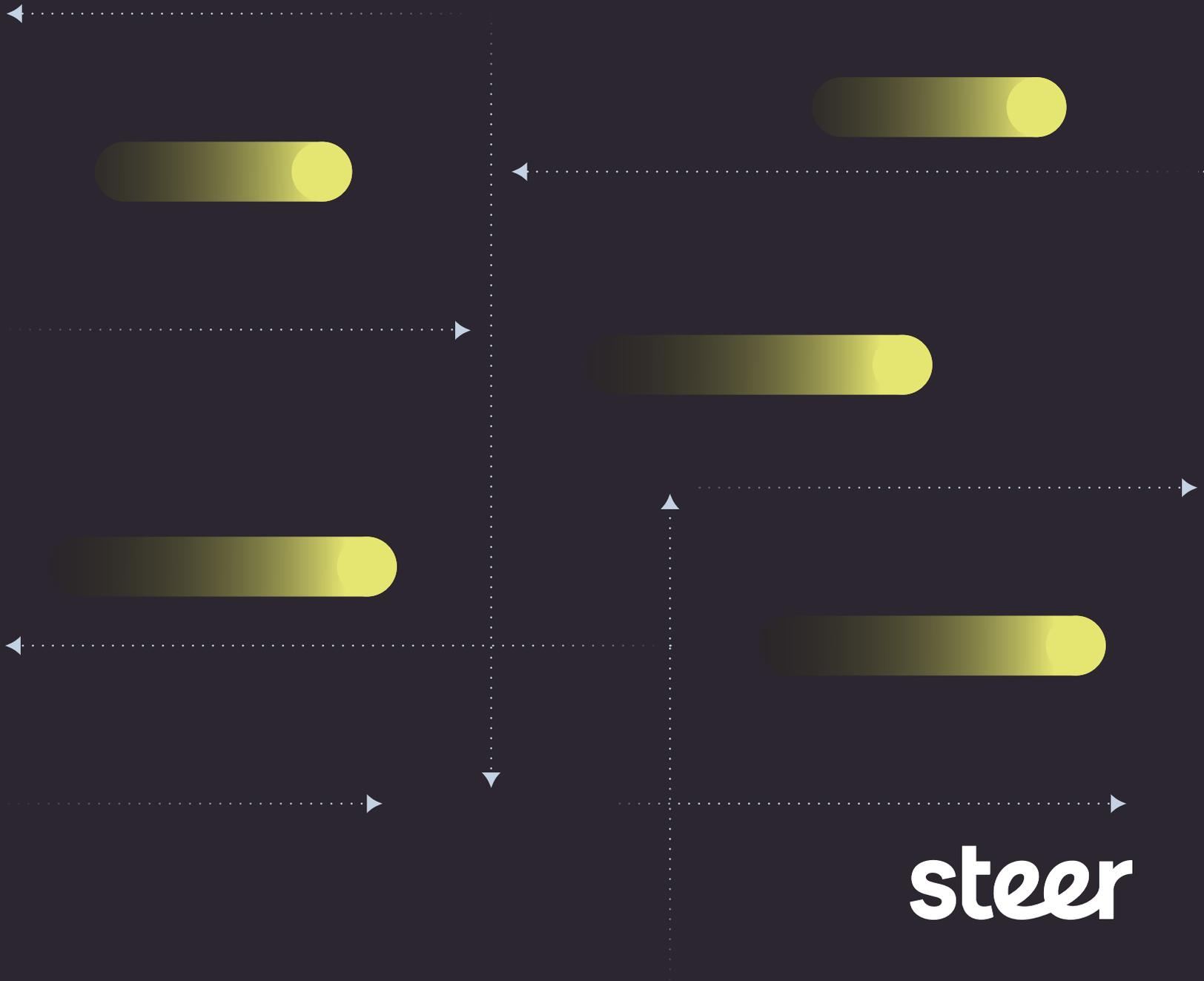


# Economic Impacts of Self-Driving Freight in the U.S.



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# Executive Summary

Self-driving freight is one of the biggest innovations in the trucking industry in decades. This report explores the potential economic impacts from long-haul self-driving freight technology, looking outwards to 2035.

## Understanding the potential

Self-driving freight on U.S. highways is expected to grow rapidly. Firms such as Aurora, Kodiak and Waabi are already piloting, testing and operating self-driving freight on U.S. highways in Texas and the Sun Belt.

By 2035, the sector could represent:



## Supporting jobs today

Already, the sector supports \$3.3 billion in total economic activity in the U.S. economy, supporting some 17,000 jobs. It is creating a new generation of job opportunities across the U.S., some examples include:



**Engineering** – Designing the hardware and software that underpins safe operation.



**Manufacturing** – Producing the perception systems installed on trucks.



**Operations** – Repairing, monitoring, inspecting and fueling the self-driving fleet.

## Safer highways

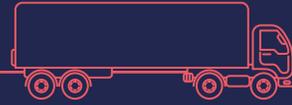
# 5,300

people killed in large truck crashes each year



# 1 in 8

fatal crashes involve large trucks



Self-driving freight has the potential to dramatically improve highway safety in the United States. We estimate that, by 2035 under an Accelerated scenario, the technology could avoid 490 fatalities and 8,800 injuries each year. Measured in line with standard US DOT approaches, this represents \$9.4 billion in safety benefits per year.

## A more efficient freight sector

**Self-driving freight has the potential to drive significant benefits to carriers, reducing operating costs, and improving productivity. This includes:**



### 100%+

**Increase fleet utilization** by 100%+ by removing hours-of-service requirements for drivers.



### 40%

**Reduce insurance costs** by \$1.4 billion a year from improved road safety, saving carriers \$1.4 billion a year.



### 32%

**Reduce fuel costs** by improving fuel efficiency by 32%, saving carriers \$5.7 billion on fuel costs.



Address the **persistent staffing challenges** facing the trucking industry.



## Benefits to consumers

Since almost everything a household buys relies on shipping, these benefits directly pass to consumers through cheaper goods:



**\$9**

**billion** in additional purchasing power for U.S. households in 2035

## Supporting the wider U.S. economy

The U.S. freight market is worth \$1 trillion per year, and a primary driver of national economic health. By introducing “Level 4” autonomy to the medium and long-haul segments, self-driving freight can catalyze growth beyond the industry itself—as lowering operational costs helps boost trade and enable greater economic specialization. Self-driving freight will become a distinct and growing high-value sector in the wider trucking sector, directly contributing to GDP and serving as a productivity multiplier that supports broader economic growth.



**\$660 billion**

Trucking sector GDP

By 2035



**\$70 billion** of which

is generated by self-driving freight



**Which enables**

net additional GDP, across the wider U.S. economy

**\$6 billion**

# 1 Introduction

## Background

Trucking is the backbone of the U.S. economy. Across the U.S., trucks move food to supermarkets, materials to factories, fuel to power homes and businesses, and products to stores and front doors. When freight works well, shelves stay stocked, deliveries are faster, and prices are lower because businesses spend less time and money moving goods around.

Self-driving freight is set to become one of the most significant innovations in the industry in decades. Instead of a driver actively steering and braking, a truck uses: sensors (such as cameras, radar, and lidar), software, and artificial intelligence to understand its surroundings, make driving decisions, and move freight safely.

Such technology has the potential to make the freight industry safer and more efficient. By eliminating driver errors, self-driving technology can help reduce the 40,000 deaths on U.S. highways every year. It can help alleviate the challenge carriers face recruiting trained, skilled drivers, benefit consumers through reducing the cost of shipping, and boost productivity across the wider U.S. economy.

## About the Project

This study explores the potential economic impacts from self-driving freight technology looking outwards to 2035. It focuses on medium and long-haul truck trips, typically made by semi-trucks<sup>1</sup> on inter-states and highways, assuming “Level 4” autonomy<sup>2</sup> where vehicles operate without human intervention within specific service areas and routes. The wider potential of “Level 5” autonomy or deliveries using vans or smaller vehicles, were not considered as part of this study.

The objective of this study is to help to determine the scale and types of benefits self-driving technology could bring and assist policymakers looking to work with self-driving companies to drive economic benefit to their states.

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1 This report focuses on freight moved by combination truck, which refers to trucking consisting of a tractor unit towing one or more trailers. A “semi” specifically refers to a tractor pulling a trailer that rests partly on the tractor, and the most common, but not the only type of freight in the scope of this study. Freight moved by single-unit trucks, which operate more shorter-distance trips, are not in the scope of study and likely to adopt self-driving technology over a longer time period.

2 “Level 4” autonomy refers to the definition in SAE J3016 Levels of Driving Automation, the industry standard for the classification of autonomous and self-driving vehicle technology. “Level 5” autonomy is where vehicles can operate entirely without human intervention under all conditions and on all roadways.

## About Aurora

This study has been commissioned by Aurora Innovation, Inc., one of the largest technology companies deploying self-driving technology for freight transportation. Aurora operates commercial driverless customer deliveries across Texas, New Mexico, and Arizona, reaching Dallas, Houston, Fort Worth, El Paso, Laredo, and Phoenix.

These operations are facilitated by the Aurora Driver – an advanced autonomous driving system designed for commercial trucks and passenger vehicles. Aurora’s mission is to deliver the benefits of self-driving safely, quickly, and broadly.

## About Steer

Working across cities, infrastructure, and transportation, Steer is a consultancy that combines commercial, economic, technical, and planning expertise to find powerful answers to our clients’ complex questions. We partner with communities and organizations, public and private, who are ready for change to equip them with tools and innovative solutions to build better communities and stronger economies.

## Disclaimer and Use of Findings

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## 2 Understanding the potential

Semi-trucks drive over 200 billion miles each year, completing 89 percent of trips on U.S. interstates, freeways, and other arterials best suited for self-driving. These trips form the core potential market for self-driving freight technology.

### Projecting future update

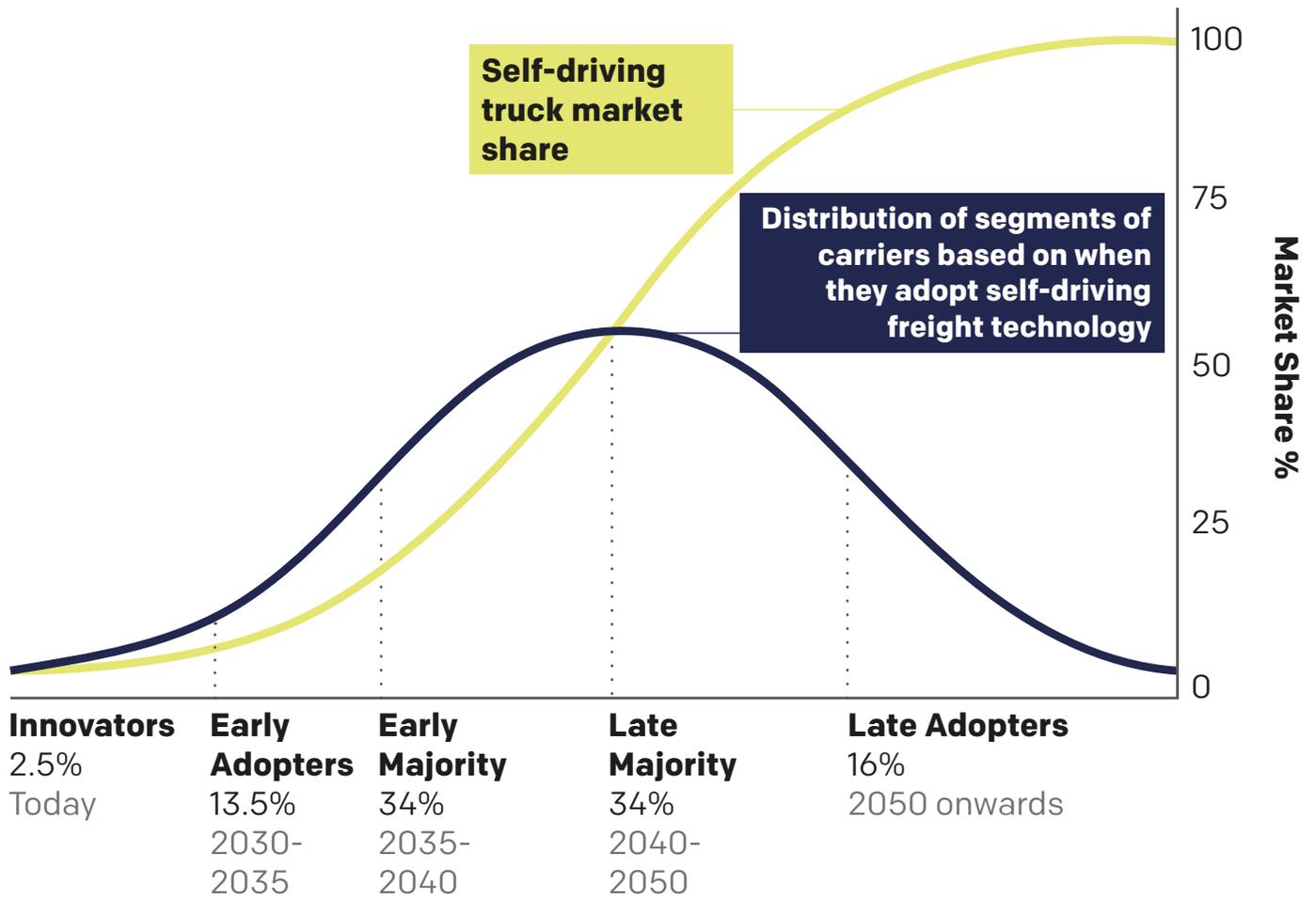
Forecasting the evolution and adoption of new technology is challenging. However, there are now several examples of self-driving technology in practice.

Aurora already operates a small fleet of self-driving trucks performing regular driverless deliveries in Texas, New Mexico, and Arizona. They anticipate expansion across the Sun Belt during 2026, growing into a national U.S. network by 2030. Kodiak operates self-driving commercial freight on private roads in the Permian Basin in West Texas and are piloting their technology on interstates in the Sun Belt. Gatik focuses on “middle mile” deliveries between regional distribution centers, warehouses, and local stores. Bot Auto, Stack, Torc Robotics, and Waabi are also actively testing and piloting self-driving freight technology.

Self-driving taxis (or robotaxis) demonstrate how self-driving technology can scale rapidly. Self-driving robotaxi company Waymo has grown from just 10,000 weekly rides in May 2023 in San Francisco to 50,000 in May 2024 across three U.S. cities. Trips reached 250,000 in April 2025 across four cities and nearly doubled to 450,000 trips across six cities in December 2025. Although the context and regulation for Waymo is different to self-driving freight, Waymo forms a useful case study of how quickly the technology can scale.

The adoption of new technology is typically non-linear. At first, progress is slow as innovators test new ideas, but adoption accelerates when *early adopters* embrace the new technology. An *early majority* then adopt new technologies after a period of careful deliberation and form a critical mass to signal an innovation has become mainstream. This process is known as the **Diffusion of Innovations** theory, as shown in Figure 1, and has been seen across history from the adoption of telephones to smartphones to televisions.

**Figure 1:** Potential uptake of self-driving freight, influenced by the Diffusion of Innovations theory



Self-driving freight is currently at the *innovators* step – just before the potential for rapid growth. This theory forms the basis for exploring how self-driving freight could grow in the U.S., and developing scenarios for its potential economic benefits.

## Scenarios for self-driving freight

As with any new technology, it is difficult to predict the future uptake of self-driving freight. There are three primary factors driving the speed of adoption:



**Technological innovation** – the pace at which sensor and software technology matures and enables safe operations across different road types and weather conditions



**Benefits for carriers** – the pace at which clear financial benefits from self-driving technology materialize for carriers / private fleets



**Public and political acceptability** – the extent to which the public and policymakers support self-driving technology and a regulatory environment that facilitates its introduction

All these factors are interrelated and influence whether individual carriers / private fleets across different states and geographies partially or fully adopt self-driving technology for their fleet and operations. We have used these factors to develop three scenarios for the future growth of self-driving freight to 2035:

## 1 Conservative



### Where self-driving freight faces several obstacles.

Self-driving technology is not able to operate in more challenging traffic and weather conditions, and the financial benefits of operating self-driving trucks are not high enough to attract carriers / private fleets.

The sector grows slowly and faces major opposition from the public and policymakers which limits its development.

## 2 Moderate



### Where self-driving freight follows contemporary expectations and historic trends.

Self-driving technology matures and brings clear benefits to carriers / private fleets. Policymakers broadly support uptake, although some barriers remain.

The focus remains on limited "hub-to-hub" operations between major metro areas, rather than more complex "destination-to-destination" deliveries.

## 3 Accelerated



### Where self-driving freight exceeds expectations.

Self-driving technology matures rapidly and can operate in all but the most challenging road and weather conditions.

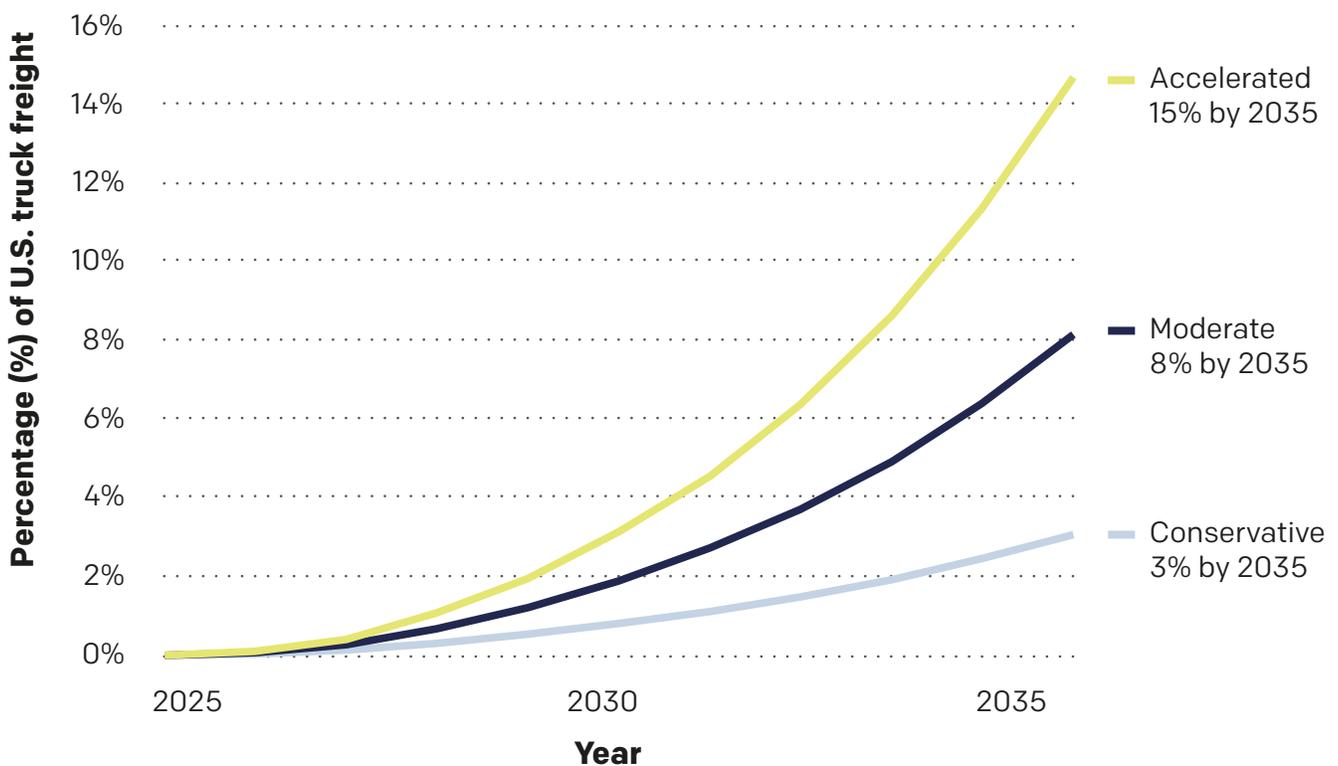
The financial benefits to carriers / private fleets are large enough that non-adopters have difficulty staying competitive. Policymakers understand and support the technology and help facilitate its introduction.

## Future uptake of self-driving freight

Our analysis indicates that self-driving freight could grow from virtually zero today to 15 percent of the trucking market by 2035. This equates to 170,000 self-driving trucks on U.S. highways by 2035 – approximately 8 percent of the trucking fleet – and 33 billion self-driving truck miles.<sup>3</sup>

Figure 2 shows the percentage of truck freight that is self-driving from today to 2035 under the three scenarios.

**Figure 2:** Percentage of U.S. truck freight that is self-driving



Source: Steer analysis, informed by Balata and Menghes (2021). Truck market refers to freight moved by combination trucks only (not light and single-unit trucks).

These projections show a large increase compared to the freight carried by the few dozen self-driving trucks operating today. We envision that self-driving freight will play an important, growing role in the trucking industry over the next 10 years, but over this timescale will remain modest compared to driver-operation.

<sup>3</sup> These values reflect how self-driving trucks achieve greater utilization, and can travel more miles per year, than a driver-operated truck, as discussed in Section 4.

## Self-driving freight in a growing truck market

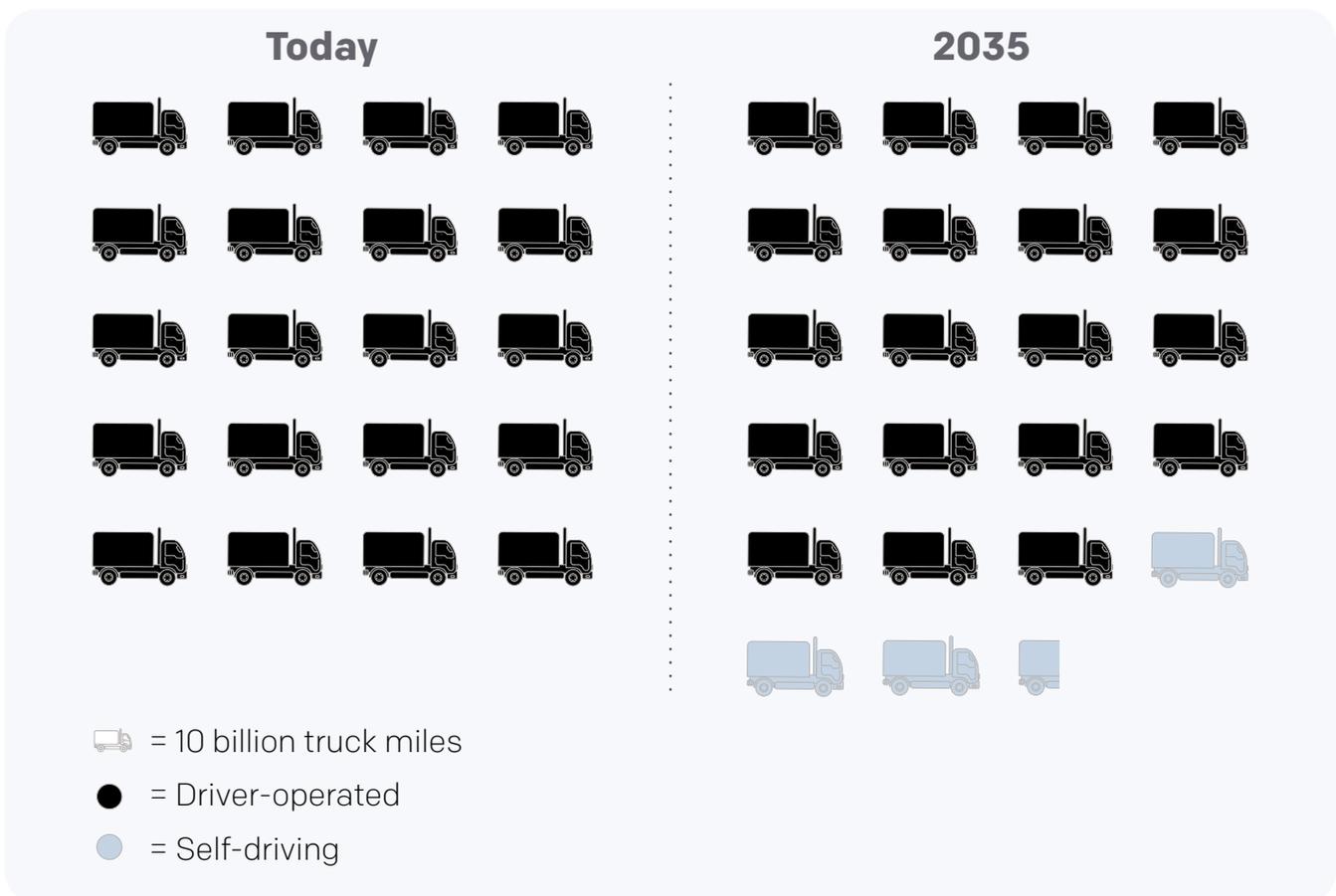
Total truck miles traveled are expected to grow from 203 billion today to 226 billion by 2035, in line with future economic and population growth.<sup>4</sup> Self-driving freight is anticipated to account for much of this growth.

Under the Conservative and Moderate scenarios, this increase in truck miles is expected to be split across both self-driving and driver-operated trucks. Both these scenarios expect driver-operated truck miles to grow slightly to 2035, alongside the uptake of self-driving technology.

Under the Accelerated scenario, by 2035, driver-operated truck miles are expected to reduce slightly, from 203 billion to 193 billion, while self-driving truck miles increase from almost zero to 33 billion. Self-driving trucks will account for a growing share of the market, but driver-operated truck miles will remain broadly stable.

Figure 3 illustrates the number of miles traveled by driver-operated and self-driving trucks today versus 2035, under the Accelerated scenario.

**Figure 3:** Driver-operated and self-driving truck miles, Accelerated scenario



<sup>4</sup> Federal Highway Administration, 2025 Forecasts of Vehicle Miles Traveled, optimistic economic growth outlook.

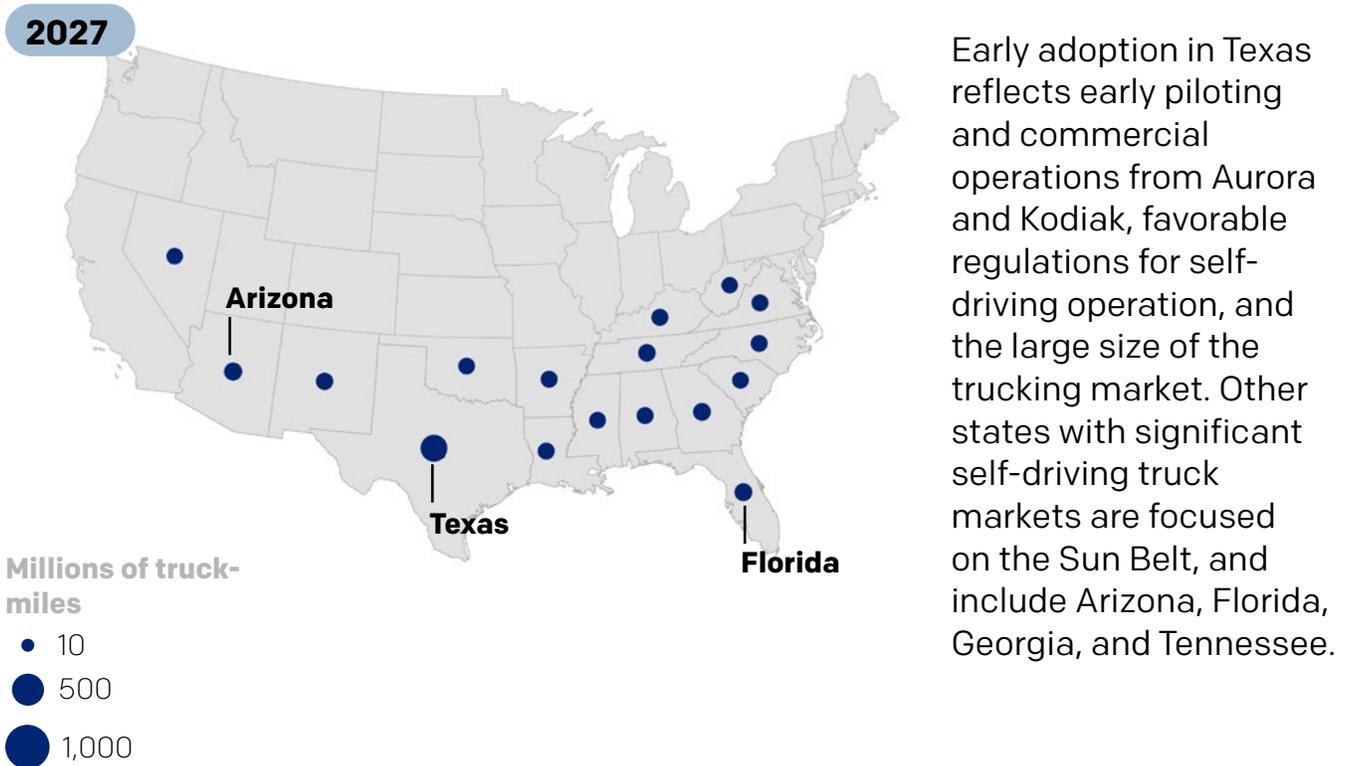
## Uptake across the U.S.

Self-driving freight uptake will vary differently throughout the U.S. Future uptake is expected to reflect existing patterns across the trucking market, focusing on the largest trucking flows and places with favorable weather and climate conditions. Initial expansion is likely to focus on the Sun Belt, reflecting the initial pilot and commercial operations of Aurora and Kodiak.

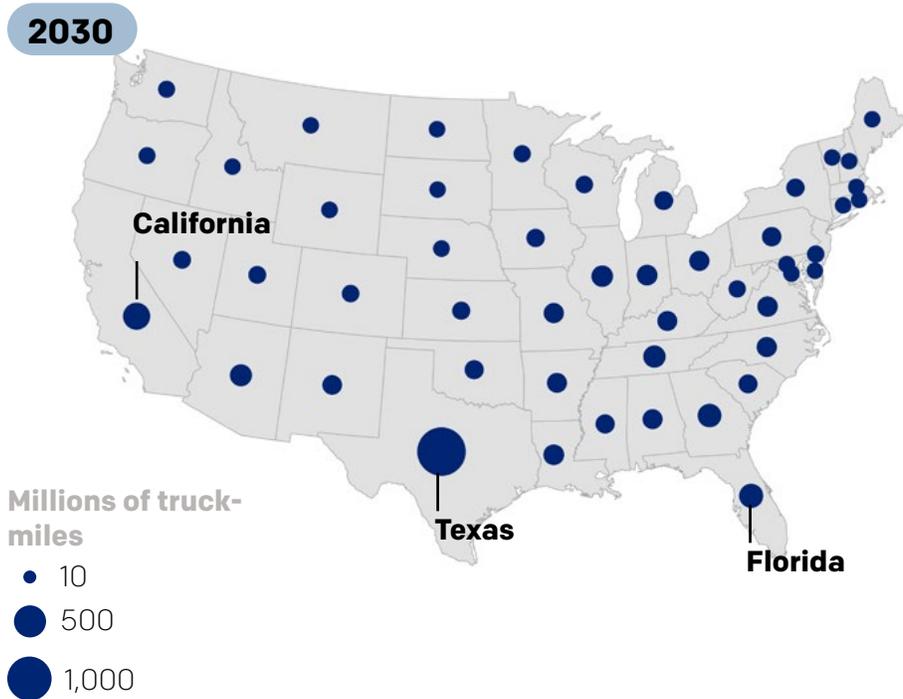
How self-driving technology is adopted across the U.S. also highly depends on the regulatory environment. Currently, while numerous states permit self-driving freight operations, other states provide less clarity on how self-driving trucks can be reasonably deployed. This poses challenges to scaling across the U.S., and the ability of self-driving freight to provide economic benefits consistently to the U.S. economy and consumers.

Figures 4-6 illustrate the expected adoption of self-driving freight across the U.S. under the Accelerated scenario.

**Figure 4:** Total self-driving truck miles, by state, 2027, Accelerated scenario

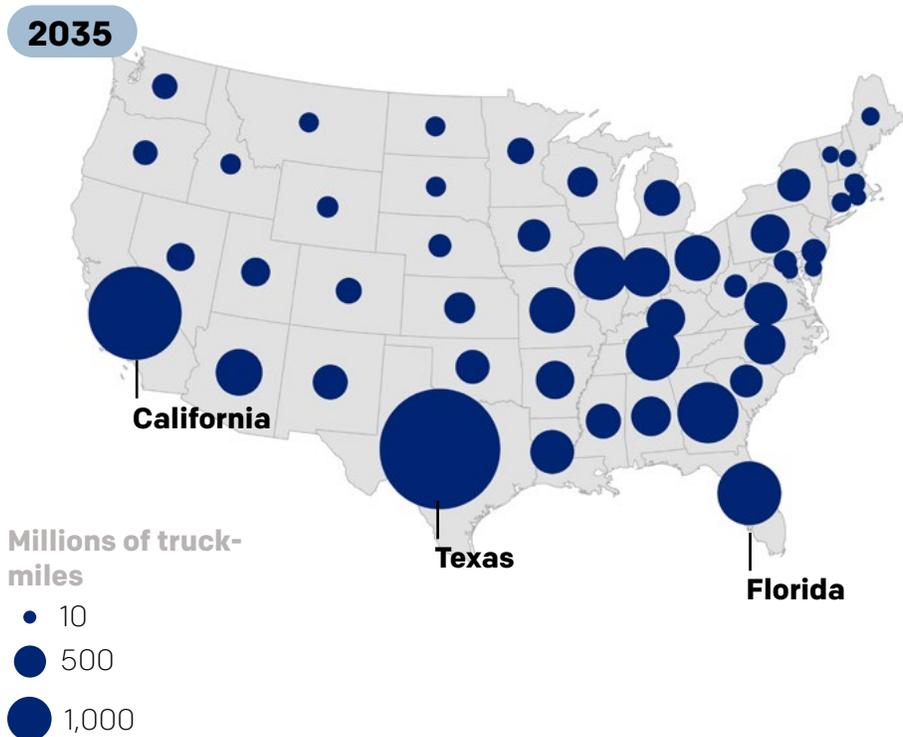


**Figure 5:** Total self-driving truck miles, by state, 2030, Accelerated scenario



By 2030, Texas is forecast to continue to have the largest self-driving truck market. California is expected to account for the second largest market, overtaking Florida and Georgia, reflecting California's large trucking market, assuming change in state regulations to explicitly allow self-driving freight technology.

**Figure 6:** Total self-driving truck miles, by state, 2035, Accelerated scenario



By 2035, adoption of self-driving freight is expected to have spread across the Continental U.S. The volume of self-driving truck mileage is a factor of both the size of the trucking market in each state and the estimated percentage uptake of self-driving freight technology.

### 3 Supporting jobs today

Self-driving freight has the ability to create jobs across the U.S.

Numerous new roles and opportunities will be created to design, manufacture, distribute, and service self-driving trucks. Research by Chamber of Progress highlights how the wider autonomous vehicle (AV) sector supports workers across a range of skill levels, with many above-average income jobs open to workers without a college degree. 82 percent of AV workers expected to make over the median wage.<sup>5</sup>

Today, approximately 3,500 people work within the self-driving freight sector, across Aurora, Kodiak, Stack, Waabi and other companies, across at least seven states, including in:



**Engineering** – highly technical, skilled roles in software, hardware and systems engineering, supporting the design of the sensor and lidar technology on board self-driving vehicles and the software that underpins safe operation.



**Manufacturing** – roles in advanced manufacturing, producing the hardware that underpins the operation of self-driving trucks, including chips, cameras, and lidar.



**Operations** – roles which directly facilitate the physical movement and maintenance of the self-driving fleet – some of which require CDL vehicle operators. These include refuelling, pre- and post-trip inspections, specialist maintenance and repair, as well as remote command center and monitoring staff.

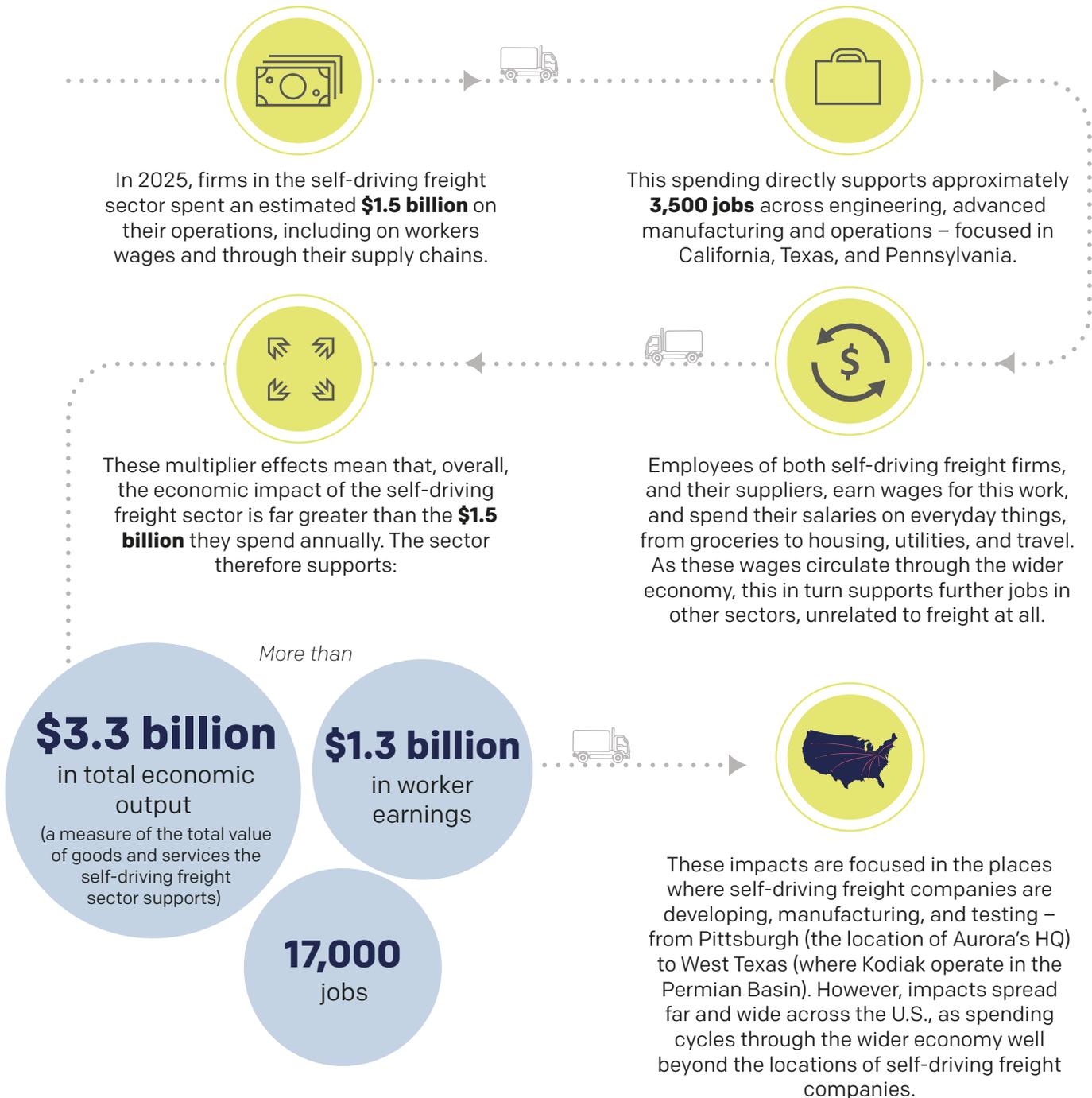


**Corporate & Professional** – administrative and support roles required to facilitate operations, including finance, facilities, and people.

<sup>5</sup> Chamber of Progress (2024) [Opportunity AV: How Many and What Type of Jobs Will Be Created by Autonomous Vehicles](#).

## The importance to the economy today

Despite the small size of the self-driving freight industry today, companies such as Aurora, Kodiak, Stack, Waabi, and others already make a sizeable contribution to the U.S. economy. Their operations are estimated to support \$3.3 billion of economic output, and 17,000 jobs, across the U.S.<sup>6</sup>



<sup>6</sup> Estimated from SEC reporting and industry insight. Excludes non-freight (i.e. passenger) self-driving technology.

## 4 Safer highways

**Self-driving freight has the potential to dramatically improve highway safety in the United States.**

Every year, **5,300 people** are killed in crashes involving large trucks in the U.S. Large trucks make up only a small share of all vehicles on the road, but are involved in **1 in 8 fatal crashes**.

Driver error – including fatigue, distraction, and speeding – is a key factor in these crashes. Self-driving truck technology can reduce these risks by replacing driver mistakes with consistent, sensor driven driving behavior. These systems maintain attention 100 percent of the time, react faster, and detect hazards that drivers cannot.



### Self-driving technology can dramatically reduce collisions

The challenges posed by trucking are fundamentally a problem of sheer mass and physics. A fully loaded tractor-trailer can weigh 20–30 times more than a passenger car, with much longer stopping distances, greater crash forces on smaller vehicles, and therefore a higher likelihood of causing fatal or life-altering injuries. Truck crashes are therefore more likely to involve multiple vehicles, serious injuries and fatalities.

#### Causes of truck crashes

Research by the Federal Motor Carrier Safety Administration estimates that 55 percent of large truck crashes (both single- and multi-vehicle) are caused by the truck driver, vehicle or environment (road or weather conditions). The remainder are caused primarily by other motorists.<sup>8</sup>

Of those crashes where the truck was the “critical reason” for a crash, 87% were attributed to truck driver error. This includes:

1. 28 percent involved inattention: the driver being distracted by something inside or outside the vehicle, or failing to observe the situation on the road adequately.
2. 38 percent involved decision-making: driving too fast for conditions, misjudgement of the speed of other vehicles, or following other vehicles too closely.

<sup>7</sup> U.S DOT National Highway Traffic Safety Administration, DOT HS 813 729

<sup>8</sup> Federal Motor Carrier Safety Administration (2007). The Large Truck Crash Causation Study

3. 12 percent involved the driver falling asleep, becoming disabled by a heart attack or seizure, or other type of physical impairment
4. 9 percent involved the driver panicking, overcompensating, or exercising poor directional control of the vehicle.

This underscores the significant potential for autonomous systems, as being introduced by Aurora, Bot Auto, Kodiak, Stack, Torc Robotics, and Waabi, to eliminate the vast majority of 'at-fault' truck crashes. They operate with consistent attention, predictable decision-making, and advanced sensing capabilities that can detect hazards beyond human perception, and eliminate the major blind spots of human-driven trucks. These features can therefore significantly reduce the underlying causes of 48 percent of large truck crashes.

Most of the remainder of large truck crashes were not related to the truck at all (i.e. vehicle failure or environmental conditions), and instead are the actions of the other driver in which self-driving technology can mitigate, but not eliminate. Faster reaction times, for example, mean that a self-driving truck can react faster – almost instantaneously – to an error from another road user such as an aggressive cut-in and thereby avoid a collision. Today, an Aurora truck is capable of seeing over 450 meters ahead – with the ability to spot and react to pedestrians 11 seconds sooner than human drivers at highway speeds at night.<sup>9</sup>

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## **90 percent reduction in serious and worse crashes achieved by Waymo self-driving technology to date**

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Because self-driving freight is still emerging, the best emerging safety evidence comes from similar autonomous vehicle systems for robotaxis. Although these typically operate on city streets, they indicate how self-driving technology can help anticipate and avoid collisions.

Waymo operate fully driverless (Level 4) robotaxi services in more than five U.S. cities, with a fleet of approximately 2,500 vehicles delivering over 450,000 rides per week. Through January 2026, they have operated nearly 200 million fully autonomous miles on public roads in the U.S., providing a good evidence base for the safety potential of self-driving technology.

Across San Francisco, Los Angeles, Phoenix, and Austin – the four cities with the most mature operations – Waymo has achieved a 90 percent reduction in serious and fatal crashes compared to an average human driver, and an 81 percent reduction for injury crashes, across 125 million miles operated.<sup>10</sup>

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<sup>9</sup> Aurora (2026) [Seeing with superhuman clarity](#)

<sup>10</sup> Waymo Safety Impact, through September 2025

While Waymo operate largely within urban environments, rather than the interstate highways which are the focus for early self-driving freight, Waymo’s track record provides evidence that the potential safety benefits of self-driving technology is real. Further, Waymo demonstrates that the technology is also effective at significantly reducing crashes that would otherwise result from the actions of the other driver.

### Injuries avoided and lives saved

By 2035, higher levels of adoption of self-driving freight could therefore prevent thousands of collisions and save numerous lives each year.

### By 2035, self-driving freight could annually avoid...

Scenario				
	▶ Conservative	▶▶ Moderate	▶▶▶ Accelerated	
	<b>100</b>	<b>270</b>	<b>490</b>	<b>Fatalities</b>
	<b>1,800</b>	<b>4,900</b>	<b>8,800</b>	<b>Injuries</b>
	<b>5,000</b>	<b>13,000</b>	<b>23,000</b>	<b>Damage-only crashes</b>
				<b>On U.S. roads<sup>11</sup></b>

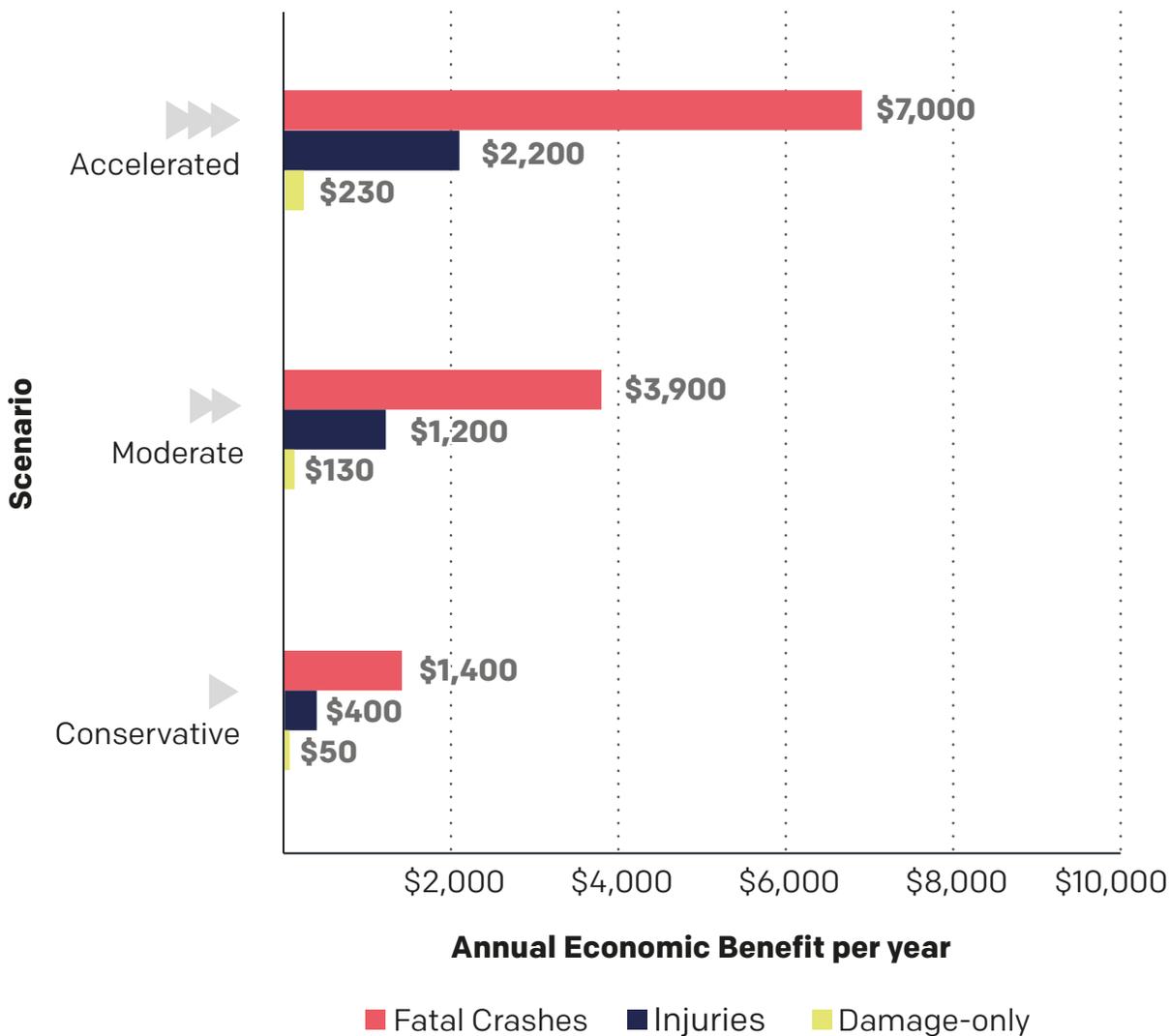
<sup>11</sup> Assumes a 75 percent, 63 percent and 64 percent reduction in fatal, injury and damage-only collision rates per truck-mile for self-driving freight, informed by observed data from Waymo and industry insight.

## Socio-economic benefits

Reducing crashes not only benefits those affected and their families. Based on established U.S. Department for Transportation guidance,<sup>12</sup> these safety benefits are equivalent to \$9.4 billion per year under an Accelerated scenario:

**By 2035, self-driving freight could generate \$9.4 billion in safety benefits per year on U.S. highways**

**Figure 7:** Economic benefits from improved road safety, 2035 estimate



<sup>12</sup> Socio-economic benefits are calculated by attributing a fixed benefit to each fatality, injury, and damage-only collision avoided, in line with U.S. DOT cost-benefit analysis guidance for transportation investments.

# 5 A more efficient freight sector

Trucking is a vital part of the U.S. economy. It moves more than 60 percent of domestic freight tonnage,<sup>13</sup> supporting more than three million jobs and contributing more than \$600 billion to U.S. GDP. It forms the backbone of commerce, impacting nearly every sector by delivering goods from farms, factories, and ports to businesses and consumers.

Improving freight efficiency by reducing the costs and delivery time of shipping, can help raise productivity across the whole economy, not just in logistics. Many of these benefits increase the size of the economy and pass down to consumers with less expensive goods on supermarket shelves to combat inflation and cost of living pressures.

Self-driving freight provides the potential to realize these benefits. Reduced fuel costs, improved fleet utilization and insurance savings, alongside a reduced reliance on drivers, could lead to a 15 to 25 percent reduction in the costs of operating a truck per mile.<sup>14</sup> Many of these savings support economic growth and benefits to consumers.

## Understanding today’s trucking costs

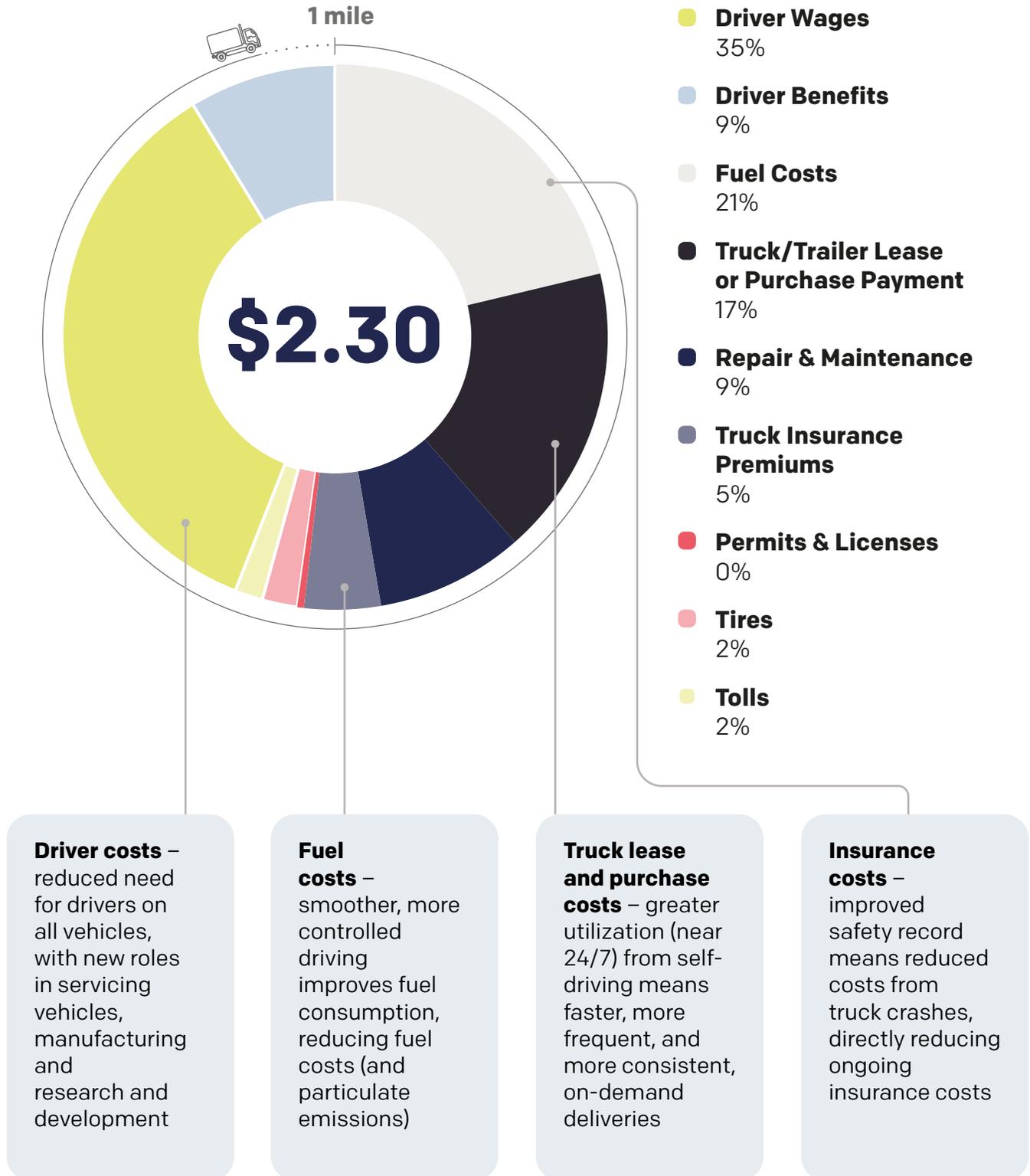
**Today, from American Transportation Research Institute Data, it costs approximately \$2.30 a mile to operate a semi combination truck in the U.S.**

The pie chart overleaf illustrates how these costs are comprised. Driver costs account for nearly half – 44 percent - of the total. Fuel costs, and truck leasing or purchase costs, account for the majority of the remainder, at circa 20 percent each. Maintenance, repair, insurance, tolls, and other consumables such as tires account for the remaining 17 percent.

Self-driving freight could create efficiencies and reduce many of these costs. This would result in a more efficient freight sector – and wider U.S. economic growth.

13 U.S. DOT, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, 2024.  
14 Steer analysis.

**Figure 8:** Current truck operating costs



## 1 Improved fleet utilization

Today, truck utilization is heavily constrained by federal driver and hour-of-service regulations. Commercial truck drivers require 10 consecutive hours off-duty after a 14-hour duty shift, with a maximum 11-hour driving time within that shift, a mandatory 30-minute break after 8 hours of driving, plus limits on total weekly hours (60 or 70 hours) requiring a 34-hour restart for reset.

### Working day for a driver-operated truck

The top figure opposite illustrates the working day for a typical single driver-operated truck operating from Fort Worth to Phoenix – a roughly 1,000-mile trip taking 15 hours to complete.

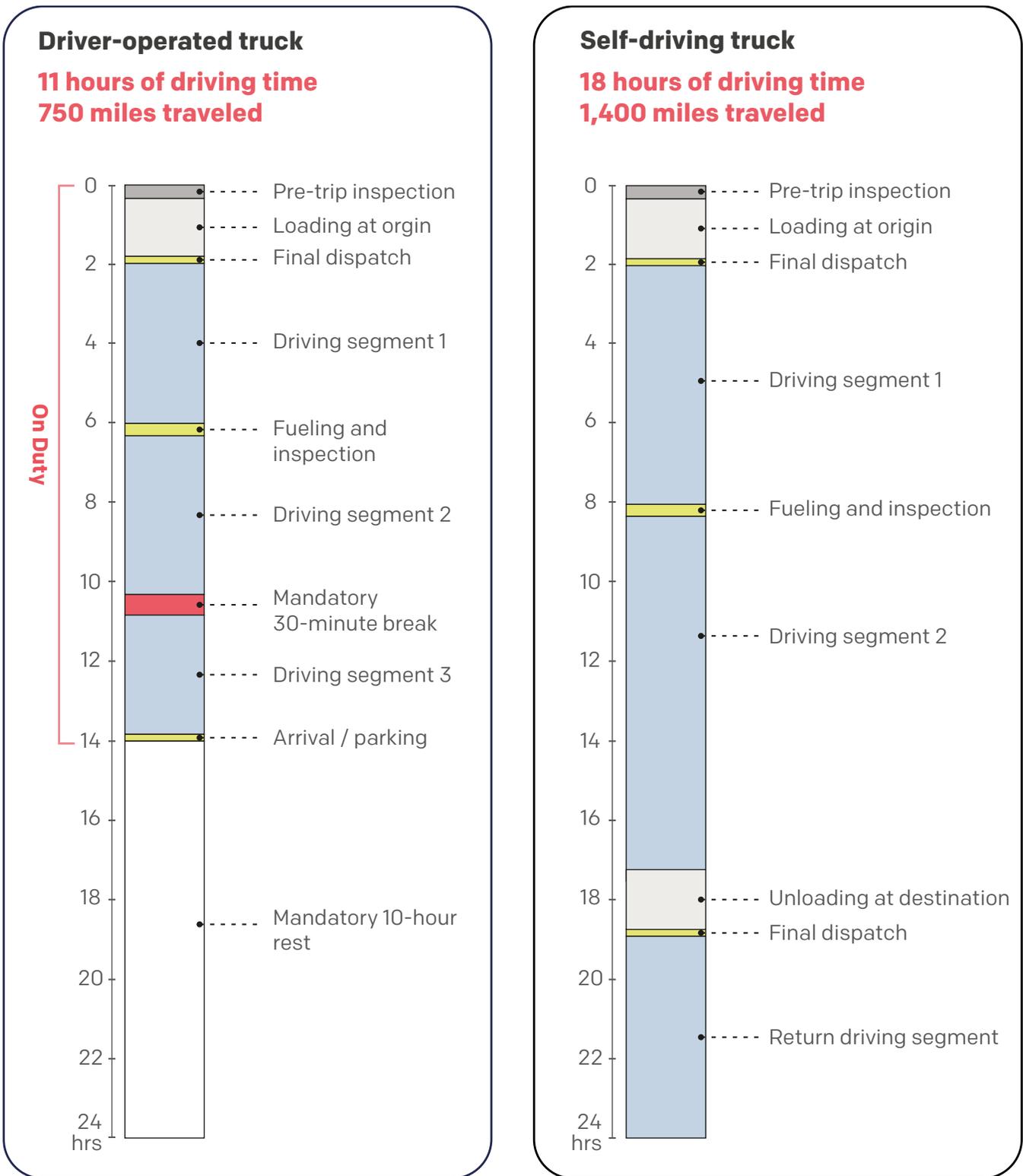
Since only 11 hours is available for driving within a 24-hour period, the truck can only travel approximately 750 of the 1,000 miles to Phoenix. The trip requires an overnight rest and multiple days to make the trip, or a second driver.

### Working day for a self-driving truck

Self-driving trucks require new operations, shifting trucking professionals into different roles due to fewer on-demand driver needs. Without requiring driver rest time, trucks can operate 24/7, with downtime only required to refuel, load and unload, and/or perform maintenance. Potential utilization – time spent moving goods, on the highway – can more than double.

The bottom figure opposite illustrates the realistic potential for a self-driving truck making the same trip. Without the need to stop to enable the driver to rest, the truck can travel the entire 1,000 mile distance from Fort Worth to Phoenix in a day and additionally make 300 miles of the return trip. More than 18 hours is spent driving – even with time spent loading at both ends of the trip. This unlocks the ability to deliver goods between numerous additional city pairs within a daily round-trip.

**Figure 9:** Operating comparison for a long-haul truck traveling from Fort Worth to Phoenix



**Legend**

- Driving time
- Loading and unloading
- Fueling, dispatch and inspections
- Rest periods

Source: Observed experience from Aurora operations

## 2 Improved fuel efficiency

Today, a typical combination truck achieves 6 to 8 miles per gallon. Fuel consumption is directly affected by not only vehicle weight, type and speed, but driving style, as well as acceleration and deceleration patterns.

Self-driving technology can help optimize these driving patterns to improve fuel consumption, therefore reducing fuel costs. Software can help identify the optimum acceleration away from a red light or when overtaking a slower-moving vehicle, and optimize performance on different gradients. Without hours of service limitations, there is a reduced need for trucks to operate at or near the speed limit, meaning trucks can operate at slower, more efficient speeds.

Research and observed evidence from Aurora suggests that these benefits can yield a 13 to 32 percent net energy efficiency improvement,<sup>16</sup> broadly consistent with wider research. Under the Accelerated scenario, with the greatest uptake of self-driving freight and assuming a 32 percent in fuel consumption, this translates into 1.6 billion gallons of fuel saved each year, representing a financial saving for carriers of \$5.7 billion per year.

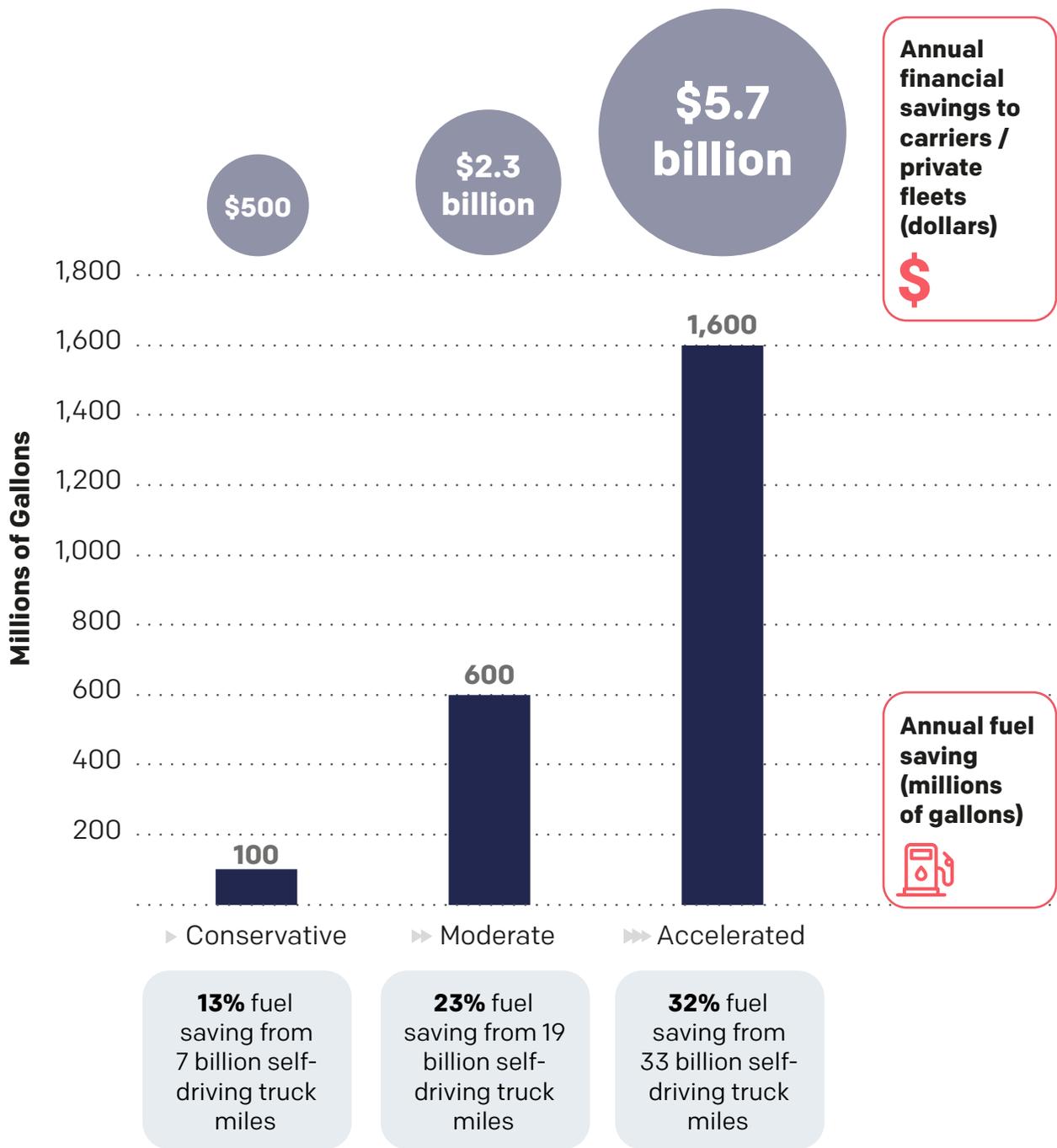


**32  
percent**

improvement in fuel  
efficiency as a result of  
self-driving operation

16 Aurora, 2024 'The Sustainability Opportunity of Autonomous Trucking'

**Figure 10:** Fuel savings and associated economic benefits, 2035 estimate



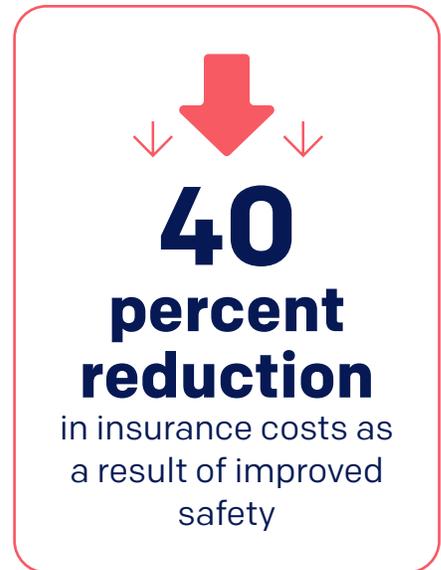
### Emissions benefits

These benefits also directly lead to reductions in air pollution (such as NOx) and particulate emissions (such as PM2.5s), which directly impact human health. The above fuel efficiency savings could reduce NOx emissions by 10,000 short tons, and PM2.5s by 600 tons per year by 2035. Combined, the public health benefits of these reductions are valued at \$730 million per year.

### 3 Insurance costs

Trucking insurance costs directly reflect the value of a truck and its goods, and the risk of a crash occurring. As highlighted in Section 4, self-driving trucks are anticipated to reduce crashes by 90 percent – with reduced damage to vehicles, goods and associated liability leading directly to reduced truck insurance costs.

Goldman Sachs estimate that, for autonomous vehicles as a whole, insurance costs will drop by 54 percent. Applying a more modest 40 percent reduction for the three scenarios – reflecting how costs will fall as the technology matures – indicates an efficiency benefit of \$1.4 billion a year by 2035 under the Accelerated scenario.<sup>17</sup>



### 4 Labor market implications

Automation and self-driving technology inevitably lead to concerns about future job losses. While self-driving truck technology does mean that traditional long-haul driver roles are at risk of decline, it is not the case that all jobs disappear.

Self-driving freight will instead lead to a shift away from traditional driver roles towards new roles that support, manage and sustain self-driving operations. Many of these roles will continue to require qualified commercial drivers licenses (CDLs), as well as new trades and skills in manufacturing, software and engineering.

Recent research undertaken by Chamber of Progress<sup>18</sup> highlights the range of roles that the wider AV industry will create. If AVs follow the same staffing patterns as other automotive manufacturing, for every 1,000 AVs approximately 190 jobs will be required for manufacturing and servicing of these vehicles – including 95 in Development and Production; 30 in Distribution; and 65 in Maintenance, Upgrades & Repairs. Core new roles include:

<sup>17</sup> Goldman Sachs (2025) The Autonomous Vehicle Market Is Forecast to Grow and Boost Ridesharing Presence

<sup>18</sup> Chamber of Progress (2024) [Opportunity AV: How Many and What Type of Jobs Will Be Created by Autonomous Vehicles](#).



**Operations and Monitoring** – roles overseeing self-driving trucks, including monitoring route conditions and providing support in unusual situations, remotely.



**Maintenance and Repair** – new technician roles providing specialized repair to advanced sensors, LIDAR, radar, and onboard computers.



**Logistics Support** – roles preparing trucks for departure, including inspections, loading/unloading, and refuelling.

### Addressing driver hiring challenges

Eliminating the need for a driver on-board every self-driving truck, rather than replacing jobs, can help address challenges carriers are having in hiring drivers.

While the short-term shortage has alleviated due to the current economic climate, these hiring challenges are expected to grow significantly. Over the next decade, trucking companies will need to hire 1.2 million new drivers to keep pace with growing demand and an aging workforce.<sup>19</sup>

Many drivers are retiring faster than new entrants are joining the industry. The average age of a professional truck driver in the U.S. is now over 48, but the demanding nature of the role, with long hours, extended periods away from family and health risks makes it difficult to attract younger workers. Self-driving freight could help to bridge this recruitment gap.



Without self-driving freight, a need to hire

**1.2 million**

new drivers within a decade, to keep pace with growing demand

<sup>19</sup> American Trucking Association (2022) Driver Shortage Update

Assuming a 30-yr trucking career, every year some 3 percent of truck drivers will retire, with the need for new workers (or self-driving technology) to replace them. However, even under the most accelerated scenario for self-driving freight uptake, total driver-operated truck miles are expected to fall by only 4 percent by 2035 compared to today. Of the 33 billion self-driving truck miles projected for 2035, 25 billion of these reflect growth in freight demand, and only 8 billion a reduction in driver-operated truck miles.

This indicates that occupational turnover can fully accommodate the uptake of self-driving freight, with no layoffs. The pace of change expected for self-driving technology is far less than that from shorter-term demand shocks, during times of recession.

**Creation of higher skilled technology focused roles**

Although there will be a net reduction in staff and salary costs associated with self-driving operation, the staff that already are, and will be, employed by self-driving truck companies will be higher skilled, and with higher average salaries, than those employed in the trucking industry today.

This is demonstrated by both the current self-driving freight workforce (as described in Section 3) and recent research undertaken by Chamber of Progress.<sup>20</sup> Employment changes will, overall, lead to highly skilled and productive workforce in trucking, with greater efficiencies and reduced staffing costs.



**Expanding Opportunity**

**82%**

of AV workers make more than the U.S. median wage. Many of these high-paying jobs are accessible to workers without a college degree.

20 Chamber of Progress (2024) [Opportunity AV: How Many and What Type of Jobs Will Be Created by Autonomous Vehicles.](#)

## 6 Helping consumers and the wider economy

### Consumer benefits

Almost everything a typical household buys or uses relies on shipping. Not only do groceries arrive by truck to the stores, but shipping industry has touched almost everything we use: a proportion of the cost for everything from the lumber and cement used to build new homes, to the parts used to repair cars, includes the shipping cost.

Over time, cost savings to the shipping industry from self-driving freight pass through to consumers through the form of lower prices, better product availability, and more consistent delivery times – especially for everyday goods that rely heavily on long-distance trucking. Under an Accelerated scenario, this represents \$9 billion to consumers in additional purchasing power in the form of cheaper goods.<sup>21</sup>

Combined, the factors described in Section 5 imply cost savings for a self-driving versus traditional truck, of 15 to 25 percent by 2035. Even though self-driving trucks, under the most Accelerated scenario, will account for just 15 percent of total truck vehicle-miles traveled by 2035, the importance of the sector to the wider U.S. economy suggests that this can deliver material benefits for consumers.



<sup>21</sup> Steer analysis, informed by US BEA and OECD data

# Supporting U.S. GDP and wider economic growth

Today, the trucking industry contributes \$600 billion to U.S. GDP annually. Under the Accelerated scenario, the total GDP of the trucking industry is expected to grow to \$660 billion, of which \$70 billion will be generated by self-driving freight.

## Wider economic benefits

The efficiency gains from self-driving freight also imply significant benefits to the wider U.S. economy and economic performance.

Transportation improvements and efficiency gains – traditionally from major infrastructure such as the interstate highway system, and today through self-driving freight technology – contribute to economic growth not merely by lowering prices, but by boosting trade and enabling greater specialization. These effects account for much of the structural changes in long-term population and economic activity movements across the U.S. since the 1950s:

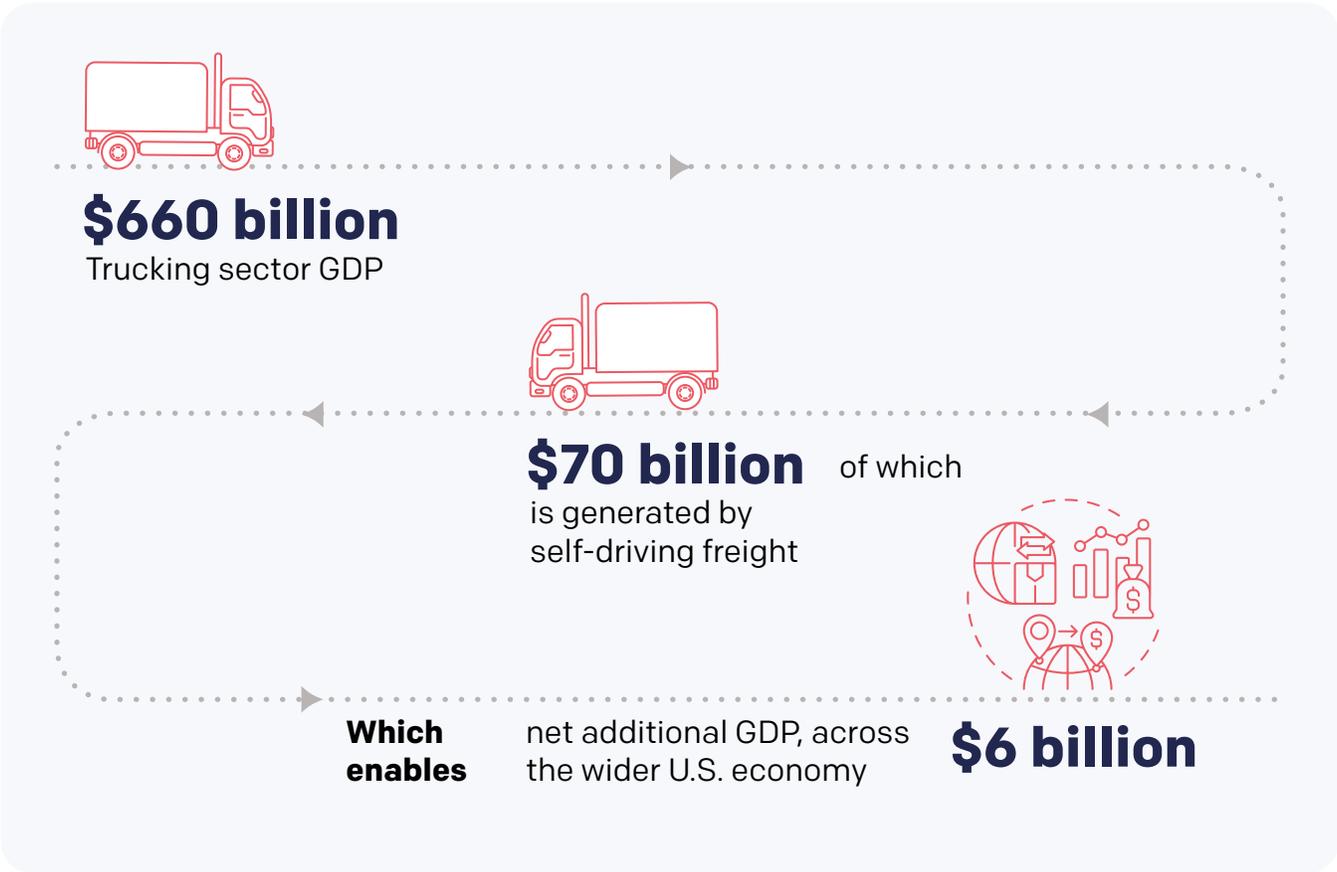
## Why cheaper freight supports economic growth

 <p><b>Greater productivity</b></p>	<p>Firms pay less to move raw materials and goods across the country. A U.S. manufacturer that can source components more cheaply can produce the same volume of goods at less cost.</p>
 <p><b>Access to cheaper and better inputs</b></p>	<p>Firms can now source inputs from more productive or specialized suppliers further away that they would not otherwise be able to access. Supply chains can become more efficient, and less constrained by geography.</p>
 <p><b>Scale and specialization</b></p>	<p>Firms can now serve larger markets from fewer, more efficient plants. Regions can focus on the sectors where they are most productive, relying on trade rather than local self-sufficiency.</p>
 <p><b>Reduced inventory and working capital requirements</b></p>	<p>Firms can operate with lower inventories (just-in-time logistics), as faster shipping means less goods need to be tied up in transit and warehousing.</p>
 <p><b>Export competitiveness and learning effects</b></p>	<p>All the above means that lower freight costs reduce prices. U.S. goods become more internationally competitive, supporting exports overseas.</p>

Research indicates that, from these effects, a 10 percent reduction in average freight costs leads to an up to 1 percent increase in GDP over the longer-term.

Even though self-driving trucks, under the Accelerated scenario, will account for just 15 percent of the trucking market, this would suggest that self-driving freight could support \$6 billion in net additional U.S. GDP by 2035. Self-driving freight can therefore support new job opportunities, rising wages and a better standard-of-living for consumers across the wider economy.

**By 2035...**



# 7 Findings and recommendations

The self-driving freight sector already makes a material contribution to the U.S. economy. Today, the industry already contributes more than \$3.3 billion in total economic impact, supporting 17,000 jobs in the wider economy. Future sector growth is expected to:

## Key findings



### **Create new skilled job opportunities**

The self-driving freight sector is expected to create millions of new jobs in engineering, manufacturing and operations. Many of these will be highly-skilled, well-paid, and not require a college degree.



### **Safer roads**

Every year, 5,300 people are killed in large truck crashes in the US. Self-driving freight can dramatically reduce such collisions, avoiding 490 fatalities and 8,700 injuries on U.S. highways each year.



### **A more efficient freight sector**

Self-driving freight has the potential to drive significant benefits to carriers, reducing operating cost per mile by 15 to 25 percent. It can also help address the persistent hiring challenges facing the trucking industry.



### **Benefits to consumers and the wider U.S. economy**

Since almost everything a household buys relies on shipping, these benefits directly pass to consumers, saving U.S. consumers \$9 billion a year by 2035 under an Accelerated scenario. They could support an increase in net U.S. GDP by \$6 billion every year by 2035 by improving productivity across the wider economy.

## Policy implications

These benefits demonstrate how even a modest uptake of self-driving freight – of 15 percent of truck miles by 2035 – can deliver significant benefits to the U.S. economy, consumers and wider society.

Enabling these benefits, however, requires a supportive regulatory environment. Varying state laws and interest in autonomous freight will impact how quickly and broadly this technology is adopted. Policymakers looking to benefit from this technology could look to states where adoption and commercialization exists today for a roadmap of how to attract and provide this technology to their constituents.



**steer**