Chapter 4
Why You Should Love Trucks

Nearly everything in our modern world was on a truck, even if only for the last mile: the furnishings and building materials in every home, store, office, and factory, the food you eat, from planting and harvest to stove-top and dinner plate, and even the asphalt and concrete in the roads that trucks travel on.

In other words, we are alive because of trucks. If trucks ever stopped running, we'd all become Amish overnight.

Trucks are mind-bogglingly varied in size, shape, and task. Buses, fire trucks, bulldozers, tractors, harvesters, concrete trucks, cranes, dump trucks, garbage trucks, log carriers, goliath mining trucks, refrigerated trucks, tank trucks, delivery trucks, freight trucks … there is no end to the work that trucks perform for us.

When I say truck, I am not referring to class 2 light trucks like pickups, which use 13.2 % of U.S. transportation fuels. Rather, I am referring to the class 3–8 trucks in Table 4.1. These are the medium class 3–6 delivery, mail, cherry picker (bucket) trucks that use 4.6 % of transportation fuel, as well as the heavy-duty class 7–8b cement, bus, tow, garbage, fire, and four-axle trucks hauling freight on highways that consume 19 % of fuel. There are even higher classes of trucks, such as the five-axle (class 9) and seven-axle multi-trailer class 13 trucks. Altogether, there are many kinds of mainly diesel engine trucks and equipment used in agriculture, mining, oil and gas, construction, roads, logging, industry, fire, deliveries, hauling goods and garbage, and all the other essential services that make civilization possible.

When railroads were built, human settlements became less dependent on vessels for shipping, and inland populations grew, especially in towns and cities near railroad depots.

After World War II cheap oil made it possible to build distant suburbs and towns across the nation, connected by 4.1 million miles of roads. Now, people can live just about anywhere inland, so much so that four out of five communities depend entirely on trucks for all of their goods (ATA 2015). Virtually no one in these communities realize this. They are truck towns.

Clearly it would be better if ships, barges, and rail delivered goods across the map since they're far more energy efficient. But with only 25,000 miles of marine highway and 95,000 route miles of rail tracks, ships and rail can't compete with the four million miles of roads trucks travel on. Trucks dominate goods moving less

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Table 4.1 Comparing light-duty vehicles with medium- and heavy-duty vehicles

Class, application	Annual fuel (billion gallons)	% of fuel used	Annual fleet miles (billion)	Gross max weight	2006 number of vehicles	Typical mpg range 2007	Ton-mpg
1c, car	74,979	42.2	1682	6000	135,000,000	25–33	15
1t, small SUV	37,400	21.1	813	6000	70,000,000	20–25	17
2a, large SUV	18,000	10.1	305	8500	23,000,000	20–21	26
2b, van	5500	3.1	93	10,000	6,200,000	10–15	26
3, utility van	1462	0.8	12	14,000	690,000	8–13	30
4, delivery	533	0.3	4	16,000	290,000	7–12	42
5, bucket	258	0.1	2	19,500	170,000	6–12	39
6, school bus	6020	3.4	41	26,000	1,710,000	5–12	49
7, tow, refuse	1926	1.1	9	33,000	180,000	4–8	55
8a, dump	3509	2.0	12	80,000	430,000	2–6	115
8b, 18-wheeler	28,075	15.8	142	80,000	1,720,000	4–8	155
Total	177,662		3115		239,390,000		

Source (NRC 2010 Table 2.1, p. 35)

than 550 miles because it is usually faster, cheaper, and easier to deliver by truck, door-to-door. Eighty percentage of cargo goes less than 550 miles, and a truck can deliver that in a day. So that makes it tough to shift a lot of freight from trucks to rail or ships (Brogan et al. 2013). Even when rail is less expensive, trucks are often preferred for just-in-time, valuable, perishable, and fragile goods.

Today's global economy—where materials and components are sourced from all over the world before being assembled—would be inconceivable without the global transportation system. Trucks do a lot of the heavy lifting.

Take the case of an auto engine. Where do they come from? The supply chain for engines might involve 22 trucks from origin to destination. For example, **12 trucks** from different suppliers deliver the parts for an engine to a factory in Japan. Assembled engines are loaded onto a **truck** and taken to the port of Tokyo, where the container is lifted by a **crane** onto a ship, unloaded by a **crane** in Oakland, taken to a yard by a **reacher-stacker (RS) truck** to wait for a train, loaded onto a rail car by an **RS truck**, unloaded in a Detroit suburb by an **RS truck** and put on an **18-wheeler** bound for a distribution center, where the engines are taken out by **forklift** and reloaded into **two smaller delivery trucks** for delivery to an auto factory in Detroit.

That's nothing compared to Apple's supply chain, which has over 200 suppliers in 361 locations across 25 countries, delivered just-in-time to the factory assembling the final Apple computers and phones (Apple 2015). Each supplier has suppliers, beginning with the minerals and plastics the other parts are made from—all put together, like a giant Russian nested doll, into a finished product.

This mobile manufacturing miracle has its cost. Just-in-time supply chains waste a lot of fuel. To deliver only what is needed, trucks arrive more frequently, half-full, and often return partly or completely empty. On the other hand less energy is required to build and maintain storage buildings.

When trucks are full, they often don't carry their full weight. About 60 % of trucks fill up with goods before they reach their maximum load weight (Bradley et al. 2009). Often this is due to bulky packaging, though this can be reduced. For example, Hamburger Helper made their curly noodles flat, which shrank the carton 20 %, saving Walmart 500 truck deliveries a year (Forbis 2008).

Over the past few decades, truck fuel efficiency was doubled in the U.S., but trucks drove more miles, so total fuel consumption didn't decrease. This was due to the rebound effect, also known as Jevon's paradox, which occurs when efficiency is improved. So if a better engine allows a truck to go twice as far using half as much fuel, a truck driver is likely to drive twice as far, and oil consumption is not reduced.

Medium and heavy trucks burn 22 % of U.S. transportation fuel. This could be reduced by 33–50 % with better engines, tires, weight reduction, driver training, hybrid power trains, aerodynamics, longer or double trailers, better logistics, and other enhancements depending on how the truck is used (NRC 2010; HDT 2014). On the other hand, many of these changes would themselves require energy, for capital costs or retiring otherwise perfectly good capital equipment early.

These improvements could shift up to 10 % of cargo from rail to truck, with little benefit, since heavy trucks cause so much road damage. Right now, truck fees cover only 20–50 % of the damage trucks do to roads, with taxpayers stuck picking up the rest of the bill. This makes trucks appear to be less expensive than they are, shifting some cargo from energy-efficient rail and ships to trucks (Parry et al. 2014).

Trucks already have a huge monetary advantage over privately funded rail and poorly-funded maritime transport because the government spends $146 billion on building and maintaining roads every year.

This shift away from energy efficiency will increase if a consortium of industries succeeds in raising maximum truck weight to 97,000 pounds from the current 80,000 (CTP 2015). If that happens, up to 20 % of rail cargo might shift to trucks, and even more if truck lengths increase (NPC 2012). The extra weight would cause 50–63 % more damage to roads and bridges costing $65 billion, on top of the existing $200 billion in repairs needed, resulting in eight million more heavy trucks on rural roads. Country roads are not built to withstand even 80,000 pounds (CRS 2012; FHWA 2000; Hjort et al. 2008; House 113-36 2013; Swift 2012; USDOE 2008; USDOT 2000).

Conclusion

The American way of life sprawls along four million miles of roads. This remarkable web of asphalt may not be sustainable. In "The Big Roads", Swift (2012) explores the history of the 47,000 mile federal interstate highway system. He concludes that since vehicles are so dependent on oil, our four million miles of roads will be a spectacular waste of money if new fuel sources aren't found.

The subsequent chapters look at what makes the world go round, oil, on how oil became integral to civilization as we know it, and after that, what other fuels could propel diesel engines when oil begins its inevitable decline. Especially what could fuel trucks, since everything in our fossil-fueled civilization, including the electric grid, depends on them.

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