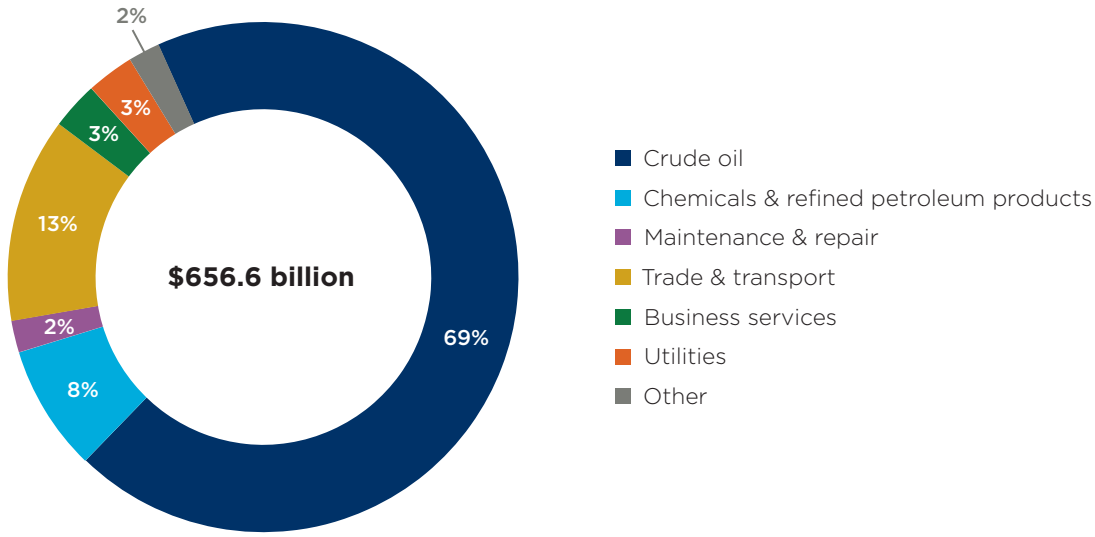
The overall employment and GDP contributions of the petroleum refining industry can be broken out by industry sector to see where the refining industry has its greatest economic impact. This breakout by industry is based on the petroleum refining industry's supply chain spending, which is discussed in subsection 2.4.1 immediately below. Subsection 2.4.2 then breaks out both the employment and GDP contribution of petroleum refining by industry.

2.4.1 Supply chain spending

The indirect contribution of the petroleum refining industry is driven by the industry's supply chain spending, which in 2022 totaled $657 billion. This supply chain spending represents the full spend by the petroleum refining industry on inputs. The overall difference between the supply chain spending ($657 billion) and the full indirect value added ($360 billion—see Fig. 8) represents foreign imports throughout the industry's full supply chain ($297 billion).

Fig. 12 shows the petroleum refining industry's supply chain spending broken out by the industry receiving the spending. By far, the largest input to petroleum refineries is crude oil. In 2022, 69 percent of refineries' supply chain spending was for crude oil produced by the crude oil and natural gas extraction industry.[20] The next largest share of supply chain spending, at 13 percent, was for trade and transport services, mainly to transport crude oil and other inputs to the refinery.[21] Another 8 percent was spent on chemicals and refined petroleum products. The remaining 10 percent of supply chain spending was on business services, utilities, maintenance and repair and other expenses.

Fig. 12. Refinery supply chain spending, 2022[22]



Source: IMPLAN, Oxford Economics

20 The economic data presented in Fig. 12 define petroleum as purchases of the products of the natural gas and crude petroleum industry. Utility supplied natural gas is classified with utility spending.

21 Trade and transport services used to ship the outputs from the refinery are not considered part of the refinery's supply chain spend but would be part of the supply chain of downstream industries purchasing those products.

22 IMPLAN data based on data from the BEA and other government statistical agencies.

2.4.2 Economic contribution by industry

The petroleum refining industry's direct contribution represents the economic activity that takes place at the petroleum refineries themselves, so the direct contribution is 100 percent in the petroleum refining industry. The industry's indirect and induced employment and GDP contributions can be further broken out by industry. These breakouts are presented in Fig. 13 and Fig. 14 respectively.

The industry breakout for the indirect channel reflects the footprint of the petroleum refining industry's full domestic supply chain.

The largest share both of the indirect employment and of the indirect GDP contributions of the refining industry is in business services, which includes a broad array of professional and scientific, administrative and support and management services; followed by trade, transport and warehousing; and oil and gas extraction. Combined, these three industries account for 82 percent of the indirect employment contribution and 87 percent of the indirect GDP contribution of the petroleum refining industry. This sectoral distribution of contributions is consistent with the supply chain spend of the petroleum refining industry as presented in Fig. 12.

The industry breakout of the induced channel is of less significance to an analysis of the refining industry because workers' spending patterns do not vary widely depending on the industry that employs them.

Fig. 13. Employment contribution by channel and industry, 2022[23]

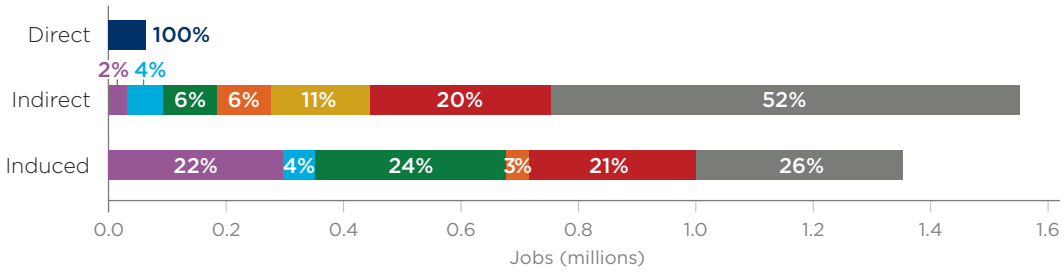
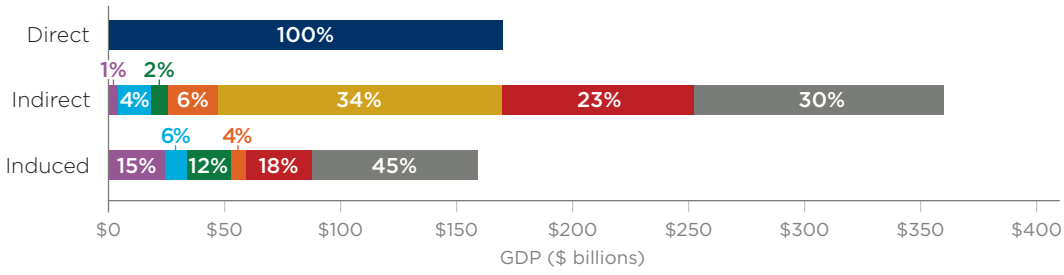


Fig. 14. GDP contribution by channel and industry, 2022



- Petroleum refineries
- Entertainment, other services
- Trade, transport, warehousing
- Health, education, government
- Agriculture, mining, construction, utilities
- Business services
- Manufacturing
- Oil & gas extraction

Note: Percentages may not sum to 100% due to independent rounding.
Source: IMPLAN, Oxford Economics

23 In this and the following chart, oil and gas extraction includes oil drilling and support services for oil and gas operations. The category agriculture, mining, construction and utilities excludes oil and gas extraction and manufacturing excludes petroleum refining.

2.5 ECONOMIC CONTRIBUTION BY GEOGRAPHY

While all 50 states and Washington, D.C. benefit from the employment and GDP contributions described in this chapter, the benefits are distributed unevenly throughout the United States. The appendix provides state-by-state data on the number and capacity of refineries, and the direct, indirect, and induced jobs, contribution to GDP, labor, income, and taxes.

In 2022, Texas had by far the largest employment contribution from the petroleum refining industry with 1,108,900 jobs and the largest contribution to GDP of $275 billion across all three impact channels—direct, indirect, and induced. In California, the petroleum refining industry contributed 257,200 jobs and $80 billion to GDP, and in Louisiana 180,900 jobs and $44 billion in GDP.

These contributions reflect the underlying geography of the petroleum refining industry, which is discussed in subsection 2.5.1.

Fig. 15.
Employment contribution of U.S. refineries by state, 2022

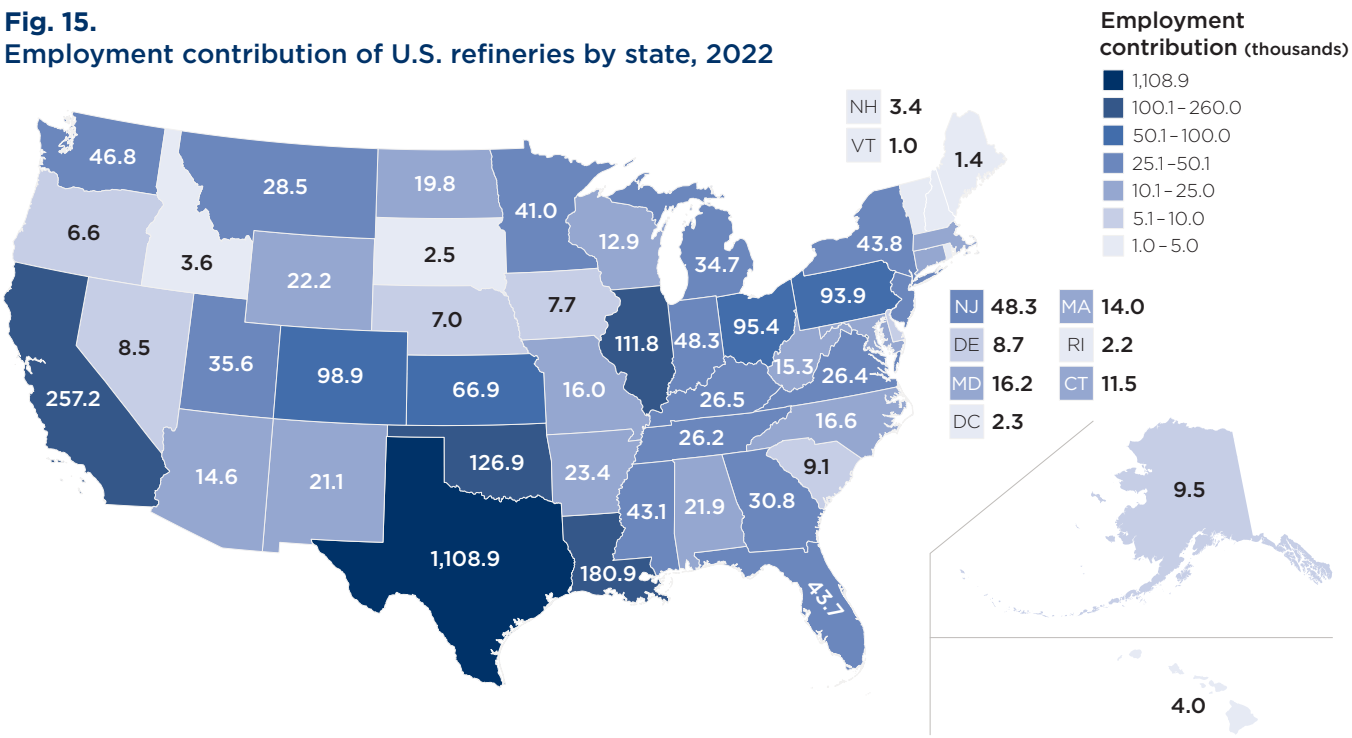
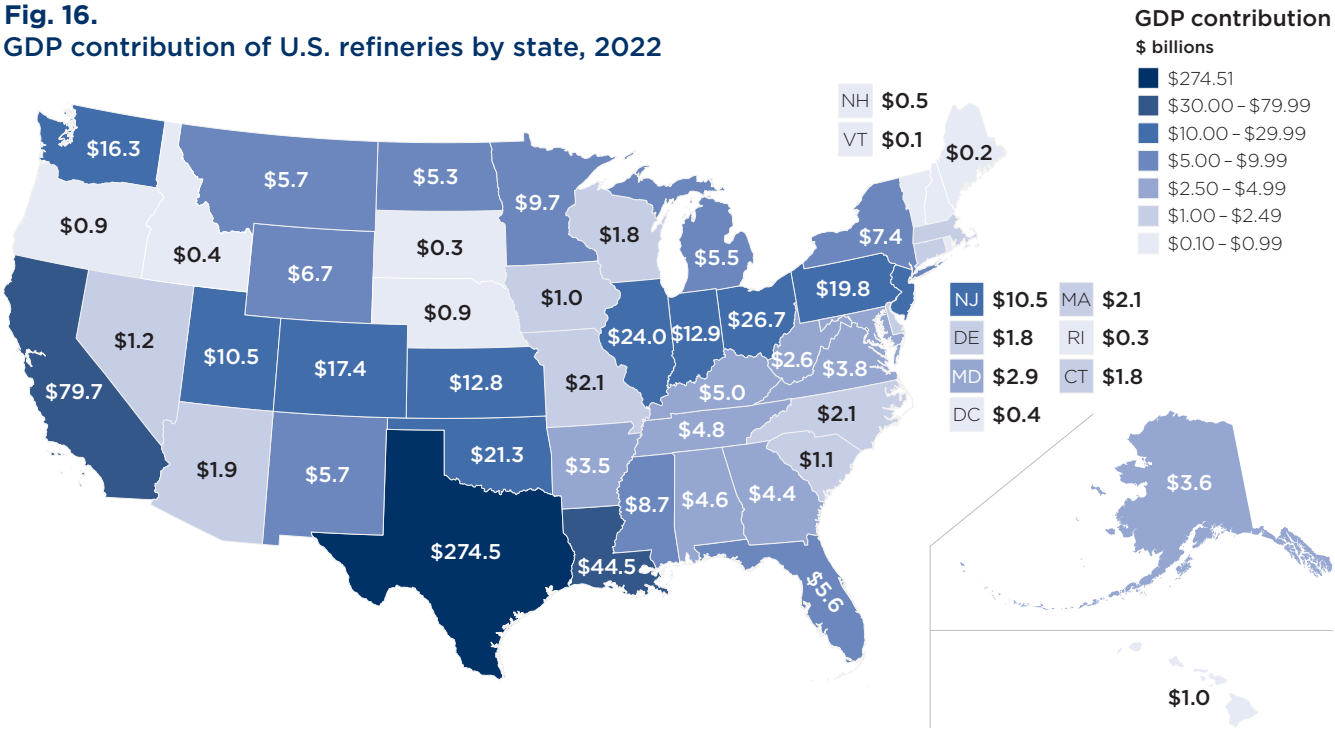


Fig. 16.
GDP contribution of U.S. refineries by state, 2022



2.5.1 Geography of the refining industry

U.S. petroleum refineries are located throughout the country, but concentrated along the Gulf Coast. In 2022, more than half (59 percent) of U.S. petroleum refining capacity was in the states of Texas, Louisiana, and California (Fig. 17), and eight of the 10 largest refineries nationally were located in these three states (Fig. 18).

Crude oil processed by U.S. refineries is delivered to refineries primarily by pipeline (76 percent in 2022), followed by marine vessel (21 percent). Only 3 percent of the crude oil processed by U.S. refineries arrives by rail or truck (Fig. 19).

Because petroleum refineries are large, capital-intensive facilities, and have become more so over time, it is now quite unusual for entirely new petroleum refineries to be constructed. In fact, the newest refinery of significant scale in the United States opened in 1977, although 17 smaller, specialized refineries with total crude distillation capacity of 650,000 barrels per day or more than 10 billion gallons per year have opened since.[24] In addition, existing refineries may expand or contract, or cease operating altogether, in response to market forces, thereby altering the geography of U.S. refining activity.

24 See https://www.eia.gov/tools/faqs/faq.php?id=29.

Fig. 17. Locations and capacity of U.S. refineries, as of 1/1/2022[25]

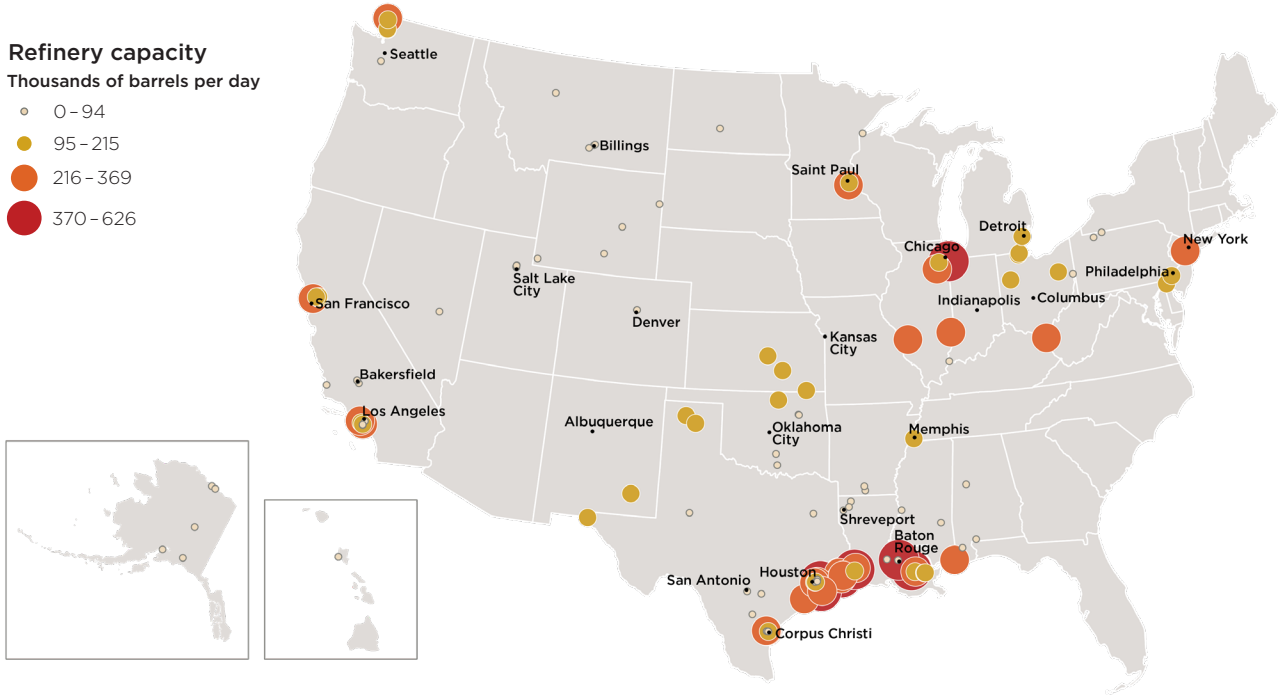


Fig. 18. Ten largest U.S. petroleum refineries, as of 1/1/2022[26]

Site	State	Owner	2022 capacity	
			Thousands of barrels per day	Billions of gallons per year
Port Arthur	Texas	Saudi Aramco dba Motiva	626,000	9.6
Galveston Bay	Texas	Marathon Petroleum	593,000	9.1
Garyville	Louisiana	Marathon Petroleum	585,000	9.0
Baytown	Texas	ExxonMobil	560,500	8.6
Baton Rouge	Louisiana	ExxonMobil	520,000	8.0
Whiting	Indiana	BP Products North America	435,000	6.7
Lake Charles	Louisiana	Citgo Petroleum	418,000	6.4
Beaumont[27]	Texas	ExxonMobil	369,024	5.7
Carson	California	Marathon Petroleum, dba Tesoro Refining & Marketing	363,000	5.6
Pascagoula	Mississippi	Chevron	356,440	5.5

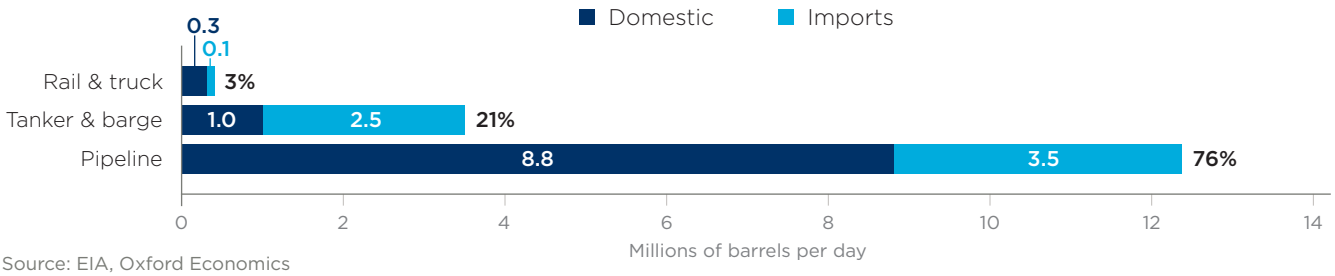
Source: EIA.

25 See https://www.eia.gov/petroleum/refinerycapacity/archive/2022/refcap2022.php. While this map references capacity as of 1/1/2022, as of year end 2022, U.S. refining capacity totaled 18.1 barrels per day, increasing to 18.3 million barrels per day as of year end 2023.

26 See https://www.eia.gov/petroleum/refinerycapacity/archive/2022/refcap2022.php.

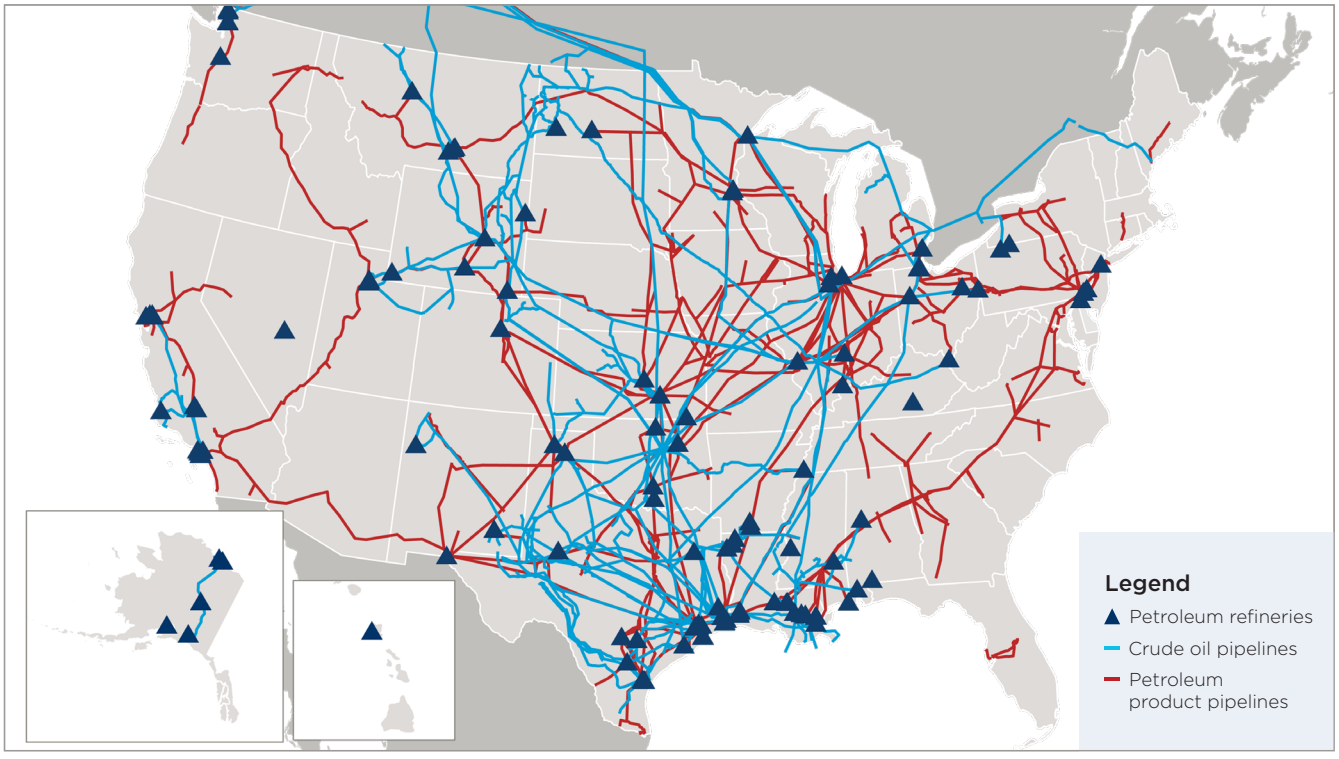
27 In March 2023, Exxon completed its 240,000 barrels per calendar day (250,000 barrels per stream day) capacity expansion at its Beaumont refinery, raising the capacity from 369,024 barrels per calendar day to 609,024 barrels per calendar day. Also in March 2023, Marathon completed its 40,000 barrels per calendar day capacity expansion at its Galveston Bay refinery, increasing the refinery's capacity from 593,000 barrels per calendar day to 633,000 barrels per calendar day.

Fig. 19. Refinery receipts of crude oil by method of transportation, 2022



Source: EIA, Oxford Economics

Fig. 20. U.S. petroleum pipelines and refinery infrastructure



Source: EIA U.S. Energy Atlas, Oxford Economics

3. WIDER CONTRIBUTION

This chapter considers the wider contribution of the petroleum refining industry to the U.S. economy, and explores several topics related to the economics of petroleum refining.

Section 3.1 discusses the end use of petroleum-derived products. Section 3.2 considers the prices of refinery inputs and outputs over time. Section 3.3 considers the ongoing capital investment made by U.S. refineries. Section 3.4 considers the contribution of refinery outputs to U.S. trade.

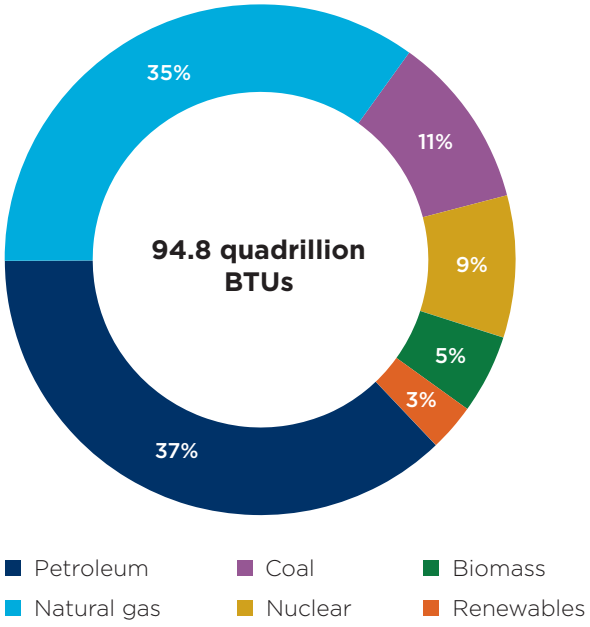
3.1 END USES OF PETROLEUM PRODUCTS

Petroleum-derived products accounted for 37 percent of U.S. energy consumption in 2022 (Fig. 21), the largest share across all sources of energy.[28]

Petroleum products are used primarily as transportation fuels, and in 2022, 70 percent of petroleum product consumption was in the transportation sector.[29] This same year, petroleum products, including gasoline, diesel, jet fuel, and residual fuel used as ship fuel, accounted for 90 percent of the total U.S. transportation sector energy use. Petroleum is also used in the industrial, residential, and commercial sectors and for power generation.

Industrial uses, which include both fuel and non-combustion uses, accounted for another 24 percent of the total petroleum-derived consumption. Residential and commercial uses—largely burning fuel oil on-site for heat—accounted for another five percent of petroleum-derived energy consumption, while electric power generation accounted for 1 percent (Fig. 22).

Fig. 21. U.S. primary energy consumption by source, 2022[30]



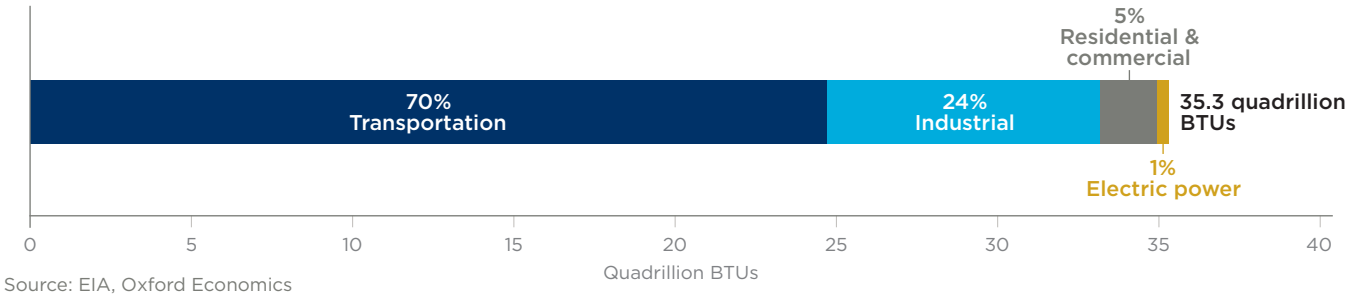
Source: EIA, Oxford Economics

28 Note that this section considers U.S. energy consumption rather than U.S. energy production. That is, it includes U.S. energy imports and excludes U.S. energy exports.

29 See EIA "March 2024 Monthly Energy Review," https://www.eia.gov/totalenergy/data/monthly/archive/00352403.pdf, tables 2.2–2.6.

30 See EIA "March 2024 Monthly Energy Review," https://www.eia.gov/totalenergy/data/monthly/archive/00352403.pdf, table 1.3. Note that this includes embodied energy in non-combustion uses of fossil fuels.

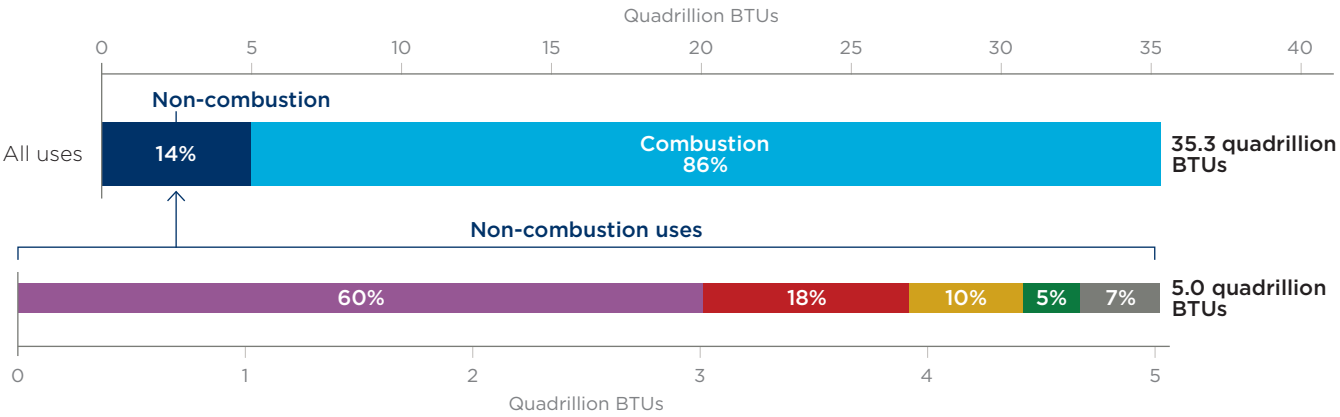
Fig. 22. Petroleum consumption by end use sector, 2022[31]



Source: EIA, Oxford Economics

In 2022 14 percent[32] of U.S. petroleum consumption was for non-combustion uses (Fig. 23).[33] The largest share of this was in hydrocarbon gas liquids[34] at 3.0 quadrillion BTUs, followed by other non-combustion uses of petroleum products such as asphalt and road oil (0.9 quadrillion BTUs) and petroleum-based petrochemical feedstocks (0.5 quadrillion BTUs). These were followed by lubricants at 0.2 quadrillion BTUs and other smaller uses such as waxes, and special naphthas that are used for a variety of purposes such as additives in petroleum-based paints.

Fig. 23. U.S. non-combustion consumption of petroleum products, 2022[35]



Numerical values are in quadrillion BTUs of heat content for both combustion and non-combustion uses.

Source: EIA, Oxford Economics

31 See EIA "March 2024 Monthly Energy Review," https://www.eia.gov/totalenergy/data/monthly/archive/00352403.pdf, tables 2.2–2.6. Please note that similar data can be found expressed in other units (thousands of barrels per day rather than quadrillion BTUs) in tables 3.7a–c.

32 Energy content provides a standard unit of measure for comparing different types of petroleum products that have different chemical properties such as density, across both combustion and non-combustion uses. This will be the unit of analysis for the remainder of this subsection.

33 See https://www.eia.gov/todayinenergy/detail.php?id=35672 for a discussion of non-combustion uses of fossil fuels.

34 Hydrocarbon gas liquids (HGL) are hydrocarbons that occur as gases at atmospheric pressure and as liquids under higher pressures. HGLs include ethane, propane, butanes, and natural gasoline. They are used as feedstocks in petrochemical plants, fuels for heating, cooking, drying, and for transportation, components of gasoline, and as diluting or thinning agents for heavy crude oil. See EIA's Hydrocarbon gas liquids explained, https://www.eia.gov/energyexplained/hydrocarbon-gas-liquids/#:~:text=What%20are%20hydrocarbon%20gas%20liquids,as%20liquids%20under%20higher%20pressures.

35 See EIA "March 2024 Monthly Energy Review," https://www.eia.gov/totalenergy/data/monthly/archive/00352403.pdf, table 1.12b.

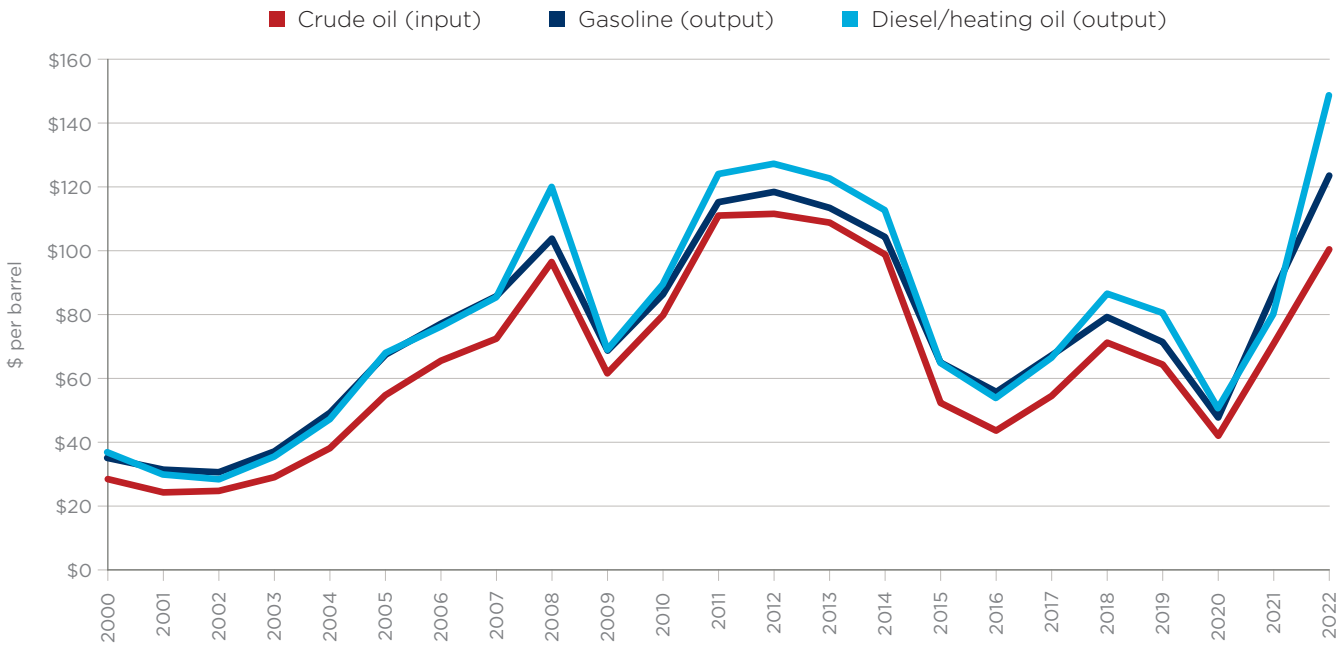
3.2 PRICES OF INPUTS AND OUTPUTS

An unusual feature of the petroleum refining industry is that the prices for both inputs—primarily crude oil—and for outputs—gasoline, diesel, jet fuel and other refined petroleum products—can be quite volatile. Crude oil and petroleum product prices are determined in global energy markets based on supply factors affecting the availability of crude oil and refined products, demand factors affecting fuel usage, as well as the strategic decisions of market participants like the Organization of Petroleum Exporting Countries (OPEC).

Petroleum refineries are price takers for both the crude oil they process and the refined products they produce. Because the price of crude oil is the primary determinant of the prices for refined petroleum products, the prices that refineries receive for their outputs track quite closely the price that they pay for crude oil.

Fig. 24 illustrates the close relationship between prices for crude oil and for refined petroleum products for the period 2000–2022, comparing the price of crude oil to prices for gasoline and diesel/heating oil, the two primary products that refineries produce, which together account for three-quarters of refinery output.[36] The three series are strongly cointegrated, meaning that they move together over time. Changes in the price of crude oil are passed through to the prices of gasoline and diesel. Over 97 percent of the variation in the observed change in the diesel and gasoline prices that petroleum refiners receive is explained by changes in the price of crude oil.[37]

Fig. 24. Prices of refining industry's primary inputs and outputs, 2000–2022



*Crude oil is Europe Brent Spot Price FOB.

*Gasoline is U.S. Gulf Coast Conventional Gasoline Regular Spot Price FOB.

*Diesel/heating oil is NYH HO Spot Price.

Source: EIA, Oxford Economics

36 See https://www.eia.gov/dnav/pet/pet_pnp_pct_dc_nus_pct_a.htm.

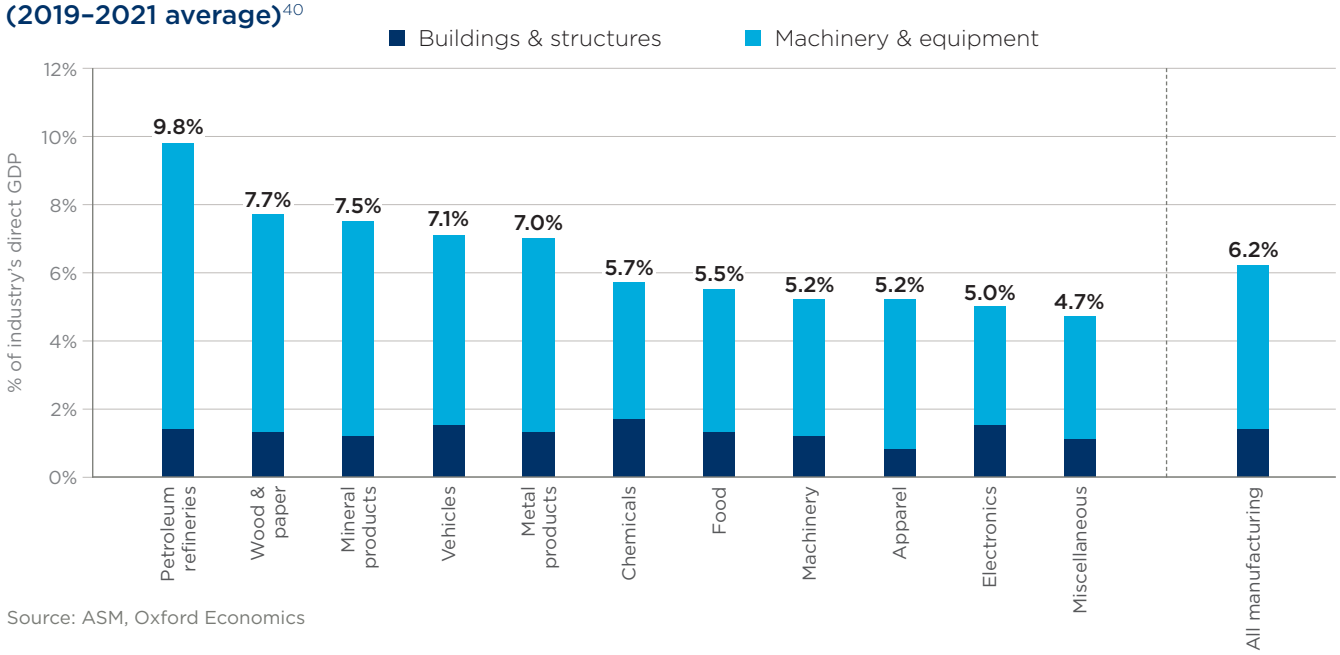
37 These results are based on two error correction models which were estimated: one for crude oil and gasoline, the other for crude oil and diesel. Appropriate specification tests were run to ensure the robustness of each model.

3.3 CAPITAL INVESTMENT

In 2019–2021, the U.S. petroleum refining industry made on average $9 billion in capital investments per year, equivalent to 10 percent of the industry's direct GDP, according to the U.S. Census Bureau's Annual Survey of Manufacturers (ASM).[38] This was the highest capital investment share of GDP of any major manufacturing industry (see Fig. 25).

Recent global geopolitical shifts have asserted the importance of U.S.-based petroleum refineries and have supported continued investment in the sector. Capital projects by some of the largest U.S. refiners that had been delayed due to the COVID-19 pandemic and its associated restrictions have now been completed, increasing U.S. refining capacity.[39]

Fig. 25. Manufacturing industries' capital investment as a share of industry GDP (2019–2021 average)[40]



Source: ASM, Oxford Economics

3.4 CONTRIBUTION TO U.S. TRADE

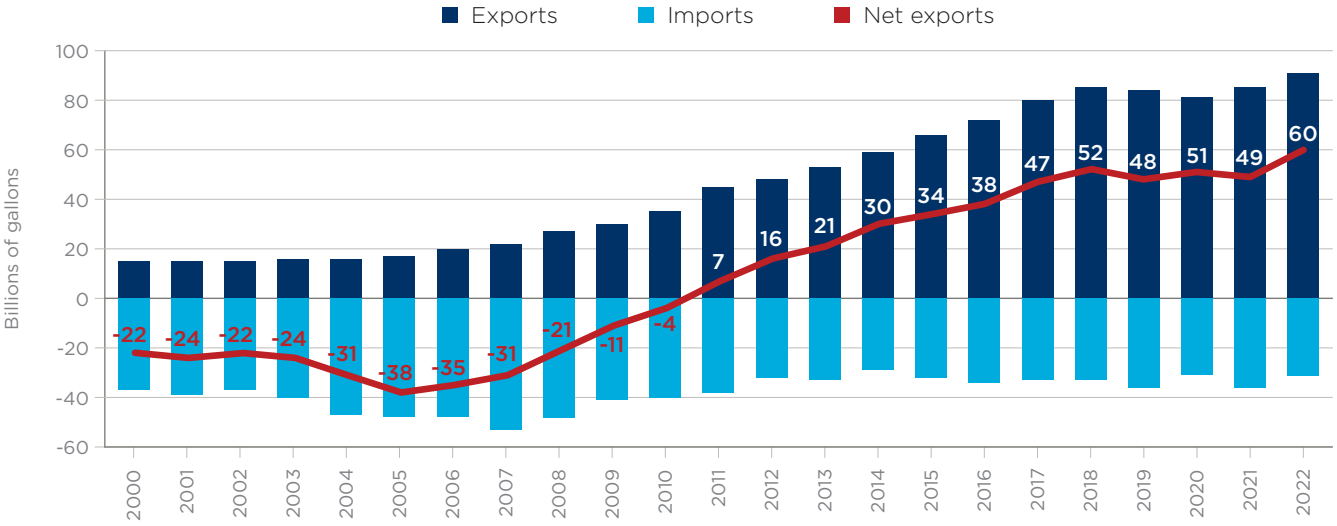
U.S. refineries are among the most competitive in the world and as a result have become major suppliers of petroleum products to the growing global market. Since 2011, the United States has been a net exporter of refined petroleum products and in 2022 exported 91 billion gallons of gasoline, diesel, jet fuel, and other refined products. The U.S. also imported 31 billion gallons of refined products to supply regions of the U.S. that lack sufficient in-region refining capacity to meet demand and can be more economically supplied from refineries outside the U.S. In 2022, net petroleum product exports totaled 60 billion gallons.

38 The ASM is an annual survey of almost 50,000 manufacturing establishments (see https://www.census.gov/programs-surveys/asm/technical-documentation.html). Among other things, it collects capital expenditure data, with the following instructions for respondents: "Report all expenses during the year for buildings and other structures, machinery and equipment that are chargeable to the fixed asset account, and for which depreciation or amortization reserves are maintained." The industry direct GDP values used as a benchmark in Fig. 25 are sourced from the ASM for consistency with the capital investment figures. 2022 ASM survey data is unavailable: The ASM was discontinued after the 2021 survey year and the data captured by the ASM will be collected by the Annual Integrated Economic Survey (AIES) commencing with survey year 2023.

39 See https://www.argusmedia.com/en/news/2335445-us-refiners-invest-sparingly-in-new-capacity.

40 Data are from the 2021 Annual Survey of Manufacturers (see https://www.census.gov/programs-surveys/asm.html). Wood and paper industry includes printing; chemicals include plastic and rubber manufacturing and petroleum and coal manufacturing industries other than petroleum refining; food includes beverage manufacturing; apparel includes textiles and leather manufacturing; miscellaneous includes furniture manufacturing.

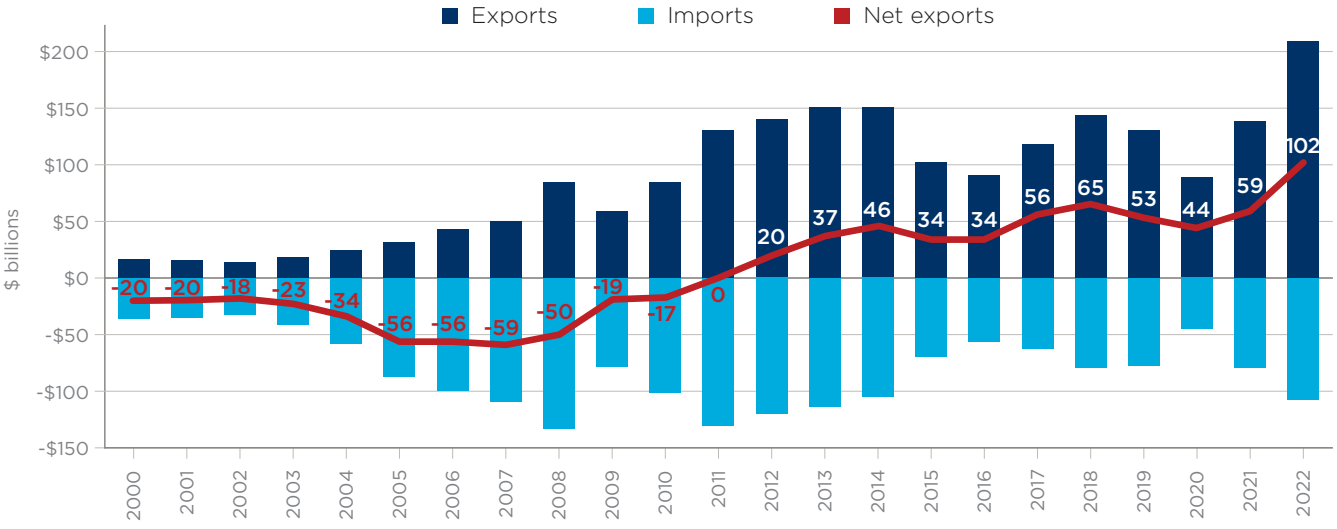
Fig. 26. U.S. trade in refined petroleum products in billions of gallons, 2000–2022[41]



Source: Oxford Economics

For refined petroleum products, trade as measured in dollars is far more volatile than trade measured in physical units due to high volatility of oil prices, but generally follows the same trends. In 2022, net exports of refined petroleum products contributed $102 billion to the U.S. balance of trade.

Fig. 27. U.S. trade in refined petroleum products in dollars, 2000–2022[42]



Source: Oxford Economics

41 See EIA, "Oil and petroleum products explained: Oil imports and exports." https://www.eia.gov/energyexplained/oil-and-petroleum-products/imports-and-exports.php.

42 See https://www.bea.gov/international/detailed-trade-data. The series reported here uses the Balance of Payments (BOP) basis rather than the Census basis. The primary difference is the treatment of fuel purchases by U.S. vessels in foreign ports and foreign vessels in U.S. ports. The BOP basis counts these purchases as imports and exports respectively. The values reported here include the categories fuel oil, other petroleum products, and liquified petroleum gases, but exclude crude.

4. CONCLUSION

U.S. refineries are among the most efficient and competitive in the world, and the U.S. refining industry is among the most well-paying and capital-intensive industries in the United States. U.S. refineries supply more than a third of total U.S. energy demand, 90 percent of U.S. transportation energy demand, and are critically important suppliers of refined products to the global market. This study explores the contribution of the U.S. petroleum refining industry to the U.S. economy. It considers the industry's contribution to GDP, employment, and local, state, and federal tax revenues. It has shown how the operations of the 129 operable petroleum refineries, and the complex supply chains on which they depend, affected the wider U.S. economy in 2022.

With average annual capital investment from 2019–2021 equivalent to 10 percent of the industry's direct GDP contribution, petroleum refining is among the most capital-intensive industries. As a consequence, refining has one of the highest labor productivities of any industry, with its 64,500 direct employees producing $169 billion in direct GDP in 2022. This high productivity allows petroleum refining to offer one of the highest compensation levels of any industry to its workers ($334,000 per worker on average), who include highly qualified engineers, scientists, electricians, technicians, and mechanics.

In addition to the direct contribution from the activity that takes place at petroleum refineries, the industry supports indirect and induced economic activity. That activity contributed $519 billion to GDP in 2022 and employed nearly 3 million workers in a range of sectors and locations across the United States.

The petroleum refining industry's direct, indirect, and induced economic activity generated $162 billion in federal, state, and local taxes.

The economic impact of the refining sector extends to every state in the country as well as Washington D.C., but the contribution to GDP, jobs, and tax revenues is greatest in Texas, California, and Louisiana, where refining capacity is concentrated.

The United States is a net exporter of refined petroleum products, with exports exceeding imports by $102 billion in 2022, thus making a sizable positive contribution to the U.S. trade balance.

Petroleum products produced by the U.S. refining industry are indispensable to the U.S. economy and society.

APPENDIX: STATE-LEVEL CONTRIBUTIONS

Jobs and GDP contributions

	Jobs				GDP ($ millions)			
State	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Alabama	679	13,301	7,966	21,947	$1,509	$2,290	$833	$4,632
Alaska	323	5,263	3,886	9,472	$438	$2,671	$459	$3,568
Arizona	3	7,496	7,108	14,606	$5	$1,086	$846	$1,937
Arkansas	548	15,275	7,566	23,388	$448	$2,311	$767	$3,526
California	9,129	136,985	111,070	257,184	$31,236	$32,933	$15,530	$79,698
Colorado	571	42,475	55,810	98,856	$1,162	$9,286	$6,942	$17,390
Connecticut	56	3,120	8,312	11,488	$106	$586	$1,127	$1,819
Delaware	559	4,869	3,278	8,706	$515	$863	$408	$1,785
District of Columbia	6	875	1,369	2,250	$0	$191	$207	$398
Florida	145	23,821	19,783	43,749	$316	$3,029	$2,257	$5,602
Georgia	225	14,402	16,219	30,846	$415	$2,103	$1,883	$4,400
Hawaii	201	2,296	1,495	3,992	$401	$403	$190	$994
Idaho	14	1,884	1,689	3,587	$5	$232	$179	$416
Illinois	3,015	55,956	52,831	111,802	$6,223	$11,139	$6,590	$23,952
Indiana	1,757	27,695	18,815	48,268	$6,074	$4,692	$2,084	$12,850
Iowa	75	3,936	3,652	7,664	$68	$589	$379	$1,036
Kansas	1,576	45,112	20,188	66,876	$3,380	$7,211	$2,174	$12,765
Kentucky	710	16,450	9,334	26,493	$1,510	$2,483	$981	$4,974
Louisiana	8,651	111,206	61,087	180,944	$16,345	$21,889	$6,233	$44,467
Maine	0	488	944	1,432	$0	$62	$110	$172
Maryland	260	5,900	10,031	16,191	$716	$982	$1,233	$2,931
Massachusetts	0	3,539	10,487	14,026	$0	$635	$1,455	$2,090
Michigan	452	18,236	16,021	34,709	$997	$2,774	$1,768	$5,539
Minnesota	1,466	21,521	18,016	41,003	$3,470	$4,028	$2,154	$9,652
Mississippi	1,934	29,167	12,010	43,111	$3,462	$4,101	$1,128	$8,691
Missouri	61	7,644	8,260	15,964	$104	$1,079	$901	$2,084

Source: IMPLAN, Oxford Economics

Jobs and GDP contributions

	Jobs				GDP ($ millions)			
State	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Montana	1,363	18,020	9,106	28,489	$1,745	$3,074	$880	$5,699
Nebraska	0	2,726	4,321	7,047	$0	$427	$482	$909
Nevada	107	4,520	3,828	8,456	$72	$663	$475	$1,210
New Hampshire	0	816	2,547	3,363	$0	$130	$329	$459
New Jersey	950	17,498	29,893	48,340	$2,983	$3,533	$3,965	$10,481
New Mexico	654	13,604	6,834	21,091	$413	$4,533	$711	$5,658
New York	32	13,616	30,181	43,829	$61	$2,869	$4,464	$7,394
North Carolina	31	7,241	9,295	16,567	$15	$986	$1,054	$2,055
North Dakota	554	12,906	6,366	19,826	$346	$4,350	$626	$5,323
Ohio	2,086	53,582	39,698	95,366	$11,293	$11,064	$4,389	$26,746
Oklahoma	1,514	66,765	58,622	126,900	$796	$14,553	$5,951	$21,300
Oregon	3	2,891	3,719	6,613	$4	$429	$439	$872
Pennsylvania	1,088	38,172	54,637	93,896	$3,777	$9,755	$6,299	$19,832
Rhode Island	0	460	1,702	2,162	$0	$62	$198	$260
South Carolina	14	4,300	4,794	9,108	$46	$549	$514	$1,109
South Dakota	0	1,254	1,246	2,500	$0	$177	$130	$307
Tennessee	460	13,488	12,258	26,206	$1,196	$2,131	$1,487	$4,815
Texas	18,119	576,310	514,460	1,108,888	$52,126	$163,591	$58,795	$274,512
Utah	1,459	20,806	13,312	35,578	$5,088	$3,901	$1,541	$10,531
Vermont	0	350	605	954	$0	$45	$69	$114
Virginia	133	9,670	16,564	26,367	$228	$1,542	$1,996	$3,766
Washington	2,156	24,569	20,065	46,789	$7,301	$5,976	$3,032	$16,309
West Virginia	168	9,220	5,923	15,311	$259	$1,708	$595	$2,563
Wisconsin	112	5,910	6,915	12,936	$163	$858	$776	$1,797
Wyoming	1,067	13,402	7,771	22,240	$2,611	$3,375	$733	$6,719
United States	**64,486**	**1,551,002**	**1,351,887**	**2,967,375**	**$169,427**	**$359,931**	**$158,748**	**$688,106**

Source: IMPLAN, Oxford Economics

Labor income and tax contributions

	Labor income ($ millions)				Taxes ($ millions)			
State	Direct	Indirect	Induced	Total	Federal	State	Local	Total
Alabama	$166	$1,054	$432	$1,652	$488	$418	$282	$1,188
Alaska	$84	$575	$262	$921	$293	$338	$261	$891
Arizona	$0	$675	$455	$1,130	$270	$99	$66	$434
Arkansas	$82	$1,157	$399	$1,639	$420	$444	$145	$1,008
California	$2,687	$14,839	$8,660	$26,186	$8,610	$7,902	$5,540	$22,052
Colorado	$201	$6,395	$3,768	$10,364	$2,430	$720	$882	$4,033
Connecticut	$9	$376	$653	$1,037	$273	$114	$92	$478
Delaware	$146	$392	$207	$745	$203	$193	$75	$471
District of Columbia	$0	$121	$139	$260	$42	$0	$26	$68
Florida	$24	$1,914	$1,191	$3,129	$832	$276	$257	$1,365
Georgia	$26	$1,187	$1,001	$2,214	$544	$237	$276	$1,057
Hawaii	$53	$186	$97	$336	$103	$114	$50	$268
Idaho	$0	$144	$98	$242	$58	$35	$16	$108
Illinois	$1,661	$6,266	$3,811	$11,737	$3,061	$1,872	$1,794	$6,726
Indiana	$466	$2,391	$1,191	$4,048	$1,288	$980	$488	$2,757
Iowa	$14	$305	$199	$519	$123	$66	$57	$246
Kansas	$345	$4,040	$1,176	$5,562	$1,471	$929	$656	$3,056
Kentucky	$175	$1,248	$554	$1,977	$537	$537	$257	$1,332
Louisiana	$2,140	$9,816	$3,296	$15,252	$4,378	$3,139	$2,978	$10,495
Maine	$0	$37	$58	$95	$22	$11	$8	$41
Maryland	$48	$532	$657	$1,237	$341	$218	$170	$728
Massachusetts	$0	$409	$875	$1,285	$311	$98	$64	$474
Michigan	$323	$1,682	$1,004	$3,009	$748	$434	$259	$1,441
Minnesota	$378	$2,197	$1,249	$3,824	$1,098	$919	$471	$2,488
Mississippi	$490	$1,853	$565	$2,908	$893	$997	$499	$2,389
Missouri	$13	$638	$499	$1,150	$263	$86	$110	$460

Source: IMPLAN, Oxford Economics

Labor income and tax contributions

	Labor income ($ millions)				Taxes ($ millions)			
State	Direct	Indirect	Induced	Total	Federal	State	Local	Total
Montana	$318	$1,465	$519	$2,302	$655	$527	$436	$1,618
Nebraska	$0	$230	$252	$482	$110	$36	$35	$181
Nevada	$30	$349	$237	$617	$168	$92	$46	$307
New Hampshire	$0	$86	$191	$277	$63	$14	$20	$97
New Jersey	$402	$2,266	$2,311	$4,980	$1,376	$912	$890	$3,177
New Mexico	$150	$1,150	$367	$1,667	$504	$779	$357	$1,639
New York	$4	$1,769	$2,552	$4,324	$1,034	$401	$398	$1,834
North Carolina	$3	$614	$578	$1,196	$277	$117	$79	$474
North Dakota	$130	$1,223	$386	$1,739	$470	$683	$222	$1,374
Ohio	$753	$4,981	$2,402	$8,137	$2,586	$1,282	$1,149	$5,018
Oklahoma	$598	$7,228	$3,214	$11,040	$2,400	$1,460	$941	$4,801
Oregon	$0	$274	$251	$526	$121	$43	$37	$201
Pennsylvania	$392	$4,784	$3,776	$8,952	$2,315	$1,243	$903	$4,461
Rhode Island	$0	$38	$111	$149	$36	$15	$12	$63
South Carolina	$2	$317	$256	$575	$141	$65	$62	$269
South Dakota	$0	$107	$77	$184	$41	$10	$9	$60
Tennessee	$115	$1,220	$849	$2,183	$566	$414	$191	$1,171
Texas	$7,685	$78,138	$32,475	$118,298	$30,860	$14,838	$14,325	$60,022
Utah	$373	$1,810	$777	$2,961	$1,041	$597	$464	$2,102
Vermont	$0	$30	$37	$67	$15	$11	$2	$28
Virginia	$30	$893	$1,025	$1,948	$484	$216	$226	$925
Washington	$649	$2,630	$1,551	$4,829	$1,729	$1,408	$789	$3,926
West Virginia	$34	$780	$329	$1,144	$273	$201	$91	$565
Wisconsin	$32	$490	$433	$954	$232	$119	$88	$439
Wyoming	$300	$1,713	$366	$2,379	$772	$548	$254	$1,574
United States	**$21,530**	**$175,014**	**$87,820**	**$284,363**	**$77,368**	**$47,209**	**$37,804**	**$162,381**

Source: IMPLAN, Oxford Economics

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