

**ATRI Research:
Information that Impacts the
Bottom Line**

**Daniel Murray
SVP**

**American Transportation Research
Institute**

ATRI

Trucking industry's not-for-profit research organization

- **Safety**
- **Mobility**
- **Economic Analysis**
- **Technology**
- **Environment**

www.TruckingResearch.org

Board of Directors

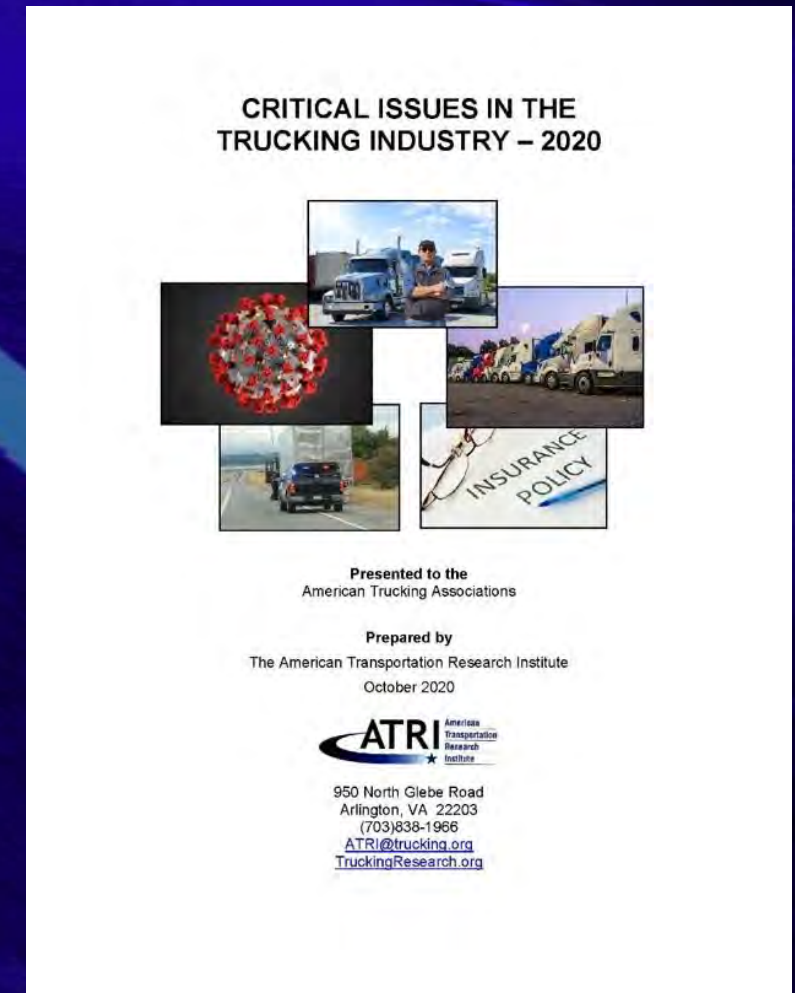


Research Advisory Committee



2020 Top Industry Issues

1. Driver Shortage (1)
2. Driver Compensation (3)
3. Truck Parking (5)
4. Compliance, Safety, Accountability (8)
5. Insurance Cost / Availability (#3 in 2005)
6. Driver Retention (6)
7. Tort Reform (#8 in 2011)
8. Economy (10)
9. Detention / Delay (4)
10. Hours-of-Service (2)



2020 Top Industry Issues

Commercial Drivers

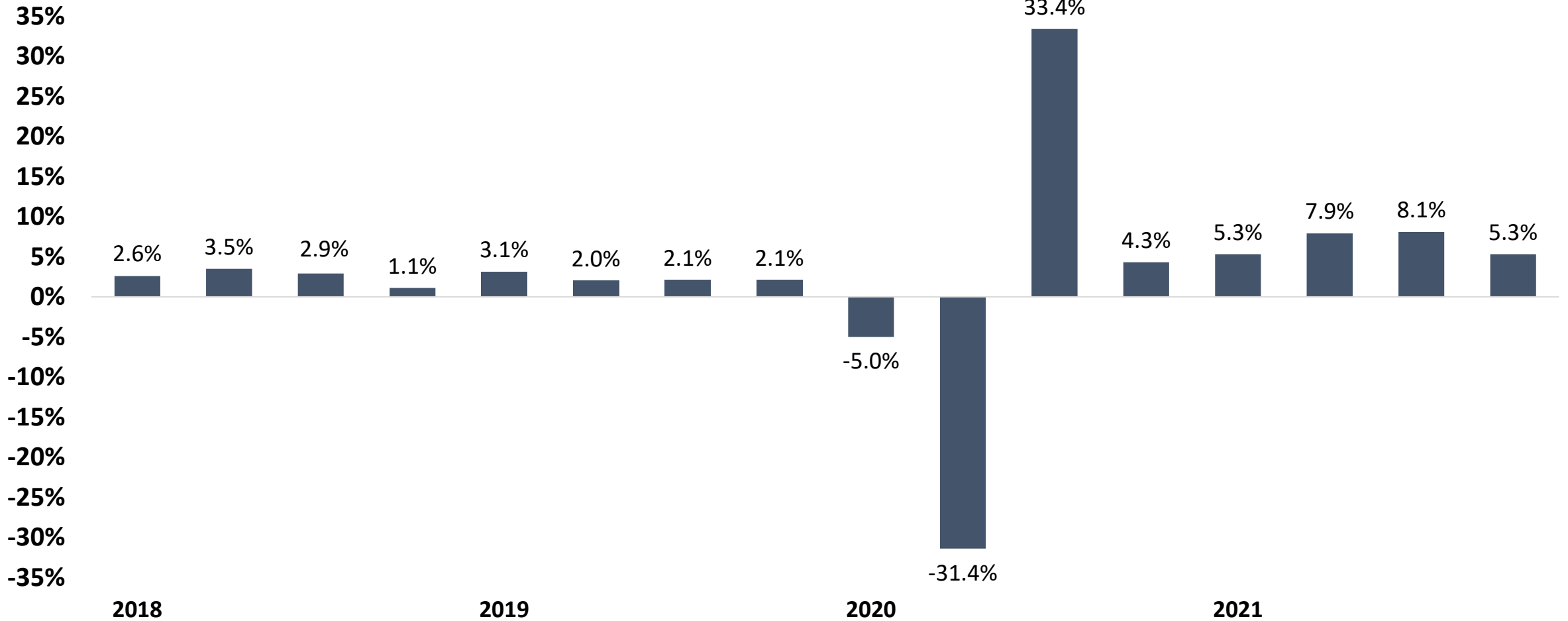
1. Truck Parking
2. Driver Compensation
3. Detention / Delay
4. Hours-of-Service
5. Driver Training Standards
6. Automated Truck Technology
7. CSA
8. Driver Health & Wellness
9. Speed Limiters
10. ELD Mandate

Motor Carriers

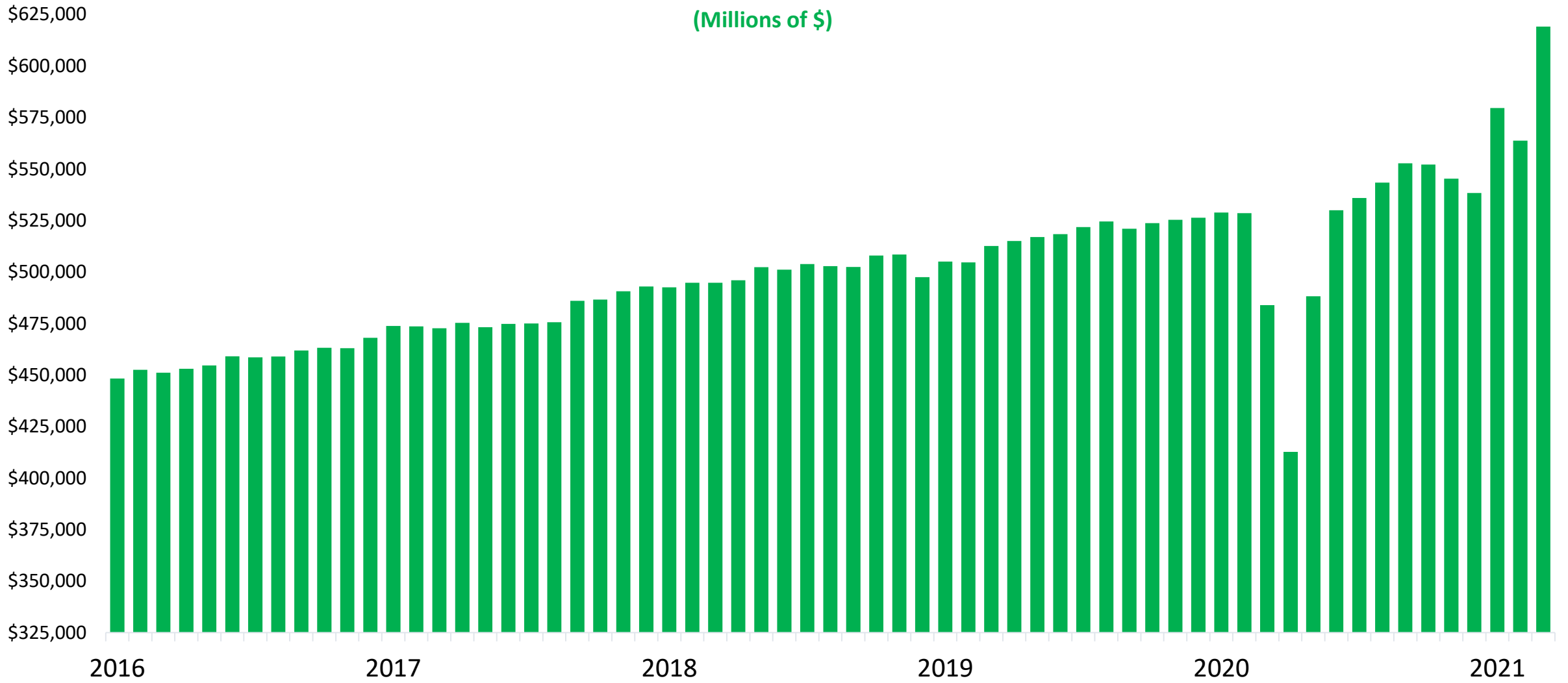
1. Driver Shortage
2. Driver Retention
3. CSA
4. Insurance Cost / Availability
5. Tort Reform
6. Economy
7. Transportation Infrastructure / Congestion / Funding
8. Driver Distraction
9. Detention / Delay
10. Hours-of-Service

Quarterly Real Gross Domestic Product Growth

Annualized Rates



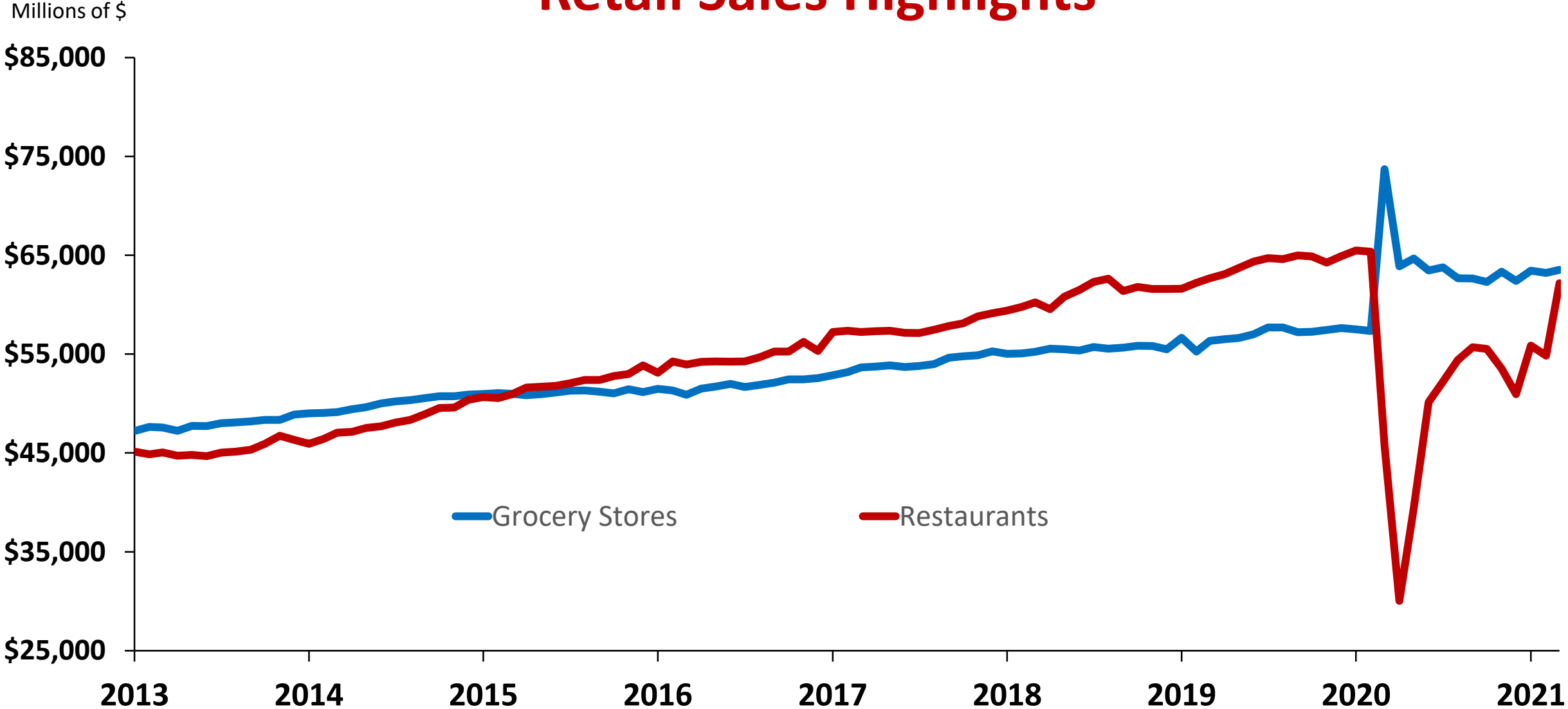
Retail Sales



Source: Census Bureau



Retail Sales Highlights

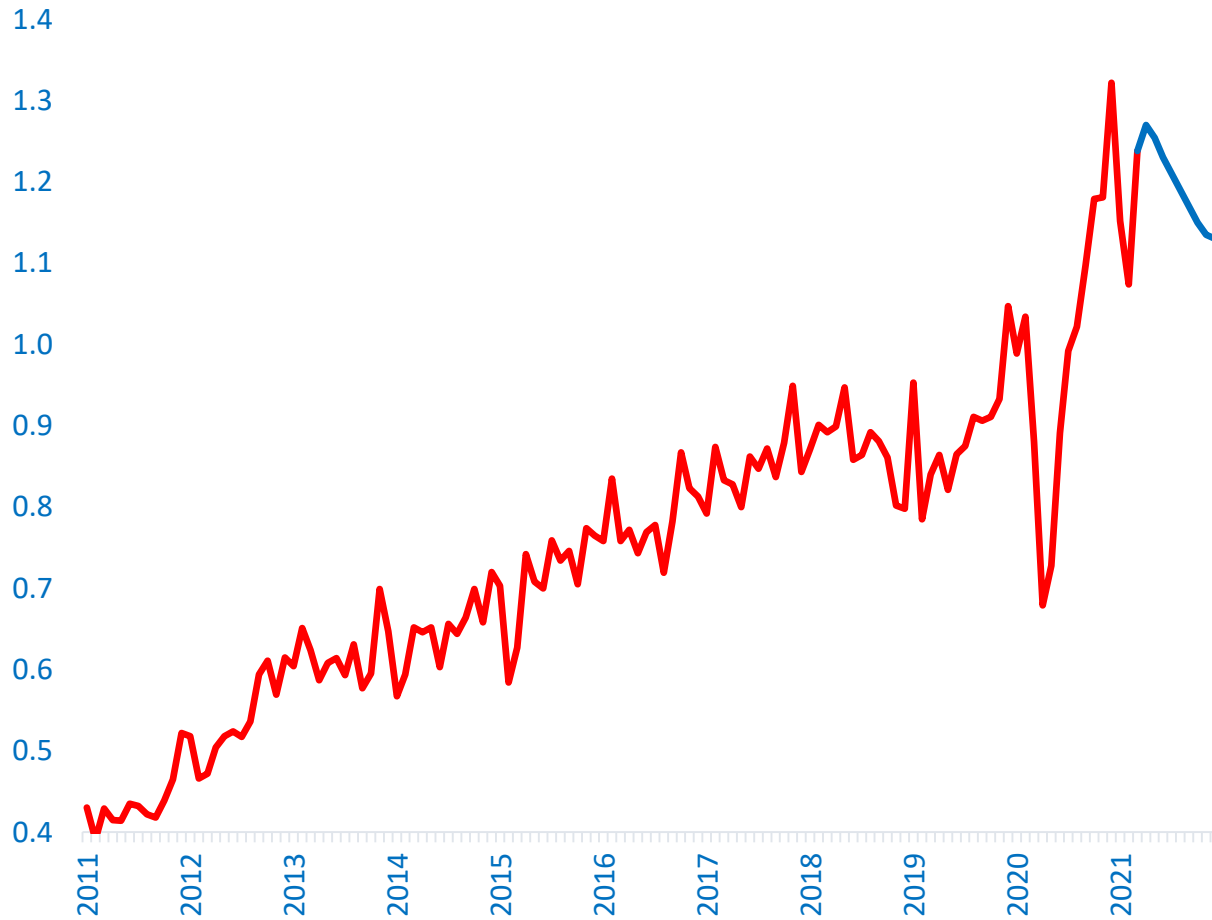


Source: U.S. Census Bureau

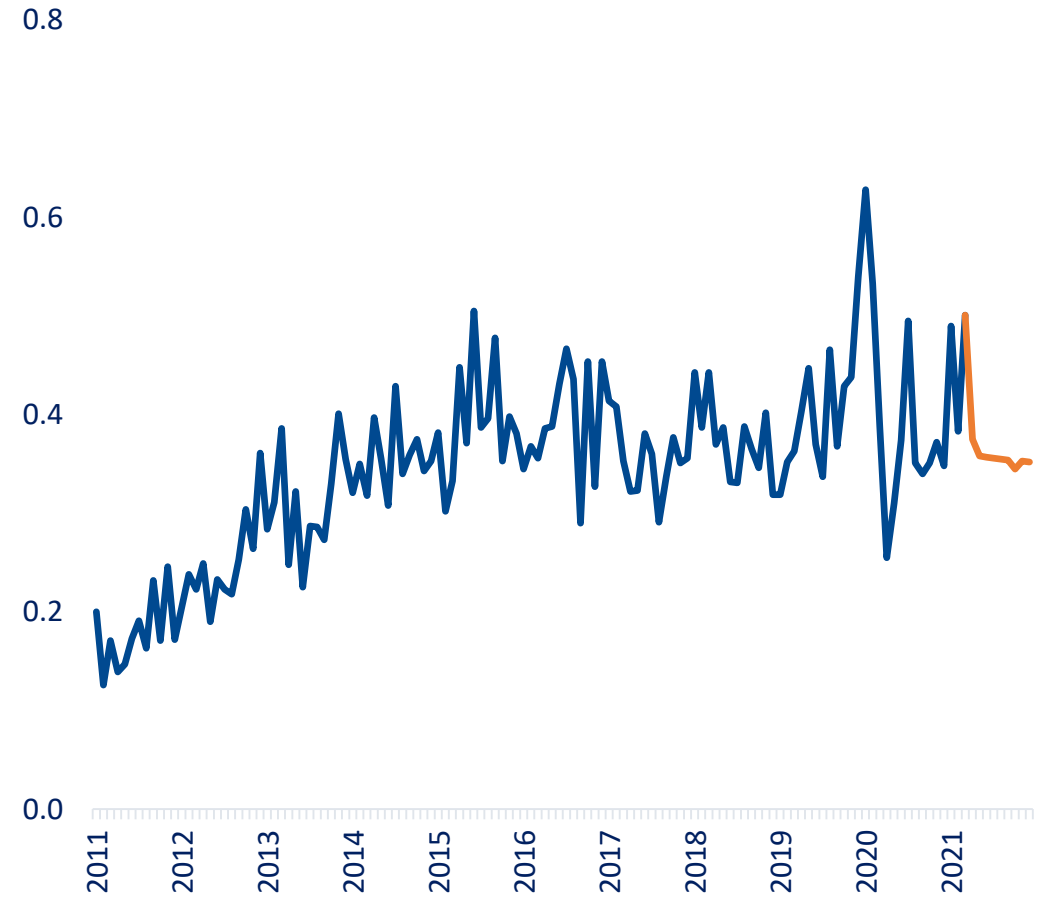


Housing Market Trends: Construction

Single-Family Housing Starts (Annualized Rate; Millions)



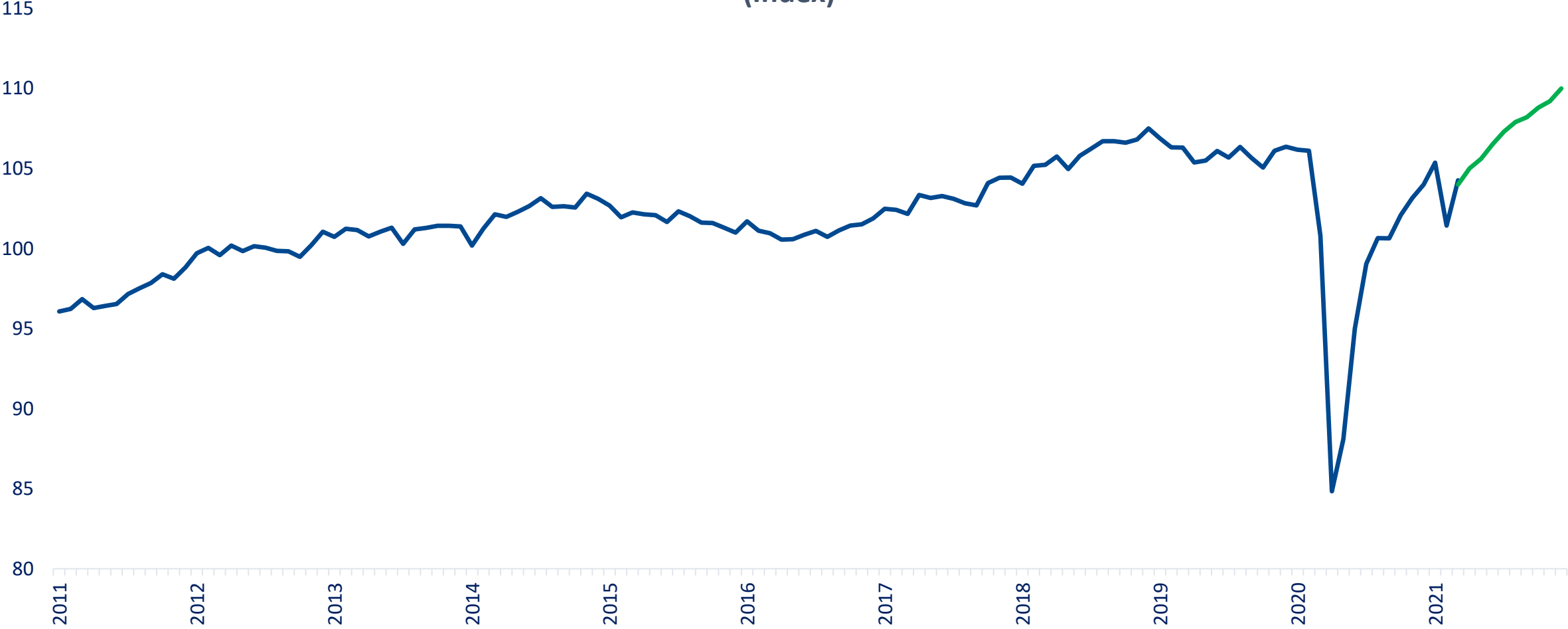
Multi-Family Housing Starts (Annualized Rate; Millions)



Sources: Census Bureau & ATA

Manufacturing Trends

Factory Output (Index)



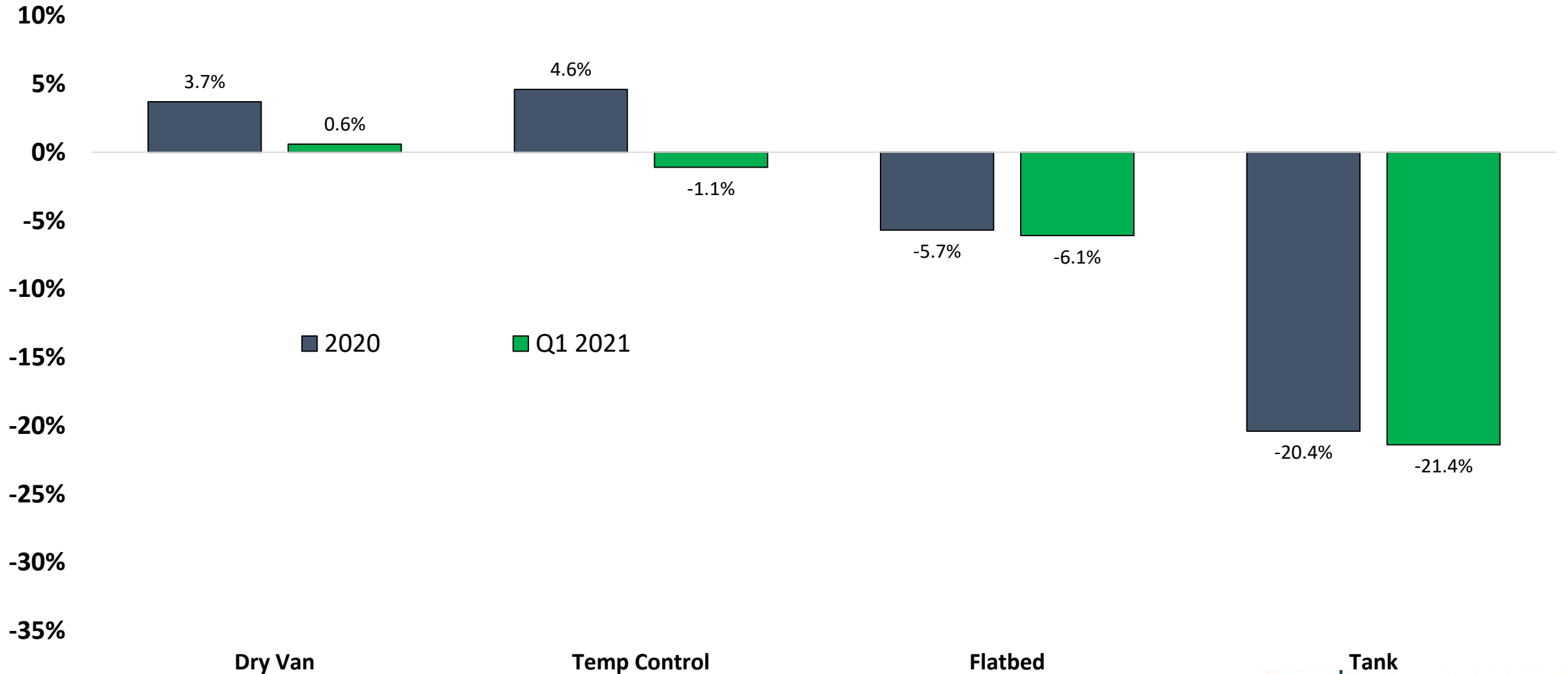
Source: Federal Reserve



Freight Trends

Truckload Market Trends

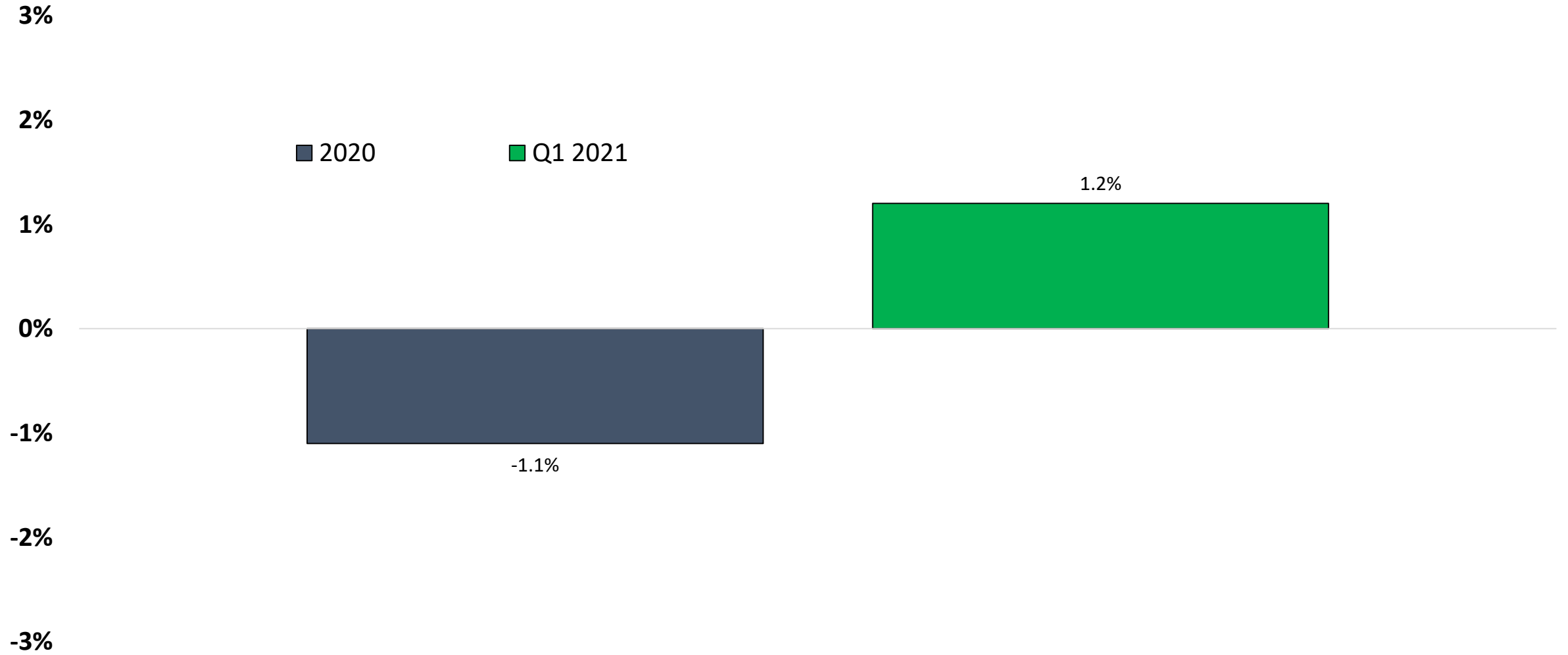
Year-over-Year Percent Change in Loads



Source: ATA's Trucking Activity Report

LTL Tonnage Trends

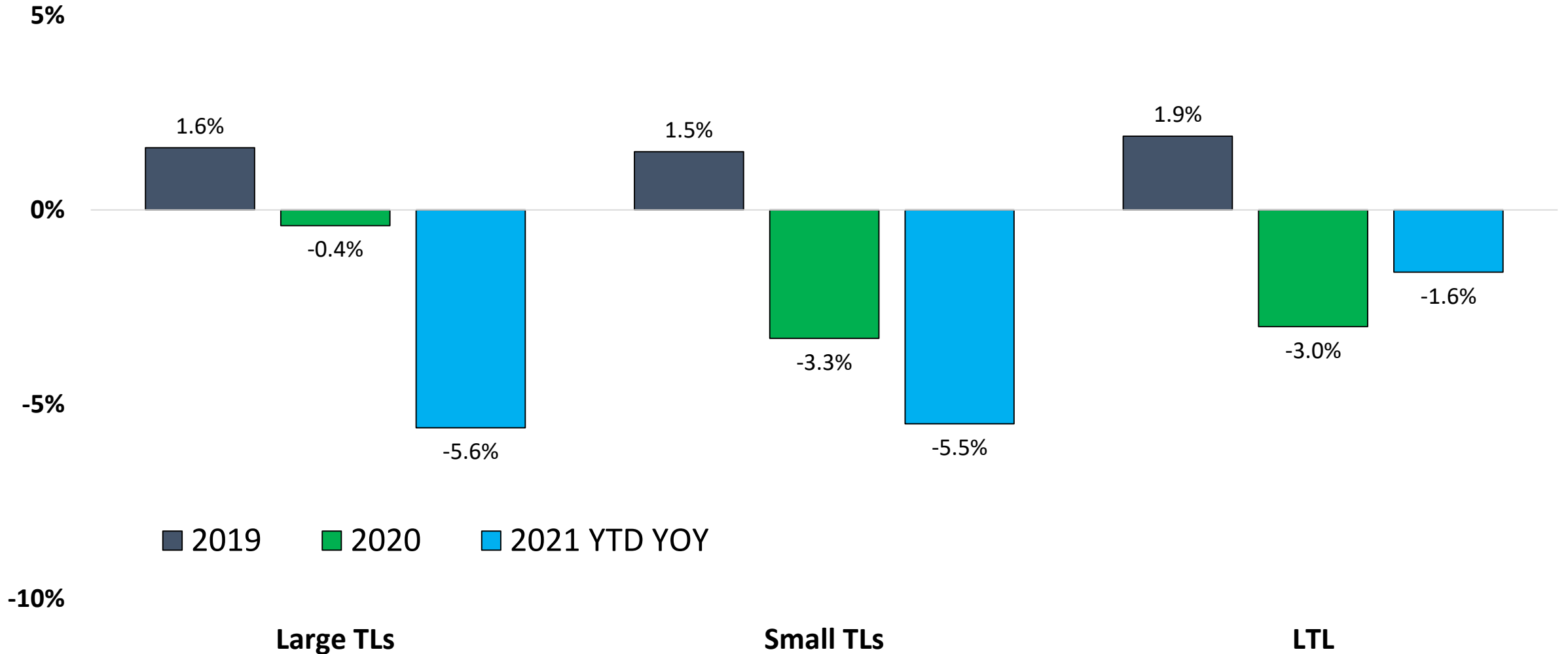
Year-over-Year Percent Change



Supply Trends

For-Hire Carrier Power Unit Fleet Trends

Year-over-Year Percent Change



Large fleets have at least \$30 million in annual revenues.

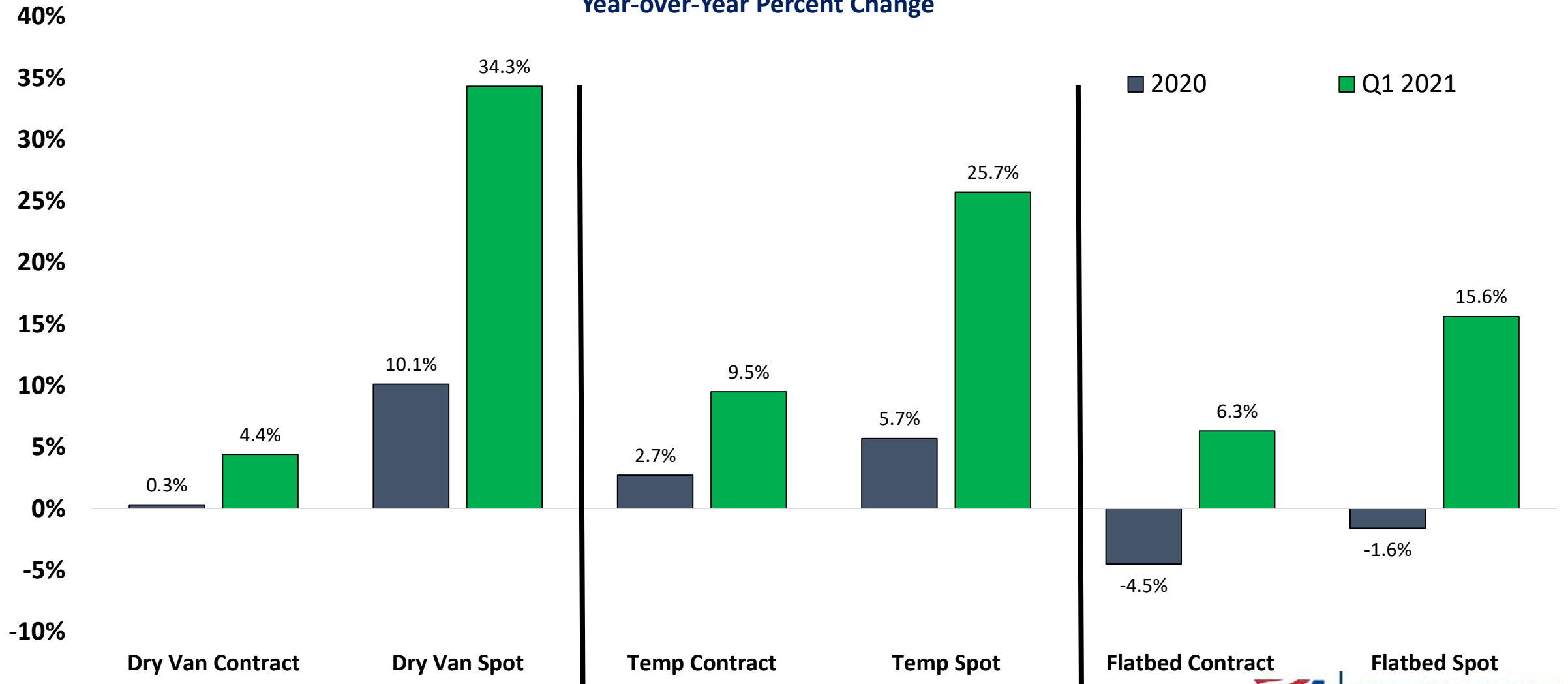
Source: ATA's *Trucking Activity Report*
Data includes company tractors and independent contractor equipment



TL Contract vs Spot Market

Rate Proxies Excluding Fuel Surcharge Revenue

Year-over-Year Percent Change

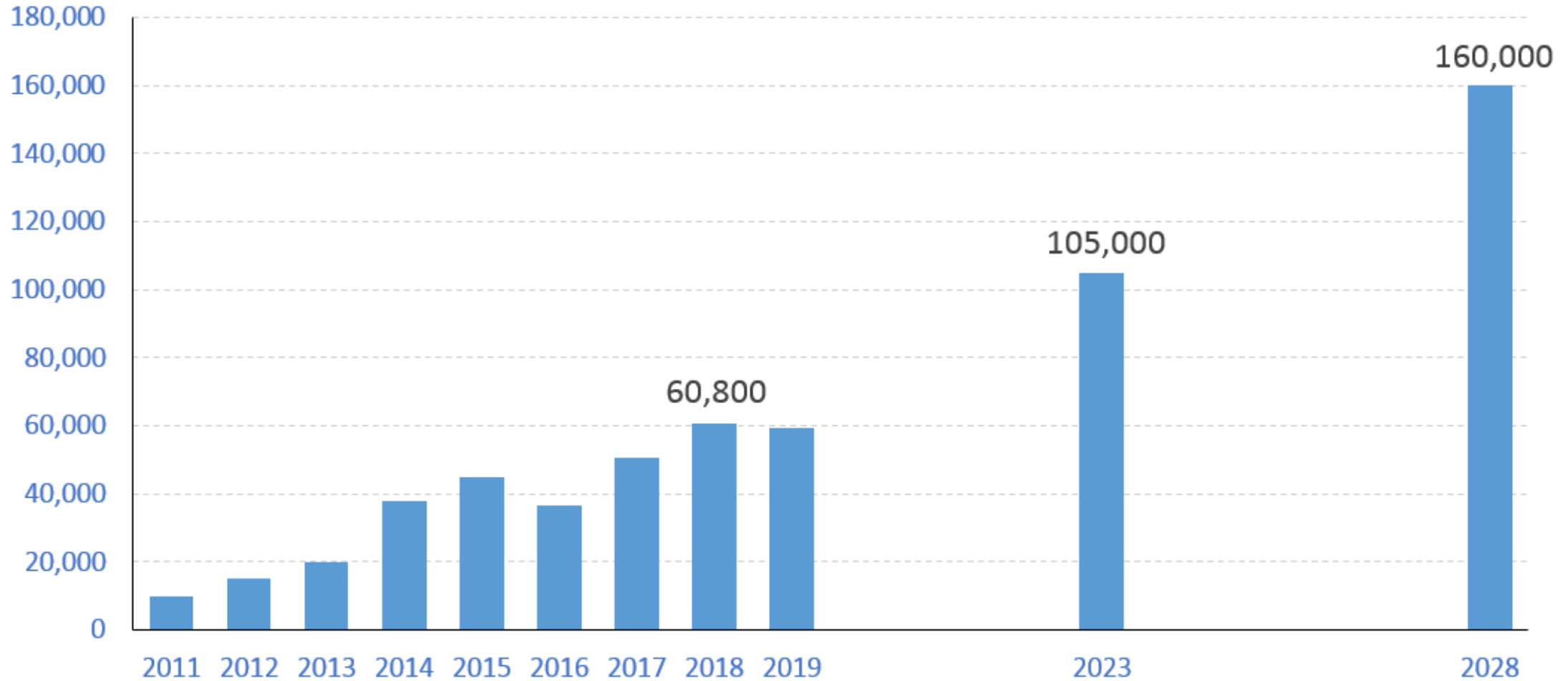


Source: ATA's Trucking Activity Report

Excluding the spot market, the other rate proxy metrics are revenue per mile x fuel surcharges



Driver Shortage



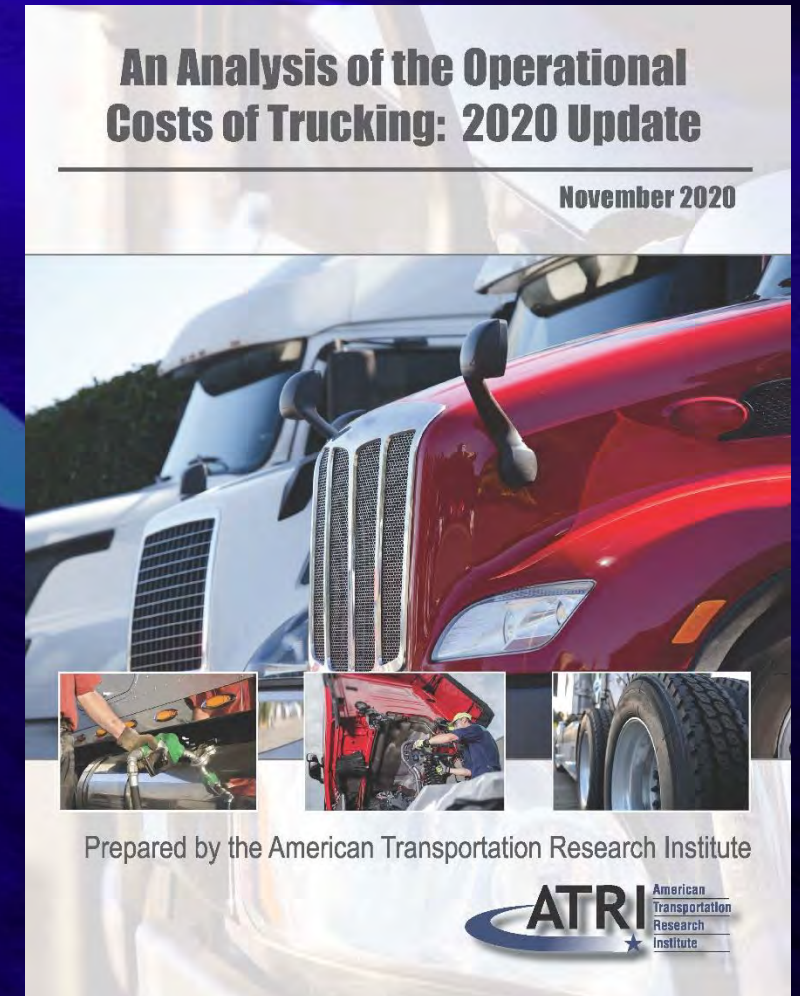
Source: ATA's Truck Driver Shortage Analysis 2018

<https://www.trucking.org/article/ATA-Releases-Updated-Driver-Shortage-Report-and-Forecast>



Operational Costs of Trucking

- **Collects and analyzes real-world motor carrier operational data**
- **Covers data 2008-2019**
- **Calculates costs by mile and by hour**
- **Includes sector, regional analyses**
 - ◆ **TL, LTL, Specialized/Other**
 - ◆ **Small vs Large Fleets**

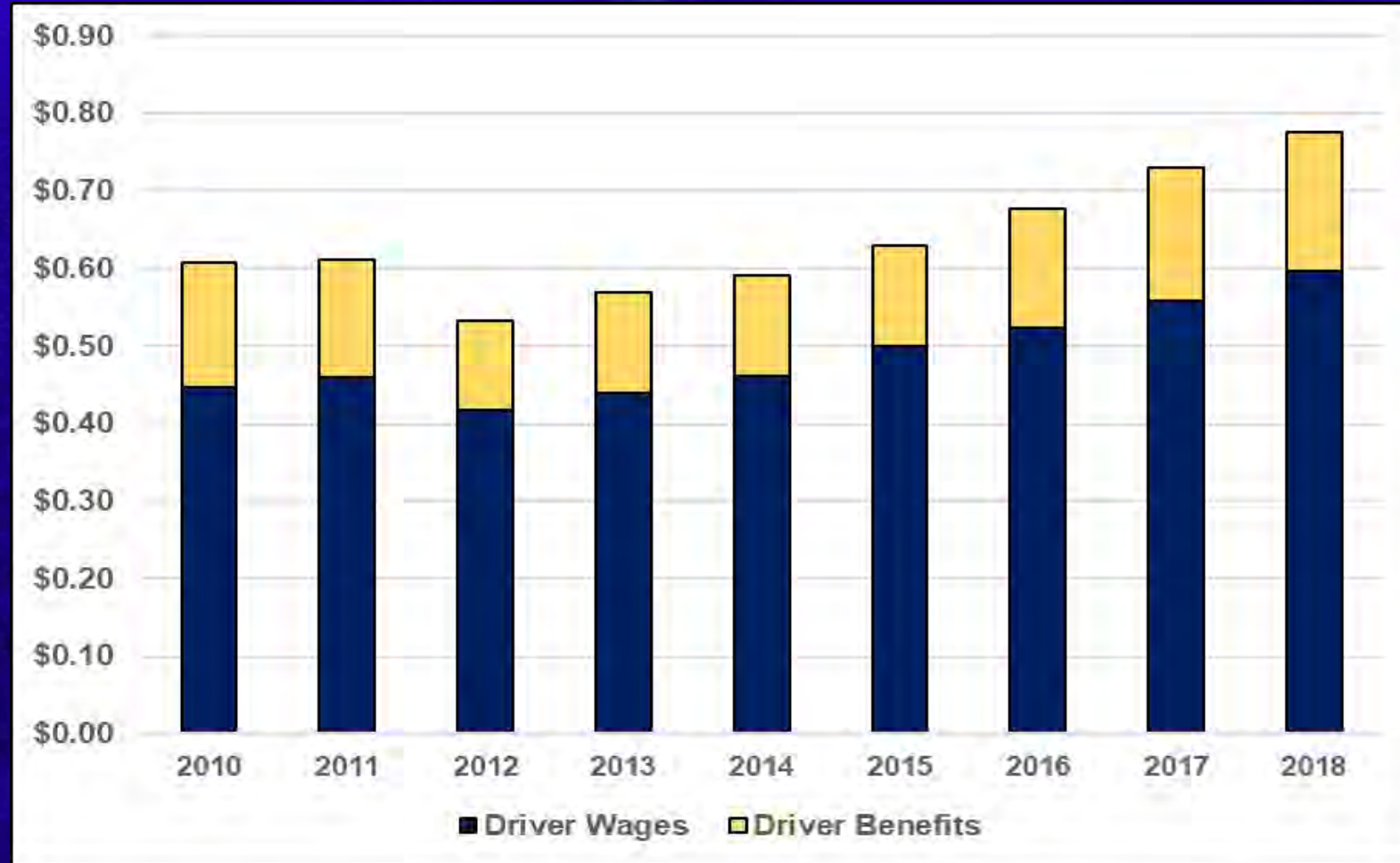


Operational Costs of Trucking

Average Carrier Costs per Mile

Motor Carrier Costs	2015	2016	2017	2018	2019
Vehicle-based					
Fuel Costs	\$0.403	\$0.336	\$0.368	\$0.433	\$0.396
Truck/Trailer Lease or Purchase Payments	\$0.230	\$0.255	\$0.264	\$0.265	\$0.259
Repair & Maintenance	\$0.156	\$0.166	\$0.167	\$0.171	\$0.143
Truck Insurance Premiums	\$0.074	\$0.075	\$0.075	\$0.084	\$0.068
Permits and Licenses	\$0.019	\$0.022	\$0.023	\$0.024	\$0.023
Tires	\$0.043	\$0.035	\$0.038	\$0.038	\$0.036
Tolls	\$0.020	\$0.024	\$0.027	\$0.030	\$0.034
Driver-based					
Driver Wages	\$0.499	\$0.523	\$0.557	\$0.596	\$0.533
Driver Benefits	\$0.131	\$0.155	\$0.172	\$0.180	\$0.160
TOTAL	\$1.575	\$1.592	\$1.691	\$1.821	\$1.652

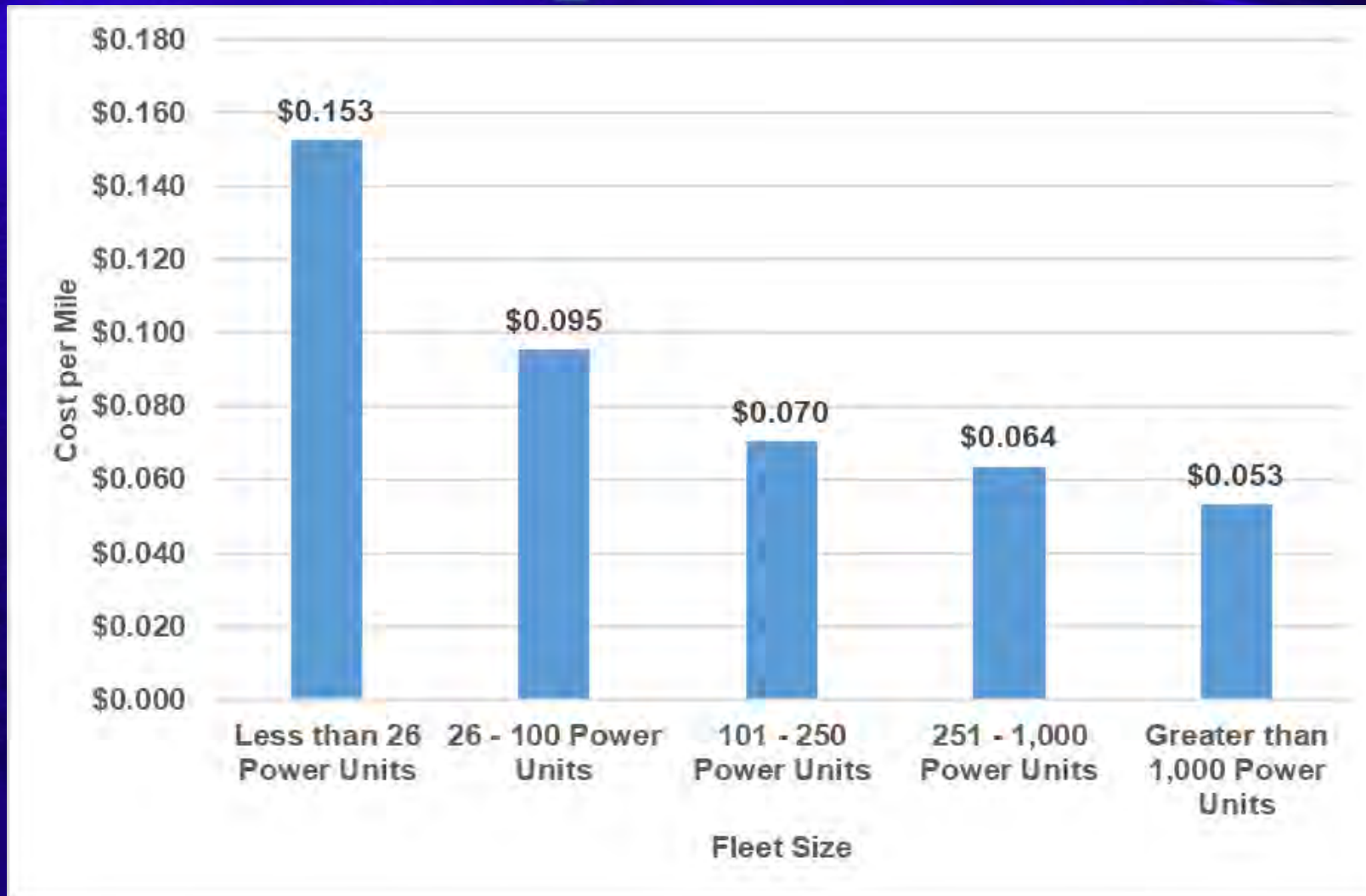
Driver Wages Up 43% Since 2012; Benefits Up 55%



Operational Costs of Trucking

Bonus Type	Average Bonus per Driver	Change 2018-2019
Safety	\$1,373	10.9%
Starting	\$1,846	18.2%
Retention	\$1,218	81.3%

Insurance Cost per Mile by Fleet Size

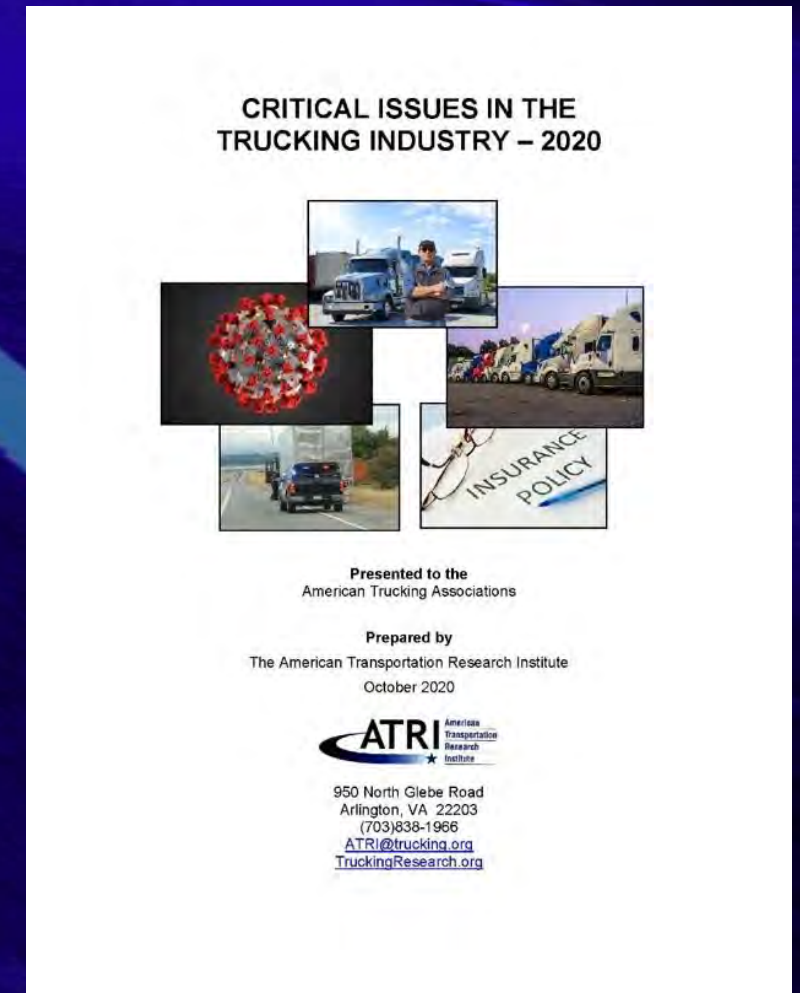


Impact of Rising Insurance Costs

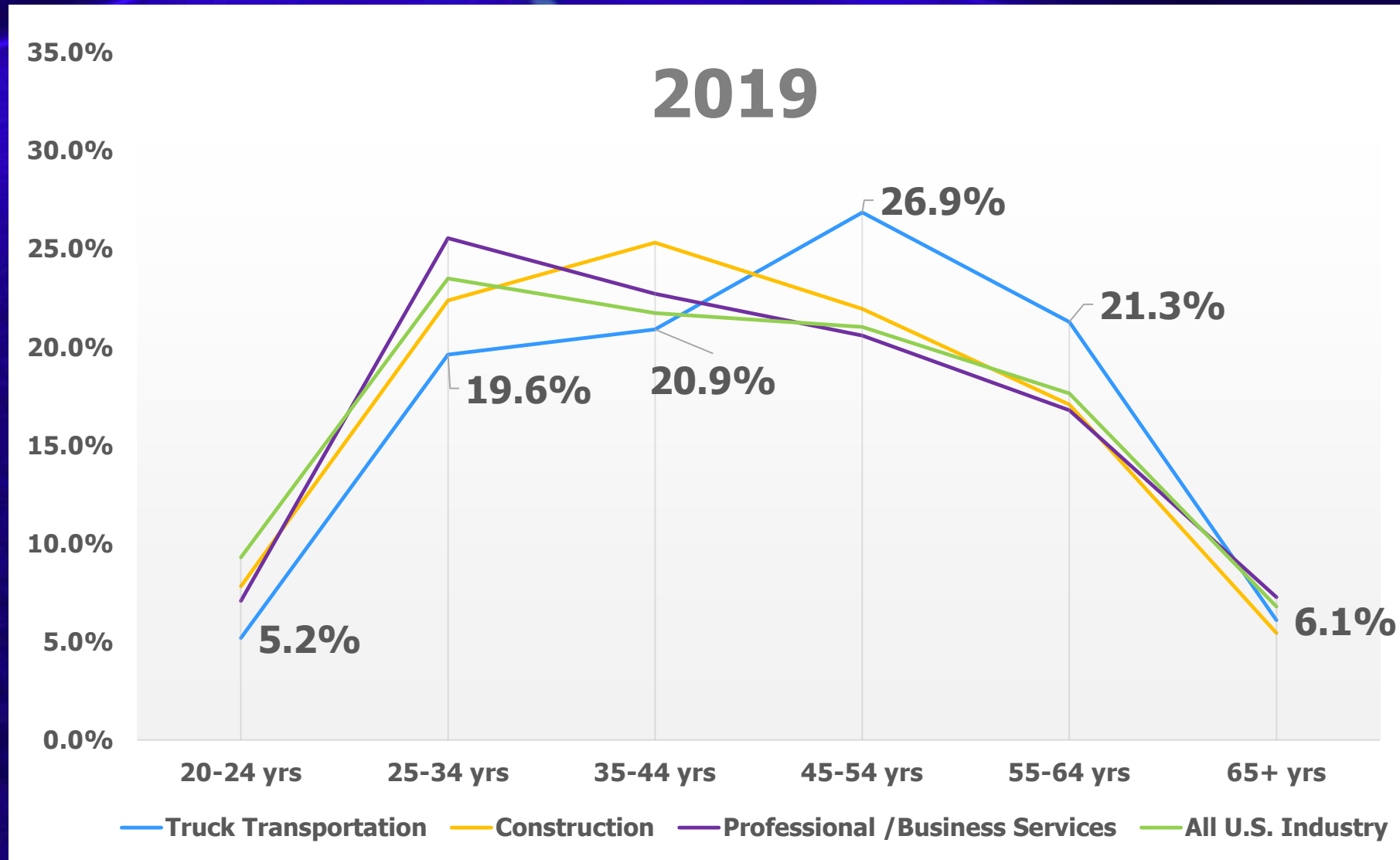
- **Top RAC priority in 2020**
- **Expansion of existing Ops Costs analysis focused on 3 years of motor carrier insurance data and trends**
- **Includes auto liability, cargo, excess coverage, captive participation**
- **Q3 2021 release**

2020 Top Industry Issues

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10. **Hours-of-Service (2)**



Truck Driver Age Demographics

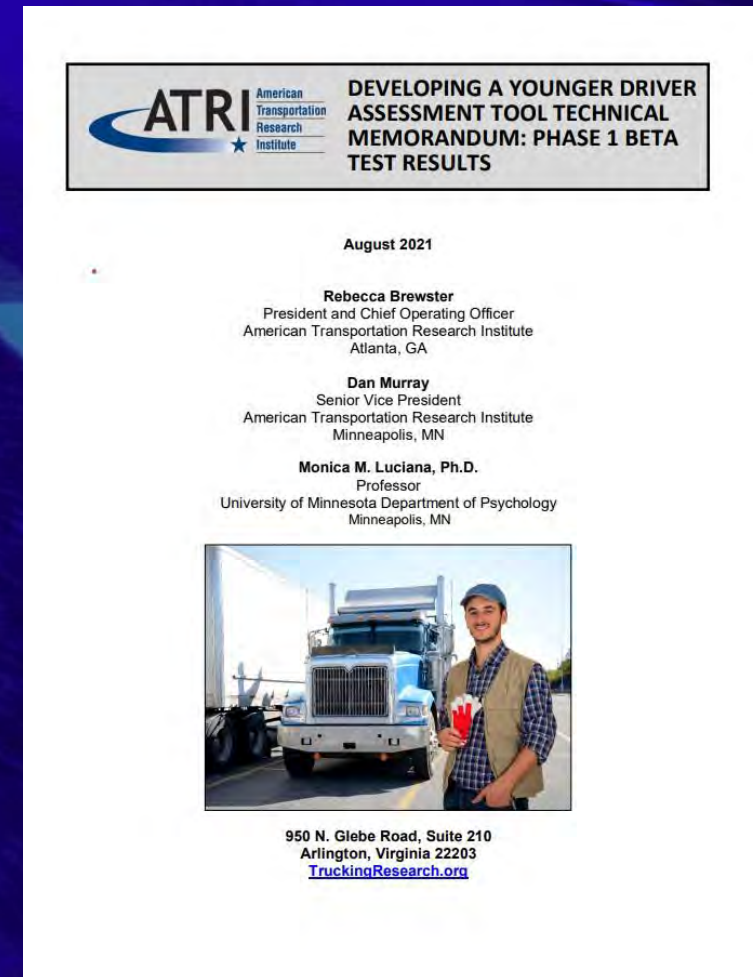


Younger Driver Assessment Tool

- **Minnesota Trucking Association Younger Driver Project Team submitted research proposal to ATRI in 2015**
 - ◆ **Selected as top priority research topic by ATRI's Research Advisory Committee**
- **Meta-analysis of research linking crash risk with specific driver traits and the relationship between those traits and driver age**

Younger Driver Assessment Tool

- ATRI-developed assessment tool to identify younger drivers with personality characteristics similar to mature, veteran drivers
- Beta test of tool included 94 drivers aged 20-60



Younger Driver Assessment Tool

- **Measures tested included:**
 - ◆ **Personality traits**
 - ◆ **Reasoning**
 - ◆ **Impulsivity**
 - ◆ **Sensation-seeking**
 - ◆ **Sleep quality**
 - ◆ **Cognitive control**
- **Participating drivers' safety performance measured through MVR and PSP – crashes and safety violations**

Younger Driver Assessment Tool

- Among statistically significant findings, safest drivers scored highest on Extraversion and Conscientiousness and lowest on Depression and Sleep Latency
- Assessment did show sensitivity to age-related variations in performance
 - ◆ Similar findings for older drivers with less driving experience

Younger Driver Assessment Tool

- **Next phase will expand sample to include more drivers under 25**
 - ◆ Working with CVTA, carriers with schools, apprenticeship programs
- **Shortened assessment will remove several tests**
 - ◆ BMI assessment – more likely to be predictive of health risks and threats to safety such as poor sleep in older and more seasoned drivers
 - ◆ UPPS-P – though highly sensitive to age, was not predictive of driver safety
 - ◆ Trail-Making Test – due to significant questions about validity in the context of automated administration
 - ◆ Attentional Network Test – the ANT is redundant in theory with the Multi-Source Interference Task and was not well received by the drivers

How to Best Integrate 18-20 Year Olds in the Trucking Industry

- Identified by ATRI's Research Advisory Committee as top research priority for 2021
- Young individuals critical to addressing workforce shortages including drivers, technicians, warehouse/dock workers
- Younger employees may segue into driving jobs
- Research Objective – identify best practices for recruiting, training, and retaining younger employees

Focuses on Key Challenge Areas

- **Legal – federal law prohibits individuals under the age of 21 from driving interstate freight**
 - ◆ **Best practices for utilizing 18-20 YO in non-driving or non-interstate driving roles evenly within company operations**
- **Operational – even if DRIVE-Safe Act made it legal for 18-20 YO to drive tomorrow, there will still be challenges**
 - ◆ **Strategies for integrating driver training into early employment to ensure optimal safety among less-tested age group**

Focuses on Key Challenge Areas

- **Generational – Gen Z and Millennials have different workplace priorities and behaviors**
 - ◆ Responding to younger employees' desires for flexibility, growth opportunities, belonging to a team where they are valued, and contributing to a greater good
- **Reputational – there is a lack of public awareness about careers in trucking among younger individuals**
 - ◆ Effective strategies, platforms, and programs for addressing stereotypes
 - ◆ High school/technical college outreach, including trucking classes or clubs



 U.S. Department of Transportation
Federal Motor Carrier Safety Administration

Tech-Celerate Now:
ADAS Performance Technology Categories

ADAS – Braking

- Automatic emergency braking
- Air disc brakes
- Adaptive cruise control

ADAS – Steering

- Lane keep assist
- Lane centering
- Adaptive steering control

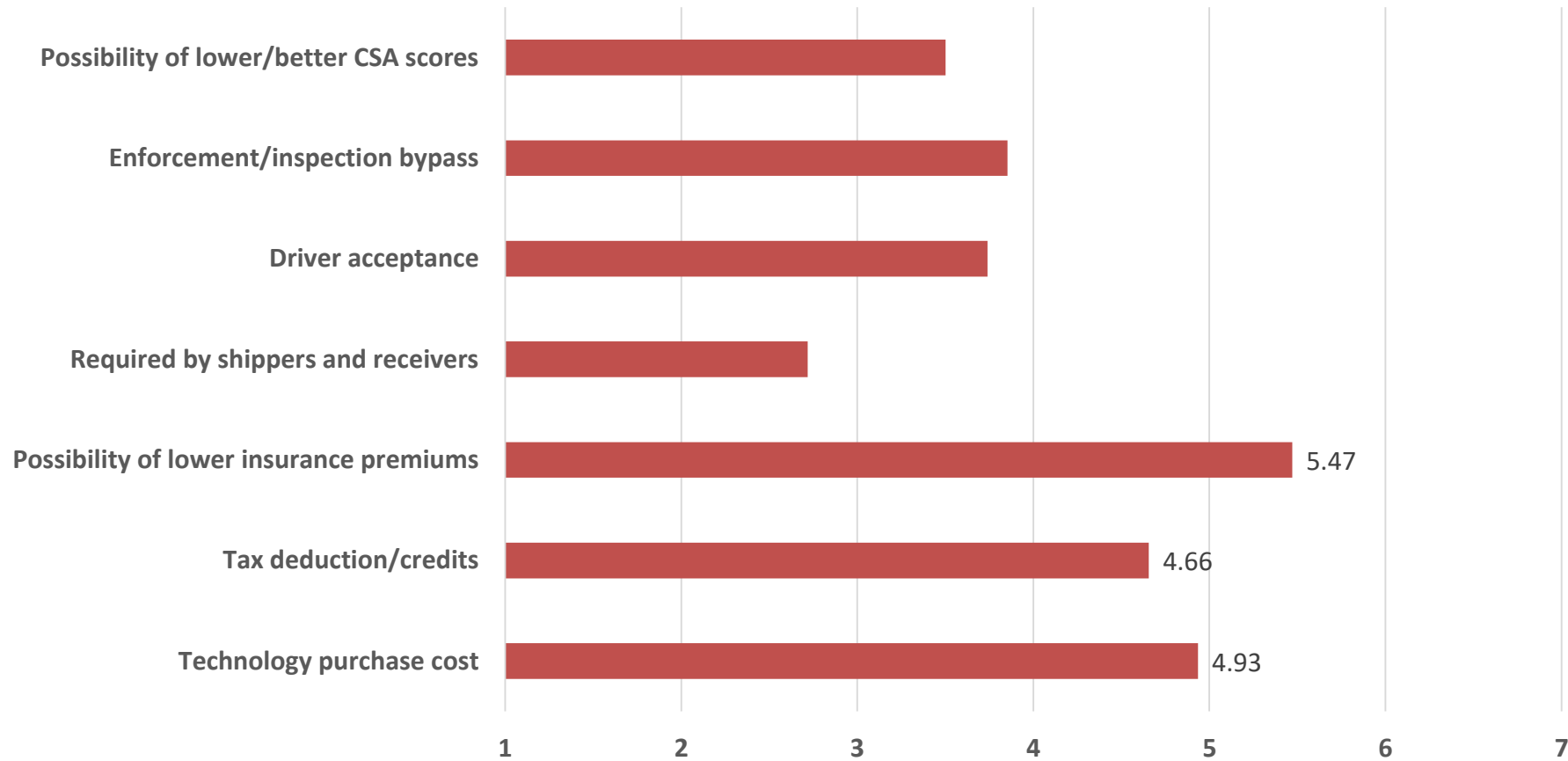
ADAS – Warning

- Lane departure
- Forward collision
- Blind spot

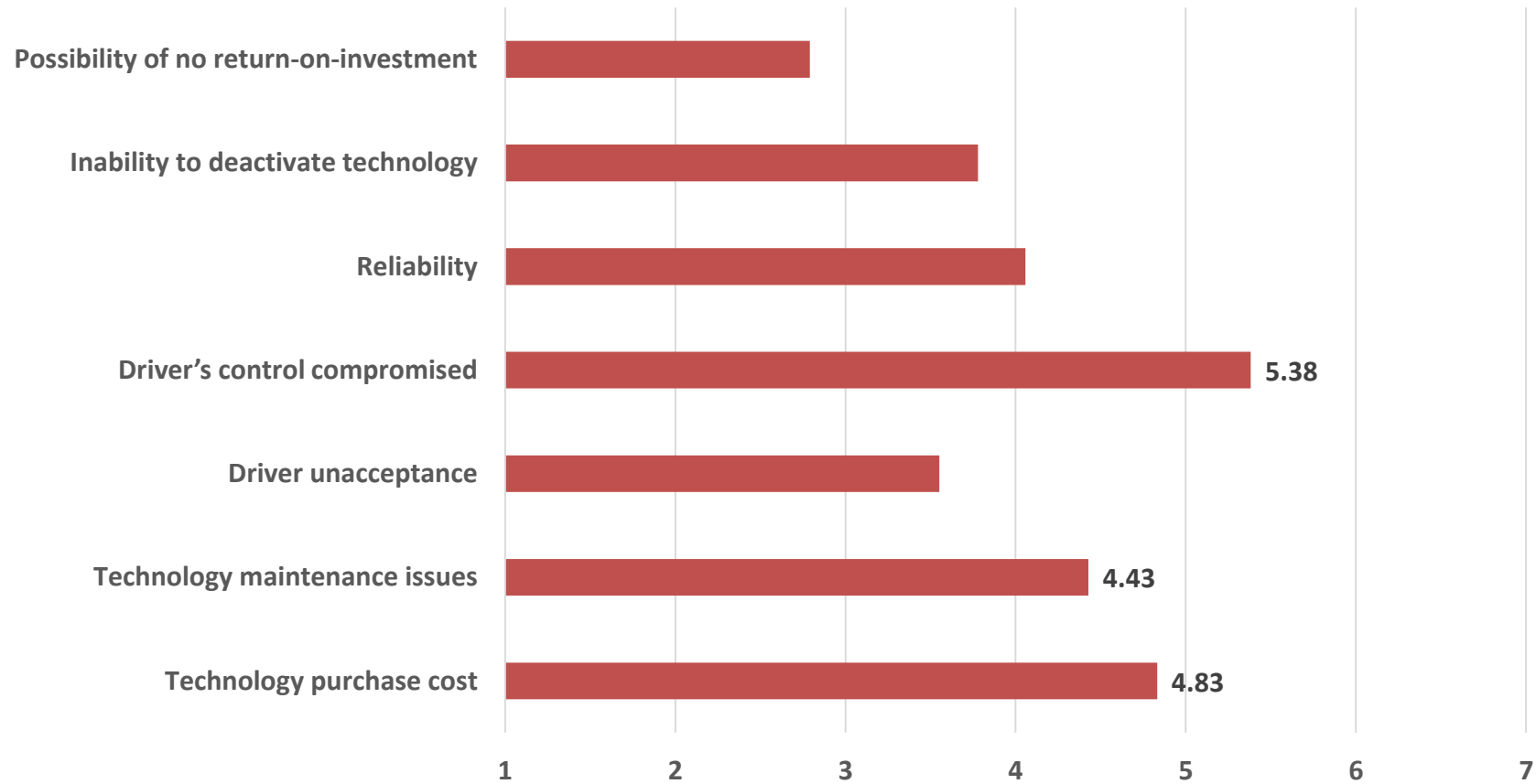
ADAS – Monitoring

- Driver-facing camera
- Road-facing camera
- Camera-based mirror systems

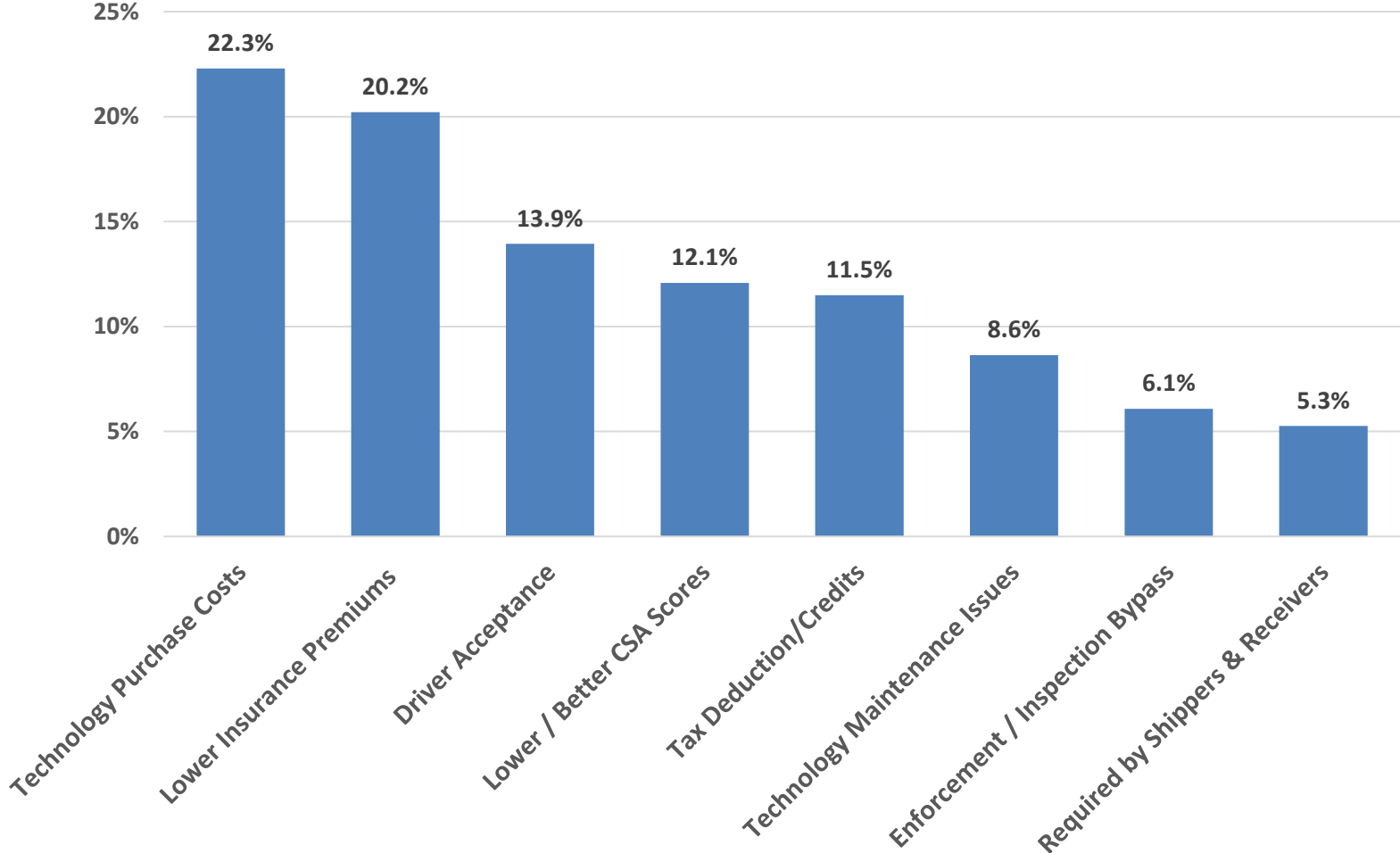
Most Influential Factors in Deciding to Purchase ADAS



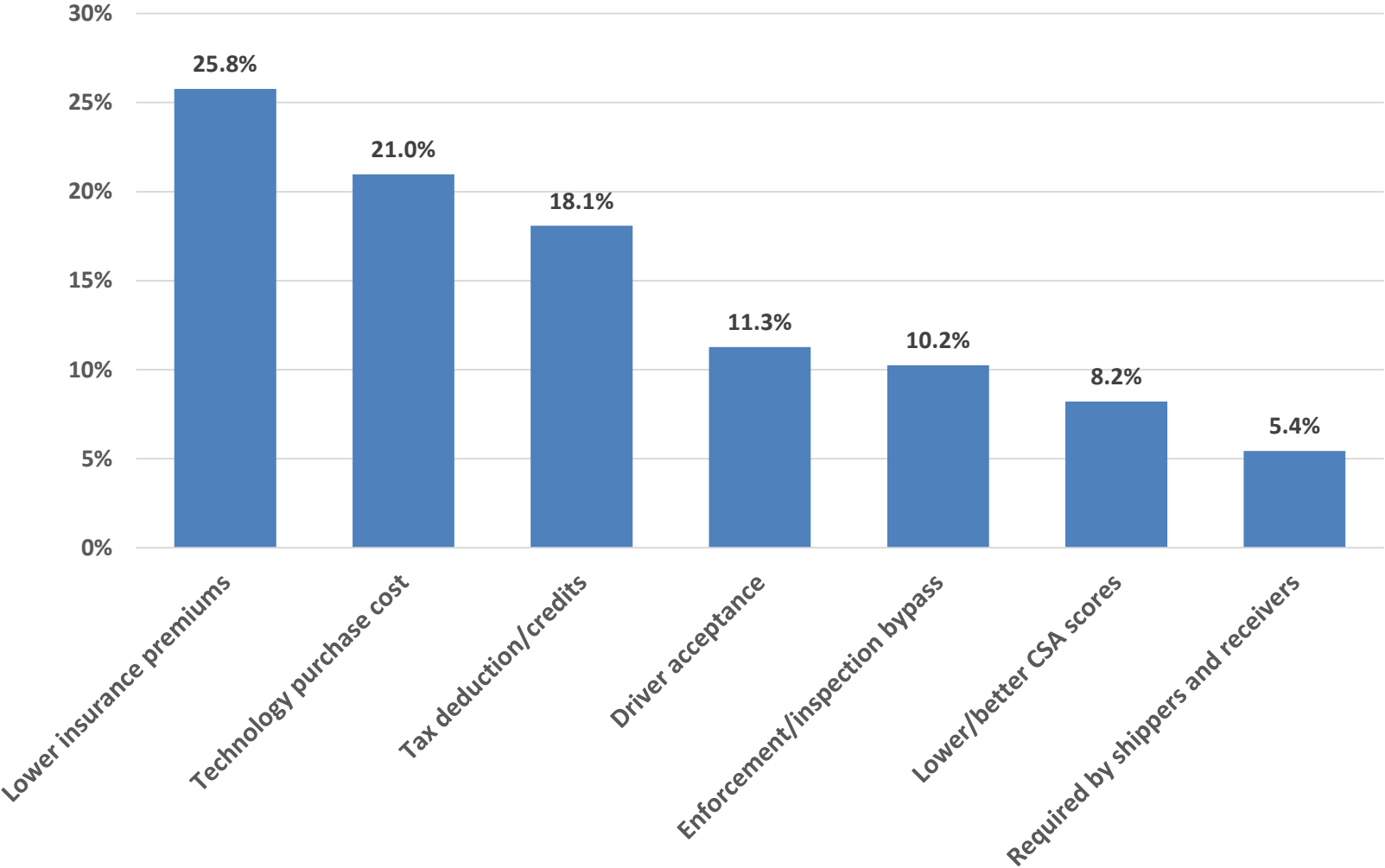
Most Influence Factors in Deciding Not to Purchase ADAS



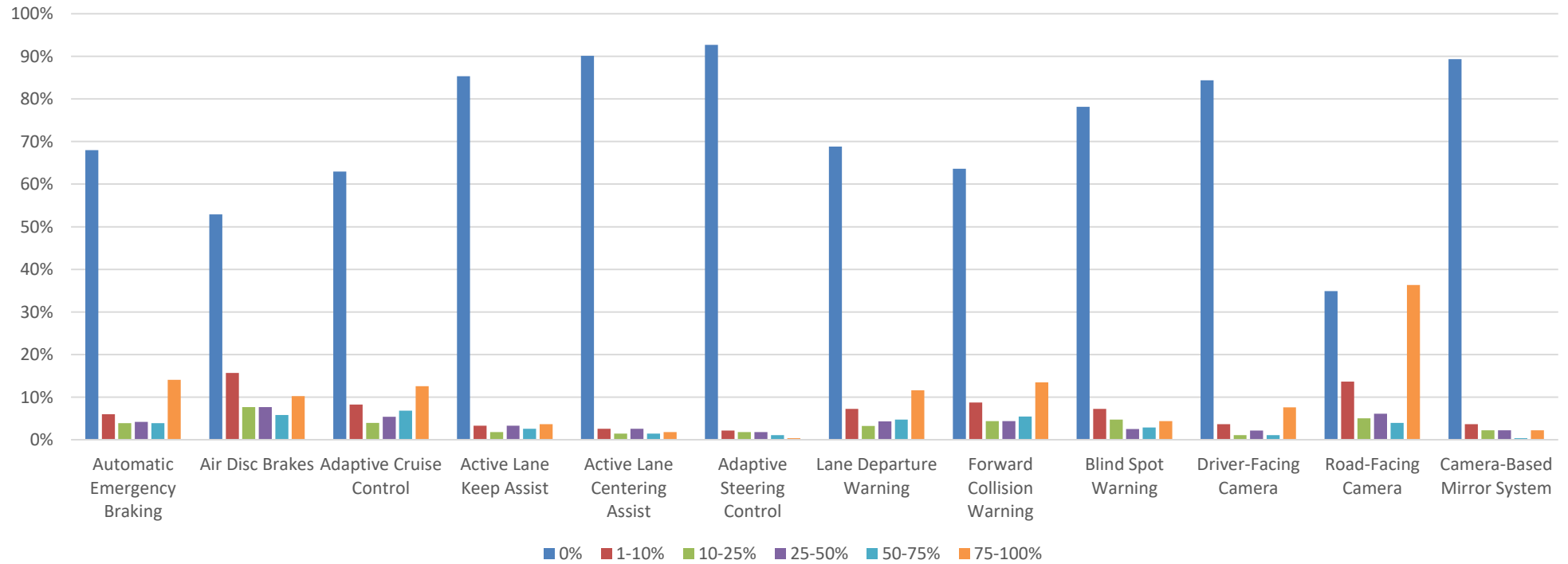
Carriers: Top Ranked Issues Impacting Adoption Benefits



Truck Drivers: Top Ranked Issues Impacting Adoption Benefits



Percent of Tractor-Trailers with Technology Installed

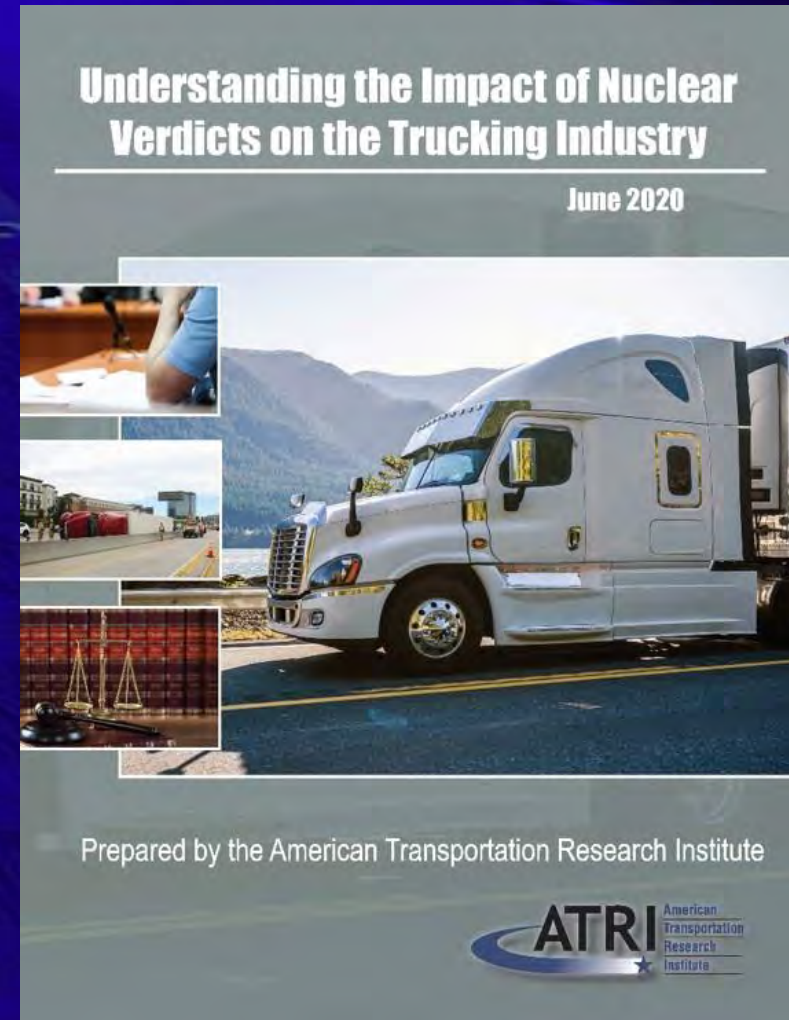


Tech-Celerate Braking:

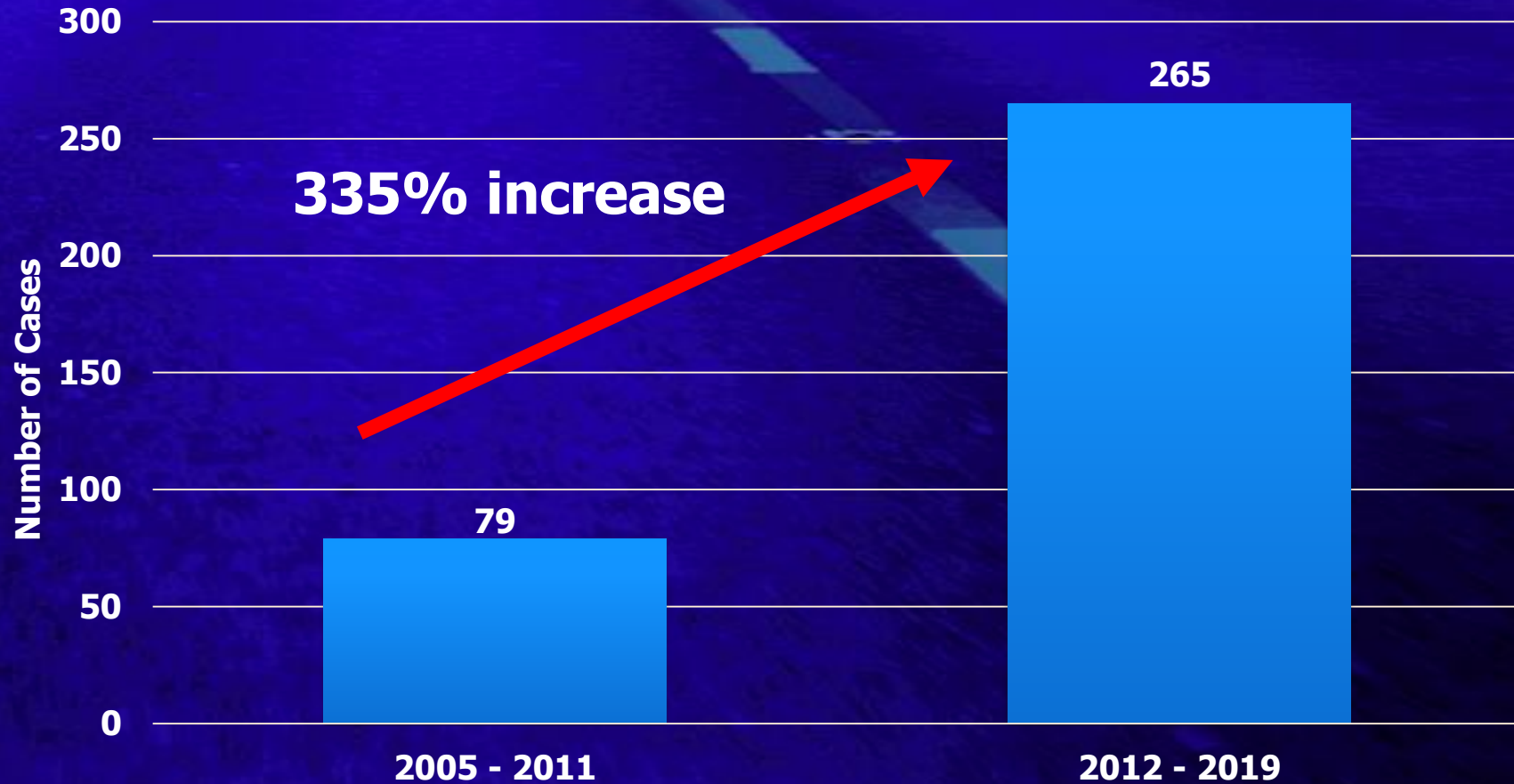
<https://youtu.be/gutc1MYFFws>

Nuclear Verdict Impacts

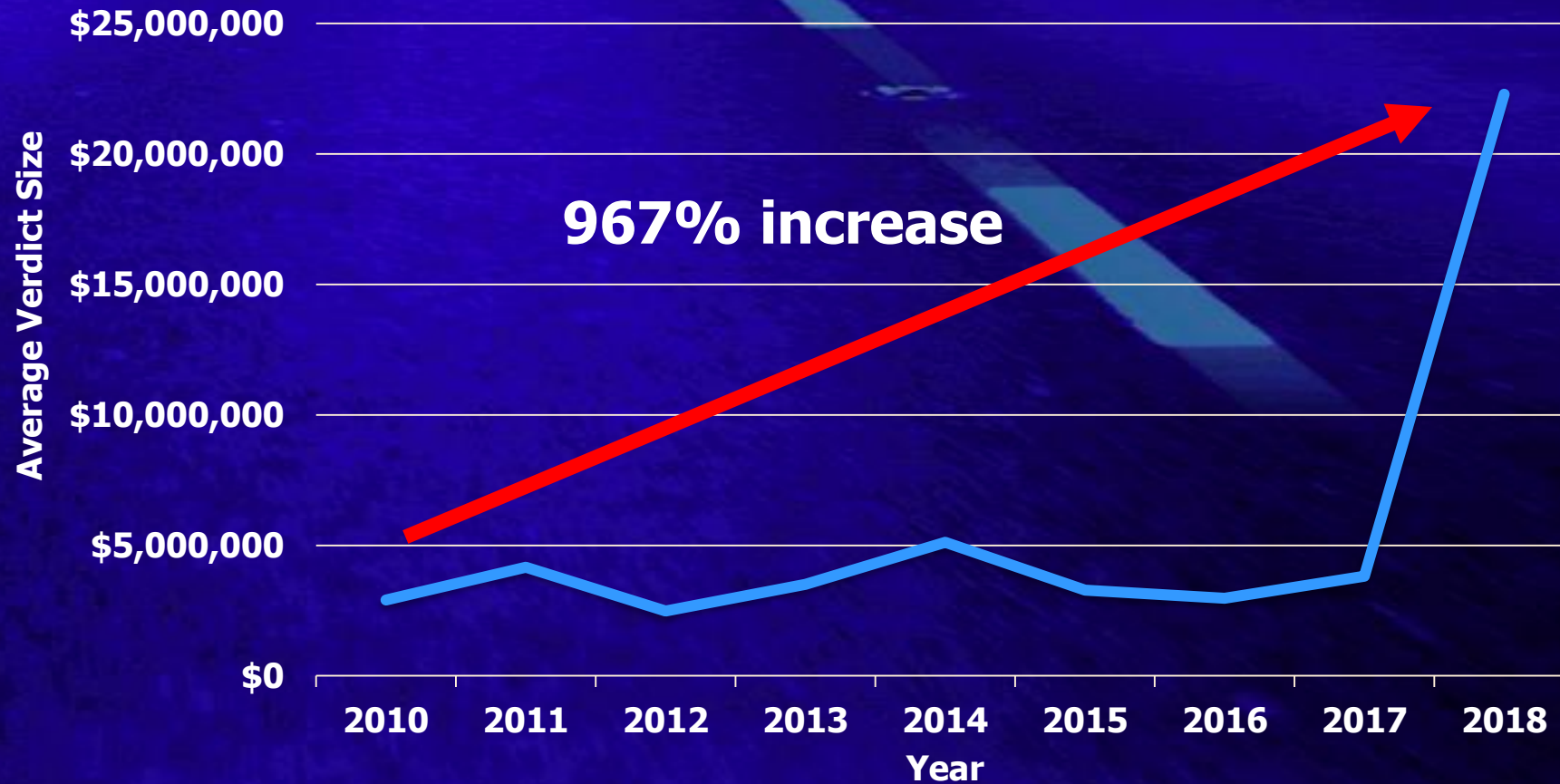
- **Comprehensive analysis of 600+ cases spanning 15 years**
- **In-depth interviews with defense and plaintiff attorneys, as well as insurance industry and safety experts**
- **Detailed analysis of litigation financing**
- **Mitigation strategies from other industries**



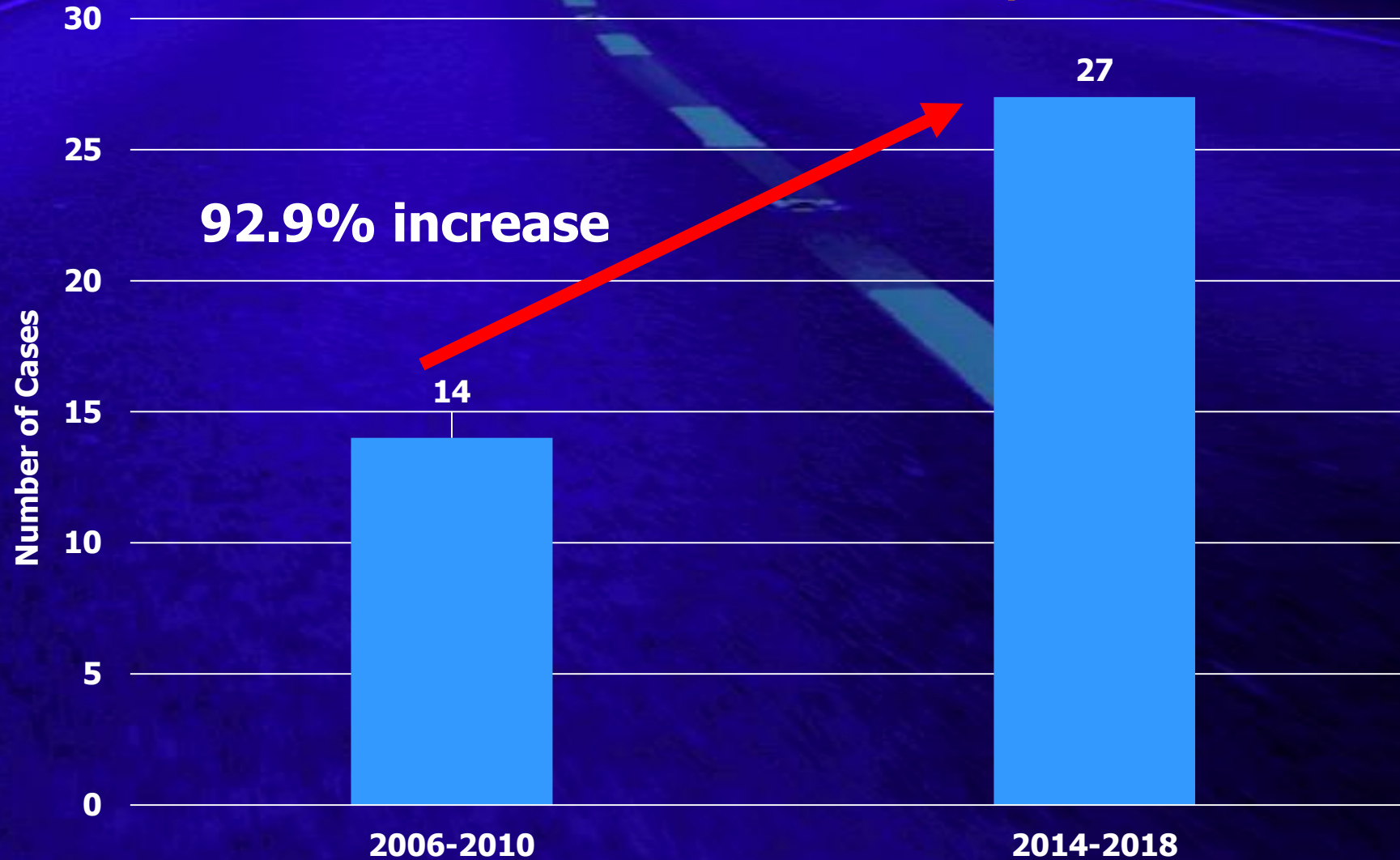
Number of Cases with Verdicts \$1 Million+



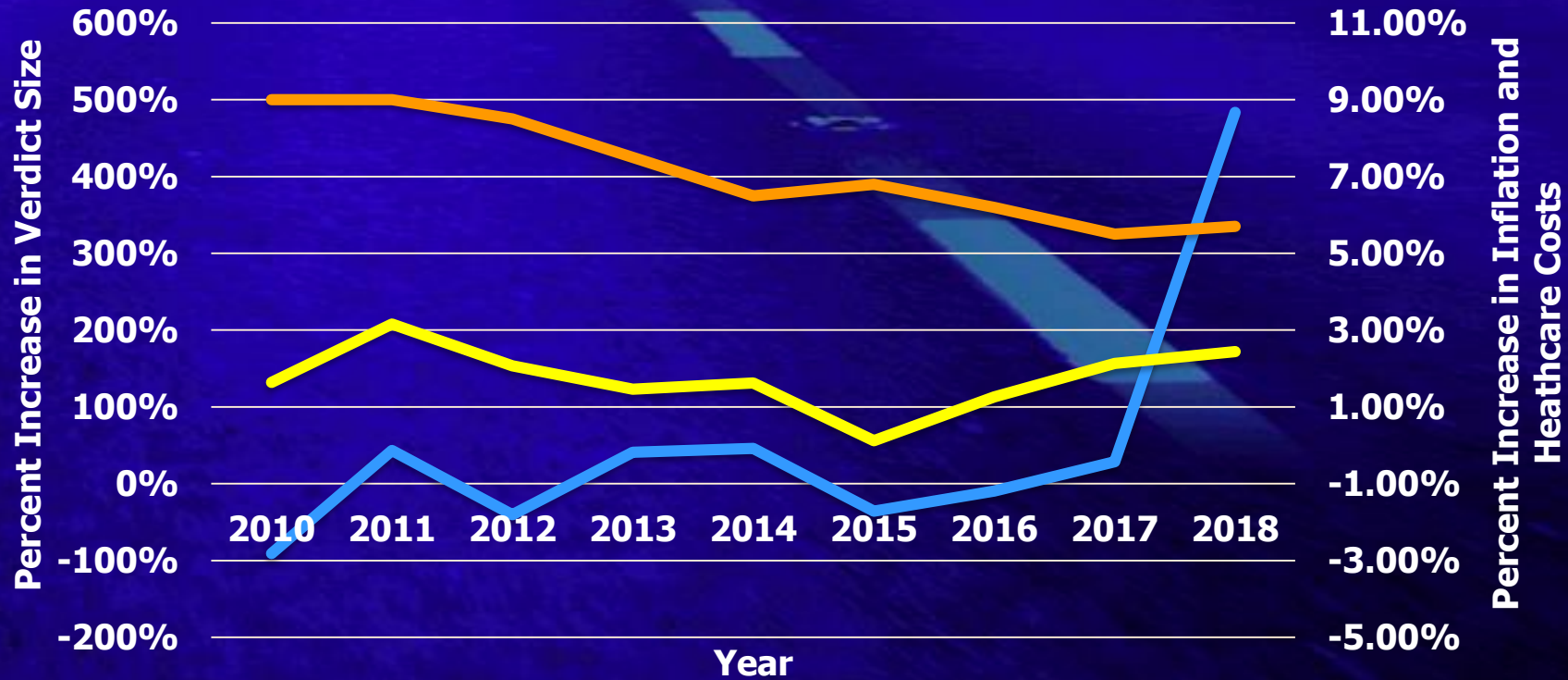
Average Verdicts Greater than \$1 Million by Year



Cases with Verdicts \$10M +



Average Verdict Size / Inflation / Healthcare Costs



- Verdict Size Increase (Over \$1 Million)
- Inflation Increase
- Healthcare Cost Increase (PwC)

Plaintiff Verdicts

Issue Brought Against the Defendant in Court	Percent of Plaintiff Verdicts
HOS / Log Book	100.0%
Driver History	100.0%
Controlled Substance	100.0%
Left Scene of the Crash / Failed to Call 911	100.0%
Health-Related Issue	100.0%
Sleep / Fatigue	91.7%
Driver on their Phone	91.7%
Rear-End Collision	89.2%
Work Zone / Construction	88.9%

Impact of Small Verdicts and Settlements on the Trucking Industry

- Follow-up to ATRI's *The Impact of Nuclear Verdicts on the Trucking Industry (2020)*
- Identified a different litigation model: Cases resulting in settlements and verdicts under \$1 million
- ATRI's Research Advisory Committee (RAC) priority
- Assess the impact of this model on the trucking industry

Impact of Small Verdicts and Settlements

- Conducted literature review to assess the current legal landscape
- Compiled litigation data from multiple external industry sources including a litigation database firm
- Identified and analyzed key metrics of case data
- Submitted key findings to trucking industry professionals for feedback to incorporate into the final report

2020 Top Industry Issues

Commercial Drivers

1. Truck Parking
2. Driver Compensation
3. Detention / Delay
4. Hours-of-Service
5. Driver Training Standards
6. Automated Truck Technology
7. CSA
8. Driver Health & Wellness
9. Speed Limiters
10. ELD Mandate


Motor Carriers

1. Driver Shortage
2. Driver Retention
3. CSA
4. Insurance Cost / Availability
5. Tort Reform
6. Economy
7. **Transportation Infrastructure / Congestion / Funding**
8. Driver Distraction
9. Detention / Delay
10. Hours-of-Service

2021 Top Truck Bottlenecks

2021 TOP TRUCK BOTTLENECKS • BY THE NUMBERS

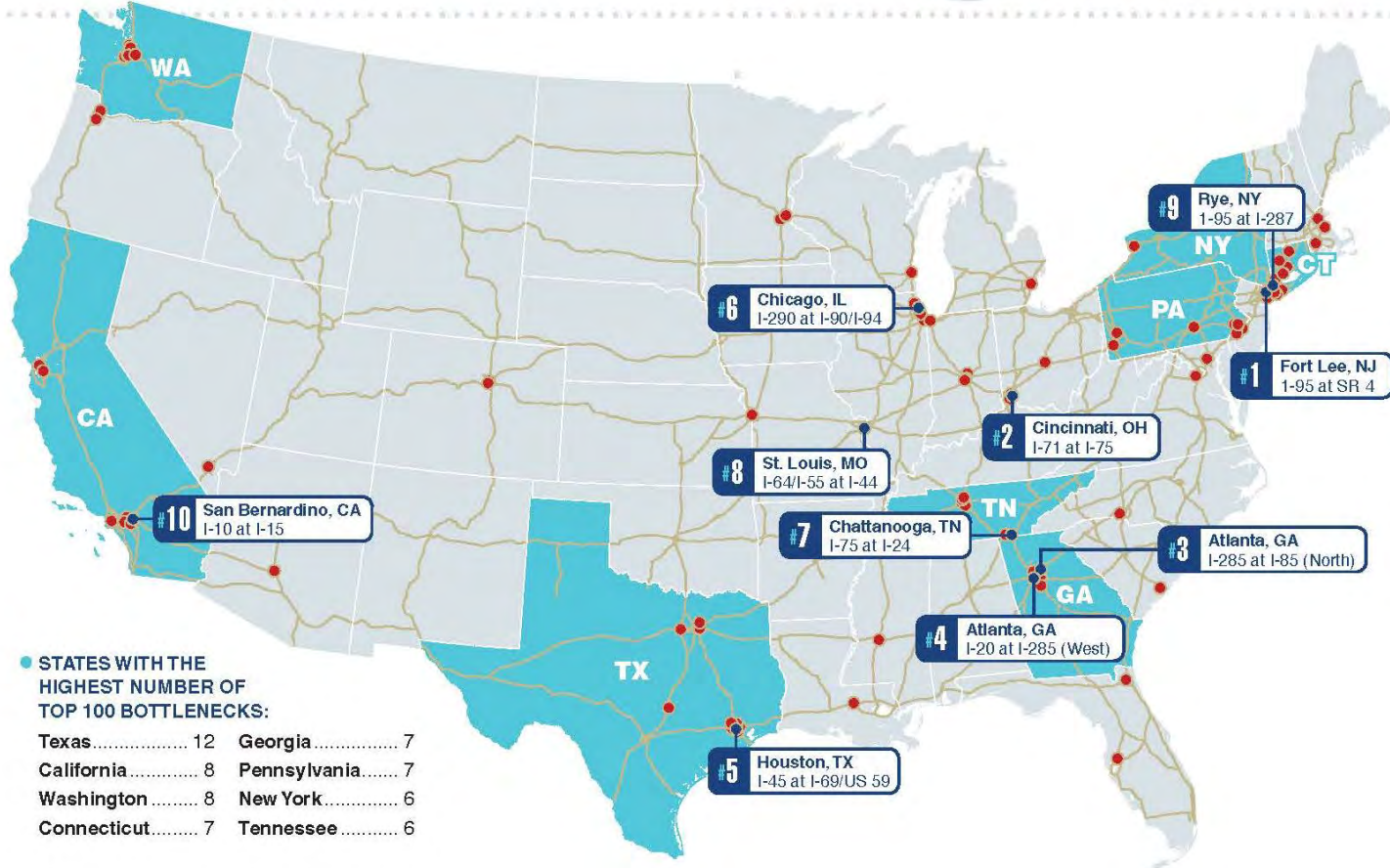
AVERAGE PEAK HOUR TRUCK SPEED: **43.0 mph**



up 33.9%
year-over-year

TOP 100 BOTTLENECKS WITH AVERAGE TRUCK SPEEDS <45 MPH: **25%**

NUMBER OF STATES WITH AT LEAST ONE TOP 100 BOTTLENECK: **29**

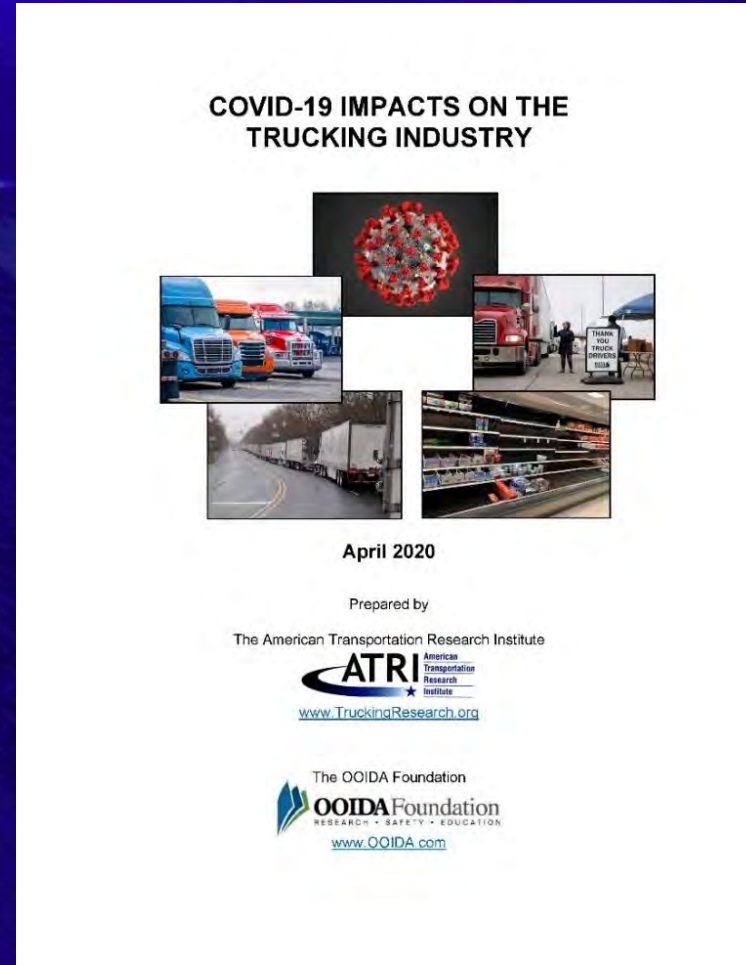


2021 Top 10 Truck Bottlenecks

Rank	Location	Average Peak Speed	Y-o-Y Change in Average Peak Speed
1	Fort Lee, NJ: I-95 at SR 4	31.3	39.4%
2	Cincinnati, OH: I-71 at I-75	40.1	11.5%
3	Atlanta, GA: I-285 at I-85 (North)	34.4	53.5%
4	Atlanta, GA: I-20 at I-285 (West)	40.9	12.6%
5	Houston, TX: I-45 at I-69/US 59	31.4	53.7%
6	Chicago, IL: I-290 at I-90/I-94	25.4	57.6%
7	Chattanooga, TN: I-75 at I-24	46.8	-1.8%
8	St. Louis, MO: I-64/I-55 at I-44	46.1	10.1%
9	Rye, NY: I-95 at I-287	45.7	12.0%
10	San Bernardino, CA: I-10 at I-15	40.7	25.1%

COVID-19 Impacts

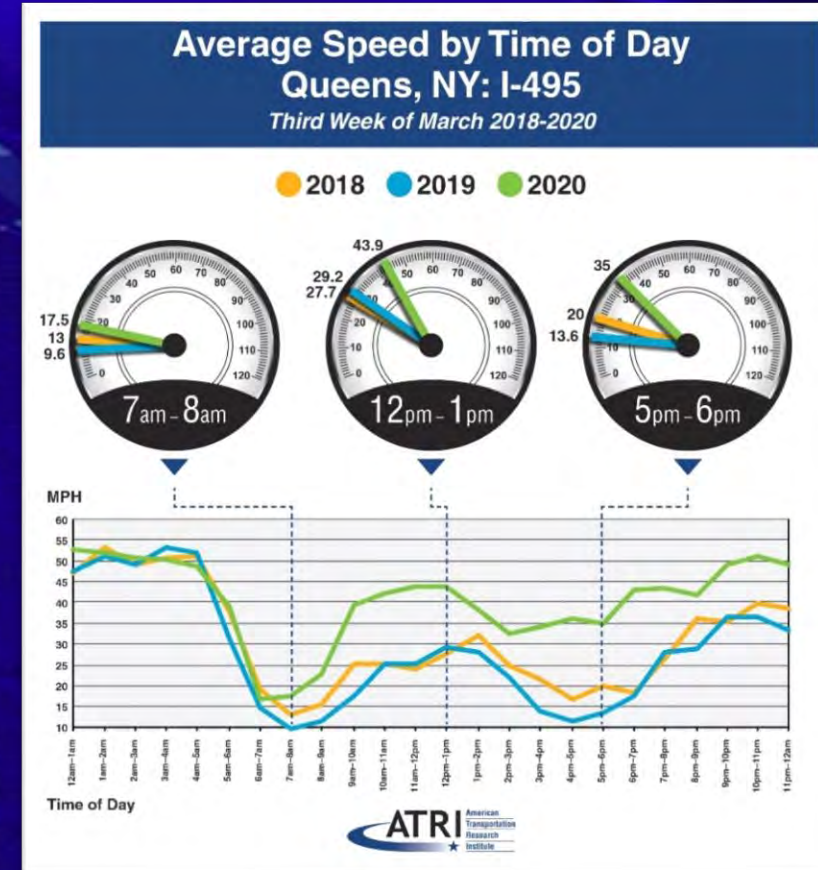
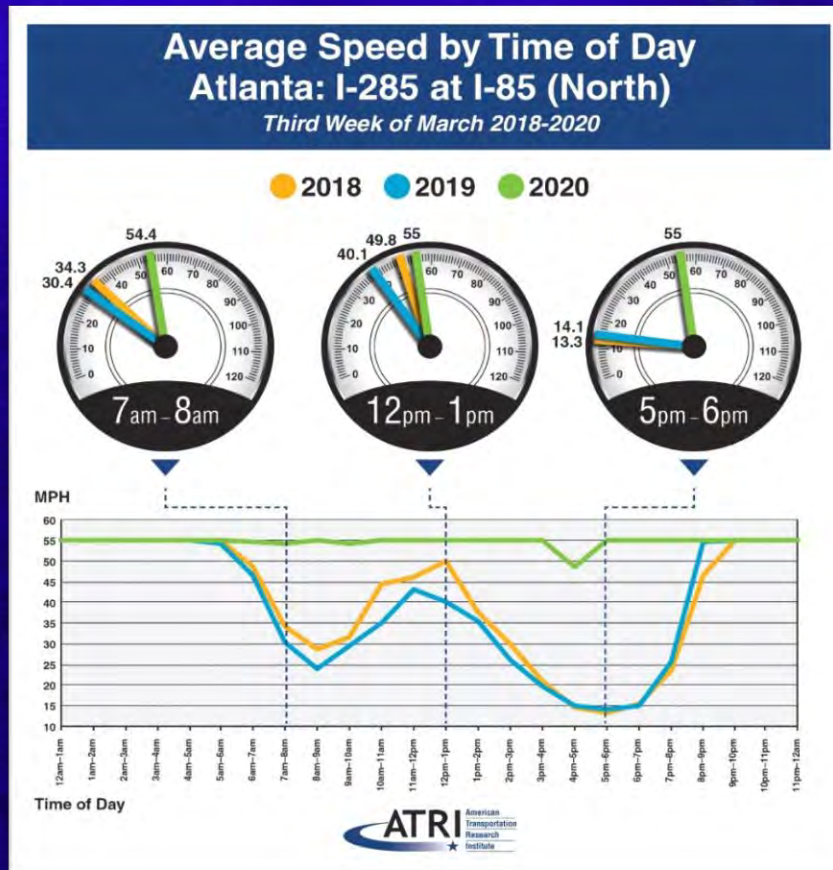
- **Multiple GPS Analyses**
- **Joint survey with OOIDA Foundation**
- **5,000+ respondents over 2 weeks**
 - ◆ **77% drivers**
 - ◆ **68.6% fleets fewer than 50 trucks**
 - ◆ **65.5.% TL**



Average Length of Haul Changes

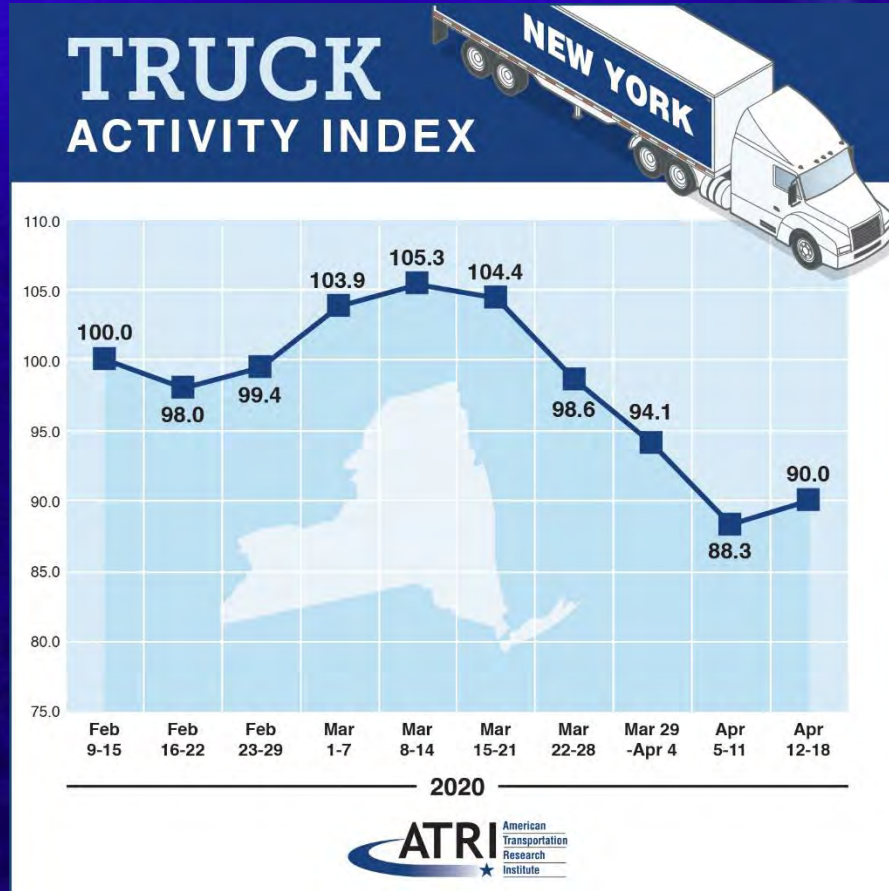
	Before Pandemic	During Pandemic
Local (less than 100 miles per trip)	7.8%	18.2%
Regional (100-499 miles per trip)	31.0%	33.8%
Inter-regional (500-999 miles per trip)	28.6%	25.2%
Long-Haul (1,000+ miles per trip)	32.7%	22.7%

Congestion Down during COVID



87% of respondents said traffic congestion reduced during COVID

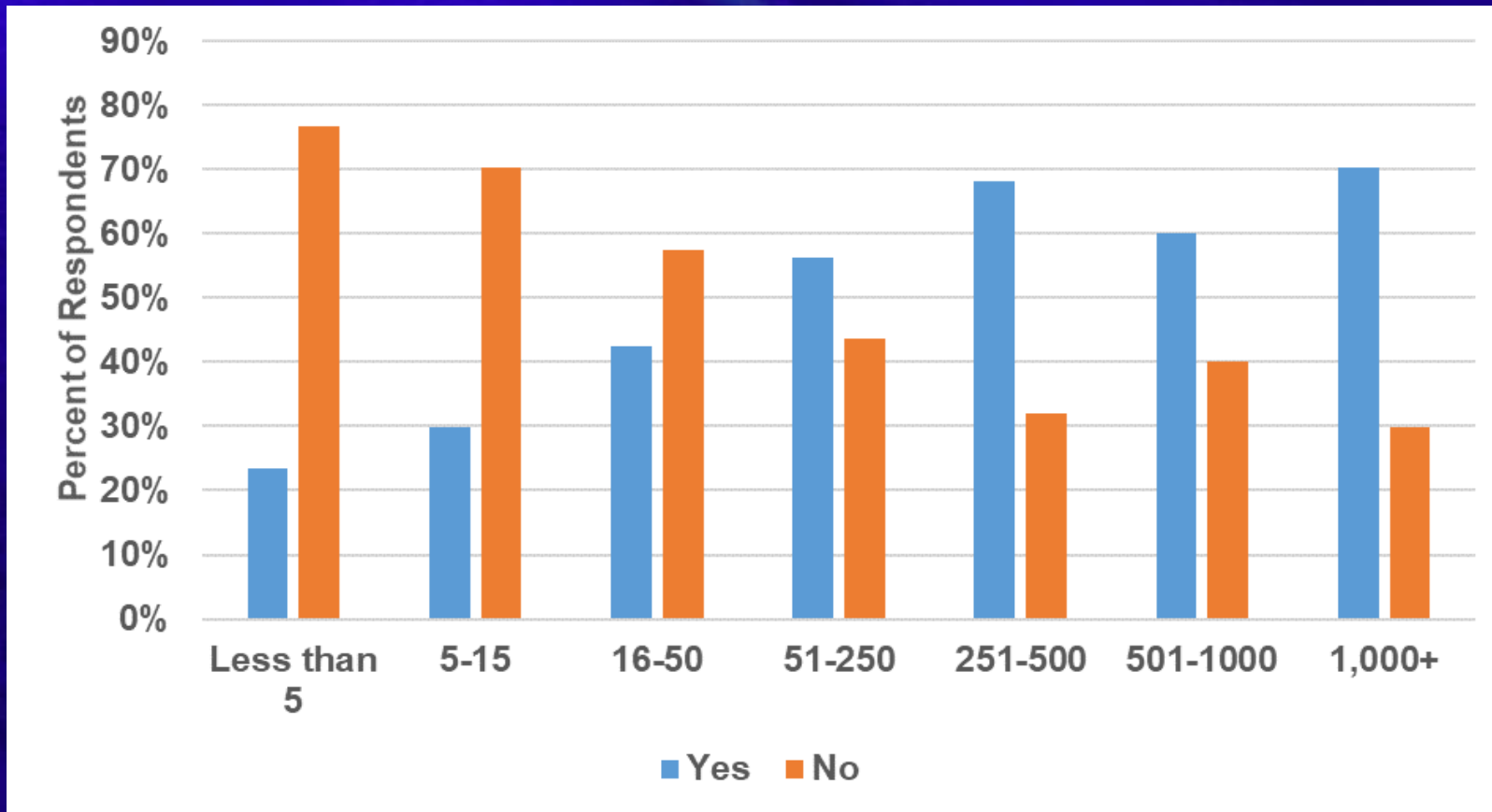
Truck Activity Impacts



Truck Activity Impacts



Disaster Response Plan in Place Pre-COVID



Questions?

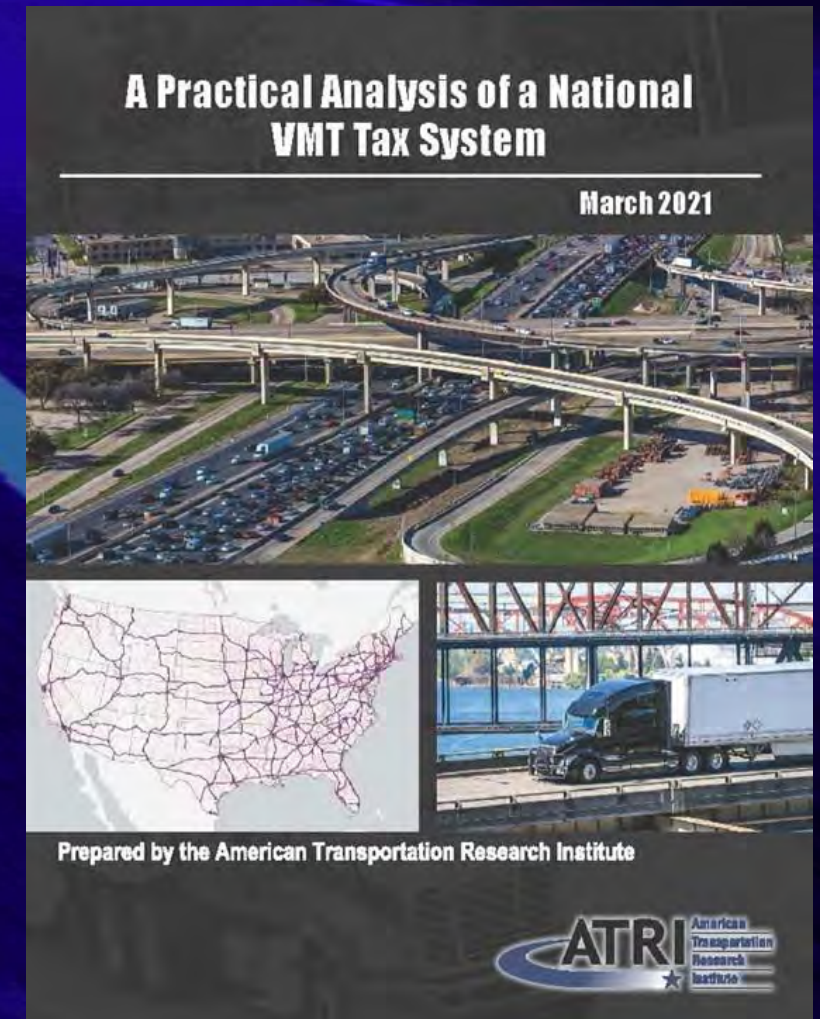
Dan Murray

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Practical Analysis of a National VMT Tax

- Examines myriad approaches for designing, developing, managing and enforcing a national Vehicle Miles Traveled tax
- VMT has been suggested as replacement for federal fuel tax

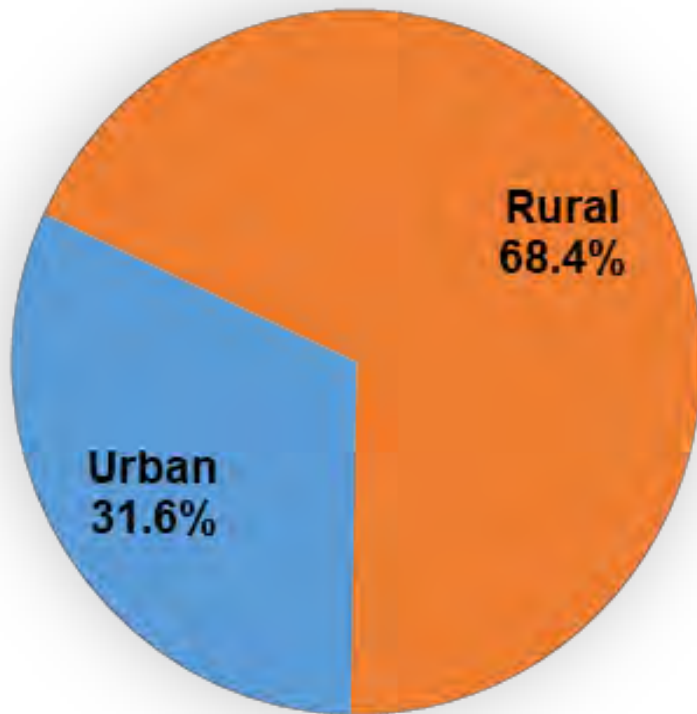


Motivations for Switching to a VMT Tax

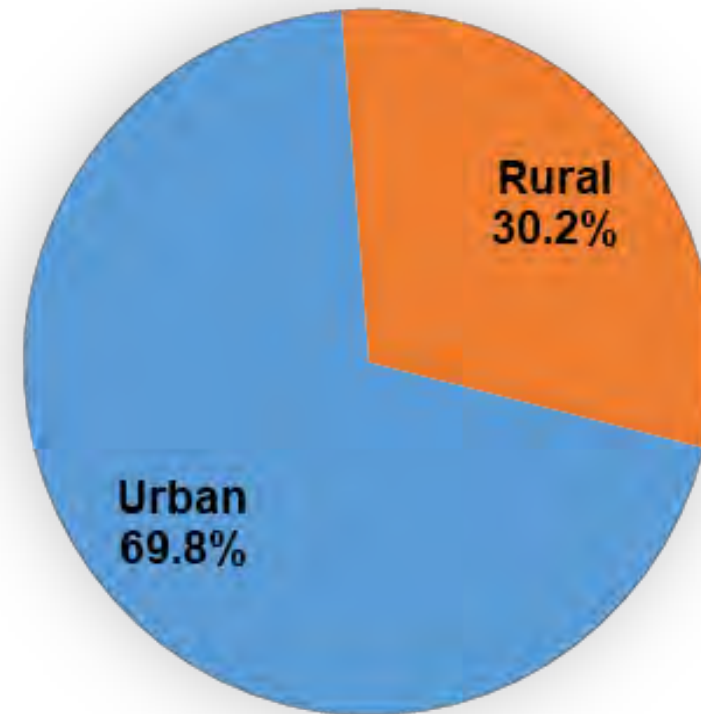
- Weak governance that does not address inflation
 - ◆ Federal fuel tax has not increased since 1993
 - ◆ While fuel consumption is up 9.2% from 2003-2019, buying power of fuel tax revenue down due to inflation which rose 39.4% between 2003-2019
- Fuel economy improvements
- Electric vehicles
 - ◆ Past decade approximately 1 million EVs sold in U.S.; estimates are for 18.7 million by 2030; will represent less than 7% of current U.S. vehicle fleet

Lane Miles vs. VMT

U.S. Lane-Miles of Roadway



U.S. Vehicle Miles Traveled



Calculating a Truck VMT

Vehicle Type	Avg MPG	2019 VMT	Gallons of Fuel Consumed	Federal Fuel Tax per Gallon	Federal Fuel Tax Paid (Gallons * Fuel Tax)	Federal Fuel Tax Cents per Mile	Cents Per Mile Ratio
Car	24.5	2,961,721,254,307	120,886,581,808	\$0.184	\$22,243,131,053	\$0.0075	1
Truck	6.5	300,050,408,534	46,161,601,313	\$0.244	\$11,263,430,720	\$0.0375	5
Total					\$33,506,561,773		

Total VMT Revenue to Maintain Existing HTF Spending Levels

Tax Method	Gross Revenue Collected	Cost to Collect (% of Gross)	Collection Cost	Net Revenue for Transportation
Existing Federal Fuel Tax	\$33,573,709,191	0.20%	\$67,147,418	\$33,506,561,773
VMT Tax with 40% Overhead	\$55,844,269,622	40.00%	\$22,337,707,849	\$33,506,561,773

Reasonable Cost Test: Administrative

Table 9: Annual Administrative Costs for Collection of \$35 billion in Federal VMT Revenue

Cost Category	Cost per Vehicle	Total Cost
Technology Cost Annualized over 5 Years	\$10.00	\$2,724,024,780
Cellular Transaction Costs	\$48.00	\$13,075,318,944
Account Management	\$15.95	\$4,344,819,524
Transaction Fees (2.1% plus \$0.10 per transaction)	\$3.90	\$1,061,882,974
TOTAL	\$77.85	\$21,206,046,222

Reasonable Cost Test: Enforcement

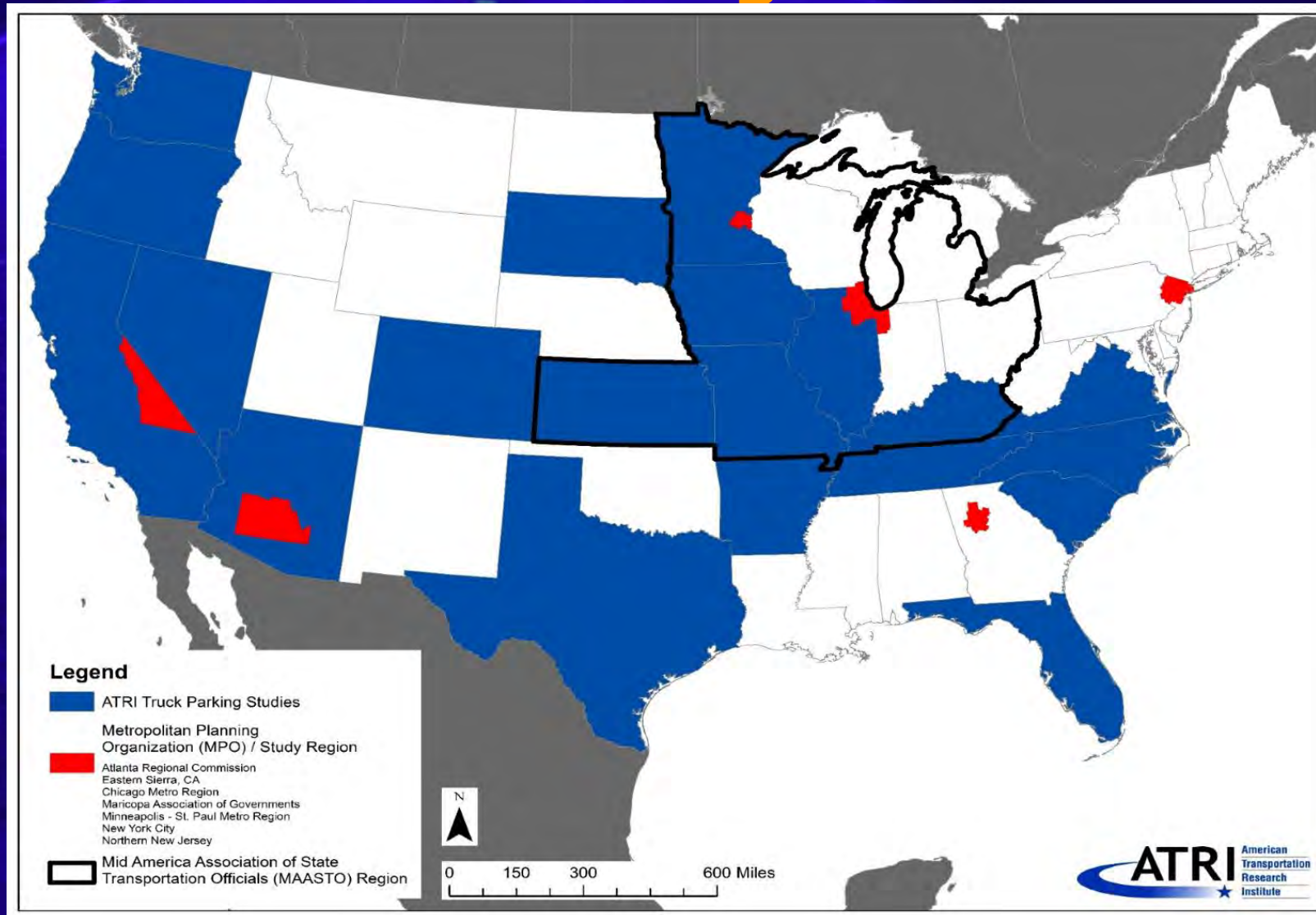
Table 11: Calculating the Estimated Cost of Enforcement

Line 1	Total Number of Vehicles in the U.S.	272,402,478
Line 2	If 9.44% of vehicle have compliance Issues, total number of compliance issue cases annually	25,714,794
Line 3	Average hours spent by police, courts, DMVs, collection agencies to resolve cases	8
Line 4	Total Compliance Hours Annually (Line 2 * Line 3)	205,718,352
Line 5	BLS Average Total Hourly Compensation, Civilian Worker	\$38.26
Line 6	Annual Cost (Line 4 * Line 5)	\$7,870,784,148

OO/IC in the Supply Chain

- Document the role of OO/IC drivers in the trucking industry and identify potential impacts should IC business models change (restricted through CA AB-5 type laws)
- Initial research underway to document operational and legal basis for using OO/IC in trucking; actions which have redefined legal basis
- Upcoming tasks to include:
 - ◆ Quantify the extent of OO/IC driver use
 - ◆ Types of driver models and differences
 - ◆ Driver progression by years of experience
 - ◆ Gov't funding implications
 - ◆ Industry impacts if use restricted
 - ◆ Recommendations to ensure proper OO/IC driver use

Truck Parking Studies



Questions?

Dan Murray

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www.TruckingResearch.org