NMPF-53A

An Analysis of the Operational Costs of Trucking: 2023 Update

June 2023

Prepared by the American Transportation Research Institute

ATRI American Transportation Research Institute

An Analysis of the Operational Costs of Trucking: 2023 Update

June 2023

Alex Leslie, Ph.D.
Research Associate
American Transportation Research Institute
Minneapolis, MN

Dan Murray
Senior Vice President
American Transportation Research Institute
Minneapolis, MN

Atlanta, GA • Minneapolis, MN • Washington, DC • Sacramento, CA

TruckingResearch.org

ATRI BOARD OF DIRECTORS

Derek Leathers
Chairman of the ATRI Board
Chairman, President and CEO
Werner Enterprises

Andrew Boyle
Co-President
Boyle Transportation

Jim Burg
President
James Burg Trucking

Hugh Ekberg
President and CEO
CRST International, Inc.

Darren D. Hawkins
Chief Executive Officer
Yellow

Robert E. Low
President and Founder
Prime Inc.

Benjamin J. McLean
Chief Executive Officer
Ruan Transportation
Management Systems

Dennis Nash
Executive Chairman of the Board
Kenan Advantage Group

Brenda Neville, CAE
President and CEO
Iowa Motor Truck Association

Srikanth Padmanabhan
President, Engine Business
Cummins Inc.

Lou Rivieccio
President, Corporate
Transportation
UPS

John A. Smith
President and CEO, U.S. and
Canada Ground Operations
FedEx Express

Rebecca Brewster
President and COO
ATRI

Chris Spear
President and CEO
American Trucking Associations

ATRI RESEARCH ADVISORY COMMITTEE

Ben Banks, RAC Chairman
Vice President, Operations
TCW, Inc.

Colin Abernathy
Director of Performance and Analytics
Groendyke Transport, Inc.

Brent Allred
Transportation Practice Leader and Managing Director
Higginbotham Transportation Services

Andrew Andrusko
Statewide Freight Planning Director
Minnesota Department of Transportation

Renee Bowen
Principal
Franklin & Prokopik, P.C.

Tony Bradley
President and CEO
Arizona Trucking Association

Michael Bray
Chief Commercial Officer
Platform Science

Joyce Brenny
President and CEO
Brenny Transportation, Inc.

Bree Bryant
Vice President of Safety
Eagle Transport Corp.

Mark Colson
President and CEO
Alabama Trucking Association

Mark Doughty
President and CEO
PrePass Safety Alliance

Steve Fields
America's Road Team Captain
Yellow

Rob Haddock
Group Director, Planning and Logistics
Coca-Cola North America

Evangelos Kaiser
Director, Freight Mobility Research Institute
Florida Atlantic University

Jackie Kelly
Senior Federal Affairs Representative
FedEx Corp.

Mike Ludwick
Chief Administrative Officer
Bison Transport

Ken Marko
Fleet Sustainability Senior Manager
US Foods

Bob Meyer
Vice President of Transportation
UPS

Andrew Mills
Vice President of Operations
TrueNorth Companies

Andrew Owens
CEO – Manager
A&M Transport

Andrew Petrofsky
Vice President
J&M Tank Lines

Dustin Ragon
Lieutenant, Commercial Carrier Enforcement
Wyoming Highway Patrol

Jose Samperio
Vice President and General Manager – North America On-Highway
Cummins Inc.

Jon Samson
Executive Director, Agricultural and Food Transporters Conference
American Trucking Associations

Amanda Schuier
Director of Employee Engagement
Jetco Delivery

Andrea Serra
Senior Enterprise Product Manager
CH Robinson

Kimberly Skelton
Senior Manager, Consumer Insights
Pilot Flying J

Mike Stapleton
Vice President of Industry Relations
ISAAC Instruments

Kerry Stritt
Vice President Fleet Services
Southeastern Freight Lines

Daniel Studdard
Principal Planner, Transportation Access and Mobility Division
Atlanta Regional Commission

Heather Sykes
Director of the Office of Supply Chain, Professional, and Business Services
U.S. Department of Commerce International Trade Administration

Gregg Troian
President
PGT Trucking

Stephen Truono
EVP and Chief Risk Officer
NFI Industries

Connie Vaughan
Manager, Government Relations
McKee Foods

Tom Weakley
Director of Operations
Owner-Operator Independent Drivers Association Foundation

TABLE OF CONTENTS

TABLES AND FIGURES

ACRONYMS

ATA	American Trucking Associations
ATRI	American Transportation Research Institute
BLS	Bureau of Labor Statistics
CPH	Cost Per Hour
CPM	Cost Per Mile
EIA	Energy Information Administration
FMCSA	Federal Motor Carrier Safety Association
FMI	Freight Mobility Initiative
IFTA	International Fuel Tax Agreement
LTL	Less-Than-Truckload
MPG	Miles Per Gallon
MPH	Miles Per Hour
NPTC	National Private Truck Council
OOs	Owner-Operators
QCEW	Quarterly Census of Employment and Wages
RAC	Research Advisory Committee
SIRs	Self-Insurance Retentions
STA	State Trucking Associations
TL	Truckload
TMC	Technology & Maintenance Council
U.S. DOT	U.S. Department of Transportation

INTRODUCTION

Since 2008, the American Transportation Research Institute (ATRI) has published *An Analysis of the Operational Costs of Trucking* in response to the need for accurate cost data. The research was originally identified as an industry priority by ATRI's Research Advisory Committee (RAC), and each annual report provides new and expanded data on trucking industry operations and cost metrics.[1]

After a strong 2021, the trucking industry entered a weaker economy in 2022. GDP declined as inflation soared during the first two quarters of 2022, and trucking rates fell throughout the year.[2] Federal and industry sources reported rising costs in key areas. Fuel costs started spiking after Russia invaded Ukraine in February 2022.[3] Truck purchase prices remained high even while availability improved, as did repair and maintenance costs.[4] Though some costs like auto liability insurance premiums stabilized, others – like driver wages – continued to rise.[5]

ATRI's comprehensive analysis encompasses all of these cost centers as well as other essential motor carrier operational and financial data from 2022 – allowing for more detailed insights into relationships between costs, trends over time, and fleet size- and sector-specific factors. It found that expenses rose in almost every cost center during the last year, including double-digit increases in fuel, truck and trailer payments, repair and maintenance, and driver wages. As a result, 2022 broke the 2021 record for the costliest year to operate in the trucking industry – whether calculated with or without fuel. Yet fleets also achieved valuable improvements in operational efficiencies such as driver turnover and equipment utilization. Though operating margins fell in most fleet sizes and sectors, all sizes and sectors posted an average operating margin of 6 percent or higher in 2022.

[1] ATRI's Research Advisory Committee RAC is comprised of industry stakeholders representing motor carriers, trucking industry suppliers, federal government agencies, labor and driver groups, law enforcement, and academia. The RAC is charged with annually recommending a research agenda for the Institute.

[2] "Gross Domestic Product (Second Estimate), First Quarter 2023," Bureau of Economic Analysis (May 25, 2023), https://www.bea.gov/sites/default/files/2023-05/gdp1q23_2nd.pdf; "Consumer Price Index: 2022 in review," U.S. Bureau of Labor Statistics (January 17, 2023), https://www.bls.gov/opub/ted/2023/consumer-price-index-2022-in-review.htm; "DAT Trendlines: National Van Rates," DAT Freight & Analytics (accessed on June 6, 2023), https://www.dat.com/trendlines/van/national-rates.

[3] U.S. Energy Information Administration, "Weekly Retail Gas and Diesel Prices" (accessed on June 13, 2023), https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

[4] J.D. Power Valuation Services, "Commercial Truck Guidelines" (April 2023), https://discover.jdpa.com/hubfs/Files/Industry%20Campaigns/Valuation%20Services/04.2023_CommercialVehicleGuidelines_FINAL.pdf; ATA Technology and Maintenance Council and Decisiv, "VMRS System Service Data Quarterly Report "(Q4 2022).

[5] The Council of Insurance Agents & Brokers, *Commercial Property/Casualty Market Index*, (Q4 2022), https://www.ciab.com/market-intel/pc-market-index-survey/; U.S. Bureau of Labor Statistics, "Occupational Employment and Wage Statistics: Heavy and Tractor-Trailer Truck Drivers, May 2022 Period" (accessed on May 2023), https://www.bls.gov/oes/2022/may/oes533032.htm.

RESEARCH OBJECTIVE

ATRI's *Operational Costs of Trucking* or "Ops Costs" report provides accurate and detailed insights into the operational costs of for-hire trucking fleets. Marginal line-item costs are the most important metrics in the report, calculated on both per-mile and per-hour bases. Other metrics have been included to provide insight into revenue levels, operating margins, efficiency metrics and operating metrics associated with maintenance, labor, and equipment use. Together, these metrics allow for-hire fleets to perform essential benchmarking activities. The Ops Costs data have also been used to inform shipper relations, equipment and parts purchases and to rationalize public sector investment in infrastructure.

METHODOLOGY

The data in ATRI's Ops Costs report is collected directly from motor carriers of all sectors and fleet sizes, including owner-operators (OOs). Data is collected confidentially, with non-disclosure agreements signed upon request, and it is presented in aggregate form only.

The methodology for collecting and analyzing motor carrier operational data has remained consistent to ensure year-to-year comparability, except where otherwise noted. Motor carriers supplied line-item cost data for numerous cost centers, and more in-depth data on fleet demographics, driver compensation, and operational efficiencies. The 2023 data collection form is included in the Appendix.

This year's data collection form introduced the following new questions based on carrier feedback:

- How many non-driving employees did your company utilize in 2022?
- What was your average days of use per year per tractor?
- On average, how many miles do trucks in your fleet run between breakdowns/failure?
- What percentage of your fleet's total repair and maintenance is conducted at in-house or company-owned shops (versus outside shops)?

Ops Costs data collection began in March 2023 and concluded in May 2023. ATRI solicited recurring motor carrier participants through direct emails and conducted general outreach through ATRI's contact lists, media coverage from industry trade press, and trade organizations such as the 50 State Trucking Associations (STA). Submissions were collected via email and secure online portal. ATRI staff carefully reviewed all data and queried participants on all outliers to achieve high data quality.[6] They also communicated with industry experts to confirm and analyze costs trends.

ATRI weights respondent data so that industry-wide marginal cost per mile (CPM) averages better reflect the industry market share of each sector. To do so, ATRI uses Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) data for the total drivers in each sector, which is compared to Ops Costs respondents in Table 1. Truckload (TL) carriers are underrepresented in the dataset, while Less-Than-Truckload (LTL) carriers are overrepresented.

[6] To ensure reliability, individual data points were excluded as outliers if they were three times the interquartile range less than the first quartile or three times the interquartile range more than the third quartile of a cost center.

Table 1: For-Hire Industry Sector Breakout by Drivers Employed

	ATRI Respondents	U.S Trucking Industry[7]
Truckload	35.2%	56.9%
Less-than-Truckload	46.6%	29.1%
Other/Specialized	18.2%	14.0%

CPM metrics were converted to cost per hour (CPH) with an average speed derived from the GPS-based U.S. Bureau of Transportation Statistics/ATRI Freight Mobility Initiative (FMI) program.[8] The average speed calculated for 2022 was 40.33 miles per hour (MPH), approximately 0.09 MPH faster than in 2021. Average speeds continue to be higher than the average speed in pre-pandemic Ops Costs reports.

Cost metrics are subdivided by fleet size, sector, and region of operation to provide more precise analysis – due to variations in business models and marginal costs across the industry.

The key line-items in this report are compared with outside federal and industry sources to corroborate findings and further develop analysis, as summarized in Table 2.

Table 2: Cost Centers and Outside Sources

Cost Center	Corroborating Sources
Fuel	Energy Information Administration (EIA)
Truck/Trailer Lease or Purchase Payments	J.D. Power Valuation Services ACT Research
Repair and Maintenance Costs	American Trucking Associations (ATA) Technology & Maintenance Council (TMC) and Decisiv Fullbay, Motor Information Systems, and TMC
Truck Insurance Premiums	The Council of Insurance Agents & Brokers Fitch Ratings AM Best
Permits and Special Licenses	
Tires	
Tolls	
Driver Wages	Bureau of Labor Statistics (BLS)
Driver Benefits	ATA

[7] U.S. Bureau of Labor Statistics, "Quarterly Census of Employment and Wages" (Q3 2022), https://www.bls.gov/cew/. SOC codes used were as follows: 484121 for truckload carriers, 484122 for less-than-truckload carriers, and 484230 for other/specialized carriers.

[8] ATRI derived this speed by analyzing one full week of national FMI data in each of the four quarters in 2022 (the 12th to the 18th of February, May, August, and October). This dataset consisted of over 300 million truck speed data points with non-zero speeds. The 40.33 MPH figure is an update to the 40.24 MPH figure from 2021 that was used in last year's report. This speed figure represents an average operational speed since it includes speeds in all types of operational conditions, sectors, and locations.

ATRI tracks numerous additional efficiency and cost metrics, which are also analyzed by sector when applicable. These include average driver bonuses by type and truck parking compensation as well as average dwell times, deadhead mileage, truck-to-trailer ratios, annualized driver turnover, and driving-to-non-driving employee ratios.

The final component of the report is an analysis of per-truck and per-mile revenue, share of costs, and operating margins.

Due to rounding, the percentages in some tables may not sum to exactly 100 percent.

RESPONDENT DEMOGRAPHICS

ATRI's Ops Costs analyzes for-hire motor carriers. For-hire carriers held 52.7 percent of the total trucking market share in 2022, with private fleets at 37.4 percent and fleets registered as both at 8 percent.[9]

Private fleets operate under fundamentally different business models. According to the National Private Truck Council's (NPTC) annual *Benchmarking Survey Report 2022*, 79 percent of private fleets operate as a cost center rather than a profit center.[10] This is due to shippers incurring transportation costs by moving their own products in their own "private fleet" trucks.

Operation Size

ATRI's 2023 report represents 2022 data encompassing 169,770 truck-tractors, 498,068 trailers, and over 13.6 billion vehicle miles traveled. The sample thus represents approximately 7 percent of all miles traveled by combination trucks during 2022.[11] In terms of fleet size, the ATRI data has a considerable number of smaller fleets. Figure 1 shows that a majority of respondents had fewer than 100 truck-tractors, reflecting national fleet size trends.

[9] American Trucking Associations, *American Trucking Trends 2022* (October 17, 2022), https://www.trucking.org/news-insights/ata-american-trucking-trends-2022.
[10] National Private Truck Council, *Benchmarking Survey Report 2022* (August 2022), https://www.nptc.org/benchmarking/benchmarking-report/.
[11] Percentage based on the most recent figures for miles traveled, from 2021. Office of Highway Policy Information, "Table VM-1: Annual Vehicle Distance Traveled in Miles and Related Data – 2021" (March 2023), 2021 Highway Statistics Series, Federal Highway Administration, U.S. Department of Transportation.

Figure 1: Respondent Fleet Size

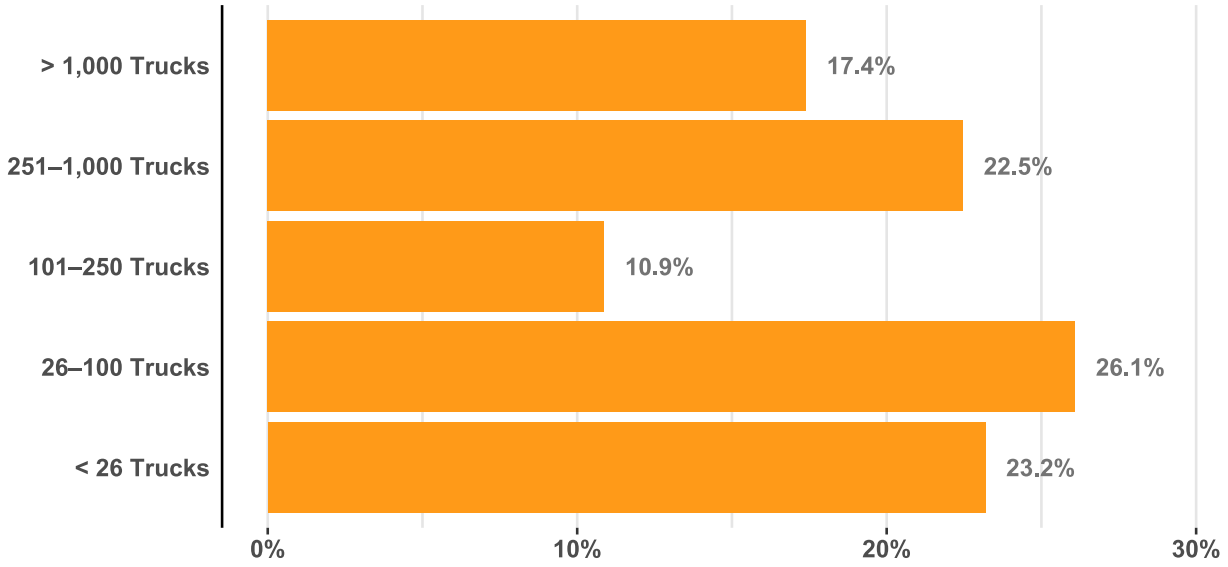
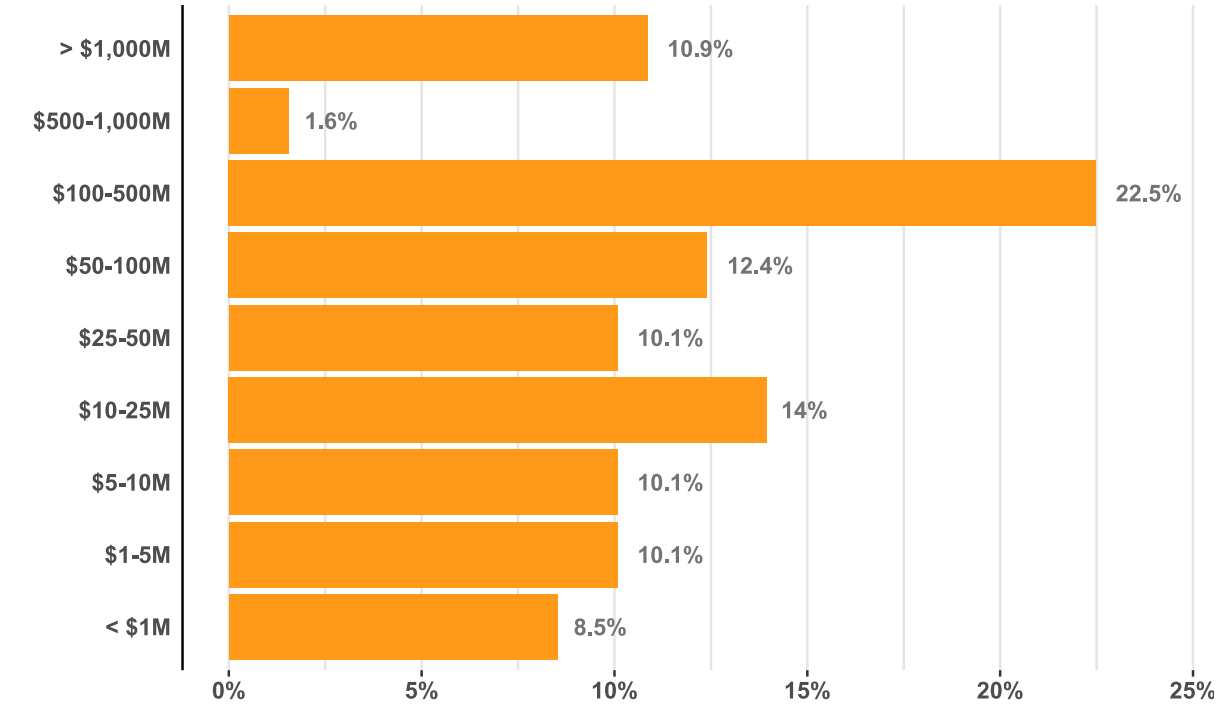


Figure 2 provides an equivalent breakdown of respondents' total trucking-related revenue (excluding brokerage, logistics or other revenue sources). A plurality of fleets reported between $100 and $500 million in 2022 revenue; most other revenue bins had approximately equal representation.

Figure 2: Respondent Revenue



Operation Type

Regional trips, between 100 and 500 miles in length, continue to be the most common trip length among fleets (Table 3). There is no clear trend in carriers' average trip lengths. Local trips rebounded after a dip in 2021, while the average for national and inter-regional trip lengths held steady.

Table 3: Respondent Trip Lengths, 2018 to 2022

	2018	2019	2020	2021	2022
Local (less than 100 miles)	26%	26%	32%	24%	28%
Regional (100-500 miles)	37%	39%	37%	40%	37%
Inter-regional (500-1,000 miles)	21%	22%	19%	22%	21%
National (over 1,000 miles)	16%	13%	12%	14%	14%

As Table 4 shows, the distribution of International Fuel Tax Agreement (IFTA) miles by region traveled by respondent carriers tracks closely with that of all combination trucks in the U.S. The Midwest is slightly overrepresented in the sample, while the Southwest and West are slightly underrepresented.

Table 4: Respondent Truck IFTA Miles and National Truck Mileage by Region

Region	Respondent Percent of IFTA Miles	Share of U.S. Truck-Tractor Miles (2021)[12]
Midwest	31.1%	27.1%
Northeast	9.5%	8.3%
Southeast	30.6%	30.0%
Southwest	10.8%	14.3%
West	17.3%	20.2%
Canada	1.0%	

Equipment

The trucking industry was responsible for transporting 10.93 billion tons of freight – 72.2 percent of total domestic tonnage – in the U.S. in 2021.[13] In that year there were 4.06 million Class 8 trucks in operation, up 2.3 percent from 2020.[14]

After two years of rising truck-tractor ages, respondents' average truck age receded from 5.7 years old in 2021 to 4.7 years old in 2022 (Table 5). This trend and its reversal played an

[12] Office of Highway Policy Information, "Table VM-2: Functional System Travel – 2021" and "Table VM-4: Distribution of Annual Vehicle Distance Traveled – 2021" (February 2023), 2021 Highway Statistics Series, Federal Highway Administration, U.S. Department of Transportation, https://www.fhwa.dot.gov/policyinformation/statistics/2021/.
[13] American Trucking Associations, *American Trucking Trends 2022* (2022), https://www.trucking.org/news-insights/ata-american-trucking-trends-2022.
[14] Ibid.

important role in repair and maintenance costs as well as truck and trailer payment costs. As discussed in the Line-Item Analyses section below, newer trucks incur lower repair and maintenance costs.

The decade-long downward trend in the number of annual miles driven per truck did continue, dropping from 79,808 in 2021 to 78,863 in 2022. On average, fleets ran each truck 251 days per year.

Table 5: Respondent Equipment Characteristics

Equipment Type	Number of Units	Average Age (Years)	Average Miles Driven per Year per Truck
Truck-Tractors	**169,770**	4.7	78,863
28' Trailers	174,910	9.9	
33' Trailers	1,023	10.1	
45' Trailers	13,709	11.2	
48' Trailers	30,818	10.4	
53' Trailers	192,488	6.7	
Tank Trailer	22,839	15.6	
Flatbed Trailer	14,103	5.9	
Refrigerated Trailer	26,524	4.5	
Intermodal Trailers	5,190	5.6	
Other Trailers	16,464	6.8	
Total Trailers	**498,068**		

The average ages of most trailer types, by contrast, did increase from 2021 to 2022.

Respondents' average truck-tractor trade cycle declined to 8.2 in 2022 compared to 8.7 in 2021, consistent with the decline in average age (Table 6). When measured by miles, the truck-tractor trade cycle dipped slightly to 592,716 miles, consistent with the trend toward fewer annual miles driven per truck.

Table 6: Respondent Equipment Trade Cycle

Equipment Type	Average Number of Years Until Replacement	Average Miles Driven Until Replacement
Truck-Tractors	8.2	592,716
Trailers	14.2	

Alternative Fuels

In 2022, 8.2 percent of respondent fleets included at least one Class 8 truck-tractor powered by an alternative fuel source, up from 7 percent in 2021. Table 7 shows the percentage of fleets that had at least one alternative fuel truck by fuel type.

Table 7: Use of Alternative Fuel Vehicles

Alternative Fuel Type	Percent of ATRI Ops Costs Respondents Using Alternative Fuels
CNG	6.2%
Battery Electric	5.1%
LNG	2.1%
LPG	0.5%
Hydrogen Fuel Cell	0%

Most of the fleets represented in Table 7, however, operate very few alternative fuel vehicles. Only 3.4 percent of all trucks in this year's sample used alternative fuels, though this figure is also on the rise from 2.7 percent in 2021. With significantly higher prices and limited use cases, alternative fuel trucks are more challenging to incorporate into small carriers' operations. Ninety-seven percent of all alternative fuel trucks in the sample belong to four carriers, all of which have more than 1,000 trucks each.

FINDINGS

The cost of operating a truck in 2022 was $2.251 per mile, surpassing two dollars per mile for the first time in the history of ATRI's Ops Costs report. Though much of this increase was due to high fuel costs, multiple other cost centers increased by double-digit percentages as well, including repair and maintenance, truck and trailer lease or purchase costs, and driver wages. The cost of trucking, with fuel included, increased by 21.3 percent in 2022 compared to the previous year; with fuel removed, the cost of trucking increased by 12 percent. Table 8 shows per-mile costs for each cost center over the past ten years.

Costs per hour in 2022 totaled $90.78, also the highest in Ops Costs history. This per-hour figure increased at a slightly higher rate (21.6%) than costs on a per-mile basis because the average truck speed in 2022 was slightly higher than in 2021 (see footnote 4). Table 9 shows per-hour costs for each cost center over the past ten years.

Table 8: Average Marginal Costs per Mile, 2013-2022

Motor Carrier Costs	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Vehicle-based										
Fuel Costs	$0.645	$0.583	$0.403	$0.336	$0.368	$0.433	$0.384	$0.308	$0.417	$0.641
Truck/Trailer Lease or Purchase Payments	$0.163	$0.215	$0.230	$0.255	$0.264	$0.265	$0.256	$0.271	$0.279	$0.331
Repair & Maintenance	$0.148	$0.158	$0.156	$0.166	$0.167	$0.171	$0.149	$0.148	$0.175	$0.196
Truck Insurance Premiums	$0.064	$0.071	$0.074	$0.075	$0.075	$0.084	$0.071	$0.087	$0.086	$0.088
Permits & Licenses	$0.026	$0.019	$0.019	$0.022	$0.023	$0.024	$0.020	$0.016	$0.016	$0.015
Tires	$0.041	$0.044	$0.043	$0.035	$0.038	$0.038	$0.039	$0.043	$0.041	$0.045
Tolls	$0.019	$0.023	$0.020	$0.024	$0.027	$0.030	$0.035	$0.037	$0.032	$0.028
Driver-based										
Driver Wages	$0.440	$0.462	$0.499	$0.523	$0.557	$0.596	$0.554	$0.566	$0.627	$0.724
Driver Benefits	$0.129	$0.129	$0.131	$0.155	$0.172	$0.180	$0.190	$0.171	$0.182	$0.183
TOTAL	**$1.676**	**$1.703**	**$1.575**	**$1.592**	**$1.691**	**$1.821**	**$1.699**	**$1.646**	**$1.855**	**$2.251**

Table 9: Average Marginal Costs per Hour, 2013-2022

Motor Carrier Costs	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Vehicle-based										
Fuel Costs	$25.78	$23.29	$16.13	$13.45	$14.50	$17.07	$15.14	$12.52	$16.78	$25.84
Truck/Trailer Lease or Purchase Payments	$6.52	$8.59	$9.20	$10.20	$10.39	$10.45	$10.09	$11.00	$11.21	$13.37
Repair & Maintenance	$5.92	$6.31	$6.23	$6.65	$6.58	$6.72	$5.87	$6.00	$7.04	$7.89
Truck Insurance Premiums	$2.57	$2.86	$2.98	$3.00	$2.95	$3.32	$2.80	$3.55	$3.46	$3.57
Permits & Licenses	$1.04	$0.76	$0.78	$0.88	$0.92	$0.95	$0.79	$0.67	$0.64	$0.60
Tires	$1.65	$1.76	$1.72	$1.41	$1.50	$1.50	$1.54	$1.73	$1.67	$1.81
Tolls	$0.77	$0.90	$0.79	$0.97	$1.05	$1.17	$1.38	$1.49	$1.30	$1.14
Driver-based										
Driver Wages	$17.60	$18.46	$19.95	$20.91	$21.97	$23.50	$21.84	$22.97	$25.24	$29.20
Driver Benefits	$5.16	$5.15	$5.22	$6.18	$6.78	$7.10	$7.49	$6.94	$7.31	$7.37
TOTAL	**$67.00**	**$68.09**	**$62.98**	**$63.66**	**$66.65**	**$71.78**	**$66.94**	**$66.87**	**$74.65**	**$90.78**

Truck and trailer payments, repair and maintenance, auto liability insurance premiums, tires, and driver wages all set record high marginal costs in 2022. Table 10 shows the annual percent change for each cost center. Driver wages grew at the fastest pace that ATRI has observed to date (15.5%), and the spike in truck and trailer payment costs constituted the greatest annual change since 2014 for that cost center (18.6%).

Table 10: 2021-2022 Annual Change of Average Costs per Mile

Motor Carrier Costs	Percent Change
Vehicle-based	
Fuel Costs	53.7%
Truck/Trailer Lease or Purchase Payments	18.6%
Repair & Maintenance	12.0%
Truck Insurance Premiums	2.3%
Permits & Licenses	- 6.3%
Tires	9.8%
Tolls	- 12.5%
Driver-based	
Driver Wages	15.5%
Driver Benefits	0.5%
TOTAL	**21.3%**

Only two cost centers – permits and licenses as well as tolls – experienced a decline in marginal cost in 2022, but these two cost centers combined only represent approximately 2 percent of all marginal costs. Table 11 shows each cost center's share of the total average marginal cost. While driver wages and driver benefits both increased, their share of the total cost fell due to the increase in the share of fuel costs.

Table 11: Share of Total Average Marginal Cost, 2014-2022

Motor Carrier Costs	2014	2015	2016	2017	2018	2019	2020	2021	2022
Vehicle-based									
Fuel Costs	34%	26%	21%	22%	24%	24%	19%	22%	28%
Truck/Trailer Lease or Purchase Payments	13%	15%	16%	16%	15%	16%	17%	15%	15%
Repair & Maintenance	9%	10%	10%	10%	9%	9%	9%	9%	9%
Truck Insurance Premiums	4%	5%	5%	4%	5%	4%	5%	5%	4%
Permits & Licenses	1%	1%	1%	1%	1%	1%	1%	1%	1%
Tires	3%	3%	2%	2%	2%	2%	3%	2%	2%
Tolls	1%	1%	2%	2%	2%	2%	2%	2%	1%
Driver-based									
Driver Wages	27%	32%	33%	33%	33%	32%	34%	34%	32%
Driver Benefits	8%	8%	10%	10%	10%	10%	10%	10%	8%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Sector Costs

Business models necessarily vary between sectors, leading to different costs. As Table 12 shows, truckload carriers had the lowest average total marginal cost while specialized carriers had the highest. However, truckload carriers experienced the highest rate of increase in 2022 at 23.6 percent. LTL carriers' 17.6 percent increase in total marginal costs was the lowest rate of increase among sectors in 2022, while the specialized sector – which includes flatbed, tanker, refrigerated, and intermodal carriers – saw an increase of 21.4 percent. All three of these totals are still well below private fleets' average total marginal costs of $2.50 per mile in the preceding year, 2021.[15]

Table 12: Average Total Marginal Costs by Sector, 2013-2022

Sector	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
LTL	$1.84	$1.83	$1.60	$1.74	$1.84	$1.92	$1.85	$1.72	$1.99	$2.34
Specialized	$1.67	$1.85	$1.72	$1.83	$1.95	$2.02	$1.85	$1.82	$2.01	$2.44
TL	$1.60	$1.58	$1.50	$1.42	$1.49	$1.71	$1.55	$1.56	$1.74	$2.15

Regional Costs

Carrier costs often vary by region. Table 13 estimates these variations in each cost center based on a method of weighting the percentage of IFTA miles traveled in each region by each respondent carrier.

Table 13: Average Marginal Cost per Mile by Region, 2022

Motor Carrier Costs	Midwest	Northeast	Southeast	Southwest	West
Vehicle-based					
Fuel Costs	$0.612	$0.606	$0.647	$0.628	$0.711
Truck/Trailer Lease or Purchase Payments	$0.338	$0.324	$0.319	$0.313	$0.315
Repair & Maintenance	$0.198	$0.183	$0.189	$0.183	$0.181
Truck Insurance Premiums	$0.087	$0.096	$0.096	$0.090	$0.081
Permits & Licenses	$0.017	$0.015	$0.016	$0.018	$0.012
Tires	$0.043	$0.044	$0.048	$0.046	$0.040
Tolls	$0.031	$0.039	$0.026	$0.028	$0.017
Driver-based					
Driver Wages	$0.699	$0.716	$0.753	$0.729	$0.652
Driver Benefits	$0.170	$0.184	$0.209	$0.203	$0.148
TOTAL	**$2.195**	**$2.207**	**$2.303**	**$2.238**	**$2.157**

[15] This figure excludes NPTC-reported administrative and "other" costs, ATRI does not track. National Private Truck Council, *Benchmarking Survey Report 2022* (August 2022), https://www.nptc.org/.

After trailing other regions for several years, in 2022 the Southeast was the most expensive region in which to operate as a motor carrier; it led all other regions in driver wage and benefits costs. After fuel, these were the two cost centers that varied most across regions.

There are several possible reasons for this change. Many fleets operating in the Northeast, previously the most expensive region, have taken steps to diversify the geography of their operations in order to avoid the Northeast region's historically high costs. This has led to declining average costs for respondents in the Northeast relative to other regions over the past four years, while costs in the Southeast have risen relative to other regions. Carriers consulted by ATRI on the subject reported that they have experienced "costs evening out" across regions during the last two years of sharply rising expenses.

The West had the highest fuel costs, and carriers in the Midwest spent the most per mile on truck and trailer payments as well as repair and maintenance.

Insurance costs were highest in the Northeast, which contains both high crash rates and litigious states.[16]

Fleet Size

Fleets with 10 or fewer trucks make up 95.7 percent of all motor carriers registered with the U.S. Department of Transportation (U.S. DOT).[17] Small and large carriers each face unique cost pressures based on their size. Larger carriers can use bargaining power and economies of scale to drive down fuel and equipment costs, while smaller carriers can save on driver wages and benefits by offering drivers a more personal or flexible employment relationship. Table 14 compares costs between smaller carriers, with 100 or fewer power units, and larger carriers, with more than 100 power units, in 2021 and 2022.

[16] Alex Leslie and Claire Evans, *The Impacts of Small Verdicts and Settlements on the Trucking Industry*, American Transportation Research Institute (November 2021), https://truckingresearch.org/2021/11/the-impact-of-small-verdicts-and-settlements-on-the-trucking-industry/.
[17] American Trucking Association, *American Trucking Trends 2022* (2022), https://www.trucking.org/news-insights/ata-american-trucking-trends-2022.

Table 14: Average Marginal Cost per Mile by Fleet Size

Motor Carrier Costs	Small Carriers 2021	Small Carriers 2022	Large Carriers 2021	Large Carriers 2022
Vehicle-based				
Fuel Costs	$0.444	$0.723	$0.408	$0.612
Truck/Trailer Lease or Purchase Payments	$0.305	$0.330	$0.279	$0.336
Repair & Maintenance	$0.197	$0.212	$0.161	$0.186
Truck Insurance Premiums	$0.102	$0.136	$0.082	$0.072
Permits and Licenses	$0.016	$0.016	$0.016	$0.014
Tires	$0.047	$0.051	$0.040	$0.045
Tolls	$0.031	$0.024	$0.031	$0.031
Driver-based				
Driver Wages	$0.603	$0.693	$0.629	$0.734
Driver Benefits	$0.135	$0.117	$0.185	$0.193
TOTAL	**$1.880**	**$2.300**	**$1.831**	**$2.223**

Small fleets spent 7.7 cents more per mile than large fleets in 2022. This gap was 2.8 cents larger than in 2021, but it was still less than in 2020 when small fleets spent 16.3 cents more than large fleets per mile.

The most significant gap between small and large carriers is in fuel, where large carriers expanded their competitive advantage significantly as fuel prices rose.

Though large carriers paid more in driver wages, small carriers remained competitive with an average wage only 4.1 cents per mile lower.

Most costs trended in the same direction, upwards, for both large and small carriers. However, cost trends diverged for large and small carriers in two key cost centers, insurance premiums and driver benefits. While large carriers managed to spend less on insurance premiums per mile in 2022 than in 2021, small carriers spent 33.3 percent more in 2022 than in 2021. In the case of driver benefits, large carriers spent more in 2022 than in 2021 while small carriers reduced driver benefits spending per mile from 2021 to 2022.

Line-Item Analyses

These broad cost trends are examined in greater detail as follows. Each line item is analyzed by fleet size for two sectors, truckload and specialized (which includes flatbed, tanker, refrigerated, intermodal, and other specialized carriers); costs are provided for the LTL sector as a whole but not by fleet size. These figures are corroborated with leading outside research. The discussion of each line-item concludes with a short section looking ahead to the second half of 2023 and 2024.

Driver Compensation

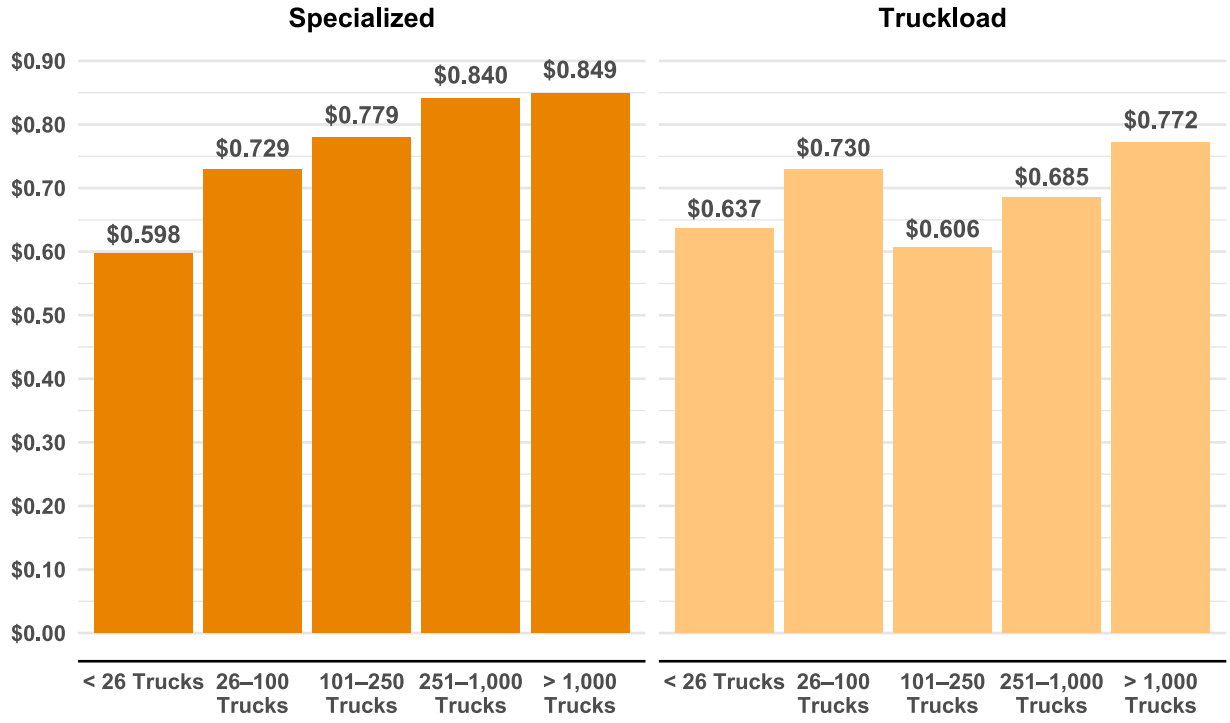
On average, the trucking industry spent 90.7 cents per mile on combined driver pay and benefits in 2022. Though benefits did not increase from 2021, wages rose more than 15 percent.

Driver Wages

Figure 3 details company driver wages per mile by sector and fleet size. Truckload wages tended to increase as fleet size increased – a reversal of last year's results – where larger truckload fleet size categories spent slightly less than their smaller competitors. In other words, larger fleets increased company driver wages by a greater percentage in 2022.

Specialized carriers' driver wages had an even stronger tendency to increase with increasing fleet size. The size of this pay differential is partly because many small fleets in this sector had more highly specialized operations, which often included supplemental pay or bonuses – such as load-specific oversize or loading pay – that larger fleets were less likely to offer.

Figure 3: Driver Wages per Mile by Fleet Sector and Size



In 2022, LTL carriers paid an average of 78.0 cents per mile in driver wages, compared to 70.2 cents per mile in 2021. In the last year, the gap between LTL driver wages and historically lower truckload driver wages has become smaller, in part under pressure from a competitive labor market.

Driver Benefits

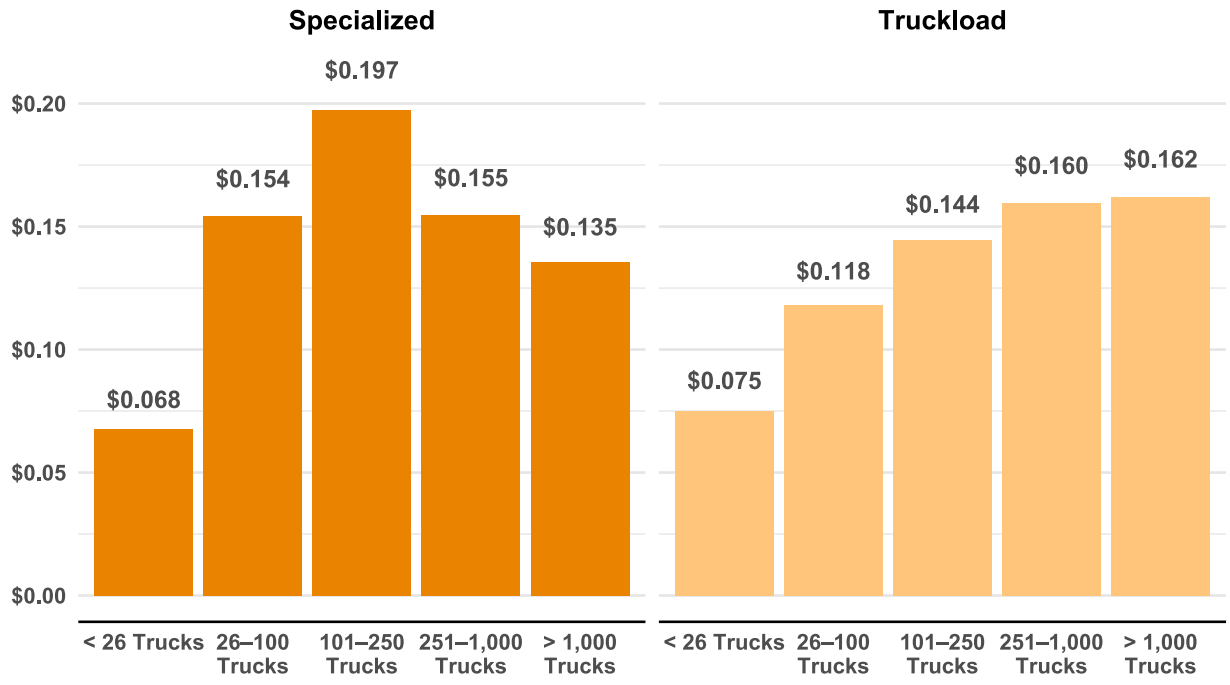
Average truckload driver benefits costs increased with fleet size, as Figure 4 indicates. Whereas in 2021 there was little difference in benefits costs among the largest four truckload

fleet size bins, in 2022 truckload fleets with more than 250 trucks increased benefits spending at a greater rate than their truckload peers. Eleven percent of truckload carriers did not offer benefits.

The average driver benefits cost for LTL carriers was 28.0 cents per mile, substantially higher than any other fleet sector or size category. The high figure in the LTL sector was exclusively responsible for the slight increase in the overall industry average benefits cost per mile in 2022.

Specialized carriers of all fleet sizes spent less on benefits in 2022 than in 2021 on average. Specialized fleets' benefits costs once again peaked in the 101 to 250 truck category and declined among larger fleets. Thirteen percent of specialized carriers did not offer benefits.

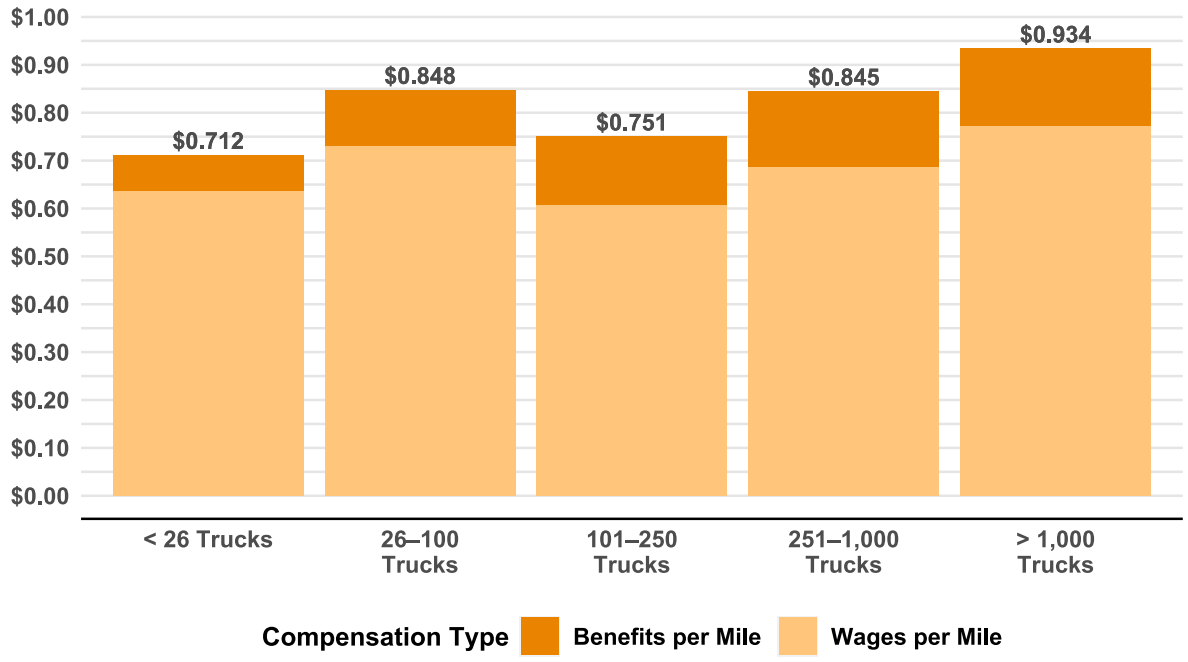
Figure 4: Driver Benefits per Mile by Fleet Sector and Size



Combined Wages and Benefits Analysis

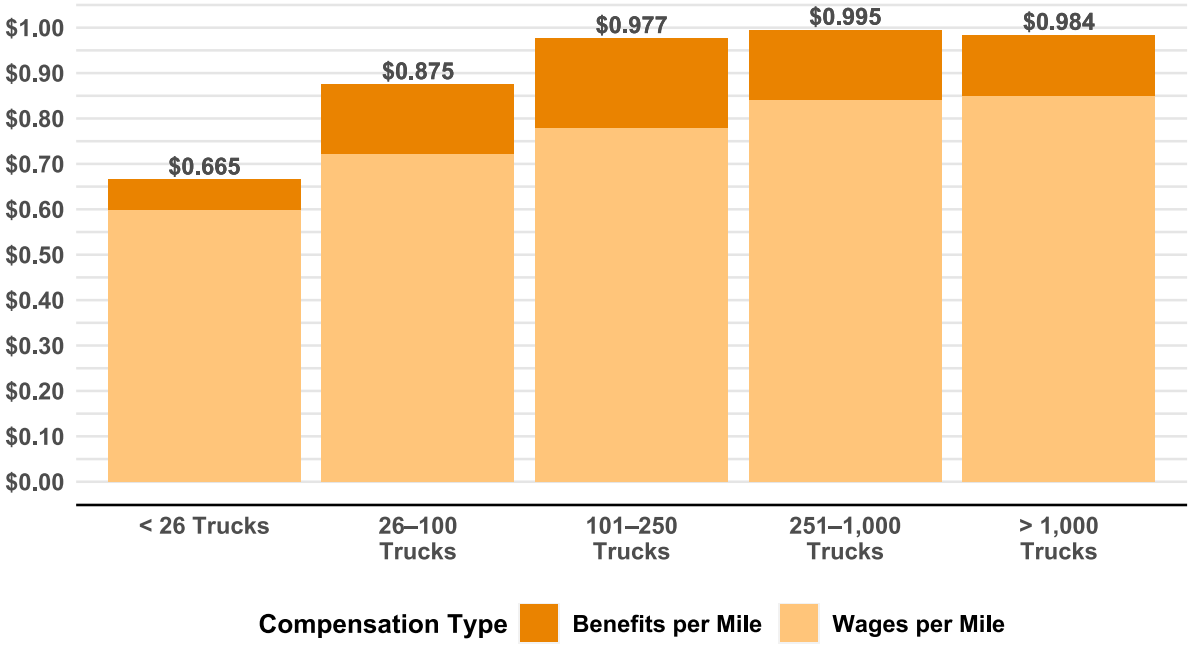
Combined driver wages and benefits costs in truckload fleets generally increased with fleet size (Figure 5). The one exception to this trend was fleets with 26 to 100 trucks, which paid a combined 84.8 cents per mile on average. Fleets with more than 1,000 trucks spent the most on combined driver compensation in the truckload sector, at 93.4 cents per mile.

Figure 5: Truckload Driver Wages and Benefits per Mile by Fleet Size



Specialized carriers spent more on combined driver wages and benefits than truckload carriers in every size group except fleets with fewer than 26 trucks (Figure 6). Just 1.8 cents separated the averages in the largest three specialized fleet size groups, as differences in benefits costs offset differences in wage costs, whereas 31.9 cents separated the largest fleet group from the smallest.

Figure 6: Specialized Carrier Driver Wages and Benefits per Mile by Fleet Size



LTL carriers spent $1.06 on combined driver wages and benefits per mile. Though LTL driver wages were comparable to wage averages in the specialized sector, their much higher benefits costs resulted in a higher combined average.

Driver Benefits Breakdown

As Table 15 shows, the most common company driver benefits offered by carriers were health insurance (97% of carriers) and paid vacation (91%).[18] The percentage of carriers offering per diems declined, while the percentage of carriers offering paid sick leave increased. Eleven percent of carriers engaged in employee ownership or profit-sharing arrangements.

Table 15: Percentage of Carriers Offering Each Benefit Type

Benefit	Percent Offered
Health Insurance	97%
Paid Vacation	91%
401(k)	85%
Dental Insurance	81%
Life Insurance	76%
Vision Insurance	75%
Per Diem	50%
Paid Sick Leave	49%
Employee Ownership / Profit Sharing	11%

These figures are consistent with the American Trucking Associations' (ATA) 2022 *Driver Compensation Study*, which found 95 percent of truckload carriers offered health insurance, 89 percent offered paid leave, and 88 percent offered 401(k) plans.[19]

Owner-Operators and Contracted Drivers

OOs and independent contractors play an indispensable role in the trucking industry. Sixty percent of carrier respondents employed at least one OO, with utilization ranging from occasional use as stopgaps to business models that rely on the exclusive use of OOs. OOs represent 24 percent of all drivers in the Ops Costs data.

OO pay increased to an average of $2.08 per mile in 2022; as with company driver wages and total marginal costs, this was a new record high.[20]

Since OO pay is meant to encompass all direct costs borne by the OO, it typically tracks closely to, though slightly below, the average total marginal cost for the industry as a whole, as shown in Table 16.

[18] These figures are calculated as a percent of carriers with more than one company driver that offer each benefit.
[19] Lindsay Bur and Bob Costello, *ATA 2022 Driver Compensation Study*, American Trucking Associations (June 2022), https://www.trucking.org/news-insights/ata-driver-compensation-study.
[20] When carriers paid separate OO wages and benefits, these two figures were summed.

Table 16: Contracted Owner-Operator Pay and Total Marginal Costs per Mile, 2019-2022

	2019	2020	2021	2022
Owner-Operator Pay	$1.36	$1.65	$1.81	$2.08
Total Marginal Cost	$1.699	$1.646	$1.855	$2.251

Driver Bonuses

Driver bonuses have become an important supplemental form of compensation, and a majority of carriers offered them in 2022. One primary reason is that bonuses reward specific performance goals for both the carrier and the driver.

For some specialized carriers in particular, driver bonuses form a substantial portion of overall compensation. Table 17 shows the average annualized bonus in the industry, among carriers that offered them, in four categories: safety; starting; retention; and referral bonuses.

Table 17: Average Annual Driver Bonus by Type, 2018-2022

Bonus Type	2018	2019	2020	2021	2022
Safety	$1,238	$1,373	$1,597	$1,943	$1,698
Starting	$1,562	$1,846	$1,662	$1,974	$2,373
Retention	$672	$1,218	$1,391	$1,055	$1,272
Referral					$1,783

Starting bonuses in 2022 continued to be the highest among the four categories, as carriers competed for talent in what remained a competitive labor market. That said, starting bonuses are only given once, whereas other bonus types are awarded more often.

Referral bonuses, added for the first time this year, were the second-highest bonus.

Retention bonuses in 2022 recovered from a 2021 dip. Some carriers award retention bonuses annually, but others do so at certain milestones, such as every five years of continuous employment.

Safety bonuses fell from a 2021 high. Though they remain high historically, safety bonuses' considerable drop comes at a time when crashes and crash costs, including litigation, are going up.

Bonus pay can be irregular from year to year as a result of changing economic conditions, labor demands, company performance, or any changes in primary compensation rates.

Parking Compensation

In 2022 truck parking was once again the single greatest issue facing the trucking industry according to drivers.[21] While much of the frustration surrounding truck parking concerns the lack of truck parking capacity, the short-term response for managing existing capacity is the use of real-time parking information systems and truck parking reservation systems. ATRI research has shown that there is a disconnect between truck parking reservation fees and what carriers and drivers are willing to pay.[22] That said, more and more carriers are covering truck parking reservation fees for their drivers.

Almost one in three (31%) truckload carriers compensated drivers for parking in 2022: 18 percent by reimbursement and 12 percent by advance reservation. Surprisingly, this percentage is down from 54 percent in 2021, though it remains higher than the 15 percent of drivers that received parking compensation in a 2016 ATRI study.[23]

Specialized carriers were more likely to provide parking compensation, with 27 percent offering parking fee reimbursement and 11 percent providing advance reservations for a total of 39 percent.

Looking Ahead

Total driver compensation rose by 12.3 percent in 2022 – an even greater rate of increase than in 2021 – while employment in the trucking industry grew despite a softening freight market.[24] The 2022 stabilization in driver benefits costs amid a rise in driver wages may indicate carriers' desire to manage long-term financial commitments while still raising compensation overall; a similar phenomenon occurred in the uncertain 2020 economy.[25]

Several market forces helped spur this double-digit driver compensation increase. Consumer inflation, for one, rose 6.5 percent from December 2021 to December 2022 according to the BLS, after peaking in June at 9.1 percent.[26] During the same period, wages in all occupations in the U.S. rose by 6.2 percent according to the BLS, indicating that the labor market remained competitive on wages.[27] The BLS recorded a more modest 5 percent average increase in truck driver wages between 2021 and 2022.[28] Other driving professions also exerted upward pressure on for-hire wages. In 2021, the annual increase in for-hire driver wages lagged behind

[21] American Transportation Research Institute, "Critical Issues in the Trucking Industry" (October 2022), https://truckingresearch.org/2022/10/critical-issues-in-the-trucking-industry-2022/.
[22] Caroline Boris and Matthew A. Johnson, "Managing Critical Truck Parking Tech Memo #1: Commercial Driver Perspectives on Truck Parking," American Transportation Research Institute (September 2015), https://truckingresearch.org/2015/09/managing-critical-truck-parking-tech-memo-1-commercial-driver-perspectives-on-truck-parking/.
[23] Caroline Boris and Rebecca M. Brewster, *Managing Critical Truck Parking Case Study – Real World Insights from Truck Parking Diaries*, American Transportation Research Institute (December 2016), https://truckingresearch.org/wp-content/uploads/2016/12/ATRI-Truck-Parking-Case-Study-Insights-12-2016.pdf.
[24] U.S. Bureau of Labor Statistics, "Employment by industry, monthly changes" (accessed on May 5, 2023), https://www.bls.gov/charts/employment-situation/employment-by-industry-monthly-changes.htm.
[25] Alex Leslie and Dan Murray, *An Analysis of the Operational Costs of Trucking: 2021 Update*, American Transportation Research Institute (November 2021).
[26] U.S. Bureau of Labor Statistics, "Consumer Price Index: 2022 in review," (January 17, 2023), https://www.bls.gov/opub/ted/2023/consumer-price-index-2022-in-review.htm.
[27] U.S. Bureau of Labor Statistics, "May 2022 National Occupational Employment and Wage Estimates" (accessed on May 2023), https://www.bls.gov/oes/2022/may/oes_nat.htm.
[28] U.S. Bureau of Labor Statistics, "Occupational Employment and Wage Statistics, May 2022: Heavy and Tractor-Trailer Truck Drivers" (accessed May 2023), https://www.bls.gov/oes/2022/may/oes533032.htm.

the annual increase in private fleet driver wages by about four percentage points, suggesting room for catch-up in the for-hire sector.[29]

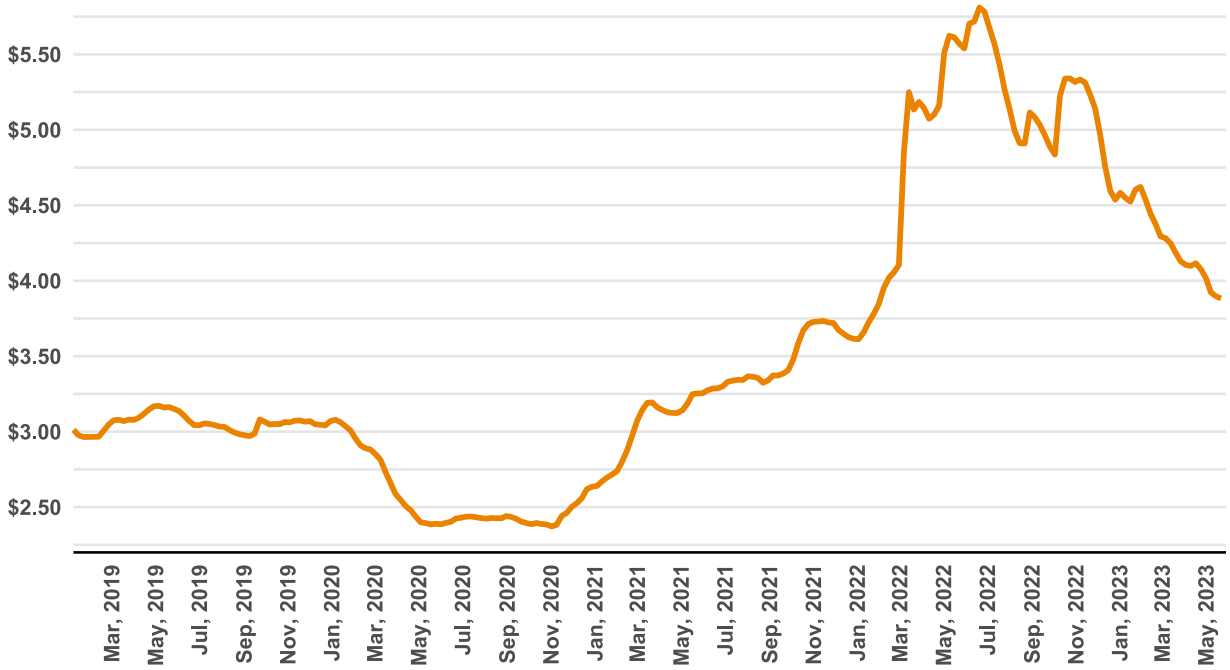
Several factors suggest a possible moderation in driver compensation increases in 2023. Inflation moderated over the first half of 2023.[30] As this general trend continues over the year, some of inflation's upward pressure on driver wages will recede – but not completely. Yet overall trucking industry employment and both national and transportation sector average wages continued to rise during the same period as well.[31] Based on these factors, driver wages will likely continue to increase – though at a more moderate rate – unless the freight market experiences significantly greater contraction.

Fuel Costs

The price of diesel fuel peaked in June 2022 driven by high demand, rising inflation and geopolitical issues such as the Russian invasion of Ukraine in February. Even though fuel costs declined in the second half of 2022, the annual increase in 2022 was higher than any other marginal cost. Figure 7 shows these fluctuations as recorded by the U.S. Department of Energy's Energy Information Administration (EIA), beginning with January 2019 for context.[32]

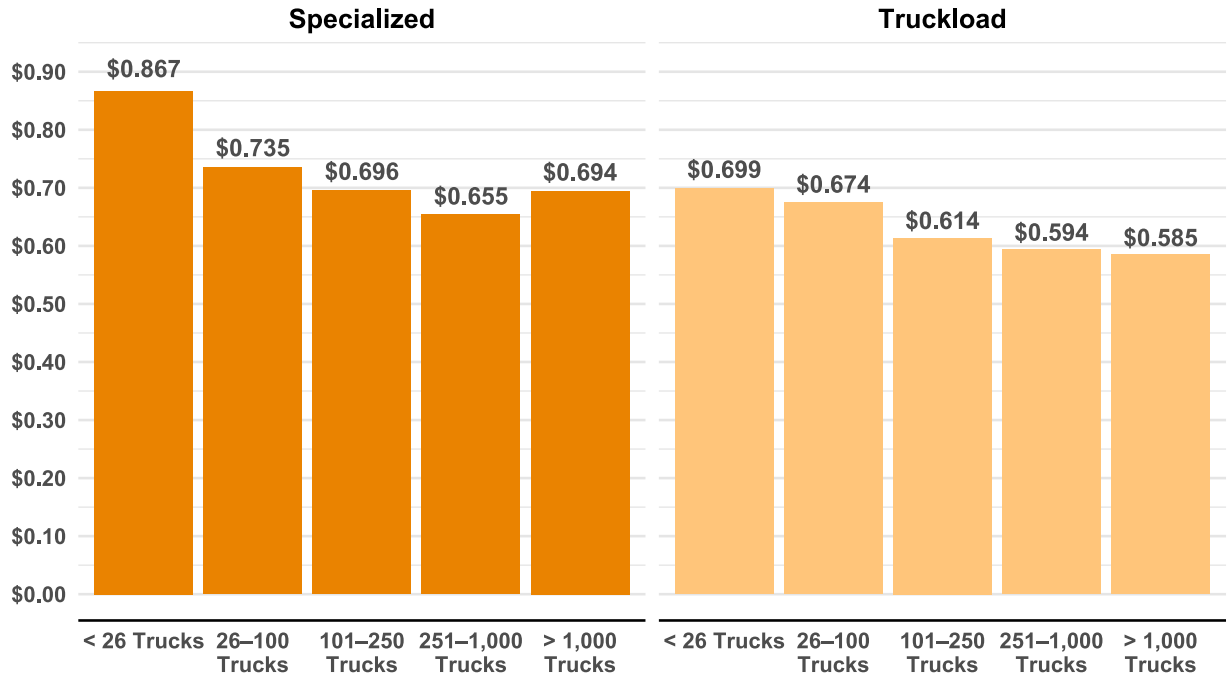
[29] National Private Truck Council, *Benchmarking Survey Report 2022* (August 2022), https://www.nptc.org/benchmarking/benchmarking-report/.
[30] U.S. Bureau of Labor Statistics, "Consumer Price Index News Release" (June 13, 2023), https://www.bls.gov/news.release/archives/cpi_06132023.htm.
[31] U.S. Bureau of Labor Statistics, "Employment by industry, monthly changes" (accessed on May 5, 2023), https://www.bls.gov/charts/employment-situation/employment-by-industry-monthly-changes.htm; U.S. Bureau of Labor Statistics, "Economic News Release" (May 5, 2023), Table B-3: Average hourly and weekly earnings of all employees on private nonfarm payrolls by industry sector seasonally adjusted, https://www.bls.gov/news.release/empsit.t19.htm.
[32] U.S. Energy Information Association, "Weekly Retail Gas and Diesel Prices" (accessed on June 13, 2023), https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm.

Figure 7: Monthly U.S. On-Highway Diesel Prices, 2019-2023



Large carriers' ability to hedge fuel markets and secure bulk pricing enables them to achieve lower marginal fuel costs. With record high fuel costs in 2022, this negotiating position was especially advantageous (Figure 8). Truckload fleets with fewer than 26 trucks spent 19.5 percent more per mile on fuel than truckload fleets with more than 1,000 trucks. Specialized fleets with fewer than 26 trucks spent 24.9 percent more per mile on fuel than specialized fleets with more than 1,000 trucks.

Figure 8: Respondent Fuel Costs per Mile by Fleet Sector and Size



Looking Ahead

In May 2023, the average weekly diesel price fell below $4 a gallon for the first time since February 2022, marking a return to pre-Ukraine invasion prices (Figure 7).

The EIA forecasts that oil prices will continue to decline gradually over the second half of 2023 and into the first half of 2024.[33] The EIA cites consistent oil consumption and lower global production while noting that lower than expected economic growth could lead to lower oil prices. If these forecasts are correct, it would be reasonable to expect fuel prices to average around sixty cents per mile for the calendar year 2023 based on previous Ops Costs reports.

Falling fuel prices were a leading contributor to the moderation of inflation in the first half of 2023.[34] Continued decline or stabilization in this area could thus contribute to stabilization in other cost centers, such as driver wages.

Equipment Costs

ATRI's Ops Costs report tracks equipment costs in three categories: truck and trailer payment costs; repair and maintenance costs; and tire costs. Since the COVID-19 pandemic, disruptions in component availability over the last three years have led to several distinct trends in these closely related cost centers.

[33] U.S. Energy Information Administration, "Short-Term Energy Outlook" (June 6, 2023), https://www.eia.gov/outlooks/steo/.
[34] U.S. Bureau of Labor Statistics, "Consumer Price Index News Release" (June 13, 2023), https://www.bls.gov/news.release/archives/cpi_06132023.htm.

Truck and Trailer Payment Costs

In 2022 truck and trailer costs spiked by 18.6 percent to $0.331 per mile as many carriers were compelled to replace aging equipment even as costs remained high.[35] Truck price and truck availability each played a key role in this cost spike.

Carriers that acquired trucks in the first half of 2022, during a period of limited supply, paid a premium. The average retail price of used 3-to-5-year-old Class 8 sleeper trucks was 79.9 percent higher in the first four months of 2022 than in 2021 during the same period.[36]

Recovering production during the remainder of 2022 improved the availability of new trucks. As a result, many carriers made large acquisitions of trucks in the second half of 2022 in order to replace aging equipment. The average truck age peaked at 5.7 years in 2021 before falling to 4.7 in 2022 (Table 5).[37] Despite improved supply, such strong demand limited the fall of truck prices.[38]

Figure 9: Truck and Trailer Lease or Purchase Costs per Mile by Fleet Sector and Size

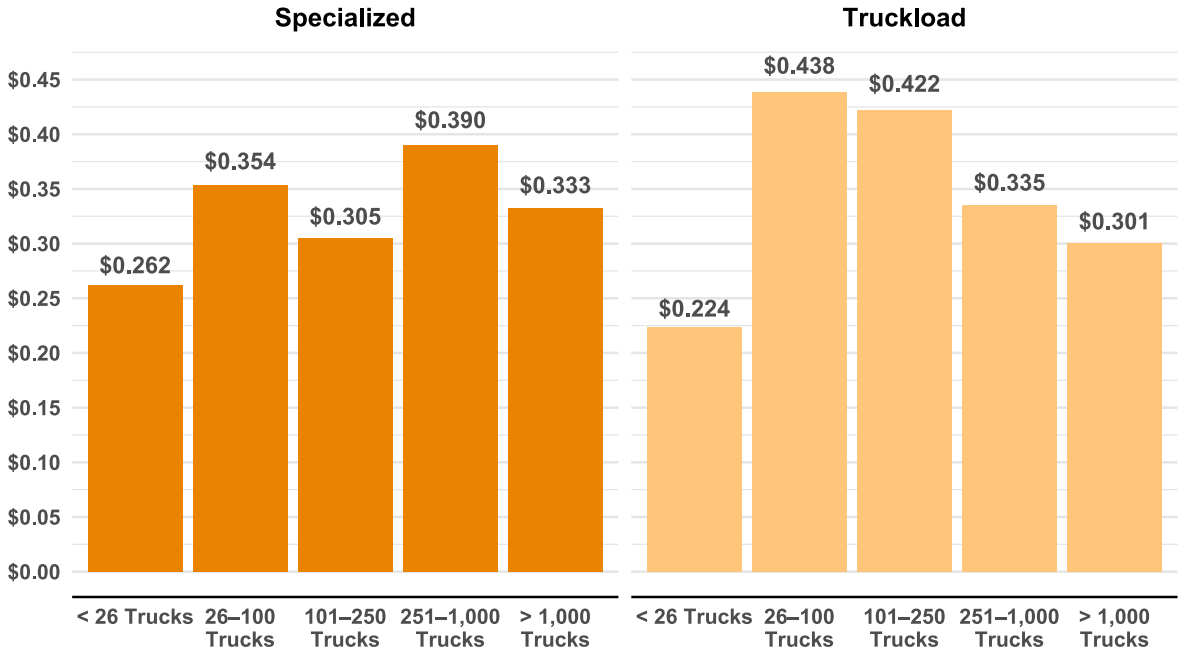


Figure 9 shows the impact of the turbulent equipment market by fleet sector and size groups. Very large fleets, especially in the truckload sector, can reduce truck and trailer payment costs

[35] ATRI asks motor carriers to report all truck and trailer payment costs as part of this figure; these expenses may take the form of outright purchases, payment installments, interest, leases, or other arrangements.
[36] J.D. Power Valuation Services, "May 2022 Commercial Vehicle Market Update: Class 8 Auction Update" (May 2022), https://discover.jdpa.com/hubfs/Files/Industry%20Campaigns/Valuation%20Services/05.2022_CommercialVehicleGuidelines_FINAL.pdf.
[37] ACT Research, "Class 8 Truck Orders at 11,600 Units in April, down 27% Y/Y" (May 2, 2023), https://www.actresearch.net/resources/blog/north-america-class-8-blog.
[38] J.D. Power Valuation Services, "April 2023 Commercial Vehicle market Update: Class 8 Auction Update" (April 2023), https://discover.jdpa.com/hubfs/Files/Industry%20Campaigns/Valuation%20Services/04.2023_CommercialVehicleGuidelines_FINAL.pdf.

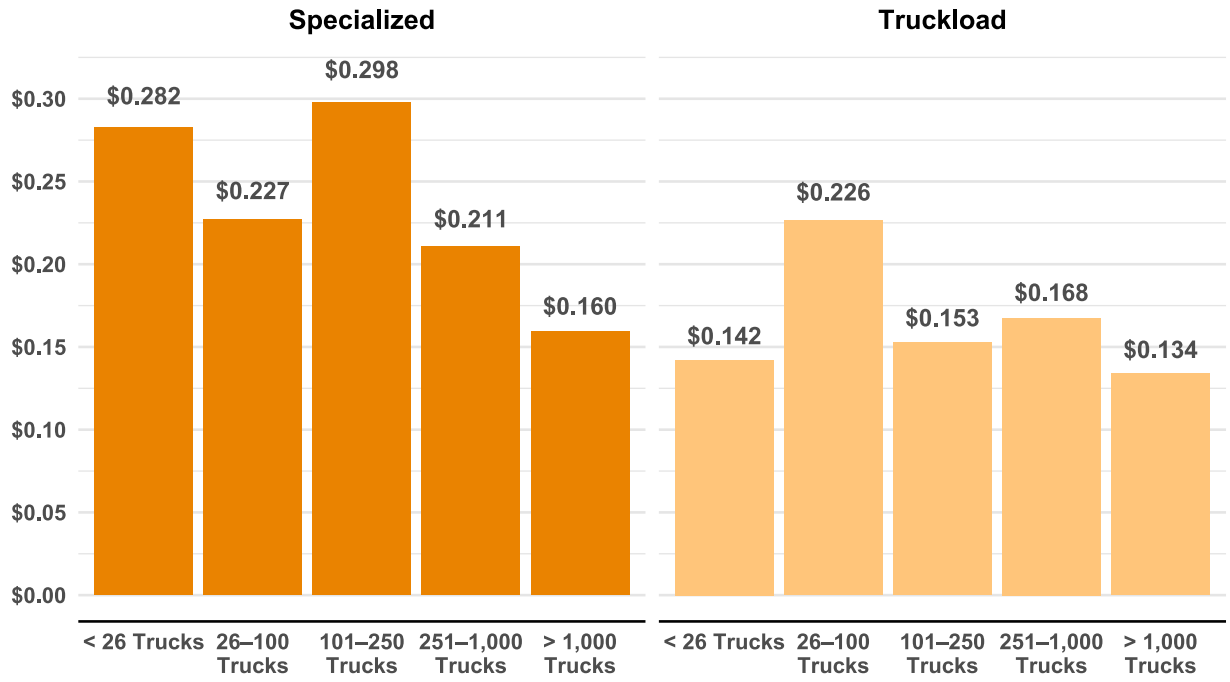
through economies of scale. By contrast, many small carriers in both sectors continued to avoid purchasing or leasing equipment in 2022 due to high prices; consequently, some had no truck and trailer payment costs whatsoever. With neither of these strategies available to them, medium-sized fleets of 26 to 250 trucks tended to spend the most on per-mile truck and trailer payments.

Repair and Maintenance

Repair and maintenance costs rose in 2022 by 12 percent to an industry average of $0.196. This rate of increase was slightly lower than the 18.2 percent increase in 2021 thanks to carriers' improved ability to acquire new trucks and thus decrease the average truck age (to 4.6 years).

ATA's TMC and Decisiv similarly found that combined parts and labor expenses rose by 13 percent between Q4 2021 and Q4 2022.[39] That report identified that the greatest contributors to repair and maintenance costs were power plants (35.7%), exhaust (14%), and brakes systems (5.1%).

Figure 10: Repair and Maintenance Costs per Mile by Fleet Sector and Size



Truckload carriers' repair and maintenance costs only varied by a few cents per mile across fleet sizes, with the exception of fleets with 26 to 100 trucks (Figure 10). Most truckload fleet size groups experienced only moderate increases of one to two cents per mile from 2021 to 2022.

In the specialized sector, repair and maintenance costs decreased as fleet size increased in 2022, with the largest fleets even spending less per mile in 2022 than in 2021 on average due in part to newer equipment. In all other specialized fleet size groups, average repair and

[39] ATA Technology Maintenance Council and Decisiv, "VMRS System Service Data Quarterly Report" (Q4 2022).

maintenance costs increased by two to eight cents per mile, a greater rate than their truckload peers.

Parts shortages continued to hamper repair and maintenance operations. Sixty-six percent of service shops experienced increased delays and 62 percent of service shops had to frequently purchase parts from outside their regular suppliers – up from 45 percent in 2021.[40]

Rising labor costs impacted repair and maintenance as well. According to the *State of Heavy-Duty Repair*, 76 percent of service shops raised labor rates in 2022. Service shops with 3 to 4 technicians raised total hourly rates by an average of $11.80, while shops with more than 40 technicians raised total hourly rates by an average of $12.60.[41] On average, raises in technicians' hourly wages represented 34 to 44 percent of the increase in hourly rates.[42]

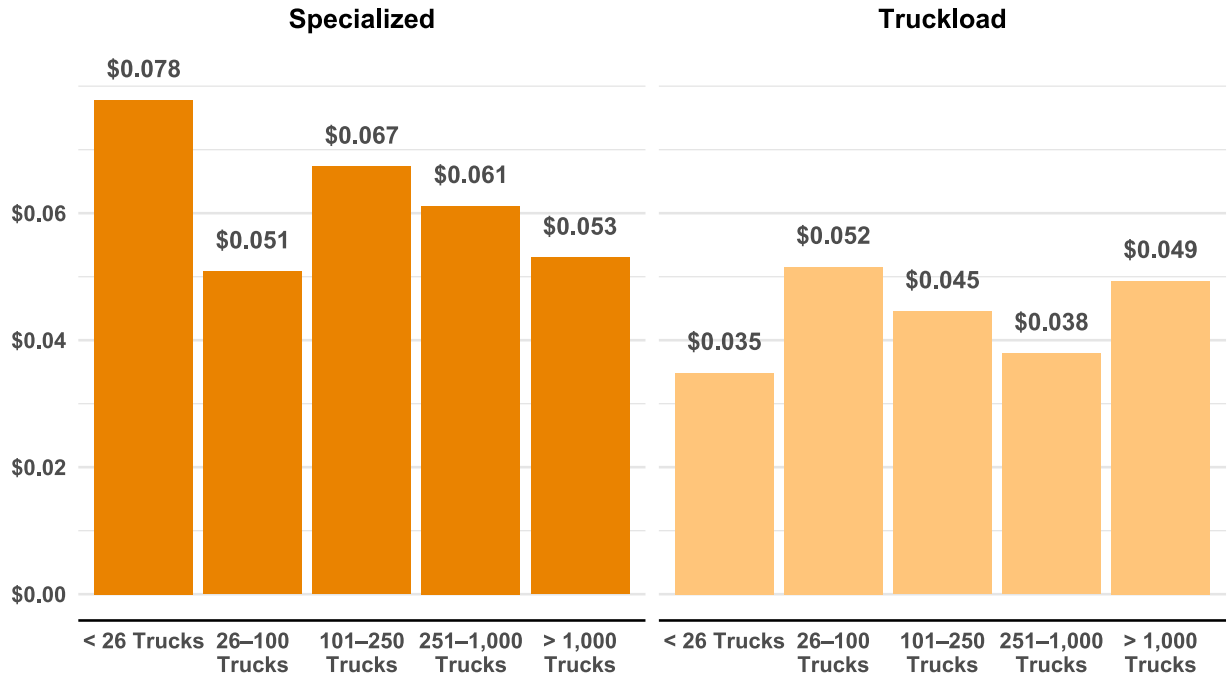
Tires

As expected, rising global oil prices in 2022 led to higher tire prices.[43] As an industry, trucking spent $0.045 per mile on tires. In the truckload sector, larger fleets did not necessarily achieve economies of scale on tire costs in 2022 (Figure 11).

Average tire costs for specialized carriers tend to be higher, in part because many specialized operations incur extra wear on their tires. This is especially the case for specialized fleets with fewer than 26 trucks, which spent 73 percent more on tires than the industry-wide average; many of these fleets are highly specialized bulk operations.

[40] Fullbay, Motor, and ATA Technology and Maintenance Council, *State of Heavy-Duty Repair 2022-2023* (2023), https://www.fullbay.com/state-of-heavy-duty-repair/.
[41] Ibid.
[42] Ibid.
[43] Tom Quimby, "Tire prices likely to extend climb this year," *Commercial Carrier Journal* (February 7, 2022), https://www.ccjdigital.com/maintenance/article/15288132/tire-price-woes-may-continue-throughout-2022.

Figure 11: Tire Costs per Mile by Fleet Sector and Size



Carriers have become savvier when it comes to managing tire costs. Some fleets are turning to retreading rather than replacement tires when possible or to more operations-specific tire models as cost management strategies.[44]

Looking Ahead

While truck prices should continue to decline in a soft economy, the total amount that carriers spend on trucks and trailers in 2023 will depend on two factors. The first is the need to continue replacing old trucks after the adverse equipment market of the previous three years (high costs with low availability), and the second is broader macroeconomic trends shaping the current soft freight market.

The average auction and retail prices of used 3-to-5-year-old sleeper trucks fell over the course of 2022 and into 2023, though used retail prices in May 2023 remained higher than the 2021 average.[45] The number of Class 8 truck orders trended downward over the first five months of 2023, though orders improved in May.[46] If the 2023 economy does not continue to contract, truck and trailer expenditures will likely increase as carriers continue to replace old equipment

[44] Kevin Rohlwing, "Tire outlook for 2023," *Fleet Owner* (January 30, 2023), https://www.fleetowner.com/equipment/article/21258300/2023-commercial-truck-tire-outlook; John Hitch, "Heavy-duty equipment trends of 2023: Tire outlook," *Fleet Maintenance* (January 4, 2023), https://www.fleetmaintenance.com/equipment/brakes-tire-and-wheel/article/21291272/heavyduty-equipment-trends-of-2023-tire-outlook.

[45] J.D. Power Valuation Services, "April 2023 Commercial Vehicle market Update: Class 8 Auction Update" (April 2023), https://discover.jdpa.com/hubfs/Files/Industry%20Campaigns/Valuation%20Services/04.2023_CommercialVehicleGuidelines_FINAL.pdf.

[46] ACT Research, "Class 8 Truck Orders at 15,500 Units in May, up 10% Y/Y" (June 2, 2023), https://www.actresearch.net/resources/blog/north-america-class-8-blog.

with more reasonably priced new equipment. If recessionary conditions worsen in the second half of 2023, however, many carriers will have only a limited ability to finance truck acquisitions at prices that still remain relatively high compared to pre-pandemic prices; fewer purchases could thus lead to a drop in truck and trailer expenses.

There is some indication that repair and maintenance costs may finally stabilize in 2023. Though shortages and delays persist, TMC and Decisiv have reported declining parts costs and only moderately increase in technician labor costs for two quarters in a row, Q4 2022 (when combined parts and labor costs fell by 0.9%) and Q1 2023 (when combined parts and labor costs rose by just 0.7%).[47] If parts availability and lower prices can offset the increase in technician labor rates, repair and maintenance costs could see annualized improvement in 2023 or 2024. This positive scenario likely requires that carriers are able to finance trucks and the average fleet age decreases; otherwise, repair and maintenance costs will likely increase again.

Certain economic indicators also point to potential stabilization in tire costs. The producer price index for tire manufacturing remained stable over the first four months of 2023.[48] Tire experts and retailers report improved tire availability and project stable demand. As such, they anticipate fewer increases in tire prices over the coming year.[49] Declining oil prices, as discussed in the Fuel Costs section above, can also contribute to lower tire prices in 2023, since oil is a key material in tire production.

Truck Insurance

After growing by nearly 50 percent in the 2010s, auto liability insurance premium costs per mile remained stable in 2022 for the second year in a row. The industry average went from 8.7 cents per mile in 2020 to 8.6 cents per mile in 2021 to 8.8 cents per mile in 2022. Low traffic during the height of the COVID-19 pandemic in 2020 led to fewer crashes, lower losses, and record profits in the auto insurance sector; this in turn led insurance premiums to stabilize.[50] Even with crash frequencies returning to pre-pandemic levels in 2021, inflation, and higher repair costs, this period of reduced crashes and higher profits allowed the insurance market to recalibrate.[51]

As Figure 12 shows, however, not all fleet sizes in 2022 enjoyed this insurance cost moderation. Though large truckload fleets paid less in premiums on a per-mile basis in 2022 than in 2021, small carriers paid between one and four cents *more* per mile on average.

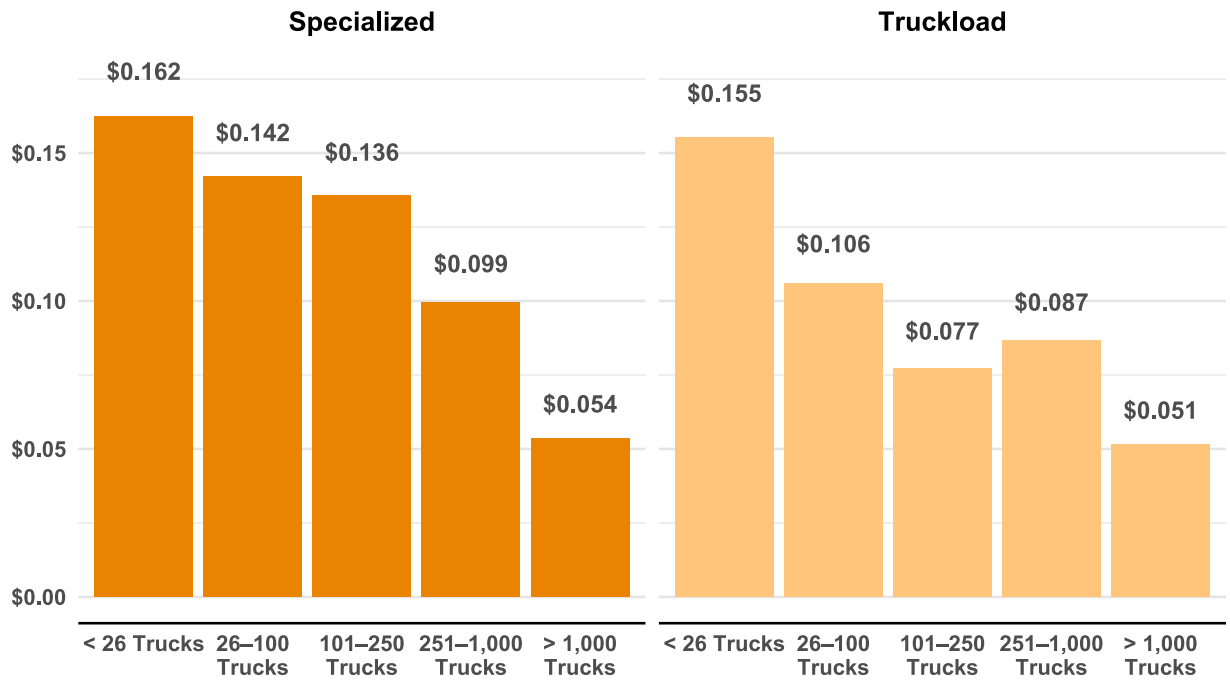
Specialized carriers experienced a similar disparity. Specialized fleets with more than 250 trucks paid less in premiums on a per-mile basis in 2022 than in 2021, but smaller specialized fleets paid between one and five cents more per mile on average during the same time.

The difference in trends for small versus large carriers may have arisen due to the fact that auto liability insurance rates had already begun rising at the end of 2022. According to the Council of

[47] ATA Technology and Maintenance Council and Decisiv, "VMRS System Service Data Quarterly Report" (Q4 2022); ATA Technology and Maintenance Council and Decisiv, "VMRS System Service Data Quarterly Report" (Q1 2023).
[48] U.S. Bureau of Labor Statistics, "Producer Price Index by Industry: Tire Manufacturing, Except Retreading: Pneumatic Tires (Including Passenger, Truck, Bus, Tractor, Industrial, and Other Tires" (accessed on May 11, 2023), https://fred.stlouisfed.org/series/PCU3262113262110.
[49] Madison Gehring, "Will There Be More Price Increases in 2023?" *Modern Tire Dealer* (January 20, 2023), https://www.moderntiredealer.com/site-placement/featured-stories/article/11546459/will-there-be-more-price-increases-in-2023.
[50] Alex Leslie and Dan Murray, *An Analysis of the Operational Costs of Trucking: 2022 Update* (August 2022).
[51] Federal Motor Carrier Safety Association, "Crash Statistics Summary Report" (accessed on June 5, 2023), https://ai.fmcsa.dot.gov/CrashStatistics/rptSummary.aspx.

Insurance Agents & Brokers, premiums rose by 7.2 percent or more in the final quarters of 2022, after a more favorable start of the year.[52] Some carriers did not have to renew their policies in the more expensive second half of 2022, and large carriers in particular, which rely less on traditional deductible policies, are more shielded from rate changes.

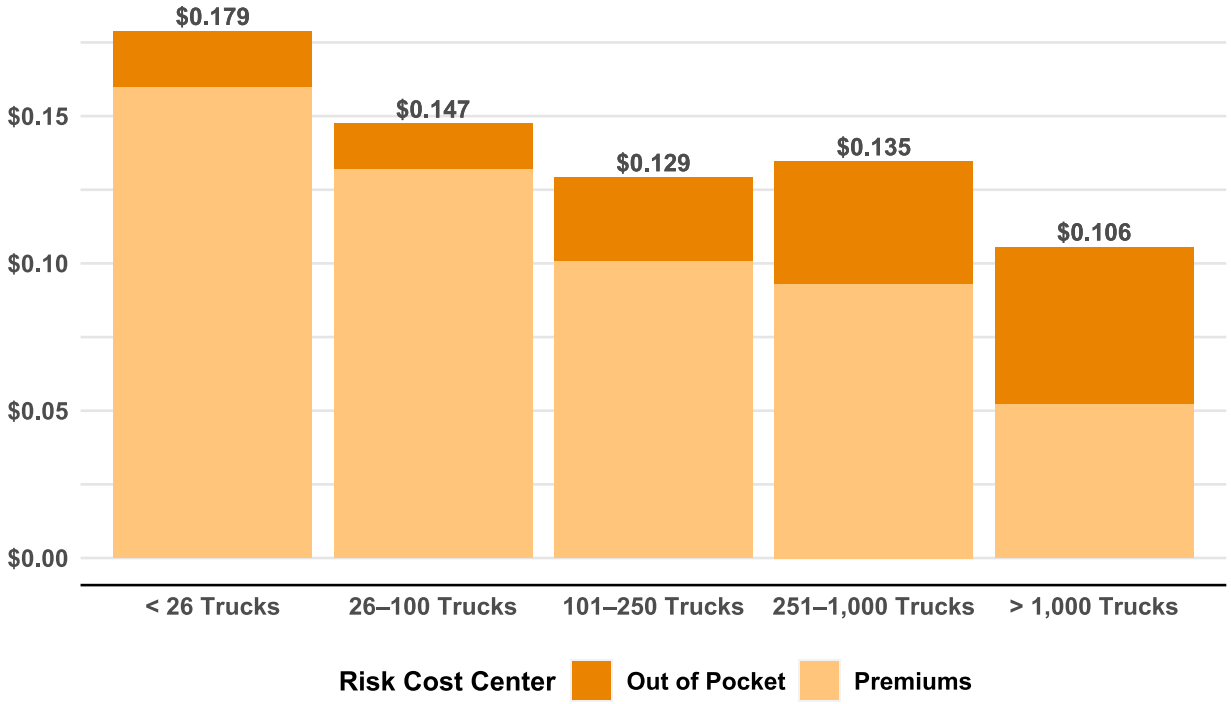
Figure 12: Commercial Auto Liability Insurance Premium Costs per Mile by Fleet Sector and Size



Experts in insurance and safety recommend that carriers treat insurance premiums as just one component of their total cost of risk alongside expenses for litigation, training, safety technology, driver compensation, and out-of-pocket incident costs. Figure 13 provides a combined analysis of the relationship between per-mile premium costs and out-of-pocket costs in the industry as a whole.

[52] The Council of Insurance Agents & Brokers, *Commercial Property/Casualty Market Index* (Q4 2022), https://www.ciab.com/market-intel/pc-market-index-survey/.

Figure 13: Auto Liability Insurance Premium and Out-of-Pocket Costs per Mile by Fleet Size



By taking steps to reduce out-of-pocket expenses, fleets with higher premium costs per mile can nonetheless achieve savings overall – as was the case for fleets with 101 to 250 trucks versus fleets with 251 to 1,000 trucks. Very large fleets tend to have higher out-of-pocket incident costs because of their greater use of Self-Insurance Retentions (SIRs), by which carriers set aside funds to pay for claims before insurance policies respond to a loss in order to reduce their reliance on the insurance market.

Looking Ahead

Large truck crashes declined from 2021 to 2022 by 2.5 percent according to the Federal Motor Carrier Safety Administration (FMCSA).[53] Yet insurance industry experts expect commercial auto liability premiums to increase at greater rates in 2023 due to rising costs and poor performance in the previous policy year.[54] After posting its first underwriting profit in a decade in 2021, the commercial auto sector slipped back into unprofitability in 2022 with a combined ratio of 104 according to AM Best.[55] There is some consolation in the fact that the workers'

[53] Federal Motor Carrier Safety Association, "Crash Statistics Summary Report," (accessed on June 5, 2023), https://ai.fmcsa.dot.gov/CrashStatistics/rptSummary.aspx.
[54] Carrier Management, "2022 in Review: It Was Bad" (March 9, 2023), https://www.carriermanagement.com/news/2023/03/09/246139.htm; Fitch Ratings, "US Property/Casualty Insurance Underwriting Losses to Moderate in 2023" (April 13, 2023), https://www.fitchratings.com/research/insurance/us-property-casualty-insurance-underwriting-losses-to-moderate-in-2023-13-04-2023.
[55] Carrier Management, "2022 in Review: It Was Bad" (March 9, 2023), https://www.carriermanagement.com/news/2023/03/09/246139.htm.

compensation sector, a separate insurance line for the trucking industry, continues to perform well.[56]

With auto liability premiums thus expected to climb again, it is likely that many of the trends documented in ATRI's 2022 report on *The Impacts of Rising Insurance Costs on the Trucking Industry* will return. These trends include carriers raising deductibles, lowering excess coverage, and looking for alternatives to traditional deductible policies such as insurance captives or Self Insured Retention.[57] This *Impacts of Rising Insurance Costs* research also identified a silver lining, however, that retaining more direct risk successfully incentivized carriers to reduce crashes and out-of-pocket costs.[58]

Other Marginal Costs

Tolls

Tolls declined slightly from 3.2 cents in 2021 to 2.8 cents in 2022. While toll costs are a comparatively small portion of all marginal costs, variations across regions are significant. In the Northeast, carriers spent 3.9 cents per mile in tolls, 39.3 percent more than the national average (Table 13). Fleets with fewer than 100 trucks spent half a cent less per mile on average than fleets with more than 100 trucks (Table 14), and truckload carriers spent half a cent more than specialized or LTL carriers did.

Permits and Special Licenses

Carriers spent nearly the same amount on permits and special licenses in 2022 as in 2021: 1.5 cents per mile compared to 1.6 cents per mile in the previous year. These costs were essentially consistent across region and fleet size, though specialized carriers, as usual, spent a fraction of a cent more per mile.

Efficiency

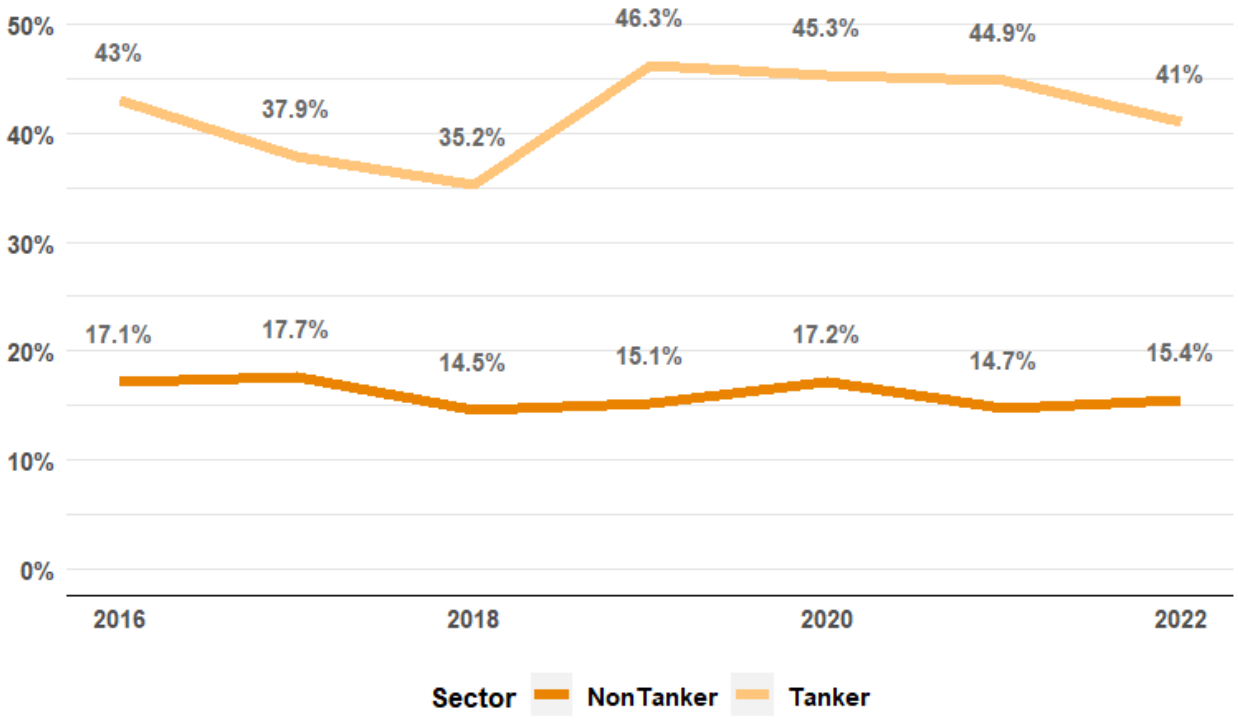
Record-high costs and declining trucking rates made operational efficiencies critical in 2022. This section provides benchmarks in key areas of logistics, equipment, maintenance, and workforce. All figures are unweighted averages of carrier responses, though sector-specific analysis is provided where appropriate.

Deadhead Mileage

Deadhead or empty mileage – miles that do not generate revenue and are not covered by fuel surcharges – are a serious financial and productivity drain, especially when fuel prices are high. In 2022, 15.4 percent of non-tanker carriers' mileage was deadhead mileage on average. Figure 14 provides historical context for non-tankers' and tankers' average deadhead mileage. 2022 marked a slight increase for non-tankers from 14.7 percent in 2021 but remained better than 2020's 17.2 percent.

[56] The Council of Insurance Agents & Brokers, *Commercial Property/Casualty Market Index* (Q4 2022), https://www.ciab.com/market-intel/pc-market-index-survey/.
[57] Alex Leslie and Dan Murray, *The Impacts of Rising Insurance Costs on the Trucking Industry*, American Transportation Research Institute (February 2022), https://truckingresearch.org/2022/02/the-impact-of-rising-insurancecosts-on-the-trucking-industry/.
[58] Ibid.

Figure 14: Deadhead Mileage for Tankers and Non-Tankers, 2016-2022



Tanker carriers, whose primary commodities make it more difficult to secure backhaul loads, ran 41.0 percent of their total mileage empty in 2022. This represents the third straight year of improvement in deadhead mileage for tanker carriers, after the sector hit a peak of 46.3 percent in 2019.

Dwell Time

Dwell time is measured as the total delay that drivers experience at shipper or receiver facilities. Part of this time includes necessary tasks such as loading or driver breaks, but any time spent waiting beyond these activities is considered driver detention. In 2022, detention and delay at customer facilities was the fourth-highest industry issue for drivers and the sixth-highest issue for the industry as a whole.[59]

The industry average dwell time in 2022 was 1 hour and 46 minutes per stop, 9 minutes less than the previous year's industry average.

Refrigerated carriers, as usual, had a longer average dwell time of 2 hours and 32 minutes due to the sensitive commodities they transport.[60] LTL carriers by contrast secured an average dwell time of 30 minutes at each stop, the lowest of any industry group.

Larger fleets are more able to make business decisions, such as detention surcharging or favoring certain shippers, that result in lower dwell times. Fleets with more than 1,000 trucks

[59] American Transportation Research Institute, "Critical Issues in the Trucking Industry – 2022" (October 2022), https://truckingresearch.org/2022/10/critical-issues-in-the-trucking-industry-2022/.
[60] Erin Speltz and Dan Murray, "Driver Detention Impacts on Safety and Productivity," American Transportation Research Institute (September 2019).

saw an average of 1 hour and 30 minutes per stop. All fleet size groups experienced an improvement in dwell times in 2022 compared to 2021, yet fleets with fewer than 26 trucks saw the most improvement with a 13 percent drop to 2 hours and 4 minutes per stop on average.

Fuel Economy

The average truck-tractor miles per gallon (MPG) in 2022 was 6.68, a slight improvement over last year's record of 6.65.

Operating or gross weight – which ATRI measures as cargo plus tractor and trailer weights – impacts fuel economy. Table 18 shows the average MPG among respondents in each average operating weight class.

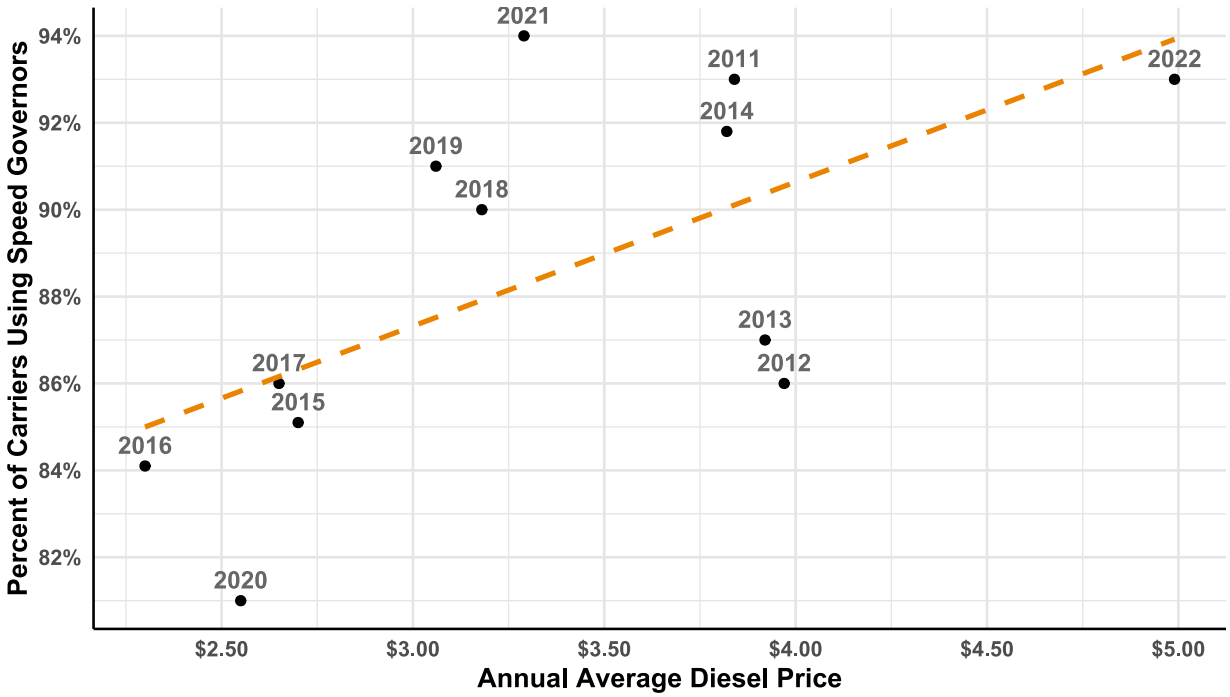
Table 18: Average MPG by Weight Class

Weight Class (lbs.)	Average MPG
30,000-40,000	6.9
40,000-50,000	6.7
50,000-60,000	6.7
60,000-70,000	7.1
70,000-80,000	6.3
80,000-120,000	6.1

Speed Governors

Speed governor use remained high in 2022, at 93 percent of carrier respondents. This was in part due to 2022's exceptionally high fuel costs, as speed governors help improve fuel efficiency. As Figure 15 shows, there is a historical relationship between a year's average diesel price and the percent of carriers utilizing speed governors.

Figure 15: Relationship between Fuel Price and Speed Governor Usage



Utilization Ratios

The ratio of trailers to truck decreased again in 2022 to 2.71 (Table 19). When demand is high or other resources like drivers or truck-tractors are in short supply, carriers can improve efficiency and flexibility by maintaining a large trailer pool. When the trucking market softens, as in 2022, carriers can retire old trailers and delay the expense of replacing them until demand rises.

Table 19: Trailer-to-Truck Ratio

Year	Average Number of Trailers per Truck
2022	2.71
2021	2.82
2020	2.90
2019	2.55
2018	2.70
2017	2.76

The average number of drivers per truck improved slightly from 0.96 in 2021 to 0.98 in 2022 (Table 20). Ratios below 1.0 indicate unseated or underutilized trucks, thus suggesting unproductive resource allocation.

Table 20: Driver-to-Truck Ratio

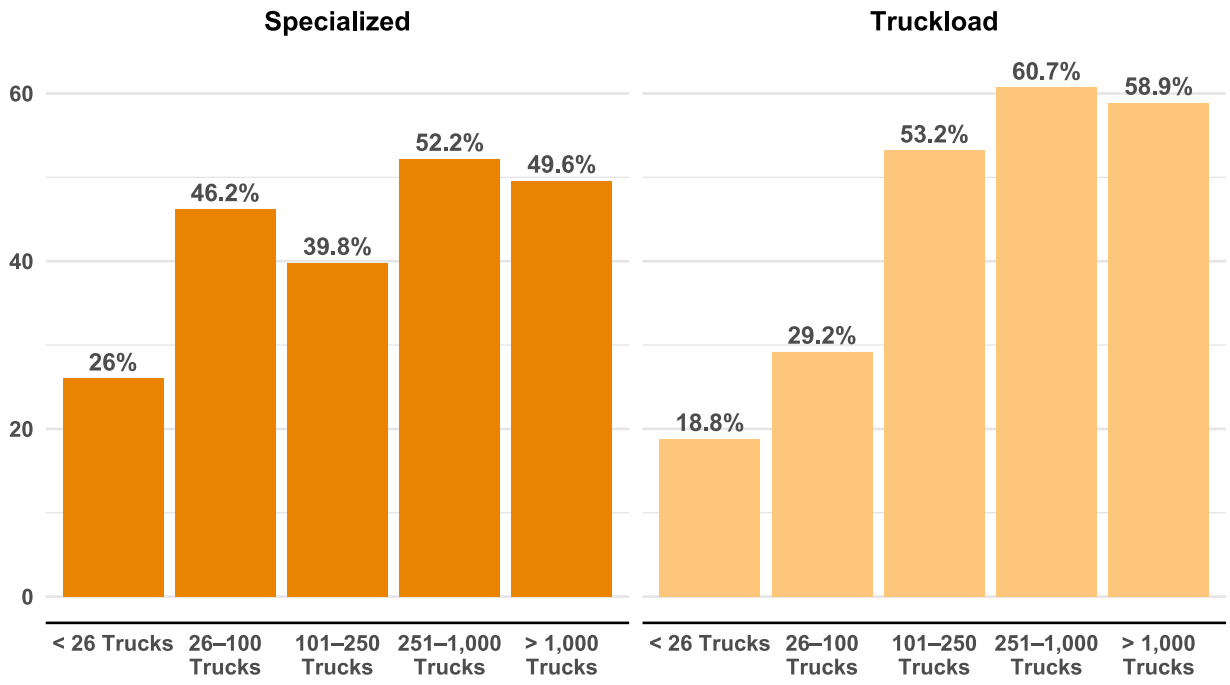
Year	Average Number of Drivers per Truck
2022	0.98
2021	0.96
2020	1.03
2019	1.02
2018	0.95
2017	0.94

The ratio of drivers to non-driving employees – a new metric this year – is a measure of workforce efficiency. Truckload, tanker, and refrigerated carriers each had three drivers for every non-driving employee on average in 2022. Flatbed carriers had a slightly higher average of 3.3 drivers for every non-driving employee. LTL carriers, with their much more personnel-intensive business model, employed just 1.4 drivers for every non-driver.

Turnover

Turnover rates declined in almost every sector and fleet size category from 2021 to 2022, possibly due to driver concerns about falling freight volume (Figure 16). Smaller fleets generally have lower turnover regardless of sector while larger fleets generally have turnover rates that exceed 50 percent.

Figure 16: Average Annualized Driver Turnover Rate by Fleet Sector and Size



Truckload carriers experienced higher turnover than all other sectors except in fleets with fewer than 100 trucks. In 2022, though, truckload fleets of all sizes saw improvements in turnover rates, with the strongest improvement in fleets with more than 1,000 trucks. Lower turnover rates may be related in part to the more uncertain economic climate in later 2022.

Specialized carriers had less variation in turnover rates across fleet sizes. Only one specialized fleet size group (251 to 1,000 trucks) had a turnover rate over 50 percent. While smaller specialized fleets did have lower turnover rates than large specialized fleets, smaller fleet turnover rates worsened from 2021 to 2022.

LTL carriers had a turnover rate of 20.6 percent, slightly higher than their 2021 rate of 18.6 percent.

In-House Servicing and Mileage between Breakdowns

This year ATRI added two new maintenance benchmarks at the recommendation of long-time Ops Costs participants. The first, mileage between unscheduled breakdowns, measures the effectiveness of preventative maintenance. On average, trucks in respondent fleets traveled 50,547 miles between breakdowns. This figure is approximately 7,900 miles higher than the miles between breakdown average reported by TMC in Q4 2021, when the average truck age was higher.[61] The same report found that tires, brakes, power plants, cranking systems, and exhaust systems were the leading causes of unscheduled breakdowns, in order of frequency.[62]

The second new metric is the percentage of maintenance conducted in-house, as opposed to outside service shops. Overall, an average of 59 percent of trucking industry maintenance was conducted in-house in 2022. Carriers that conducted a larger percentage of maintenance in-house tended to have lower repair and maintenance costs per mile.

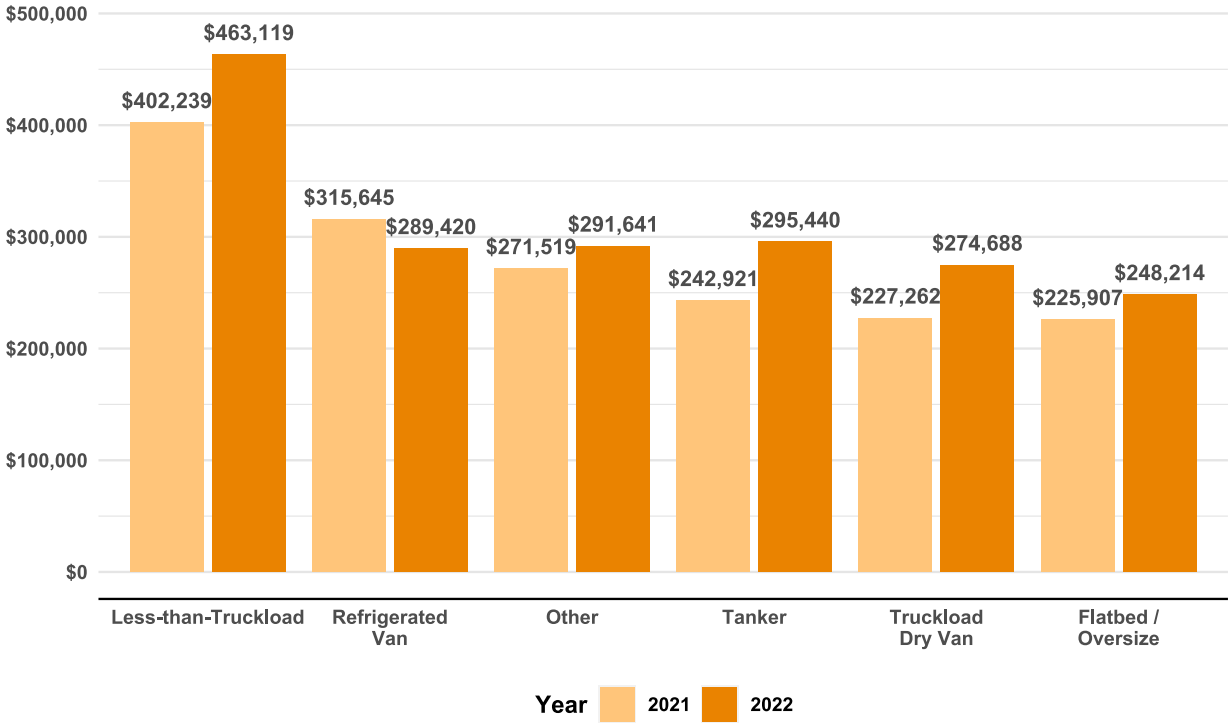
Large carriers are more likely to utilize in-house service departments, as fleets with more than 1,000 trucks conducted 66 percent of maintenance in-house. While OOs do much of their own maintenance, the next smallest size group, fleets with 26 to 100 trucks, conducted 51 percent in-house.

Revenue and Operating Margins

Carrier respondents submitted 2022 revenue including fuel surcharge revenue but excluding any brokerage or other revenue sources. Figure 17 shows each sector's average annual revenue per truck, a measure of the efficiency of asset usage that is typically affected by business model, in 2021 versus 2022.

[61] "Vertical Benchmarking Executive Summary," TMC and FleetNet (Q4 2021).
[62] Ibid.

Figure 17: Average Respondent Annual Revenue per Truck by Sector, 2021-2022



LTL carriers generated $463,119 in revenue on average for every truck in 2022, an increase of 15.1 percent over 2021 and well higher than all other sectors.

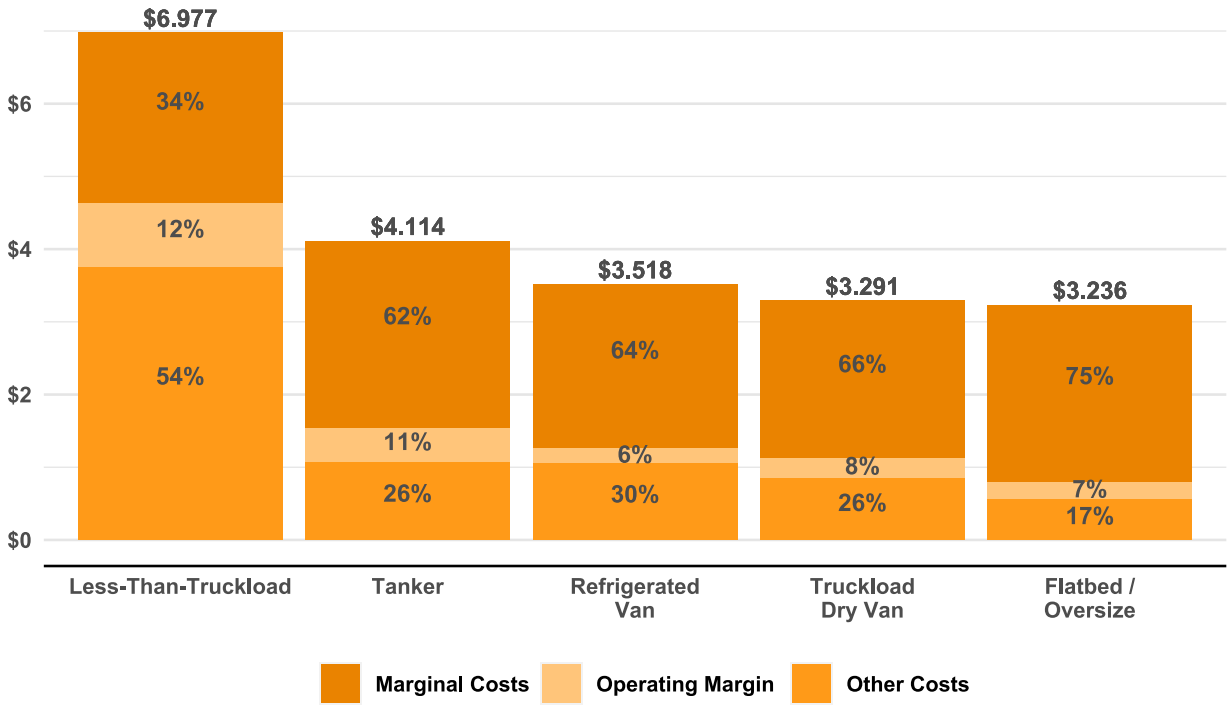
Tanker carriers also saw a 21.6 percent increase, for an average revenue per truck of $295,440 in 2022.

Truckload carriers had an increase of 20.8 percent to $274,688 per truck, and flatbed carriers had an increase of 9.8 percent to $248,214.

In the refrigerated sector, revenue per truck fell by 8.3 percent to $289,420. This was primarily due to changes in asset use rather than a fall in revenue. As shown in Figure 18, revenue per mile in the refrigerated sector averaged $3.518 in 2022, up from $2.542 in 2021. Instead, refrigerated fleets ran more trucks but with fewer annual miles per truck in 2022 than in 2021, resulting in lower revenue per truck but higher revenue per mile.

Figure 18 shows each sector's revenue on a per-mile basis, which allows for direct comparison with per-mile marginal costs. It also includes reported operating margins. Finally, an approximation of all other costs was derived by subtracting marginal costs and operating earnings from total carrier revenue.

Figure 18: Average Respondent Revenue, Costs, and Profit per Mile



All sectors brought in higher average revenue per mile in 2022 than in 2021, though fuel surcharges accounted for most of this difference. Despite rising costs, average operating margins held at six percent or higher in all sectors. Table 21 shows the change in average operating margin from 2021 to 2022 for each sector.

Table 21: Operating Margins by Sector, 2021-2022

Sector	2021 Operating Margin	2022 Operating Margin
LTL	10%	12%
Tanker	7%	11%
Refrigerated Van	11%	6%
Truckload	10%	8%
Flatbed / Oversize	10%	7%

LTL carriers generate more revenue per mile than any other sector, but they also have the highest costs. In addition to higher-than-average marginal costs in areas like driver benefits, LTL carriers have fixed costs – in areas like facilities and non-driving employees – that are more than three times higher than other sectors' fixed costs. It was in these fixed costs that LTL carriers realized improvement in 2022 versus 2021. While marginal costs remained steady at

34 percent of revenue, other costs dipped from 56 percent of revenue to 54 percent, resulting in an average 2022 operating margin that was 2 percentage points higher than in 2021.

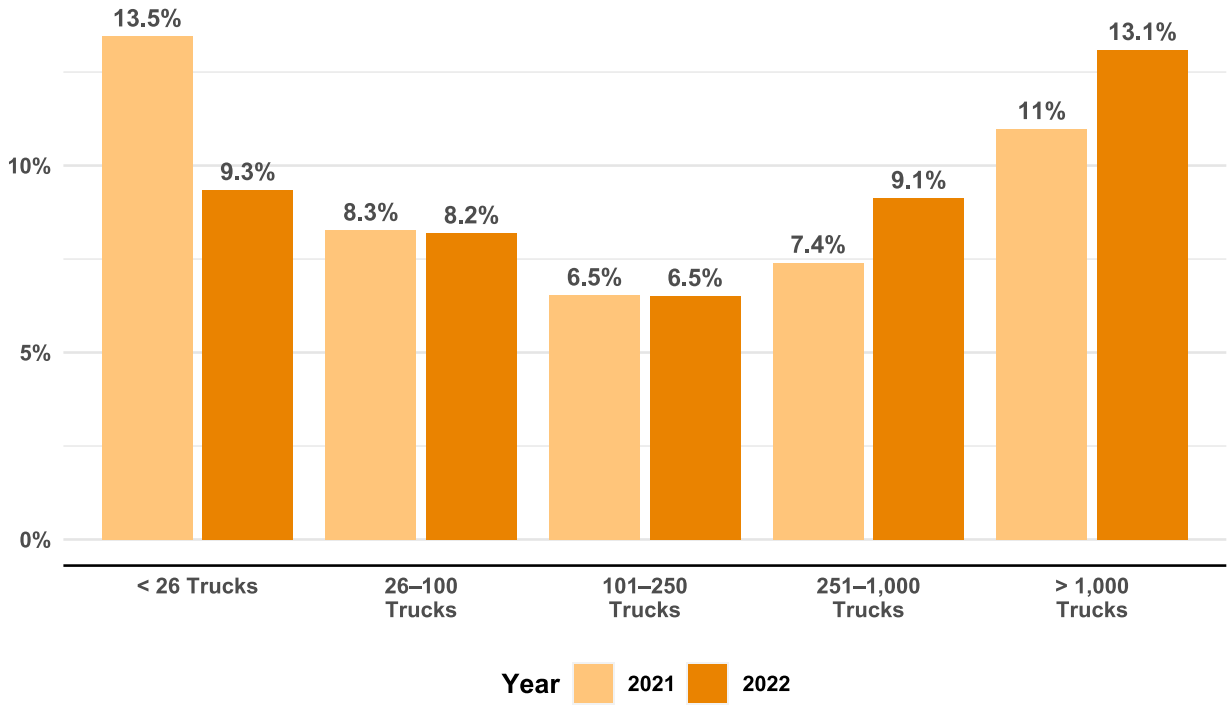
Tanker carriers, on average, also reduced the share of revenue devoted to other costs and increased operating margins to 11 percent in 2022.

Truckload and flatbed carriers have lower per-mile revenues than other sectors, but they also have lower total expenses than other sectors. Additionally, marginal costs represent a greater proportion of both truckload and flatbed carriers' expenses.

The average operating margins fell in the remaining sectors: truckload (by two percentage points); flatbed (by three percentage points); and refrigerated (by five percentage points).

Small fleets drove this decline in average operating margins (Figure 19). The average operating ratio for the smallest fleets (across all sectors) fell from 13.5 percent to 9.3 percent as spot markets cooled considerably from 2021 to 2022.

Figure 19: Average Operating Ratio by Fleet Size, 2021-2022



Fleets with 26 to 100 trucks across all sectors saw a slight decline in operating margins from 2021 to 2022, while fleets with 101 to 250 trucks remained steady at 6.5 percent – though this was the lowest operating margin among fleet size groups in both years.

Large and very large fleets, by contrast, were able to improve operating margins from 2021 to 2022 despite an adverse freight market and rising marginal costs.

Brokers and forwarders realized similar margins according to a Descartes benchmarking report of the industry, which found 29 percent of Descartes respondents with 3 to 10 percent operating margins and 31 percent of respondents with operating margins over 10 percent.[63]

CONCLUSION

The average marginal costs of trucking set a record high for the second year in a row in 2022, crossing the two-dollar threshold for the first time to $2.251 per mile. With fuel included, this represents a 21.3 percent increase over 2021; with fuel excluded, it represents a 12.0 percent annual increase.

Fuel was again the largest driver of higher costs, jumping by 53.7 percent to 64.1 cents per mile. However, multiple other line-items rose by double digits, well beyond the high rate of annual inflation: truck/trailer payments (by 18.6% to $0.331 per mile); repair and maintenance (by 12% to $0.196 per mile); and driver wages (by 15.5% to $0.724 per mile). Driver benefits, insurance premiums, and tires costs all experienced more moderate increases.

Whereas high rates in 2021 helped mitigate high marginal costs, declining rates in late 2022 made the continued rise in costs a significant challenge for the trucking industry. Despite this adverse environment, the trucking industry still found ways to realize average operating margins of 6 percent or more in each sector. Improvements in several key operational efficiencies – such as driver turnover and equipment utilization – were likely contributors to these positive results.

Economic conditions for the freight market remain uncertain for the second half of 2023 and leading into 2024. GDP growth was stagnant in the first quarter of 2023, and demand in trucking continued to soften.[64] Freight shipments and spending both fell in the final two quarters of 2022 and the first quarter of 2023, though the rate of decline has moderated with each quarter.[65]

Several other freight market indicators also spell caution. Housing starts have remained generally flat overall in 2023 thus far after falling more than 20 percent over the first half of 2022, and manufacturing output remained lower at the start of Q2 2023 than it was a year earlier.[66] Retail sales have trended slightly higher in 2023 than in 2022 (excluding price changes) but slid from January highs, though the trend of falling inflation could help ease costs and promote consumer spending.[67]

---

[63] Descartes, *Broker & Forwarder Benchmark Survey* (May 2023), https://www.descartes.com/sites/default/files/media/documents/2023-05/wp_broker_forwarder_benchmark_2023_final.pdf.
[64] DAT Freight & Analytics, "DAT Trendlines: National Van Rates" (accessed on June 6, 2023), https://www.dat.com/trendlines/van/national-rates; Bureau of Economic Analysis, "Gross Domestic Product (Second Estimate), First Quarter 2023" (May 25, 2023), https://www.bea.gov/sites/default/files/2023-05/gdp1q23_2nd.pdf.
[65] U.S. Bank, "U.S. Bank Freight Payment Index" (Q1 2023), https://www.usbank.com/content/dam/usbank/documents/pdf/corporate-and-commercial-banking/industry-expertise/transportation/freight-payment-index/04-0170-07_Freight-Index-2023-Q1.pdf.
[66] U.S. Census Bureau, "Monthly New Residential Construction" (May 2023), https://www.census.gov/construction/nrc/pdf/newresconst_202304.pdf; U.S. Federal Reserve, "Industrial Production and Capacity Utilization" (May 16, 2023), https://www.federalreserve.gov/releases/g17/current/default.htm.
[67] U.S. Census Bureau, "Advance Monthly Sales for Retail and Food Services" (June 15, 2023), https://www.census.gov/retail/sales.html.

The bearish economy in 2023 will create considerable uncertainty for carriers, who will need to carefully monitor and prioritize costs in order to maintain financial stability. Despite an adverse economic climate, the trucking industry has made strides over the previous two years – in newer equipment, more competitive driver compensation, and improved operations – that put it in a good position to meet these challenges.

APPENDIX A: Operational Costs Data Collection Form

OPERATIONAL COSTS OF TRUCKING DATA COLLECTION

The American Transportation Research Institute (ATRI) is conducting its annual **for-hire** motor carrier data collection initiative to obtain truck-related operational costs for ATRI's *Operational Costs of Trucking* report. ATRI is seeking cost data **from 2022** associated with operating a truck. The final report will support studies related to industry productivity, driver issues, and fuel efficiency. Please note that the questions below are focused on TRACTOR-TRAILER Combos only.

All collected data will be kept completely **confidential**. Personal, organizational, and/or financial information will never be released for public use under any circumstance. The final published report will only be presented in an aggregated, non-identifying format. As needed, ATRI will sign a confidentiality agreement.

The data collection form can be completed online at https://www.research.net/r/ATRI-2023-Ops-Cost, **OR** by completing this form and returning it via email to aleslie@trucking.org or via fax to 770-432-0638.

All participants submitting a completed, usable data collection form will receive an advance copy of the 2023 *Operational Costs of Trucking* report. Each participant will also receive a confidential, customized report directly comparing your operational costs to the operational cost trends of peer carriers of the same sector and size.

For any of your costs that were equal to zero in 2022, please explicitly enter "0" in the submission box. If you have any questions please contact Alex Leslie at aleslie@trucking.org or 651-641-6162 ext. 2.

CONTACT INFORMATION

1) Please enter your contact information below. Occasionally ATRI will follow up with participants to clarify answers. Your information will be kept strictly confidential**. All participants will receive an advance copy of the full report as well as a confidential, customized report directly comparing your operational costs to those of your peer carriers.**

Company	Contact Name
Street Address	Position/Title
City, State	Zip
Phone	Email

COSTS DATA

2) Please list your 2022 average TRUCK-TRACTOR cost per mile for the following key cost centers, calculated using IFTA miles: *(i.e. Tires: .04. If the line-item does not apply to your operation, please enter N/A. If based in Canada, please report as US Dollars.)*

Expense Type	2022 Cost per Mile USD
Repair & Maintenance • Include R&M costs, including R&M labor and roadside repairs, for all trucks and trailers; do not include tire-related expenses.	$
Tires • Include all purchase, maintenance, re-treading, and replacement costs.	$
Fuel Costs • Include all IFTA-related fuel. Do not include fuel surcharge revenue.	$
Truck Insurance Premiums • Include all liability, cargo, and excess liability policy premiums related to insuring the truck. Do not include workers compensation costs/insurance, physical damage, jury awards, or out-of-court settlements.	$
Truck and Trailer Lease or Purchase Costs • Include all payment costs, and interest and fees associated with the payments. Do not include depreciation tax benefits.	$
Tolls • If you paid tolls in 2022, what were your costs per mile (total annual toll costs/annual IFTA miles)? If you had no toll costs in 2022, please enter 0.	$
Permit Costs • Include permits for oversize/overweight, HazMat, etc. Do not include truck registration or CDL costs.	$
Other • Please specify: _____	$
Total	**$**

3) What was your total out-of-pocket expense for incident costs below your deductible or self-insured retention (S.I.R.) in 2022?

4) Please list the average pay and benefits per IFTA mile ($/mile) OR the average pay and benefits per hour ($/hour) for TRUCK-TRACTOR SOLO drivers in 2022. *(Do not include bonuses in this question. If there are multiple pay and benefit rates for the same type of driver, please use the average pay and benefits rates. If you use a different compensation method, e.g. percent of load or salary, please list it here.)* **You do not need to submit both per-mile and per-hour costs.**

	Company Driver / Company Truck	Owner-Operator
Pay per Mile[1]		
Benefits per Mile[2]		
Pay per Hour[1]		
Benefits per Hour[2]		
Other Compensation Method (please specify):		

[1] Pay – Include only base pay. Do not include benefits, incentives and bonuses.
[2] Benefits – Include employer contributions to medical insurance, per diem and other financial benefits to the driver that are a standard part of employment. Do not include incentives and bonuses.

Please check the benefits you provide to drivers that were included in previous question:

- ❑ Health Insurance
- ❑ Dental Insurance
- ❑ Vision Insurance
- ❑ Other – please specify: _____
- ❑ Paid Vacation
- ❑ Paid Sick Leave
- ❑ Per Diem
- ❑ 401k
- ❑ Life insurance
- ❑ Employee Ownership / Profit Sharing

5) Do you provide any additional financial incentives and/or bonus pay for TRUCK-TRACTOR SOLO drivers that are not part of their regular wages?

❑ Yes ❑ No ❑ Don't Know

If yes, what was the average annual incentive and/or bonus pay paid per driver who received the bonus in 2022? (i.e. Safety Bonus: $2,000. *Please report as an annual average paid per driver. Please only include drivers who received bonuses in 2022.)*

Type of Bonus	Company Driver / Company Truck	Owner-Operator
Safety Bonus		
New / Starting Driver Bonus		
Referral Bonus		
Retention Bonus		
Fuel Economy Bonus		
Other (please specify):		
Other (please specify):		

DEMOGRAPHIC AND WORKFORCE DATA

6) **What was your fleet's total IFTA mileage in 2022?** *(Include Owner-Operator miles reported for IFTA purposes)*

_____

7) **What was your company's annual trucking-related revenue in 2022?** *(Include fuel surcharge revenue; exclude brokerage/logistics revenue)*

_____

8) **What was your company's before-tax operating or profit margin in 2022?** (*Include as a percentage*)

_____**%**

9) **What is your <u>primary</u> for-hire business operation type?** *(Check only one)*

- ❑ Truckload Dry Van
- ❑ Less-Than-Truckload
- ❑ Refrigerated Van
- ❑ Tanker
- ❑ Flatbed
- ❑ Specialized – Oversize/Overweight
- ❑ Express / Parcel Service
- ❑ Intermodal Containers
- ❑ Automotive Transportation
- ❑ Household Goods Mover
- ❑ Other (please specify):_____

10) **What are the three <u>primary</u> types of commodities that your company hauls?** *(While your company may haul multiple commodities, select <u>only the top 3</u> most frequently hauled commodities.)*

- ❑ Agricultural Products
- ❑ Automotive Parts
- ❑ Construction/Building Materials
- ❑ Finished Vehicles
- ❑ Food Products – Refrigerated
- ❑ Food Products – Non-Refrigerated
- ❑ Forest Products
- ❑ Garbage or Sanitation
- ❑ General Freight
- ❑ Hazardous Materials
- ❑ Heavy Machinery/Equipment
- ❑ Household Goods
- ❑ Industrial Gases
- ❑ Intermodal Containers
- ❑ Livestock
- ❑ Manufactured Goods
- ❑ Mine Ores
- ❑ Modular/Mobile Homes
- ❑ Paper Products
- ❑ Petroleum Products
- ❑ Refrigerated Food
- ❑ Retail Store/General Merchandise
- ❑ U.S. Mail/Parcel Service
- ❑ Other (please specify):_____

11) **Are any of the trucks in your fleet speed-limited or governed?**

❑ Yes ❑ No ❑ Don't Know

12) If you answered yes to previous question, please provide the maximum speed setting and the percent of your fleet governed at that speed.

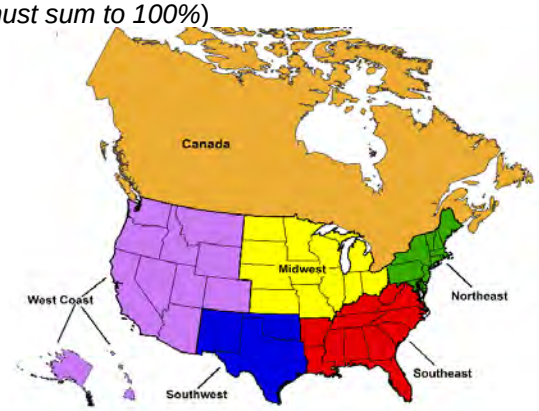
	Maximum Speed (MPH)	Percent of Trucks
Speed Setting 1		
Speed Setting 2		
Speed Setting 3		

13) Based on your fleet's IFTA miles, what percentage of your drivers' trips were in the following categories in 2022? *(Total must sum to 100%)*

Local pickups and deliveries (less than 100 miles)	
Regional pickups and deliveries (100 – 500 miles)	
Inter-regional pickups and deliveries (500 – 1,000 miles)	
National (greater than 1,000 miles)	
Total	**100%**

14) Please estimate the percentage of miles traveled by your fleet (include IC/Owner-Operator miles) in the following regions during 2022. (*Total must sum to 100%*)

Region	% of Total Miles
Midwest	
Northeast	
Southeast	
Southwest	
West	
Canada	
Total	**100%**



15) How many drivers did your company utilize in 2022 for each type of equipment?

	Company Driver / Company Truck	Leased Driver / Company Truck	Owner-Operator
Truck-Tractor – Solo Driver			
Truck-Tractor – Team Drivers (Total number of team drivers)			

16) How many non-driving employees did your company utilize in 2022? _____

17) What was your company's annualized driver turnover rate in 2022? _____

TRUCK-TRACTOR AND EFFICIENCY DATA

18) What was your fleet size, average age and average number of miles traveled (including Owner-Operators) in 2022?

	Total Number of Truck-Tractors	Average Age (in years)	Average Miles per Year per Tractor	Average Days of Use per Year per Tractor
Truck-Tractors				

Trailer Type	Number of Units	Average Age (in years)
28' Trailer		
33' Trailer		
45' Trailer		
48' Trailer		
53' Trailer		
Tank Trailer		
Flatbed Trailer		
Auto Transporter		
Refrigerated Trailer		
Intermodal Chassis		
Other Trailer (please specify):		
Other Trailer (please specify):		
Other Trailer (please specify):		

19) For your fleet of TRUCK-TRACTORS, what is the average loaded weight of a tractor-trailer combination in pounds? (cargo + truck + trailer)

_____ LBS

20) How long do you typically keep your equipment? *(Please check years or miles)*

Equipment Type	Avg. Trade Cycle	Years	Miles
Truck-Tractors			
Trailers			

21) Are any of the TRUCK-TRACTORS in your fleet powered by an alternative fuel? Do not include diesel, gasoline or biodiesel fuel.

❑ Yes ❑ No ❑ Don't Know

22) If you answered yes to previous question, please indicate the number of <u>TRUCK-TRACTORS</u> in your fleet that use each of the alternative fuels listed below.

Alternative Fuel Type	Number of Trucks
Compressed Natural Gas (CNG)	
Liquefied Natural Gas (LNG)	
Liquefied Petroleum Gas (LPG)	
Battery Electric Vehicle	
Hydrogen Fuel Cell Electric Vehicle	
Other (please specify):	

23) Based on your fleet's total IFTA data for <u>TRUCK-TRACTORS</u>, what was your average fuel economy in miles per gallon (MPG) for 2022 (i.e. real IFTA miles driven divided by gallons of fuel purchased)?

_____MPG

24) What percent of your total annual TRUCK-TRACTOR miles were non-revenue/dead-head miles in 2022?

_____ % of total 2022 miles

25) What was your average TRUCK-TRACTOR total dwell time (loading + detention) per stop at shipper/receiver facilities in 2022?

_____ hours per stop

26) On average, how many miles do trucks in your fleet run between breakdowns/failure?

_____ miles

27) What percentage of your fleet's total repair and maintenance is conducted at in-house or company-owned shops (versus outside shops)?

_____ % in-house

28) Do you pay truck parking costs to your drivers?

❑ Yes, in advance (via reservation, pre-paid card, etc.) ❑ Yes, by reimbursement ❑ No

If you answered yes, how much do you pay drivers for truck parking per day on average?

$_____

Thank you! We greatly appreciate your participation.
Please return completed data collection form to ATRI via fax 651-631-9500 or email aleslie@trucking.org.

ATRI American Transportation Research Institute

Atlanta, GA • Minneapolis, MN • Washington, DC • Sacramento, CA

(770) 432-0628

ATRI@Trucking.org

TruckingResearch.org