Engines for Change

From Cell Phones to Sodas, How New Truck Standards Can Improve the Way America Ships Goods

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Executive Summary

The United States moves more than $10 trillion worth of goods by truck each year. Nearly every product we buy—from the bed in which we awoke this morning, to the clothes we are dressed in, to the cell phone in our pocket, to the breakfast food that helps us start the day—has been on a truck at some point.

While trucks carry everything from food to fuel, and from industrial equipment to animal feed, **more than a third of the fuel used by trucks to move freight brings consumer goods to market**. That means the fuel efficiency of trucks directly affects the costs, oil use, and global warming emissions linked to the items we purchase and use every day.

The amount of fuel used to ship everyday products is staggering. Trucking the food we eat to local stores and restaurants requires more than 2.5 billion gallons of fuel. And transporting the gasoline used to do things like grocery shopping in the first place? That requires fuel, too—263 million gallons just to truck that fuel to gas stations so we can fill up our vehicles. Even trucking the 163 million cell phones sold in the United States every year to retailers and consumers uses nearly half a million gallons of fuel (Table ES-1).

Heavy-duty trucks use more fuel to move freight around the country—getting food and beverages to supermarkets, transporting construction materials, and bringing orders from retailers to our door—than for any other purpose. **And freight shipments consume more than 21 billion gallons of fuel annually—almost 70 gallons for every U.S. resident**.

Fortunately, we have a tremendous opportunity to reduce fuel use by setting standards that boost the fuel economy of heavy-duty trucks by more than 40 percent by 2025. The use of these fuel-efficient trucks and advanced technologies—available now and over the next decade—would cut fuel costs for carriers, shippers, and consumers alike while slashing global warming emissions.

> ***Heavy-duty trucks use more fuel to move freight around the country than for any other purpose.***

ECONOMIC BENEFITS OF MORE EFFICIENT TRUCKS

Stronger standards could raise the average fuel economy of trucks used to ship goods around the country from 6.3 mpg to 10.7 mpg. And that, in turn, would reduce fuel use by billions of gallons annually and prevent tens of millions of metric tons of global warming emissions (Figure ES-1).

Many different types of companies move freight. For-hire carriers such as UPS and FedEx move goods for other companies—whether imported goods from a central distribution center to some of the largest retailers in the country, or packages from retailers to your doorstep.

Other companies, including some of America's biggest brands, such as Coca-Cola, Pepsi, and Walmart, own their own truck fleets. That enables them to respond quickly to changes in consumer demand and ensure that perishable products arrive without delay.

No matter what type of trucking firm, the savings from deploying cost-effective fuel economy technologies quickly add up. Owners of more efficient tractor-trailers would save $30,000 in fuel costs for each truck each year, for example, enabling them to quickly recoup the estimated $32,000 they

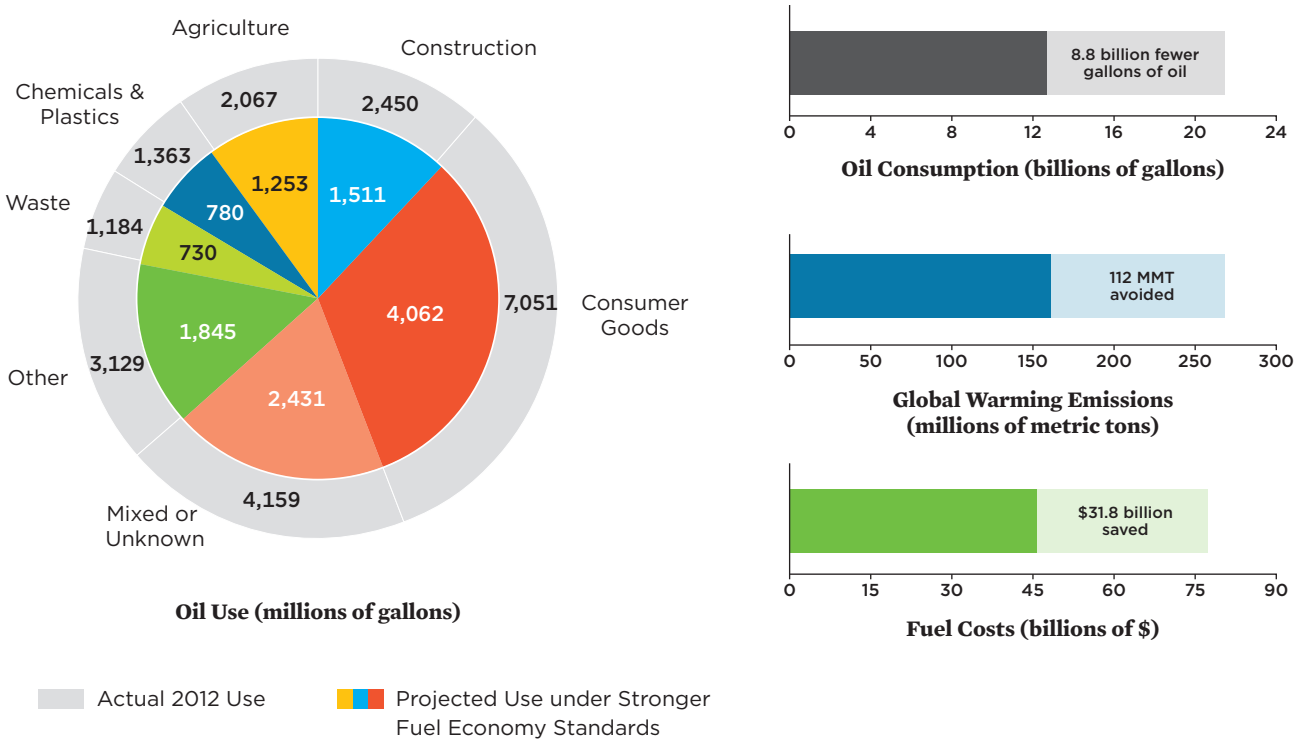
TABLE ES-1. Fuel Used to Ship Consumer Goods

Product	Quantity Sold	Fuel Use (gallons)
Cell Phones	163 million	0.4 million
Shoes	316 million pairs	2.2 million
Cars and Trucks	16.4 million	114.9 million
Diapers	14.7 billion	2.4 million
Beer	48.7 billion pints	62.8 million
Wine	4.5 billion bottles	10.9 million
Gasoline	135 billion gallons	262.6 million

Nearly every one of the products we use every day spent time on a truck, from the shoes on our feet to the cell phone in our pocket. The heavy-duty trucks used to ship these products burn 21 billion gallons of fuel each year.

SOURCE: BREWERS ASSOCIATION 2014; EIA 2014A; MAWSTON 2014; NIELSEN CO 2013; RICHER N.D.; WARDSAUTO 2015; WINE INSTITUTE 2014; OUR ANALYSIS (FUEL USE).

FIGURE ES-1. Reductions in Fuel Costs, Oil Use, and Global Warming Emissions, from Shipping Commodities Using More Efficient Trucks



Shipping nearly 20 billion tons of freight around the country each year consumes over 21 billion gallons of oil (outer pie chart). Stronger standards for fuel economy and global warming emissions from trucks could shrink the amount of oil used for the shipment of commodities that Americans use every day by over 40 percent (inner pie chart). If today's trucks met these standards, fuel costs would be reduced by over $30 billion, savings for truck owners which could be passed on to consumers via reduced shipping rates. Moving the same quantity of goods, trucks that met these standards would reduce petroleum consumption by over 570,000 barrels of oil a day, which is more than the oil produced by Alaska. Not only would this reduction in petroleum consumption save money, but it would prevent over 110 million metric tons of global warming emissions annually, equivalent to shutting down 30 coal-fired power plants.

Notes: MMT=Millions of metric tons of carbon dioxide-equivalent. "Other" commodities include metals, minerals, machinery, and miscellaneous manufactured goods.

would spend on efficiency upgrades. **These owners would save about $170,000 over the lifetime of each vehicle, compared with trucks on the road today, even after accounting for the higher up-front costs**.

A 40 percent drop in fuel use by trucks could reduce freight rates by nearly 10 percent. If truck owners and retailers passed on just half the fuel savings from more efficient trucks to consumers, each household would have $135 more to spend each year, based on today's freight volumes. And with the projected growth in the movement of goods, truck owners and households would likely save even more.

Tighter fuel efficiency standards for trucks would create tens of thousands of jobs and add billions to the U.S. gross domestic product. Stronger standards would create jobs directly—through investments in fuel-saving technologies—and indirectly, as companies and consumers spend their savings in other sectors of the economy. And reducing fuel use and global warming emissions from the movement of goods would also bolster national security.

STRONG STANDARDS ARE CRITICAL TO OVERCOMING MARKET BARRIERS

In 2011, the Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) issued the first-ever standards regulating the fuel economy and global warming emissions of heavy-duty trucks. Despite the large amount of fuel used by this sector, no regulations previously existed to ensure that efficiency technologies were

being deployed to minimize fuel use. That is a key reason why the fuel economy of tractor-trailers has hovered around just 6 miles per gallon since the 1970s.

The new standards, which took effect in 2014, require manufacturers to improve the fuel efficiency of new trucks by 16 percent by 2018, compared with new trucks sold in 2010. However, our analysis shows that the average new truck could become 40 percent more efficient by 2025 by employing technologies that are both technically feasible and cost-effective.

Fuel expenditures are one of the largest concerns of any shipper. However, most for-hire carriers limit their exposure to volatility in fuel prices by imposing a fuel surcharge on the goods they transport. Retailers, in turn, typically pass on these fuel surcharges to consumers. That means for-hire truckers have less incentive to invest in technologies that reduce the fuel use from heavy-duty trucks.

The owners of private fleets of heavy-duty trucks have a greater incentive to buy more efficient vehicles. However, a stricter fuel economy standard would ensure that manufacturers bring more fuel-efficient trucks and advanced, cost-effective technologies to market faster. That, in turn, would enable these fleet owners to reduce both their costs and their exposure to volatility in fuel prices.

TAKING ACTION PAYS OFF

Stronger standards are essential to overcome the market barriers that have kept the fuel economy of new trucks stagnant for so long. Standards that ensure that heavy-duty trucks are 40 percent more efficient by 2025 will save carriers, shippers, and consumers billions of dollars in fuel costs, putting money back in their pockets. Stronger standards will also cut U.S. oil use and millions of metric tons of carbon emissions, curbing the global warming impact of moving goods by truck.

TABLE ES-2. Estimated Savings for Five Major Fleets Under Strong Standards

Fleet	2013 Fuel Use	Potential Fuel Savings		Avoided Global Warming Emissions	
	M gallons	millions $	M gallons	kMT	
FedEx	439–485	$571.1	173	2,241	38%
UPS	374–413	$456.3	139	1,794	35%
Coca-Cola	99–110	$146.0	44	573	42%
PepsiCo	182–201	$237.8	72	924	38%
Walmart	96–106	$132.2	40	519	40%

FedEx, UPS, Coca-Cola, PepsiCo, and Walmart operate five of the largest fleets in the country, consuming more than a billion gallons of fuel annually. New fuel economy standards could help reduce the fuel usage of these fleets by over 500 million gallons, saving $1.7 billion in fuel and preventing 6.7 million metric tons of global warming emissions annually.

Notes: M gallons = millions of gallons; kMT= thousands of metric tons of CO_2-equivalent.

Because diesel fuel is the overwhelming majority of fuel used by these truck fleets (95 percent on an energy-basis), fuel usage is given in millions of gallons of diesel-equivalent. Financial savings assume fuel prices projected out to 2020 by the Energy Information Administration (EIA 2014b) discounted by 10% to reflect private fuels contracts (e.g., $3.31 per gallon of diesel fuel).

Heavy-duty trucks of all shapes and sizes move freight around the United States. Tractor-trailers (top left) include both line-haul trucks, which travel hundreds of miles daily, and regional-haul trucks, which typically operate within 200 miles of a central location. Other heavy-duty vehicles include box trucks (top right); step vans, commonly known as delivery vans (bottom left); and cargo vans (bottom right).

Photos (clockwise from top left): TruckPR (Flickr); Thomas R. Machnitzki (Wikimedia); IFCAR (Wikimedia); and qnr (Flickr).

Introduction

Nearly every product we buy—from the bed we awoke in this morning, to the clothes we are wearing, to the food we had for breakfast, to the cell phone we hold in our hand—has been on a truck at some point.

All told, shippers move more than $10 trillion worth of goods within the United States exclusively via truck, far exceeding the $1.1 trillion worth of goods transported just by air, the $551 billion worth transported by rail, or the $339 billion worth of goods via waterways. Shippers also move another $3 trillion worth of goods via multiple modes of transportation, and those goods usually spend some time on trucks.

Most vehicles in use today are actually passenger cars and trucks: heavy-duty trucks account for just 7 percent of all vehicles traveling U.S. roads. However, trucks consume more than 25 percent of the fuel used by all on-road vehicles (UCS 2013). And that share is growing as the U.S. population expands and the economy improves.

Although people often think of trucks as tractor-trailers or other big rigs, heavy-duty vehicles also include buses, delivery trucks, cement trucks, utility vans, bucket trucks, and heavy-duty pickups. These vehicles use fuel in a number of ways. Utility trucks might spend most of their time idling as they run cranes used to fix downed wires, while motor coaches and transit buses carry people from place to place. However, most heavy-duty trucks use fuel to move freight from point A to point B—and these are the focus of this report.

Until recently, despite the large amount of fuel used by the freight sector, no regulations ensured that owners and operators of heavy-duty trucks minimize fuel use while

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performing critical tasks. That is a key reason why the fuel economy of tractor-trailers—which use more fuel than any other type of truck—rose only from 5 miles per gallon (mpg) to just 6 mpg over the past 40 years (ORNL 2014; NRC 2010). The fuel economy of other heavy-duty trucks has also stagnated, remaining at about 7 mpg over the same timeframe (ORNL 2014).

The fuel economy of heavy-duty vehicles is so low for a reason: weight. The tractor portion of a tractor-trailer typically weighs 9 to 10 tons—about six times as much as a Toyota Camry. And the trailer it pulls can add as much as nearly 30 tons of freight. Single-unit box trucks used to transport goods to and from warehouses can weigh up to 13 tons when laden with freight. Even delivery vans weigh more than 8 tons fully loaded. Needless to say, no matter how efficient the engines of such trucks might be, moving those weights requires a lot of energy.

Aerodynamics are also a factor in how much energy these vehicles use: because the primary purpose of these trucks is to move freight, many resemble the boxes with which they're filled. But while a boxy shape may be ideal for packing as many goods as possible into a vehicle, it is highly inefficient when it comes to enabling that vehicle to move down the road. That's especially true for tractor-trailers, as they operate at high speed most of the time they are on the road.

BOX 1.

Our Methodology

In analyzing the impact of stronger standards for fuel-efficient trucks, we used the average 2010 truck as a baseline because the EPA and NHTSA did so in setting the 2014–2018 standards for medium- and heavy-duty engines and vehicles (EPA and NHTSA 2011). We also used the average 2010 truck in our earlier analysis of technologies that would be feasible, widely deployable, and cost-effective by 2025 (Khan, Cooke, and Tonachel 2015).

Under stronger standards, manufacturers would begin to produce new technologies and vehicles by 2020. However, because heavy-duty trucks remain in use for 10 to 20 years, more fuel-efficient vehicles would likely not dominate the overall U.S. fleet until 2035 or later. To calculate the resulting cuts in costs, fuel use, and global warming emissions, we assumed that all heavy-duty trucks in use nationwide would meet the stronger standard.

For the analysis we report here, we assumed that the number of miles traveled by trucks carrying freight would remain constant at 2012 levels due to the uncertainty in projections around the scale of deployment of these new vehicles as well as socioeconomic factors that would effect goods movement. However, it is expected that miles traveled by truck to carry freight is likely to increase (EIA 2014b). That means actual fuel and cost savings and avoided carbon emissions from stronger standards are likely to be much higher than we report.

In analyzing fuel use linked to each commodity shipped by heavy-duty truck, we used the Federal Highway Administration's Freight Analysis Framework (FHWA 2014). However, this framework significantly underestimates the amount of retail goods moved by truck—particularly those shipped from warehouses to retailers and the "last mile" to consumers (TRB 2006). To account for the latter, we relied on information from the Vehicle Inventory and Use Survey (U.S. Census Bureau 2004).

To estimate the fuel used by fleets of heavy-duty vehicles owned by our five major companies, we relied upon publicly available data, including industry reports, sustainability reports and press releases from the companies, and the analysis that supported federal regulations. We adjusted some of our estimates based on feedback from the companies. To account for the fact that the owners of large fleets often use fuel contracts to lower their fuel costs, we discounted the retail price of fuel by 10 percent when assessing the impact of stronger standards on the private fleets. Further detail on the methodology is available at *www.ucsusa.org/enginesforchange*.

TABLE 1. Improving the Efficiency of Heavy-Duty Vehicles by 2025

Truck Type	Fuel Economy of New 2010 Truck (mpg)	Fuel Economy of New 2025 Truck (mpg)	Reduction in Fuel Use and Global Warming Emissions	Cost of Technology Improvements	Time to Recoup Investment in Technology
Tractor-trailers*	5.8	10.7	46%	$32,000	13 months
Vocational Vehicles**	9.7	14.3	32%	$9,700	47 months
Pickups and Vans	11.3	15.7	28%	$4,083	35 months
Total			**40%**		**22 months**

Strong standards on fuel economy and global warming emissions could reduce average fuel use of new heavy-duty trucks in 2025 by 40 percent compared with 2010. The technologies used to reach the standards would pay for themselves in two years.

Notes: *The costs and payback for tractor-trailers include the purchase of technology improvements for three trailers. **Vocational vehicles include utility trucks, delivery vans, and garbage trucks. MPG = miles per gallon. Fuel price based on 2020 projection (EIA 2014b) of $3.67 per gallon diesel and $3.08 per gallon gasoline.

SOURCE: KHAN, COOKE, AND TONACHEL 2015

In 2011, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) issued the first-ever standards on the fuel economy and global warming emissions of heavy-duty trucks, to reduce the energy use of this sector. These standards, which took effect in 2014, require vehicle manufacturers to reduce the fuel consumption from new trucks by about 16 percent in 2018, compared with new trucks sold in 2010—more than matching the level of improvement over the previous 40 years. But while these regulations will help spur manufacturers to bring more fuel-efficient vehicles and technologies to market, they are simply a small first step in reducing fuel use from this sector. Technologies that are available now—or will be in the next decade—can reduce the amount of fuel used by heavy-duty vehicles far beyond the bar the agencies set for 2018.

For example, engines lose a lot of energy in the form of exhaust heat. By using a strategy similar to that found in many fossil fuel–based power plants, waste heat recovery systems can capture this heat and use it to do additional work, allowing the engine to operate more efficiently.

Improved control over shifting by employing advanced automated manual transmissions can ensure that these improved engines run under optimal conditions more of the time. Tires made of advanced materials and designed to reduce the amount of energy needed to roll can also improve the fuel efficiency of heavy-duty trucks. Improving the aerodynamics of trailers can also lead to significant reductions in fuel use.

In a recent analysis of the impact of these technologies, we found that the average new truck could become at least 40 percent more efficient in 2025, compared with 2010 (Khan, Cooke, and Tonachel 2015). Tractor-trailers could be almost 50 percent more fuel-efficient by that date, our analysis shows, while "vocational vehicles"—which include utility trucks and garbage trucks as well as delivery vans—could be 30 percent more fuel-efficient (Table 1). What's more, the fuel savings from employing these technologies would allow truck owners to recoup their investments in more fuel-efficient trucks in, on average, less than two years.

For this report, we analyzed the amount of fuel used to ship the commodities Americans use every day, as well as the market barriers to reducing that fuel use (Box 1). We also analyzed the fleets of heavy-duty vehicles owned by five of the nation's best-known companies, and the cuts in fuel and global warming emissions they could achieve under standards that required trucks to become 40 percent more efficient by 2025. Two of these companies—UPS and FedEx—use their fleets to ship other companies' products, while three—the Coca-Cola Company, PepsiCo, and Walmart—ship their own products. We found that stronger standards would reduce

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fuel use by billions of gallons annually and put money back in the pockets of fleet owners, truck drivers, and consumers—all while preventing tens of millions of metric tons of global warming emissions.

Impacts of Transporting Goods by Truck

Shipments of goods by air and rail travel much greater distances, on average, than truck shipments. However, trucks transport a higher total weight of goods and rack up more ton-miles (FHWA and BTS 2014). The result: heavy-duty trucks use more fuel—more than 21 billion gallons each year—and produce more global warming emissions than other modes used to ship freight.

Products used by households account for more than one-third of the fuel used by trucks to transport goods—more than any other segment of the economy, according to our analysis (Figure 1). And food accounts for half of all fuel used to transport consumer goods. Trucks that ship meat, produce, baked goods, and prepared and packaged foods from farms and food-processing facilities to grocery store shelves burn 2.5 billion gallons of fuel every year. That is more than 8.5 gallons of fuel each year per U.S. resident—not including the fuel consumers use to haul the food home.

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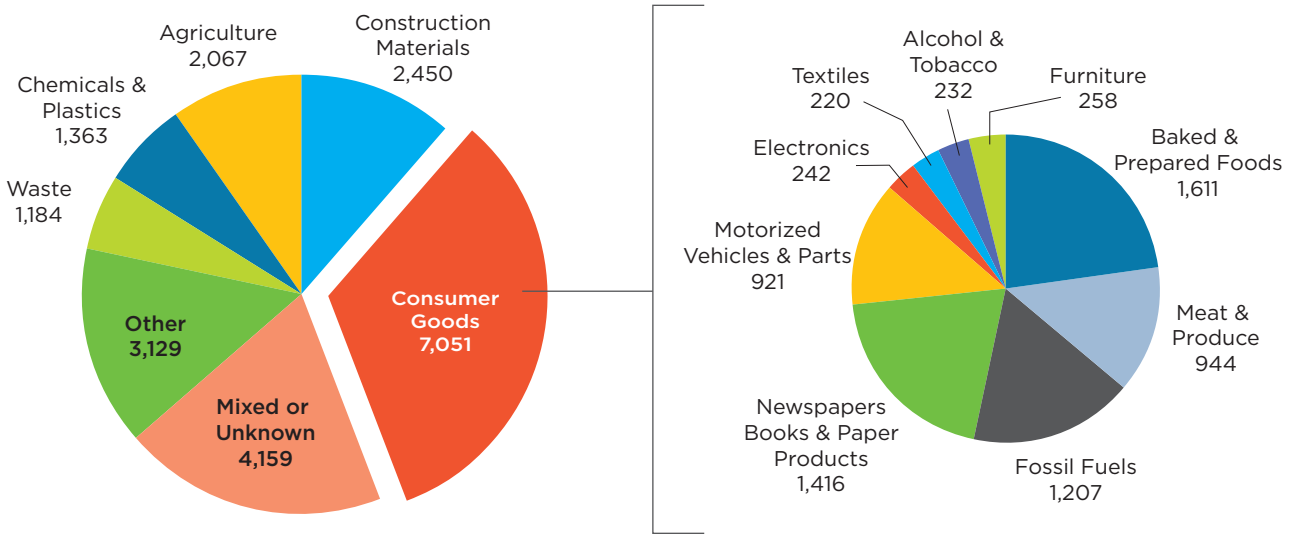
For example, trucks used 66 million gallons of fuel to transport milk in 2014 (Table 2), and that figure does not even include the fuel used to transport feed for the cows that produced that milk. The agricultural sector uses another 2 billion gallons of fuel to ship animal feed, fertilizer, and raw grain for processing.

Shipping other common foods, including fruit juice and vegetables, also requires a lot of fuel. For example, Americans eat a lot of potatoes, much of them in the form of French fries. That is not so good for fuel consumption or global warming

FIGURE 1. Amount of Fuel Used to Ship Commodities by Truck (millions of gallons)



Heavy-duty trucks move more than $10 trillion worth of commodities every year, consuming more than 21 billion gallons of fuel in the process. More than one-third of that fuel is used to transport common consumer goods, of which food accounts for the most fuel use. "Mixed or unknown" freight includes "last-mile" shipping from retailers to consumers. That means consumer products actually account for even more fuel use.

SOURCES: FHWA 2014; U.S. CENSUS BUREAU 2004; OUR ANALYSIS (FUEL).

TABLE 2. Fuel Used to Transport Food by Truck

Food	Per Capita Annual Consumption	Cups of Fuel per Person	Total Fuel Used to Transport Each Type of Food (M gal)
Milk	20 gallons	3 1/2	66.0
Potatoes	53 pounds	1/2	11.3
Fruit Juice	24 cups	1/2	10.1
Bread	12 loaves	1/2	9.0
Cereal	160 bowls	1/2	8.4
Eggs	14 dozen	1/2	8.4
Chocolate	11 pounds	1/4	4.5
Broccoli	7 heads	1/8	2.4

Food accounts for the single greatest fuel use for households. Just shipping food around the country consumes 2.5 billion gallons of fuel. Every item purchased at a store—including household staples such as milk, bread, and eggs—required fuel to get there.

Notes: Shipping weights to determine fuel use come from the U.S. Department of Agriculture, which analyzes how much of each food is consumed frozen, processed, fresh, or dried. M gal = millions of gallon.

SOURCES: USDA 2014, 2012, 2003, 1992; SOSLAND 2013; ICCO 2012; OUR ANALYSIS (FUEL USE).

emissions: trucks burn 11 million gallons of fuel to move all those spuds to supermarkets and restaurants.

Americans also buy a lot of household products, and trucks require a lot of fuel to transport them to stores and homes. For example, although we buy new vehicles less often than other goods, trucking the more than 16 million new vehicles sold in 2014 to dealers' lots required some 115 million gallons of fuel. To put that into perspective, it is as though every new car or truck used about a third of a tank of fuel to arrive at your local dealer, according to our analysis (Table 3).[1] And trucking the gas used by U.S. vehicles in 2014 to the pump required even more fuel: more than 260 million gallons.

U.S. households consume more than 40 million disposable diapers every day and 14.7 billion each year (Richer n.d.). Trucks use 2 million gallons of fuel just to move this one product to stores every year. Trucks also consume more than 2.2 million gallons of fuel annually while transporting shoes to consumers, we found, if we conservatively assume that everyone buys just one pair of shoes each year. And trucks used 400,000 gallons of fuel just to move cellphones sold in 2014 around the country, our analysis shows, using the iPhone 5 as a representative model (Hughes 2014).

How Strong Fuel Economy Standards Could Help

REDUCING THE FUEL USED TO TRANSPORT FREIGHT BY TRUCK

A proven and effective way to make the freight system more fuel-efficient is to improve the efficiency of the trucks that form the backbone of that system. Technologies available in the next decade could boost the average fuel economy of heavy-duty trucks used to ship goods around the country from 6.3 mpg to 10.7 mpg, our analysis shows.

If stronger standards for fuel economy and global warming emissions reduced the amount of fuel used by the average new truck in 2025 by 40 percent compared with 2010, the trucking sector would curb its annual fuel use by nearly 9 billion gallons, according to our analysis (Figure 2, p. 10).

Oil use would drop by 570,000 barrels a day—more than Alaska now produces. And that drop in fuel use would enable the trucking sector to avoid more than 110 million metric tons of carbon emissions annually—equivalent to shutting down 30 coal-fired power plants (EPA 2014).

Annual savings in fuel costs would total more than $30 billion, and shipping costs would drop by nearly 10 percent (MJB 2014). If even half those savings made it into consumers' pockets, every household would have at least $135 more to spend each year, our analysis shows. And as trucks transport rising quantities of goods in coming years, households would probably save much more (CFA 2014).

TABLE 3. Fuel Used to Ship Consumer Goods

Product	Quantity Sold	Fuel Use (gallons)
Cell Phones	163 million	0.4 million
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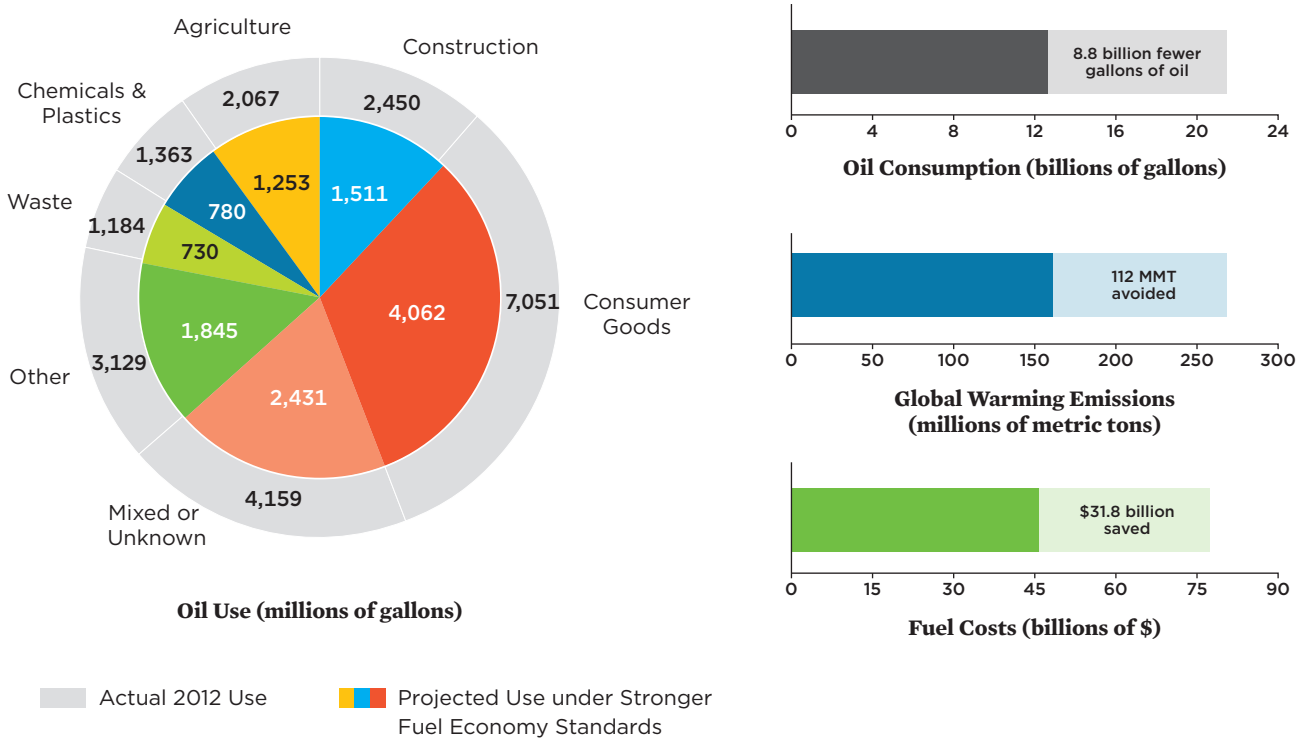
1 *Based on the weight of the most popular car (Toyota Camry) and truck (Ford F-150).*

FIGURE 2. Reductions in Fuel Costs, Oil Use, and Global Warming Emissions from Shipping Commodities Using More Efficient Trucks



Shipping nearly 20 billion tons of freight around the country each year consumes over 21 billion gallons of oil (outer pie chart). Stronger standards for fuel economy and global warming emissions from trucks could shrink the amount of oil used for the shipment of commodities that Americans use every day by over 40 percent (inner pie chart). If today's trucks met these standards, fuel costs would be reduced by over $30 billion, savings for truck owners which could be passed on to consumers via reduced shipping rates. Moving the same quantity of goods, trucks that met these standards would reduce petroleum consumption by over 570,000 barrels of oil a day, which is more than the oil produced by Alaska. Not only would this reduction in petroleum consumption save money, but it would prevent over 110 million metric tons of global warming emissions annually, equivalent to shutting down 30 coal-fired power plants.

Notes: MMT=Millions of metric tons of carbon dioxide-equivalent. "Other" commodities include metals, minerals, machinery, and miscellaneous manufactured goods.

More efficient trucks would be cost-effective for truck owners as well. For example, we found that more efficient tractor-trailers would cost an average of $32,000 more in 2025 than new tractor-trailers in 2010, if we assume that owners buy one new tractor and three new trailers. However, each tractor-trailer would use 46 percent less fuel. If we assume a fuel price of $3.67 per gallon, an owner would recoup the extra investment in just 13 months. The owner would net about $170,000 in total savings over the lifetime of the vehicle—typically 15 to 20 years, depending on vehicle use (Table 4).

Of course, the precise benefits for owners of trucking fleets would vary with the type of vehicles they use and the freight they carry. However, regardless of the market segment they serve, owners could take advantage of lower fuel costs to deploy more efficient vehicles across their fleets. The next sections explore how owners of different types of trucking fleets would benefit from more fuel-efficient vehicles, and the market barriers to widespread adoption of those vehicles.

The Freight System

The freight system is composed of a complex web of actors that work together to bring goods from the place of origin to the customer—whether a farmer who needs seed to plant wheat, a mill owner who processes that wheat into flour, or a home cook who needs flour to bake a cake. To understand the market barriers to reducing the amount of fuel used to deliver

TABLE 4. Lifetime Fuel and Cost Savings from More Efficient Tractor-Trailers

2010 fuel economy of new tractor-trailer	5.8 mpg
2025 fuel economy of new tractor-trailer under stricture standards	10.7 mpg
Cost of technology improvements	$32,000
Annual savings in fuel costs (at $3.67/gallon)	$30,000
Time to recoup initial investment	13 months
Total discounted lifetime savings	**$170,300**

Boosting the average fuel economy of new tractor-trailers from 5.8 to 10.7 mpg would raise their purchase price by $32,000. However, because fuel use would drop by nearly 50 percent, owners would recoup the higher cost in just 13 months, assuming a fuel price of $3.67 per gallon. And owners would net more than $170,000 savings over the life of the vehicle.

Notes: Lifetime savings are calculated based on a lifetime mileage of 1,250,000 (EPA and NHTSA 2011) and include a 5 percent annual discount rate for future fuel savings. Fuel price is based on 2020 projections (EIA 2014b).

freight, we must consider all the components of that system and the roles they play.

Freight that does not originate in the United States enters the country almost exclusively via ships—less than 1 percent arrives by plane (AAPA 2008). Most container ships hold enough goods to fill about 2,500 trailers, although the largest ships can move about 9,000 trailers' worth of goods.

After arriving at a port, imported goods move by either truck or rail. But even if a shipment moves first on rail, trucks almost always transport products from a centralized facility to their ultimate destination. From the port, drayage trucks travel short point-to-point distances, often to rail yards or distribution centers, where the products are then sorted. At this point, imported goods are essentially indistinguishable from domestic goods and can be shipped via the nation's extensive network of freight corridors (Figure 3).

Freight moved domestically can be shipped via different types of trucks, depending on the length of the trip and the type of freight in question. Heavy-duty trucks are typically categorized by gross vehicle weight rating (GVWR), which includes the weight of cargo as well as the truck itself. States set maximum weights for these vehicles—typically 80,000

FIGURE 3. Freight Flows by Highway, Railroad, and Waterway

While shippers often transport coal on railroads and move some goods on barges on the Mississippi and Missouri rivers, they transport most goods in the United States by truck using interstate highways.

SOURCE: FHWA AND BTS 2014.

pounds, or 40 tons. Vehicles intended to carry freight could range from Class 2b, with a GVWR of 8,500 to 10,000 pounds, to Class 8, which includes any vehicle that weighs more than 33,000 pounds, such as tankers and flatbeds as well as tractor-trailers. A typical tractor-trailer can carry as much as 45,000 to 50,000 pounds of freight. Some trailers carrying a dense product can reach their weight limit when half-empty, while others could be packed to the gills with light products and still not hit the 80,000-pound threshold.

Class 3-6 delivery trucks include larger vehicles such as box trucks, which weigh 14,000 to 26,000 pounds—more than half of which can be cargo. Carriers often use box trucks to transport goods from warehouses to local retailers, or to deliver products such as furniture directly to homes. This class also includes vans used to deliver parcels—the domain of for-profit carriers.

For-Hire Carriers

Most manufacturers do not ship their own products. Instead, they contract with a for-hire shipping company to move their goods. These for-hire carriers come in all shapes and sizes. Companies such as JB Hunt and Conway move freight for manufacturers and retailers from ports and other locations to warehouses and store. For-hire carriers also include package companies with large fleets of trucks such as UPS and FedEx, as well as operators with a single truck (Box 2). Most

For-hire fleet operators manage large numbers of vehicles, often with the same configuration and designed with their specific application in mind.

BOX 2.

Truck Drivers and For-Hire Carriers

The typical image of a truck driver is someone who owns his or her own truck and is responsible for finding individual loads to transport, such as the shipment of beer at the center of the iconic film Smokey and the Bandit. However, only about 1 in 10 U.S. drivers—165,100 of 1,701,500—were owner-operators in 2012 (BLS 2014; Heine 2013). That number dropped by 15 percent during the Great Recession, primarily because of a significant drop in freight shipments, though it has now largely rebounded (Heine 2013).

Owner-operators must seek out freight shipments, often by using a freight broker or "load board": an online database of available loads. Although brokers cost money, they can ensure that drivers are maximizing road time given limited resources. Because trucking is highly competitive, some owner-operators specialize in specific types of freight or regional hauling. For example, these drivers may find moving hazardous freight enticing because it commands a higher rate, even though it requires certification and additional safety measures.

Like owner-operators, owner-drivers own their truck, but they contract with a larger carrier. Unlike owner-operators, owner-drivers do not have to line up shipments: the larger company does that. However, these drivers have less control over the rate they receive and how often they work. Some owner-drivers make lease payments on a truck owned by the company for a fixed amount of time, after which they own the vehicle.

Most commonly, for-hire carriers employ truckers as full-time drivers. Some carriers run their own training programs to enable drivers to obtain a commercial license and work for the company.

for-hire carriers use big rigs—tractors pulling 53-foot-long trailers—to move freight.

For-hire carriers are often categorized based on the types of loads they transport. In truckload shipping, a trailer is filled with freight at location A and then unloaded at a single final destination, location B. The trucking company or driver then usually tries to locate another pickup nearby to minimize dead load—the number of miles spent driving an empty trailer. Because of the simplicity and relatively low overhead of this approach, smaller for-hire trucking companies often prefer it.

An alternative is less-than-truckload carriage, where a manufacturer or retailer contracts with a carrier to pick up smaller loads at multiple locations. In some cases, a trailer-load may include goods from several companies—much as movers may use a single trailer to move multiple households. The carrier typically combines the freight into full truckloads at a central warehouse before delivering to the customer(s) who have contracted for the shipping. This process is resource-intensive, as drivers make many stops and loading the truck to satisfy operational and safety concerns requires many man-hours of labor. While LTL firms account for less than one in five for-hire trucking companies, they employ two of five workers in that sector (TRB 2010).

Parcel delivery—dominated by UPS and FedEx (Box 3, and Box 4, p. 14)—has much in common with LTL carriage. However, parcel delivery tends to be more automated: carriers tend to use conveyer belts to move goods around a warehouse. Delivery options also vary considerably, depending on whether the carrier is shipping to a home or a business with a loading dock, and whether the receiver is in a rural or an urban area. Until recently, manufacturers and retailers shipped most goods weighing more than 150 pounds via LTL carriers. However, the distinction between parcel and LTL carriers has narrowed with the advent of "heavy freight" options offered by parcel carriers.

BOX 3.

UPS

UPS owns the biggest trucking fleet in the United States, shipping more than 4 billion packages annually. As one of the largest fuel users in the country, UPS is constantly looking for ways to reduce fuel costs, employing a host of different strategies and technologies. For example, the company uses a wide variety of vehicle types to reduce the use of fossil fuel.

UPS has more than 3,000 alternative-fuel vehicles in its fleet, including hydraulic hybrids, electric hybrids, battery-electric vehicles, natural gas tractors and trucks, and propane vehicles. Different kinds of vehicles offer different opportunities to reduce fuel use, depending on the route. For example, natural gas tractors cannot travel as far as their diesel counterparts, but they can be used extensively in regional operation. Hybrids and electric vehicles may not be appropriate for high-mileage rural routes, but they offer significant advantages in urban routes.

UPS keeps its vehicles from cradle to grave—you will never find a UPS truck on the secondary market. The typical brown delivery van is made of aluminum, and at the end of its life it is crushed and recycled. That means UPS is more willing than many carriers to pay the higher up-front costs of advanced-technology vehicles, because the company will reap large returns in lower fuel costs over the 10 to 20 years they are in use.

TABLE 5. UPS's Fleet of Heavy-Duty Trucks

Characteristics	2013 Statistics	Annual Savings from Strong 2025 Standards
17,000 tractors	3.0 billion miles traveled	$460 million in fuel costs
90,000 trailers	360–400 million gallons of diesel used	140-milllion-gallon drop in fossil fuel use
75,000 delivery vehicles	5.1 million metric tons of global warming emissions released	1.8 million metric tons of global warming emissions avoided

Note: Fleet use estimates were obtained using public data. Detailed information can be found in the methodology.

BOX 4.

FedEx

With one of the largest trucking fleets in the country, FedEx is very concerned about its fuel use. In 2006, the for-hire carrier came out in support of federal standards for fuel economy and global warming emission for commercial vehicles. As a member of the Heavy Duty Fuel Efficiency Leadership Group in 2010, FedEx again supported the need to set these standards. The group noted that "important U.S. environmental, economic, and national security benefits can be achieved through the establishment of a strong national GHG/fuel efficiency program" (HDFELG 2010).

For its part, FedEx is replacing a large fraction of its older gasoline-powered delivery vehicles with more efficient diesel vans. The FedEx fleet also includes more than 350 hybrid vehicles, and the company has recently deployed 200 battery-electric vans on urban delivery routes. FedEx has also tested natural gas and hybrid tractors on some freight routes, and has widely deployed aerodynamic devices on its trailer fleet.

FedEx has also extensively deployed automated manual transmissions to help ensure that drivers are operating their vehicles most fuel-efficiently. These allow more optimal shifting than traditional manual transmissions. The company also uses "eco-driving" route management to minimize vehicle idling time and unnecessary acceleration and deceleration.

TABLE 6. FedEx's Fleet of Heavy-Duty Trucks

Characteristics	2013 Statistics	Annual Savings from Strong 2025 Standards
24,261 tractors	3.3 billion miles traveled	$570 million in fuel costs
86,707 trailers	440–490 million gallons of diesel used	170-million-gallon drop in fossil fuel use
39,015 straight trucks	6.0 million metric tons of global warming emissions released	2.2 million metric tons of global warming emissions avoided annually
18,320 delivery vans		

Note: Fleet use estimates were obtained using public data. Detailed information can be found in the methodology.

Using Logistics to Reduce Fuel Use

Because LTL and parcel carriers pick up and deliver goods from numerous locations, small changes in packing and routing a truck can have a significant impact on shipping time and fuel use. For-hire carriers therefore focus relentlessly on logistics to improve efficiency.

One innovation from UPS is its "right turn policy": the company designs its routes to enable drivers to avoid left turns, which minimizes truck idling time and allows them to deliver more packages (UPS 2012). LTL carriers focus heavily on improving warehouse logistics, loading the products in a way that enables efficient delivery while maintaining a balanced trailer for safety. Time spent reorganizing a trailer mid-delivery is time not spent delivering goods. Improvements in logistics can even lead to complementary technologies that further improve freight efficiency. For example, some truck technologies allow LTL drivers to take advantage of lighter loads as they drop off shipments at various locations. These technologies include one that allows a trailer to shift to a

One innovation from UPS is its "right turn policy": the company designs its routes to enable drivers to avoid left turns, which minimizes truck idling time and allows them to deliver more packages.

single axle mid-route, which cuts fuel use by reducing the amount of energy lost to friction.

Because of the complexities of freight logistics, some carriers focus on a specific niche, such as transporting vehicles or providing last-mile shipping: the final leg of a freight shipment. Last-mile shipping can entail transporting products from warehouses and furniture and home improvement stores to homes—in which case they resemble parcel delivery and courier services. Small companies often specialize in these niche markets where interaction with consumers plays a strong role. These companies often rely on vans or box trucks to deliver products from warehouses to homes, from TVs to washer/dryers to smaller products from Internet retailers.

Market Barriers to Reducing Fuel Use by For-Hire Carriers

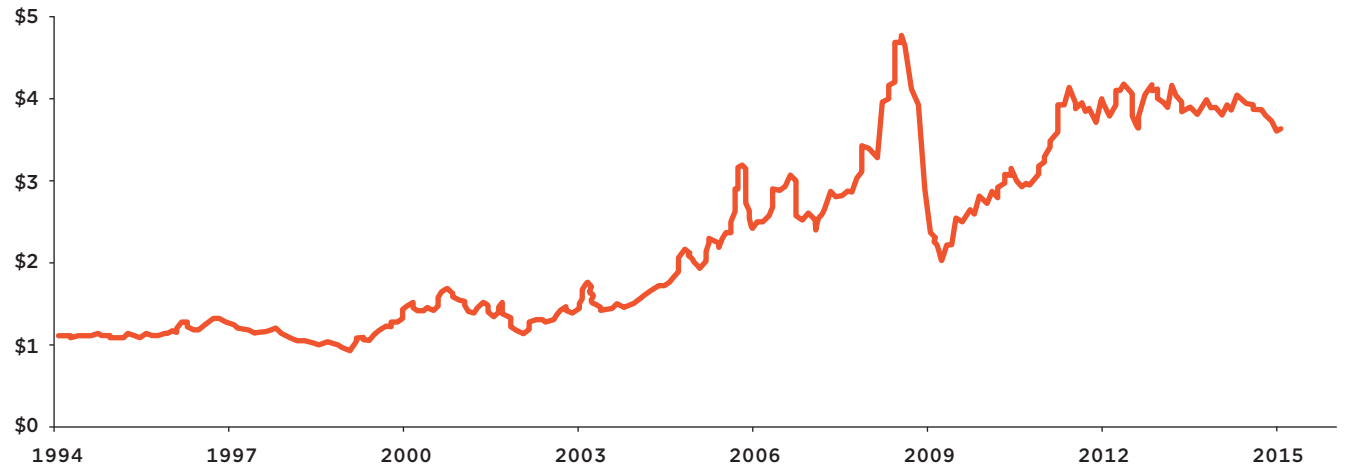
Fuel and labor costs vie for the top costs of all for-hire carriers, so they are often interested in cutting fuel use. However, the structure of most shipping contracts does not incentivize carriers to invest in more fuel-efficient trucks: a major market failure.

The cost of fuel can vary widely over the course of a contract between carriers and their customers—whether those contracts last weeks, months, or years (Figure 4). To limit their exposure to such volatility, most carriers include a fuel surcharge in their contracts. The surcharge is based on a threshold price for diesel fuel: the contracted company pays a surcharge for shipping goods when the price exceeds that level. The threshold is usually $1.15 per gallon—a price not seen since 2002.

While this surcharge protects carriers from fluctuations in the price of fuel, it also undercuts their incentive to invest in more fuel-efficient trucks, and in technologies that can improve the fuel-efficiency.

While this surcharge protects carriers from fluctuations in the price of fuel, it also undercuts their incentive to invest in more fuel-efficient trucks, and in technologies that can improve the fuel-efficiency of existing trucks, as they can pass on a significant portion of fuel costs to their customers. Some retailers, in turn, pass on higher fuel prices to customers to

FIGURE 4. Volatile Diesel Prices ($/gallon U.S. average)



The average price of diesel fuel rose from just over $1 per gallon in 1994 to more than $3.50 in 2015. The price also saw significant swings, including a rise and fall of $2 in less than a four-year span. This volatility led to more reliance on fuel surcharges, which retailers often pass on to consumers and curb owners' incentives to invest in more fuel-efficient trucks.

SOURCE: EIA 2014C.

© Walmart

Walmart's tractor-trailers are a critical component of its just-in-time delivery model. The skirts on the tractor and trailer as well as more aerodynamic design of the tractor help reduce fuel use from these large trucks.

cover the surcharge, reducing retailers' incentives to urge for-hire truckers to reduce fuel use.

For their part, individual drivers who own their trucks can boost their profit margins if they can cut fuel use below a contracted average—typically 6 mpg. However, these owner-operators often buy vehicles on the secondary, or used, market, because they have less access to capital. Large carriers are the primary customers of truck manufacturers, and therefore drive the technologies that are available on the market. While more efficient vehicles would trickle down to the used market over time, they might do so at a cost premium thanks to their advanced technologies, putting small owner-operators at a disadvantage in affording these vehicles, even though these vehicles pay for themselves in less than two years. Recognizing this, some states offer incentives or novel financing to encourage small businesses to buy more efficient vehicles, enabling them to cut costs by reducing operating expenses. And standards can help drive costs down for advanced technologies through economies of scale.

Some states offer incentives or novel financing to encourage small businesses to buy more efficient vehicles.

Owners of large for-hire fleets typically keep tractors for only three to five years, after which they sell them on the secondary market for use by lower-mileage truckers. That means fleet owners, who pay all the up-front technology costs, often look for fuel savings within a short time period, and discount the potential to recover some of the investment when selling the vehicle. This may undervalue the fuel savings advanced technologies can provide, and dampen demand for manufacturers to employ technologies that could reduce fuel use over a vehicle's lifetime.

Fleet owners must also deal with other challenges that new technologies can bring, such as changes in maintenance schedules and the need for more driver training, which may affect operating costs over a vehicle's lifetime. These sometimes unknown costs may curb the willingness of fleet owners to buy more-efficient trucks and technologies that can increase efficiency—though many of these barriers fall over time.

These market complexities are precisely why stronger standards for fuel economy and global warming emissions from heavy-duty trucks are critical. By ensuring that vehicle

manufacturers invest in new technologies to reduce fuel consumption, and use them in all the trucks they make, stronger standards can drive down fuel use and costs for all truck owners—even owner-operators who buy their vehicles on the secondary market. And because more efficient trucks mean lower fuel surcharges for retailers, the prices of consumer goods will be less susceptible to fluctuations in the fuel market, benefiting consumers.

Private Fleets of Heavy-Duty Trucks

Some manufacturers and distributors—including major food producers and retailers—maintain their own trucking fleets to ensure adequate delivery capacity, timely customer service, and flexible scheduling, and to protect themselves from rising fuel costs. These owners of private fleets already focus on reducing fuel costs. However, even they and their customers would benefit from strong standards for heavy-duty vehicles.

RETAILERS' FLEETS

Major retailers sell products from all over the country. However, to minimize inventory, much of the stock is located at centralized warehouses or distribution centers. Products can then be shipped by truck to any number of stores in a region based on demand. Maintaining enough inventory in stores can be especially challenging for retailers that stock many large items, such as Home Depot. These retailers maintain their own fleets to ensure timely delivery and lower freight costs.

Companies with their own fleet of trucks can also reduce the impact of volatile fuel prices on day-to-day operations by signing contracts to obtain fuel at a discounted volume rate. This is especially helpful to companies that transport large volumes of goods. Perhaps most famously, Walmart relies on a network of distribution centers and detailed logistics to minimize overhead, drive down shipping costs, and respond quickly to customer demand (Box 5).

BOX 5.

Walmart

Walmart has the largest fleet of heavy-duty trucks of any retailer in the country. The company's 7,000 trucks service 158 distribution centers and nearly 5,000 retail locations. Walmart has historically relied on logistics to drive down costs—specifically its just-in-time model. That approach minimizes inventory and thus overhead costs but also requires rapid delivery.

Walmart has also focused on improving the efficiency of its large tractor-trailer fleet by improving the aerodynamics of its tractors and adding devices that improve the aerodynamics of its trailers. For example, the company recently debuted the Walmart Advanced Vehicle Experience concept vehicle. This tractor-trailer features an extremely aerodynamic tractor propelled by a microturbine hybrid system. This powertrain uses a highly efficient turbine to generate electricity, which the motor then uses to propel the vehicle.

The trailer pulled by the tractor is also much more aerodynamic. And because it is built extensively with lightweight carbon fiber, it can carry more freight, improving overall freight efficiency.

TABLE 7. Walmart's Fleet of Heavy-Duty Trucks

Characteristics	2013 Statistics	Annual Savings from Strong 2025 Standards
6,239 tractors	Nearly 700 million miles traveled	$130 million in annual fuel costs
61,743 trailers	100–110 million gallons of diesel used	40-million-gallon drop in fossil fuel use
38 straight trucks	1.3 million metric tons of global warming emissions released	500,000 metric tons of global warming emissions avoided annually
768 pickups and vans		

Note: Fleet use estimates were obtained using public data. Detailed information can be found in the methodology.

BOX 6.

Coca-Cola Company

Known for selling the most popular carbonated beverage in the United States, the Coca-Cola Company moves more than just its namesake around the country. Besides soft drinks, the company produces and distributes beverages from water to juices to energy drinks. And it does so using the nation's third-largest private tractor fleet.

Coca-Cola's biggest fuel user is its bulk delivery fleet, whose trucks transport drinks from production facilities to major grocery stores, traveling hundreds of miles between deliveries. To reduce oil use, Coca-Cola is testing the use of natural gas vehicles in this fleet.

But the company is focusing most strongly on reducing fuel use by electrifying its fleet. It is using hybrid-electric trucks—from vans to bay trucks—for all types of delivery, and testing the nation's the first refrigerated electric delivery trucks in California.

TABLE 8. Coca-Cola's Fleet of Heavy-Duty Trucks

Characteristics	2013 Statistics	Annual Savings from Strong 2025 Standards
7,479 tractors	More than 650 million miles traveled	$150 million in annual fuel costs
9,523 trailers	100 million gallons of diesel used	45-million-gallon drop in fossil fuel use
1,901 straight trucks	1.4 million metric tons of global warming emissions released	600,000 metric tons of global warming emissions avoided annually
3,690 vans		

Note: Fleet use estimates were obtained using public data. Detailed information can be found in the methodology.

FOOD AND BEVERAGE FLEETS

Many major grocery chains and food producers own their own fleets to move enormous volumes of goods—many of which are perishable—in response to consumer demand. Major food service companies such as Aramark and Sysco also often use their own fleets to transport goods to numerous clients.

Meanwhile, manufacturers of food and beverages items want to control their distribution directly because of rapid turnover in their products. Manufacturers may use their fleets to deliver to centralized warehouses of large food retailers, which then distribute the items to their stores. Other food manufacturers, such as the Coca-Cola Company and PepsiCo (Boxes 6 and 7), deliver products direct to retailers, with some drivers making a dozen stops daily to stock shelves and vending machines, especially at small local stores.

Companies rely on many types of heavy-duty trucks—often specialized for specific products—to ship foods and beverages. For example, distributors of perishable and frozen goods use refrigerated box trucks and trailers known as "reefers." The refrigeration unit is powered by a diesel-powered compressor, which consumes additional fuel. Shippers of liquid products such as milk, oil, juice, and corn syrup rely on tanker trucks and trailers. And beverage distributors often use side-loaded bay trucks because they give drivers easy access to products, particularly when they are delivering to convenience stores and other facilities that lack loading docks.

AGRICULTURAL FLEETS

Suppliers of food commodities use a tremendous amount of fuel throughout the supply chain. Because these suppliers are often local to food processors, shipping their commodities via truck can be more efficient than using rail.

Processors of raw materials such as grains often have their own fleets of heavy-duty trucks to transport large volumes from numerous far-flung locations to a central facility, working in an inverted hub-and-spoke model. Producers of processed foods such as corn syrup may also have their own truck fleets because shipping on the open freight market is costly, as carriers of such products often cannot secure return hauls.

Shipments of animals and animal feed are another major freight expense in the agricultural sector. Livestock owners ship animals almost exclusively by truck because they require supervision, which is impossible via other modes of freight transportation. Changes in the design of trailers to increase capacity and provide more thorough protection from moisture and contami-

nants have enabled more efficient movement of bulk ingredients for feed, increasing demand for truck freight services.

Additional private fleets are owned to service the agricultural industry. Many fertilizer producers maintain fleets of heavy-duty trucks to transport more than 150 million tons of their products annually. And the largest seed producers often have their own trucking fleets as well.

TRANSPORTING FOSSIL FUELS

Producers of raw fossil fuels tend to use transportation networks other than trucks. For example, they rely on rail to ship coal and on pipelines to move oil, gas, and diesel to central distribution centers. However, companies that sell more refined products usually use heavy-duty trucks to deliver them. For example, fuel companies rely almost exclusively on trucks to deliver propane and heating oil—both especially popular in the Northeast for cooking and for heating homes. And companies use tankers to deliver gasoline to underground storage tanks at local gas stations. All told, the fossil fuel sector consumes more than 1 billion gallons of fuel every year just in freight movement.

Companies in the fossil fuel sector with the largest fleets provide services to the oil and gas industry. Halliburton owns the largest fleet in this sector, using its vehicles to provide well-drilling and well-completion services, pressurized pumping for hydraulic fracturing (fracking), and equipment and data-logging services.

WHY OWNERS OF PRIVATE FLEETS WOULD BENEFIT FROM STRICTER STANDARDS

Because owners of private fleets treat their vehicles as assets, many of the market failures at work in the for-hire shipping sector do not apply. For example, because they buy their own vehicles and contract for their own fuel, owners of these

BOX 7.

PepsiCo

PepsiCo has the nation's largest private tractor fleet, selling not only its eponymous soft drink and other beverages, but also numerous food products through brands such as Frito-Lay. Besides its tractor-trailers, which range from bulk delivery vehicles that travel up to 200,000 miles annually to bay trucks that make local deliveries, PepsiCo maintains a robust fleet of box trucks and vans.

PepsiCo is reaping some of its biggest improvements in fuel economy by adding aerodynamic devices to its trailers. These cost-effective technologies have been on the market for a number of years. However, recent regulations in California mandating the use of these devices have helped reduce their cost by 50 percent, as manufacturers produce them at larger scale. And that, in turn, has enabled PepsiCo to reduce fuel use and global warming emissions cost-effectively. The company has also recently introduced natural gas tractors to Frito-Lay's long-haul fleet to further reduce fuel use.

Besides its natural gas vehicles, Frito-Lay also operates the nation's largest fleet of all-electric vehicles, which provide further cuts in both oil consumption and global warming emissions. An overnight charge gives these electric vehicles more than enough power to operate in urban areas, where they are effective for stop-and-go driving in heavy traffic. PepsiCo's beverage delivery fleet also has a significant share of hybrid-electric vehicles, to reduce fuel use in urban areas.

TABLE 9. PepsiCo's Fleet of Heavy-Duty Trucks

Characteristics	2013 Statistics	Annual Savings from Strong 2025 Standards
12,132 tractors 10,548 trailers 7,745 straight trucks 17,761 vans	More than 1.4 billion miles traveled 170 million gallons of diesel used 2.5 million metric tons of global warming emissions released	$238 million in annual fuel costs 80-million-gallon reduction in fossil fuel use 900,000 metric tons global warming emissions prevented annually

Note: Fleet use estimates were obtained using public data. Detailed information can be found in the methodology.

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At truck stops like this around the country, millions of trucks are busy fueling up to carry the products that we use every day.

fleets have direct incentives to buy more fuel-efficient vehicles and add advanced technologies to improve the vehicles they already own.

However, these owners would still benefit tremendously from stronger standards for the fuel economy and global warming emissions of heavy-duty trucks. The resulting regulations would spur manufacturers to bring advanced technologies to market at a faster pace, making cost-effective, fuel-efficient vehicles more widely available. Stronger standards would also enable owners of private fleets to take advantage of lower costs, as manufacturers produce advanced technologies in larger volumes. No matter what products the owners of private fleets are shipping, strong fuel economy standards will enable them to save money while reducing their exposure to swings in fuel prices.

The Payoff from Taking Action

Heavy-duty trucks play a major role in the U.S. economy: we rely on them to carry almost everything. Companies use them to move goods—mostly household goods—from ports to warehouses, from warehouses to retailers, from food producers to stores, and from retailers to homes.

The resulting regulations would spur manufacturers to bring advanced technologies to market at a faster pace, making cost-effective, fuel-efficient vehicles more widely available.

In transporting these products and other materials around the country, heavy-duty trucks consume more than 21 billion gallons of oil each year—or a million barrels every day (Table 10). Topping the list is food: trucks burn 2.5 billion gallons of fuel every year just to enable producers to put food on our tables. And the food and agriculture industries use another 2 billion gallons of fuel to ship commodities earlier in the supply network.

Ensuring that this critical economic backbone moves goods more efficiently would benefit companies, consumers, and the environment. However, while fuel costs are one of the largest concerns of any shipper, most carriers use a fuel surcharge to limit their exposure to volatility in fuel prices. Retailers, in turn, typically pass on these fuel surcharges to consumers, reducing carriers' incentive to invest in more fuel-efficient vehicles and advanced technologies that reduce fuel use. While companies that maintain their own fleets have more incentive to adopt fuel-efficient vehicles and fuel-saving technologies, stronger regulations can help bring these advances to market more quickly, enabling these owners to cut their costs.

Some of the best-known U.S. companies with fleets of heavy-duty trucks use tremendous amounts of oil to transport their own products and those of other companies. While owners of these fleets are using some cutting-edge technologies to reduce fuel use, they can still reduce their fuel use much more dramatically. Standards that improve the average fuel efficiency of new trucks in 2025 by 40 percent would enable these companies to reduce their fuel use by more than 500 million gallons, save $1.8 billion, and avoid 6.7 million metric tons of global warming emissions each year (Table 11, p. 22).

Strong standards for fuel economy and global warming emissions would spur vehicle manufacturers to adopt technologies that drive down costs for all fleets, including for owners that are already beginning to use these fuel-saving strategies. These advances would pay for themselves in less than two years. And fuel use in the freight sector would drop by 6.6 billion gallons each year, putting more money in the pockets of carriers, retailers, and consumers.

Previous analysis has shown that tighter fuel efficiency standards for trucks would create tens of thousands of jobs and add billions to the U.S. gross domestic product (Goldberg 2010). The standards would create jobs directly—through investments in fuel-saving technologies—and indirectly, as companies and consumers spend their savings in other sectors of the economy. Finally, reducing fuel use and global warming emissions from the movement of goods would bolster national security.

TABLE 10. Estimated Savings for Five Major Fleets Under Strong Standards

Fleet	2013 Fuel Use	Potential Fuel Savings		Avoided Global Warming Emissions	
	M gallons	millions $	M gallons	kMT	
FedEx	439–485	$571.1	173	2,241	38%
UPS	374–413	$456.3	139	1,794	35%
Coca-Cola	99–110	$146.0	44	573	42%
PepsiCo	182–201	$237.8	72	924	38%
Walmart	96–106	$132.2	40	519	40%

FedEx, UPS, Coca-Cola, PepsiCo, and Walmart operate five of the largest fleets in the country, consuming more than a billion gallons of fuel annually. New fuel economy standards could help reduce the fuel usage of these fleets by over 500 million gallons, saving $1.7 billion in fuel and preventing 6.7 million metric tons of global warming emissions annually.

Notes: M gallons = millions of gallons; kMT = thousands of metric tons of CO_2-equivalent.

Because diesel fuel is the overwhelming majority of fuel used by these truck fleets (95 percent on an energy-basis), fuel usage is given in millions of gallons of diesel-equivalent. Financial savings assume fuel prices projected out to 2020 by the Energy Information Administration (EIA 2014b) discounted by 10% to reflect private fuels contracts (e.g., $3.31 per gallon of diesel fuel).

TABLE 11. How Strong Standards Could Cut the Amount of Fuel Used to Truck Commodities

Commodity	2012 Fuel Use (M gal)	Under Strong Standards			
		Reduction in Fuel Use (millions of gallons)	Cuts in Fuel Costs (billions of dollars)	Avoided Global Warming Emissions (MMT)	Percent Reduction in Fuel Use and Costs
Consumer Goods	7,051	2,989	10.8	38.2	42%
Baked and Prepared Foods	1,611	703	2.5	9.0	44%
Meat and Produce	944	406	1.5	5.2	43%
Fossil Fuels	1,207	462	1.7	5.8	38%
Newspapers, Books, and Magazines	1,416	598	2.2	7.6	42%
Motorized Vehicles and Parts	921	398	1.4	5.1	43%
Electronics	242	107	0.4	1.4	44%
Alcohol and Tobacco	232	103	0.4	1.3	44%
Textiles	220	98	0.4	1.3	45%
Furniture	258	115	0.4	1.5	45%
Construction Materials	2,450	940	3.4	11.9	39%
Agriculture	2,067	814	2.9	10.4	39%
Chemicals and Plastics	1,363	583	2.1	7.5	43%
Waste	1,184	454	1.6	5.7	38%
Other	3,129	1,284	4.7	16.4	41%
Mixed/unknown	4,159	1,728	6.3	22.1	42%
Total	**21,403**	**8,792**	**31.8**	**112.2**	**41%**

Shipping more than 10 billion tons of commodities that Americans use every day consumes more than 21 billion gallons of oil each year. Stronger fuel-economy standards would cut petroleum use by more than 570,000 barrels of oil a day, and the costs of moving this freight by over $30 billion. And the nation would avoid more than 110 million metric tons of global warming emissions each year.

Note: MMT = millions of metric tons of CO_2-equivalent..

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