Chapter 4
Light Vehicles and Characteristics

Summary Statistics from Tables in this Chapter

Source		
Table 4.1	Cars, 2014	
	Registrations (thousands)	*113,899*
	Vehicle miles (billion miles)	*1,436.6*
	Fuel economy (miles per gallon)	*25.4*
Table 4.2	Two-axle, four-tire trucks, 2014	
	Registrations (thousands)	*124,681*
	Vehicle miles (billion miles)	*1,274.0*
	Fuel economy (miles per gallon)	*18.5*
Table 4.7	Light truck share of total light vehicle sales	
	1970 calendar year	*14.8%*
	2015 calendar year	*56.0%*
Table 4.12	Car production share, 2015 model year	59.6%
	Car	*49.0%*
	Car SUV	*10.6%*
Table 4.12	Light truck production share, 2015 model year	*40.4%*
	Pickup	*13.4%*
	Van	*3.5%*
	Truck SUV	*23.6%*
Tables 4.21	Corporate average fuel economy	(mpg)
and 4.22	*Domestic car standard, MY 2016*	*36.5*
	Import car standard, MY 2016	*37.3*
	Light truck standard, MY 2016 (unreformed)	*28.8*
	Light truck fuel economy, MY 2016	*27.6*
Table 4.28	Average fuel economy loss from 50 to 70 mph	24.5%

The data in this table from 1985–on DO NOT include minivans, pickups, or sport utility vehicles. Much of the data for 2009-on were estimated; the FHWA no longer publishes travel and fuel data for cars. A methodology change for the number of cars registered affected the series in 2012.

Table 4.1
Summary Statistics for Cars, 1970–2014

Year	Registrations[a] (thousands)	Vehicle travel (billion miles)	Miles (per vehicle)	Fuel use (million gallons)	Fuel economy[b] (miles per gallon)	
1970	89,244	916.7	10,272	67,820	13.5	
1975	106,706	1,034.0	9,690	74,140	13.9	
1980	121,601	1,111.6	9,141	69,981	15.9	
1985[c]	127,885	1,246.8	9,749	71,518	17.4	
1986	130,004	1,270.2	9,770	73,174	17.4	
1987	131,482	1,316.0	10,009	73,308	18.0	
1988	133,836	1,370.3	10,238	73,345	18.7	
1989	134,559	1,401.2	10,413	73,913	19.0	
1990	133,700	1,408.3	10,533	69,568	20.2	
1991	128,300	1,358.2	10,586	64,318	21.1	
1992	126,581	1,371.6	10,836	65,436	21.0	
1993	127,327	1,374.7	10,797	67,047	20.5	
1994	127,883	1,406.1	10,995	67,874	20.7	
1995	128,387	1,438.3	11,203	68,072	21.1	
1996	129,728	1,469.9	11,330	69,221	21.2	
1997	129,749	1,502.6	11,580	69,892	21.5	
1998	131,839	1,549.6	11,754	71,695	21.6	
1999	132,432	1,569.1	11,848	73,283	21.4	
2000	133,621	1,600.3	11,976	73,065	21.9	
2001	137,633	1,628.3	11,831	73,559	22.1	
2002	135,921	1,658.5	12,202	75,471	22.0	
2003	135,670	1,672.1	12,325	74,590	22.4	
2004	136,431	1,699.9	12,460	75,402	22.5	
2005	136,568	1,708.4	12,510	77,418	22.1	
2006	135,400	1,690.5	12,485	75,009	22.5	
2007	135,933	1,672.5	12,304	74,377	22.5	
2008	137,080	1,615.9	11,788	71,497	22.6	[d]
2009	134,880	1,566.8	11,616	66,587	23.5	
2010	130,892	1,496.4	11,432	62,245	24.0	
2011	125,657	1,457.8	11,601	59,646	24.4	
2012	111,290	1,438.8	12,928	57,899	24.9	
2013	113,676	1,446.0	12,720	57,290	25.2	
2014	113,899	1,436.6	12,613	56,470	25.4	
			Average annual percentage change			
1970–2014	0.6%	1.0%	0.5%	-0.4%	1.5%	
2004–2014	-1.8%	-1.7%	0.1%	-2.8%	1.2%	

Source:
1970-2008: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2009*, Washington, DC, 2011, Table VM-1 and annual. 2009-on: See Section 7.1 in Appendix A. (Additional resources: www.fhwa.dot.gov)

[a] This number differs from IHS Automotive's estimates of "number of cars in use." See Table 3.4.
[b] Fuel economy for car population.
[c] Beginning in this year the data were revised to exclude minivans, pickups and sport utility vehicles which may have been previously included.
[d] Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

Much of the data for 2009-on were estimated; the FHWA no longer publishes travel and fuel use data for two-axle, four-tire trucks. A methodology change for the number of registrations affected the data series in 2012.

Table 4.2
Summary Statistics for Two-Axle, Four-Tire Trucks, 1970–2014

Year	Registrations (thousands)	Vehicle travel (billion miles)	Miles (per vehicle)	Fuel use (million gallons)	Fuel economy (miles per gallon)
1970	14,211	123.3	8,675	12,313	10.0
1975	20,418	200.7	9,830	19,081	10.5
1980	27,876	290.9	10,437	23,796	12.2
1981	28,928	296.3	10,244	23,697	12.5
1982	29,792	306.1	10,276	22,702	13.5
1983	31,214	327.6	10,497	23,945	13.7
1984	32,106	358.0	11,151	25,604	14.0
1985[a]	37,214	391.0	10,506	27,363	14.3
1986	39,382	423.9	10,764	29,074	14.6
1987	41,107	456.9	11,114	30,598	14.9
1988	43,805	502.2	11,465	32,653	15.4
1989	45,945	536.5	11,676	33,271	16.1
1990	48,275	574.6	11,902	35,611	16.1
1991	53,033	649.4	12,245	38,217	17.0
1992	57,091	706.9	12,381	40,929	17.3
1993	59,994	745.8	12,430	42,851	17.4
1994	62,904	764.6	12,156	44,112	17.3
1995	65,738	790.0	12,018	45,605	17.3
1996	69,134	816.5	11,811	47,354	17.2
1997	70,224	850.7	12,115	49,389	17.2
1998	71,330	868.3	12,173	50,462	17.2
1999	75,356	901.0	11,957	52,859	17.0
2000	79,085	923.1	11,672	52,939	17.4
2001	84,188	943.2	11,204	53,522	17.6
2002	85,011	966.0	11,364	55,220	17.5
2003	87,187	984.1	11,287	60,758	16.2
2004	91,845	1,027.2	11,184	63,417	16.2
2005	95,337	1,041.1	10,920	58,869	17.7
2006	99,125	1,082.5	10,920	60,685	17.8
2007	101,470	1,112.3	10,962	61,836	18.0
2008	101,235	1,108.6	10,951	61,199	18.1 [b]
2009	100,154	1,066.5	10,649	61,824	17.3
2010	102,702	1,152.1	11,218	64,687	17.8
2011	105,571	1,192.7	11,298	65,786	18.1
2012	120,847	1,225.6	10,142	66,395	18.5
2013	120,523	1,231.8	10,220	65,555	18.8
2014	124,681	1,274.0	10,218	69,012	18.5
			Average annual percentage change		
1970–2014	5.1%	5.5%	0.4%	4.0%	1.4%
2004–2014	3.1%	2.2%	-0.9%	-0.7%	1.3%

Source:
1970-2008: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2009*, Washington, DC, 2011, Table MV-9. Previous years Table VM-1. 2009-on: See Section 7.2 in Appendix A. (Additional resources: www.fhwa.dot.gov)

[a] Beginning in this year the data were revised to include all vans (including mini-vans), pickups and sport utility vehicles.

[b] Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

These data are the combination of the car and two-axle, four-tire truck data from Tables 4.1 and 4.2. The methodology change after 2008 affects these data as well. However, there is no change in registration methodology for total light vehicles in 2012, as there is for the car and two-axle, four-tire truck categories.

Table 4.3
Summary Statistics for Light Vehicles, 1970–2014

Year	Registrations (thousands)	Vehicle travel (billion miles)	Miles (per vehicle)	Fuel use (million gallons)	Fuel economy (miles per gallon)
1970	103,455	1,040	10,053	80,133	13.0
1975	127,124	1,235	9,712	93,221	13.2
1980	149,477	1,403	9,383	93,777	15.0
1981	152,026	1,430	9,404	92,809	15.4
1982	153,494	1,468	9,563	91,818	16.0
1983	157,658	1,523	9,658	94,267	16.2
1984	160,264	1,585	9,890	96,267	16.5
1985[a]	165,099	1,638	9,920	98,881	16.6
1986	169,386	1,694	10,001	102,248	16.6
1987	172,589	1,773	10,272	103,906	17.1
1988	177,641	1,872	10,541	105,998	17.7
1989	180,504	1,938	10,735	107,184	18.1
1990	181,975	1,983	10,896	105,179	18.9
1991	181,333	2,008	11,071	102,535	19.6
1992	183,672	2,078	11,316	106,365	19.5
1993	187,321	2,120	11,320	109,898	19.3
1994	190,787	2,171	11,378	111,986	19.4
1995	194,125	2,228	11,479	113,677	19.6
1996	198,862	2,286	11,497	116,575	19.6
1997	199,973	2,353	11,768	119,281	19.7
1998	203,169	2,418	11,901	122,157	19.8
1999	207,788	2,470	11,888	126,142	19.6
2000	212,706	2,523	11,863	126,004	20.0
2001	221,821	2,572	11,593	127,081	20.2
2002	220,932	2,625	11,879	130,691	20.1
2003	222,857	2,656	11,919	135,348	19.6
2004	228,276	2,727	11,946	138,819	19.6
2005	231,905	2,749	11,856	136,287	20.2
2006	234,525	2,773	11,824	135,694	20.4
2007	237,403	2,785	11,730	136,213	20.4
2008	238,315	2,724	11,432	132,696	20.5 [b]
2009	235,034	2,633	11,204	128,411	20.5
2010	233,594	2,649	11,338	126,932	20.9
2011	231,228	2,651	11,463	125,432	21.1
2012	232,137	2,664	11,478	124,294	21.4
2013	234,199	2,678	11,434	122,845	21.8
2014	238,580	2,711	11,361	125,482	21.6
			Average annual percentage change		
1970–2014	1.9%	2.2%	0.3%	1.0%	1.2%
2004–2014	0.4%	-0.1%	-0.5%	-1.0%	1.0%

Source:
U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 2014*, Washington, DC, 2015, Table VM-1. (Additional resources: www.fhwa.dot.gov)

[a] Beginning in this year the data were revised to include all vans (including mini-vans), pickups and sport utility vehicles.
[b] Due to FHWA methodology changes, data from 2009-on are not comparable with previous data.

Because data on Class 2b trucks are scarce, the U.S. DOE funded a study to investigate available sources of data. In the final report, four methodologies are described to estimate the sales of Class 2b trucks. Until another study is funded, the 1999 data are the latest available.

Table 4.4
Summary Statistics on Class 1, Class 2a, and Class 2b Light Trucks

	CY 1999 truck sales (millions)	2000 truck population (millions)	Percent diesel trucks in population	Average age (years)	Estimated annual miles[a] (billions)	Estimated fuel use (billion[a] gallons)	Estimated fuel economy (miles per gallon)
Class 1	5.7	49.7	0.3%	7.3	672.7	37.4	18.0
Class 2a	1.8	19.2	2.5%	7.4	251.9	18.0	14.0
Class 2b	0.5	5.8	24.0%	8.6	76.7	5.5	13.9

Note: CY - calendar year.

Source:
Davis, S.C. and L.F. Truett, *Investigation of Class 2b Trucks (Vehicles of 8,500 to 10,000 lbs GVWR)*, ORNL/TM-2002/49, March 2002, Table 16.

Table 4.5
Sales Estimates of Class 1, Class 2a, and Class 2b Light Trucks, 1989–1999

	Sales estimates (thousands)			
Calendar year	Class 1 (6,000 lbs and under)	Class 2a (6,001-8,500 lbs)	Class 2b (8,501-10,000 lbs)	Total
1989	3,313	918	379	4,610
1990	3,451	829	268	4,548
1991	3,246	670	206	4,122
1992	3,608	827	194	4,629
1993	4,119	975	257	5,351
1994	4,527	1,241	265	6,033
1995	4,422	1,304	327	6,053
1996	4,829	1,356	334	6,519
1997	5,085	1,315	397	6,797
1998	5,263	1,694	342	7,299
1999	5,707	1,845	521	8,073
		Percent change		
1989–1999	72.3%	101.0%	37.5%	75.1%

Note: These data were calculated using Methodology 4 from the report.

Source:
Davis, S.C. and L.F. Truett, *Investigation of Class 2b Trucks (Vehicles of 8,500 to 10,000 lbs GVWR)*, ORNL/TM-2002/49, March 2002, Table 1.

[a] Estimates derived using 2000 population data and 1997 usage data. See source for details.

Car sales in 2009 and 2010 were below 6 million but increased to more than 7.5 million by 2015. In 1980, the Big 3 (FCA, Ford and General Motors) held 73.8% of the market; by 2015, that had dropped to 29.8%.

Table 4.6
New Retail Car Sales in the United States, 1970–2015

Calendar year	Domestic[a]	Import[b]	Total[c]	Percentage imports	Percentage Big 3 sales[d]	Percentage diesel
		(thousands)				
1970	7,119	1,280	8,399	15.2%	[e]	0.07%
1975	7,053	1,571	8,624	18.2%	[e]	0.31%
1980	6,580	2,369	8,949	26.5%	73.8%	4.32%
1985	8,205	2,775	10,979	25.3%	72.9%	0.83%
1990	6,919	2,384	9,303	25.6%	65.7%	0.08%
1991	6,162	2,023	8,185	24.7%	64.2%	0.10%
1992	6,286	1,927	8,213	23.5%	65.8%	0.06%
1993	6,742	1,776	8,518	20.9%	67.3%	0.04%
1994	7,255	1,735	8,991	19.3%	65.9%	0.04%
1995	7,114	1,506	8,620	17.5%	65.3%	0.03%
1996	7,206	1,272	8,479	15.0%	64.1%	0.09%
1997	6,862	1,355	8,217	16.5%	62.2%	0.09%
1998	6,705	1,380	8,085	17.1%	59.7%	0.14%
1999	6,919	1,719	8,638	19.9%	58.3%	0.16%
2000	6,762	2,016	8,778	23.0%	55.0%	0.26%
2001	6,254	2,098	8,352	25.1%	51.4%	0.18%
2002	5,817	2,226	8,042	27.7%	48.4%	0.39%
2003	5,473	2,083	7,556	27.6%	47.1%	0.52%
2004	5,333	2,149	7,483	28.7%	44.9%	0.40%
2005	5,473	2,187	7,660	28.5%	43.1%	0.63%
2006	5,417	2,345	7,762	30.2%	40.5%	0.82%
2007	5,197	2,365	7,562	31.3%	36.9%	0.10%
2008	4,491	2,278	6,769	33.7%	34.2%	0.11%
2009	3,558	1,843	5,402	34.1%	31.3%	2.93%
2010	3,791	1,844	5,636	32.7%	31.7%	2.69%
2011	4,143	1,947	6,090	32.0%	33.3%	1.47%
2012	5,119	2,125	7,244	29.3%	31.6%	2.69%
2013	5,433	2,153	7,585	28.4%	32.4%	2.45%
2014	5,591	2,098	7,689	27.3%	31.1%	2.42%
2015	5,611	1,914	7,525	25.4%	29.8%	2.02%
		Average annual percentage change				
1970–2015	-0.5%	0.9%	-0.2%			
2005–2015	0.2%	-1.3%	0.2%			

Source:

Domestic and import data - 1970–97: American Automobile Manufacturers Association, *Motor Vehicle Facts and Figures 1998*, Detroit, MI, 1998, p. 15, and annual. 1997 data from *Economic Indicators, 4th Quarter 1997*. 1998–2010: Ward's Communication, *Ward's Automotive Yearbook*, Detroit, MI, 2009, p. 249. 2011-2015: Ward's Communications, www.wardsauto.com.

Diesel data - Ward's Communications, *Ward's Automotive Yearbook*, Detroit, MI, 2009, p. 31, and Ward's Communications, www.wardsauto.com.

[a] Any vehicle built in North America regardless of manufacturer.

[b] Any vehicle built outside of North America regardless of manufacturer. Does not include import tourist deliveries.

[c] Sums may not add to totals due to rounding.

[d] Big 3 includes Ford, General Motors, and Fiat-Chrysler (and predecessor entities).

[e] Data are not available.

Light trucks, which include pick-ups, minivans, sport-utility vehicles, and other trucks less than 10,000 pounds gross vehicle weight (GVW), accounted for more than half of light vehicle sales from 2001 to 2007 and again from 2011 to 2015.

Table 4.7
New Retail Sales of Trucks 10,000 Pounds GVW and Less in the United States, 1970–2015

		Percentages				
Calendar year	Light truck sales[a] (thousands)	Import[b]	Big 3 sales[c]	Diesel[d]	Light trucks of light-duty vehicle sales[e]	Light trucks of total truck sales
1970	1,457	4.5%	Not available	[f]	14.8%	80.5%
1975	2,053	10.0%	Not available	[f]	20.9%	82.8%
1980	1,960	24.4%	Not available	4.0%	17.5%	78.6%
1985	3,688	22.6%	78.2%	4.0%	25.1%	77.7%
1986	4,594	21.3%	76.9%	3.7%	28.7%	93.4%
1987	4,610	20.0%	78.3%	2.3%	31.1%	92.2%
1988	4,800	14.8%	81.6%	2.3%	31.3%	91.5%
1989	4,610	13.9%	81.9%	2.9%	32.0%	91.0%
1990	4,548	13.5%	80.9%	2.3%	32.8%	93.8%
1991	4,122	13.1%	79.4%	3.2%	33.5%	94.4%
1992	4,629	8.8%	83.1%	2.5%	36.0%	94.4%
1993	5,351	7.1%	83.4%	2.3%	38.6%	94.2%
1994	6,033	6.8%	82.9%	2.5%	40.2%	94.0%
1995	6,053	6.6%	83.4%	3.8%	41.3%	93.2%
1996	6,519	6.7%	83.8%	3.1%	43.5%	93.4%
1997	6,797	8.5%	81.9%	2.7%	45.3%	93.4%
1998	7,299	9.0%	80.5%	2.6%	47.4%	92.6%
1999	8,073	9.6%	78.0%	2.9%	48.3%	92.0%
2000	8,386	10.2%	76.1%	3.4%	48.9%	92.8%
2001	8,598	11.4%	75.3%	2.9%	50.7%	94.3%
2002	8,633	12.4%	74.7%	2.7%	51.8%	94.9%
2003	8,938	13.7%	72.4%	2.9%	54.2%	95.0%
2004	9,254	13.5%	70.1%	2.8%	55.3%	94.3%
2005	9,114	13.3%	68.2%	2.7%	54.3%	93.1%
2006	8,574	15.7%	63.9%	2.8%	52.5%	92.3%
2007	8,305	16.7%	61.9%	3.2%	52.3%	93.3%
2008	6,246	17.6%	61.2%	3.4%	48.0%	92.9%
2009	4,834	18.3%	57.8%	4.2%	47.2%	93.0%
2010	5,758	15.6%	57.6%	4.9%	50.5%	93.8%
2011	6,449	15.2%	59.4%	5.4%	51.4%	92.8%
2012	6,975	15.2%	57.7%	5.5%	49.1%	92.5%
2013	7,693	16.1%	57.3%	5.3%	50.4%	92.7%
2014	8,484	16.0%	57.6%	5.4%	52.5%	92.7%
2015	9,578	18.6%	56.9%	5.5%	56.0%	92.9%
		Average annual percentage change				
1970–2015	4.3%					
2005–2015	0.5%					

Source:
Ward's Communications, *Ward's Automotive Yearbook*, Detroit, MI, 2014, and updates at www.wardsauto.com. (Additional resources: www.wardsauto.com)

[a] Includes all trucks of 10,000 pounds gross vehicle weight and less sold in the United States.
[b] Excluding transplants.
[c] Big 3 includes Ford, General Motors, and Fiat-Chrysler (and predecessor entities).
[d] Based on model year factory installations.
[e] Light-duty vehicles include cars and light trucks.
[f] Indicates less than 1 percent.

The production-weighted fuel economy of cars increased dramatically from 1975 (13.5 mpg) to 1985 (23.0 mpg), but rose only 0.5 mpg from 1985 to 2005. Since 2005, fuel economy rose 5.8 mpg—from 23.5 mpg in 2005 to 29.3 mpg in 2015. The fuel economy values have been adjusted to provide the best estimate of real world performance.

Table 4.8
Production, Production Shares, and Production-Weighted Fuel Economies of New Domestic and Import Cars, Model Years 1975-2015[a]

	Car			Car SUV		
Model year	Production (thousands)	Production share (%)[b]	Fuel economy (mpg)	Production (thousands)	Production share (%)[b]	Fuel economy (mpg)
1975	8,237	99.9%	13.5	10	0.1%	11.1
1980	9,443	100.0%	20.0	0	0.0%	14.6
1985	10,791	99.2%	23.0	88	0.8%	20.1
1986	11,015	99.5%	23.7	59	0.5%	18.9
1987	10,731	99.1%	23.8	95	0.9%	19.4
1988	10,736	99.0%	24.1	109	1.0%	19.2
1989	10,018	98.9%	23.7	108	1.1%	19.1
1990	8,810	99.3%	23.3	65	0.7%	18.8
1991	8,524	97.4%	23.4	224	2.6%	18.2
1992	8,108	97.1%	23.1	243	2.9%	17.8
1993	8,456	94.7%	23.5	473	5.3%	17.0
1994	8,415	96.2%	23.3	332	3.8%	18.0
1995	9,396	97.7%	23.4	220	2.3%	17.8
1996	7,890	96.5%	23.3	287	3.5%	18.4
1997	8,334	95.8%	23.4	361	4.2%	19.2
1998	7,971	94.6%	23.4	454	5.4%	18.2
1999	8,376	94.5%	23.0	488	5.5%	18.5
2000	9,125	93.7%	22.9	617	6.3%	17.9
2001	8,405	91.9%	23.0	743	8.1%	18.8
2002	8,301	93.2%	23.1	603	6.8%	19.3
2003	7,921	93.2%	23.3	575	6.8%	19.9
2004	7,537	92.2%	23.1	639	7.8%	20.0
2005	8,027	90.8%	23.5	813	9.2%	20.2
2006	7,993	91.4%	23.3	751	8.6%	20.5
2007	8,082	89.8%	24.1	919	10.2%	20.6
2008	7,319	88.8%	24.3	924	11.2%	21.2
2009	5,636	90.3%	25.3	608	9.7%	22.0
2010	6,061	86.9%	26.2	915	13.1%	23.0
2011	5,743	82.6%	26.1	1,207	17.4%	23.7
2012	7,392	85.4%	27.9	1,265	14.6%	23.4
2013	8,226	84.5%	28.6	1,514	15.5%	24.5
2014	7,639	83.0%	28.7	1,566	17.0%	24.6
2015	[c]	82.2%	29.3	[c]	17.8%	24.9

Note: See Table 4.11 for all cars (car + car SUV). See Table 4.9 for car SUV listing.

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See section 10 of the source document for details on adjustment methodology.
[b] Production share is based on total of cars plus car SUVs. Percentages may not sum to totals due to rounding.
[c] Data are not available.

A vehicle classification was created to match the Corporate Average Fuel Economy (CAFE) methodology. Under CAFE, small, two-wheel drive sport utility vehicles will be held to the same standards as cars. The Environmental Protection Agency has defined these vehicles as "car SUVs." The vehicles below make up this category.

Table 4.9
Definition of Car Sport Utility Vehicles in Model Year 2015

Acura RDX 2WD	Kia Sorento AWD
BMW X3 sDrive 28i	Kia Sorento FWD
Buick Encore	Kia Sportage FWD
Cadillac SRX	Kia Sportage SX FWD
Cadillac SRX AWD	Lexus NX 200t
Cadillac XTS Hearse	Lexus NX 200t AWD F Sport
Cadillac XTS Limo	Lexus NX 300h
Chevrolet Captiva FWD	Lexus RX 350
Chevrolet Equinox AWD	Lexus RX 350 AWD
Chevrolet Trax	Lexus RX 450h
Dodge Journey	Lexus RX 450h AWD
Ford Edge FWD	Lincoln MKC FWD
Ford Escape FWD	Lincoln MKX FWD
Ford Transit Connect Wagon FWD	Mazda CX-5 2WD
GMC Terrain AWD	Mercedes-Benz GLK 350
Honda Crosstour 2WD	Mitsubishi Outlander Sport 2WD
Honda Crosstour 4WD	Nissan NV200 NYC Taxi
Honda CR-V 2WD	Nissan Rogue FWD
Hyundai Santa Fe Sport AWD	Nissan Rogue Select
Hyundai Santa Fe Sport FWD	Nissan XTERRA 2WD
Hyundai Santa Fe Sport Ultimate FWD	RAM Promaster City
Hyundai Tucson Fuel Cell [a]	Toyota RAV4
Hyundai Tucson FWD	Toyota RAV4 LE/XLE
Infiniti QX70 RWD	Toyota Venza
Jeep Cherokee FWD	Volkswagen Tiguan
Jeep Patriot FWD	Volvo XC60 FWD
Jeep Renegade 4x2	Volvo XC70 FWD

Note: 2WD = Two-wheel drive. 4WD = Four-wheel drive. AWD = All-wheel drive. FWD = Front-wheel drive.

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] Alternative fuel vehicle.

Production of sport utility vehicles (SUVs) has grown substantially since 1975. The production-weighted fuel economy of SUVs was more than 21 mpg in 2015. Almost 60% of all light trucks produced in 2015 were SUVs.

Table 4.10
Production, Production Shares, and Production-Weighted Fuel Economies of New Domestic and Import Light Trucks, Model Years 1975-2015[a]

	Pickup			Van			Truck SUV		
Model Year	Production (Thousands)	Share (%)[b]	Fuel Economy (mpg)	Production (Thousands)	Share (%)[b]	Fuel Economy (mpg)	Production (Thousands)	Share (%)[b]	Fuel Economy (mpg)
1975	1,343	67.9%	11.9	457	23.1%	11.1	177	9.0%	11.0
1980	1,437	77.1%	16.5	242	13.0%	14.1	184	9.9%	13.2
1981	1,440	79.1%	17.9	245	13.5%	14.8	136	7.5%	14.3
1982	1,441	75.8%	18.5	311	16.4%	14.7	150	7.9%	14.7
1983	1,628	71.8%	18.9	383	16.9%	15.1	256	11.3%	15.8
1984	2,043	62.1%	18.3	676	20.6%	16.1	570	17.3%	16.2
1985	2,078	58.0%	18.2	855	23.9%	16.5	648	18.1%	16.5
1986	2,532	59.0%	18.9	1,044	24.3%	17.5	714	16.6%	17.0
1987	2,147	53.2%	19.0	1,114	27.6%	17.7	779	19.3%	17.3
1988	2,459	55.3%	18.1	1,133	25.5%	17.9	859	19.3%	17.0
1989	2,232	51.6%	17.8	1,278	29.5%	17.8	818	18.9%	16.6
1990	1,835	49.1%	17.4	1,262	33.7%	17.8	643	17.2%	16.4
1991	1,920	50.2%	18.2	1,034	27.0%	17.9	871	22.8%	16.7
1992	1,840	48.1%	17.5	1,221	31.9%	17.9	761	19.9%	16.2
1993	2,002	46.8%	17.6	1,441	33.7%	18.2	838	19.6%	16.3
1994	2,669	49.6%	17.4	1,418	26.4%	17.8	1,291	24.0%	16.0
1995	2,271	41.1%	16.9	1,662	30.1%	18.1	1,596	28.9%	16.0
1996	1,955	39.4%	17.1	1,409	28.4%	18.3	1,603	32.3%	16.2
1997	2,408	41.8%	16.8	1,265	22.0%	18.2	2,089	36.3%	16.1
1998	2,415	40.0%	17.0	1,489	24.7%	18.7	2,127	35.3%	16.2
1999	2,544	40.1%	16.3	1,463	23.0%	18.3	2,342	36.9%	16.1
2000	2,612	38.2%	16.7	1,691	24.8%	18.6	2,526	37.0%	16.0
2001	2,519	39.0%	16.0	1,232	19.1%	18.0	2,707	41.9%	16.4
2002	2,380	33.0%	15.8	1,243	17.2%	18.7	3,588	49.8%	16.3
2003	2,474	34.0%	16.1	1,232	16.9%	19.0	3,571	49.1%	16.4
2004	2,505	33.3%	15.7	953	12.7%	19.2	4,075	54.1%	16.5
2005	2,300	32.6%	15.8	1,481	21.0%	19.3	3,272	46.4%	16.7
2006	2,188	34.4%	16.1	1,166	18.3%	19.5	3,006	47.3%	17.2
2007	2,113	33.7%	16.2	847	13.5%	19.5	3,314	52.8%	17.7
2008	1,794	31.7%	16.5	790	14.0%	19.8	3,072	54.3%	18.2
2009	989	32.2%	16.9	368	12.0%	20.1	1,714	55.8%	19.3
2010	1,276	30.8%	16.9	559	13.5%	20.1	2,305	55.7%	19.7
2011	1,479	29.2%	17.2	521	10.3%	21.0	3,069	60.5%	19.8
2012	1,357	28.3%	17.2	661	13.8%	21.3	2,771	57.8%	20.0
2013	1,577	28.9%	17.4	571	10.5%	21.1	3,310	60.6%	20.9
2014	1,929	30.6%	18.0	672	10.7%	21.3	3,706	58.8%	21.7
2015	[c]	33.2%	18.9	[c]	8.7%	21.9	[c]	58.4%	21.7

Note: Includes light trucks of 8,500 lbs. or less. See Table 4.11 for all light trucks (pickup + van + truck SUV).

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See section 10 of the source document for details on adjustment methodology.

[b] Production share is based on the total of pickups, plus vans and truck SUVs. Percentages may not sum to totals due to rounding.

[c] Data are not available.

The average fuel economy of cars more than doubled from 1975 to 2015 while the average fuel economy of light trucks grew by 78% in that same time period. This was not steady annual growth, but growth in the 1970's and early 1980's followed by a long period with little improvement. Growth resumed around 2008-2009.

Table 4.11
Production and Production-Weighted Fuel Economies of New Domestic and Import Cars, Light Trucks and Light Vehicles, Model Years 1975-2015[a]

	All Cars		All Light Trucks		All Light Vehicles	
Model Year	Production (Thousands)	Fuel Economy (mpg)	Production (Thousands)	Fuel Economy (mpg)	Production (Thousands)	Fuel Economy (mpg)
1975	8,247	13.5	1,977	11.6	10,224	13.1
1980	9,444	20.0	1,863	15.8	11,307	19.2
1981	8,734	21.4	1,821	17.1	10,555	20.5
1982	7,832	22.2	1,901	17.4	9,733	21.1
1983	8,035	22.1	2,267	17.7	10,302	21.0
1984	10,730	22.4	3,289	17.4	14,019	21.0
1985	10,879	23.0	3,581	17.5	14,460	21.3
1986	11,074	23.7	4,291	18.2	15,365	21.8
1987	10,826	23.8	4,039	18.3	14,865	22.0
1988	10,845	24.1	4,450	17.8	15,295	21.9
1989	10,126	23.6	4,327	17.6	14,453	21.4
1990	8,875	23.3	3,740	17.4	12,615	21.2
1991	8,748	23.3	3,825	17.8	12,573	21.3
1992	8,350	22.9	3,822	17.3	12,172	20.8
1993	8,929	23.0	4,281	17.5	13,210	20.9
1994	8,747	23.0	5,378	17.2	14,125	20.4
1995	9,616	23.3	5,529	17.0	15,145	20.5
1996	8,177	23.1	4,967	17.2	13,144	20.4
1997	8,695	23.2	5,762	16.8	14,457	20.2
1998	8,425	23.0	6,030	17.1	14,455	20.1
1999	8,865	22.7	6,350	16.6	15,215	19.7
2000	9,742	22.5	6,829	16.8	16,571	19.8
2001	9,148	22.6	6,458	16.5	15,606	19.6
2002	8,904	22.8	7,211	16.5	16,115	19.5
2003	8,496	23.0	7,277	16.7	15,773	19.6
2004	8,176	22.9	7,533	16.5	15,709	19.3
2005	8,839	23.1	7,053	16.9	15,892	19.9
2006	8,744	23.0	6,360	17.2	15,104	20.1
2007	9,001	23.7	6,275	17.4	15,276	20.6
2008	8,243	23.9	5,656	17.8	13,898	21.0
2009	6,244	25.0	3,071	18.5	9,316	22.4
2010	6,976	25.7	4,141	18.8	11,116	22.6
2011	6,949	25.6	5,069	19.1	12,018	22.4
2012	8,658	27.1	4,790	19.3	13,448	23.7
2013	9,740	27.9	5,458	19.8	15,198	24.3
2014	9,205	27.9	6,307	20.4	15,512	24.3
2015	[b]	28.4	[b]	20.7	[b]	24.7

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] The fuel economy data on this table are adjusted to provide the best estimate of real world performance. See section 10 of the source document for details on adjustment methodology.
[b] Data are not available, but 59.6% of all light vehicles were cars and 40.4% were light trucks in 2015.

Back in 1975 only 19.3% of new light vehicles produced were light trucks. Because of the boom in production of minivans, sport utility vehicles, and pick-up trucks, that number rose to over 40% in 1998. The car SUV category was about 10% of production in 2015.

Table 4.12
Light Vehicle Production Shares[a], Model Years 1975–2015

Model Year	Car	Car SUV	Pickup	Van	Truck SUV	Total Light Vehicles Produced (thousands)	Production Share: Cars[b]	Production Share: Light Trucks
1975	80.6%	0.1%	13.1%	4.5%	1.7%	10,224	80.7%	19.3%
1980	83.5%	0.0%	12.7%	2.1%	1.6%	11,306	83.5%	16.5%
1981	82.7%	0.0%	13.6%	2.3%	1.3%	10,554	82.8%	17.3%
1982	80.3%	0.1%	14.8%	3.2%	1.5%	9,732	80.5%	19.5%
1983	77.7%	0.3%	15.8%	3.7%	2.5%	10,302	78.0%	22.0%
1984	76.1%	0.4%	14.6%	4.8%	4.1%	14,020	76.5%	23.5%
1985	74.6%	0.6%	14.4%	5.9%	4.5%	14,460	75.2%	24.8%
1986	71.7%	0.4%	16.5%	6.8%	4.6%	15,365	72.1%	27.9%
1987	72.2%	0.6%	14.4%	7.5%	5.2%	14,865	72.8%	27.2%
1988	70.2%	0.7%	16.1%	7.4%	5.6%	15,295	70.9%	29.1%
1989	69.3%	0.7%	15.4%	8.8%	5.7%	14,453	70.1%	29.9%
1990	69.8%	0.5%	14.5%	10.0%	5.1%	12,615	70.4%	29.6%
1991	67.8%	1.8%	15.3%	8.2%	6.9%	12,573	69.6%	30.4%
1992	66.6%	2.0%	15.1%	10.0%	6.2%	12,172	68.6%	31.4%
1993	64.0%	3.6%	15.2%	10.9%	6.3%	13,211	67.6%	32.4%
1994	59.6%	2.3%	18.9%	10.0%	9.1%	14,125	61.9%	38.1%
1995	62.0%	1.5%	15.0%	11.0%	10.5%	15,145	63.5%	36.5%
1996	60.0%	2.2%	14.9%	10.7%	12.2%	13,144	62.2%	37.8%
1997	57.6%	2.5%	16.7%	8.8%	14.5%	14,458	60.1%	39.9%
1998	55.1%	3.1%	16.7%	10.3%	14.7%	14,456	58.3%	41.7%
1999	55.1%	3.2%	16.7%	9.6%	15.4%	15,215	58.3%	41.7%
2000	55.1%	3.7%	15.8%	10.2%	15.2%	16,571	58.8%	41.2%
2001	53.9%	4.8%	16.1%	7.9%	17.3%	15,605	58.6%	41.4%
2002	51.5%	3.7%	14.8%	7.7%	22.3%	16,115	55.3%	44.7%
2003	50.2%	3.6%	15.7%	7.8%	22.6%	15,773	53.9%	46.1%
2004	48.0%	4.1%	15.9%	6.1%	25.9%	15,709	52.0%	48.0%
2005	50.5%	5.1%	14.5%	9.3%	20.6%	15,892	55.6%	44.4%
2006	52.9%	5.0%	14.5%	7.7%	19.9%	15,104	57.9%	42.1%
2007	52.9%	6.0%	13.8%	5.5%	21.7%	15,276	58.9%	41.1%
2008	52.7%	6.6%	12.9%	5.7%	22.1%	13,898	59.3%	40.7%
2009	60.5%	6.5%	10.6%	4.0%	18.4%	9,316	67.0%	33.0%
2010	54.5%	8.2%	11.5%	5.0%	20.7%	11,116	62.8%	37.3%
2011	47.8%	10.0%	12.3%	4.3%	25.5%	12,018	57.8%	42.2%
2012	55.0%	9.4%	10.1%	4.9%	20.6%	13,448	64.4%	35.6%
2013	54.1%	10.0%	10.4%	3.8%	21.8%	15,198	64.1%	35.9%
2014	49.2%	10.1%	12.4%	4.3%	23.9%	15,512	59.3%	40.7%
2015	49.0%	10.6%	13.4%	3.5%	23.6%	[c]	59.6%	40.4%

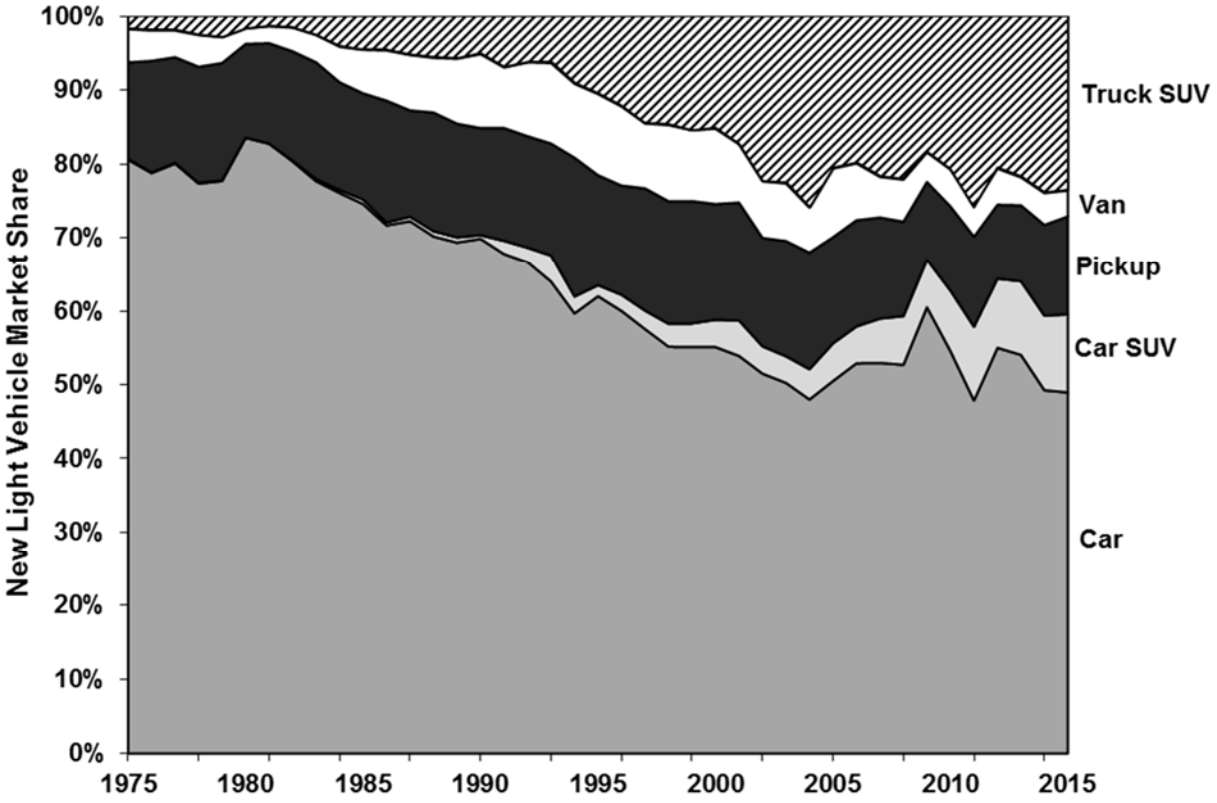
Note: Includes light trucks of 8,500 lbs. or less.

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] Percentages may not sum to totals due to rounding.
[b] Cars include both car and car SUV categories.
[c] Data are not available.

The effects of the Japanese earthquake/tsunami in 2011 are apparent in the large decline in car production for that year. Light trucks were gaining market share from the early 1980s until 2004, mainly due to increases in the market share of sport utility vehicles (SUVs) and pickup trucks. A new category of SUVs has been added to the vehicle classification—car SUVs. The car SUVs are two-wheel drive SUVs that will be counted as cars in the Corporate Average Fuel Economy Standards for model years 2011-on. A listing of the makes/models of car SUVs is in Table 4.9.

Figure 4.1. Light Vehicle Production Shares, Model Years 1975–2015



Source:
See Table 4.12.

The production-weighted average engine displacement of cars in 1975 was 4.72 liters, but had declined to 2.36 liters by 2015. Car SUVs also experienced a decline in engine displacement. For a list of car SUVs, see Table 4.9.

Table 4.13
Production-Weighted Engine Size of New Domestic and Import Cars
Model Years 1975-2015
(liters[a])

Model Year	Car	Car SUV
1975	4.72	4.29
1980	3.08	4.59
1981	2.98	5.21
1982	2.87	2.61
1983	2.98	2.67
1984	2.93	2.93
1985	2.90	2.80
1986	2.74	2.79
1987	2.65	2.93
1988	2.62	3.26
1989	2.67	3.70
1990	2.67	3.43
1991	2.67	3.52
1992	2.79	3.44
1993	2.72	3.90
1994	2.75	3.43
1995	2.74	3.51
1996	2.70	3.52
1997	2.69	3.11
1998	2.69	3.57
1999	2.72	3.46
2000	2.70	3.46
2001	2.70	3.18
2002	2.72	3.00
2003	2.70	2.97
2004	2.75	3.13
2005	2.72	3.05
2006	2.82	3.02
2007	2.70	3.03
2008	2.70	2.93
2009	2.54	2.87
2010	2.56	2.82
2011	2.61	2.72
2012	2.43	2.74
2013	2.38	2.64
2014	2.39	2.52
2015	2.36	2.56
Annual average percentage change		
1975–2015	-1.7%	-1.3%
2005–2015	-1.4%	-1.7%

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] 1 liter = 61.02 cubic inches.

The production-weighted engine size of truck sport utility vehicles (SUVs) declined an average of 1.9% per year from 2005 to 2015, while the engine size of pickups in 2015 is exactly the same as 2005.

Table 4.14
Production-Weighted Engine Size of New Domestic and Import Light Trucks, Model Years 1975-2015
(liters[a])

Model Year	Pickup	Van	Truck SUV
1975	5.01	5.21	5.44
1980	3.87	4.72	4.83
1981	3.88	4.65	4.75
1982	3.74	4.70	5.00
1983	3.47	4.82	4.34
1984	3.52	4.08	3.79
1985	3.62	3.87	3.64
1986	3.38	3.74	3.44
1987	3.31	3.70	3.47
1988	3.75	3.75	3.64
1989	3.87	3.69	4.00
1990	4.05	3.69	3.85
1991	3.80	3.61	3.82
1992	4.02	3.64	3.85
1993	4.00	3.57	4.00
1994	4.06	3.70	4.02
1995	4.21	3.79	4.02
1996	4.11	3.61	4.24
1997	4.33	3.61	4.18
1998	4.13	3.56	4.13
1999	4.38	3.65	4.15
2000	4.18	3.56	4.15
2001	4.41	3.75	3.92
2002	4.44	3.57	4.02
2003	4.33	3.59	4.05
2004	4.61	3.59	4.13
2005	4.65	3.54	4.00
2006	4.56	3.54	3.87
2007	4.69	3.59	3.93
2008	4.69	3.61	3.77
2009	4.70	3.52	3.46
2010	4.80	3.51	3.47
2011	4.62	3.47	3.56
2012	4.69	3.44	3.52
2013	4.62	3.43	3.36
2014	4.80	3.49	3.21
2015	4.65	3.33	3.31
Annual average percentage change			
1975–2015	-0.2%	-1.1%	-1.2%
2005–2015	0.0%	-0.6%	-1.9%

Note: Includes light trucks of 8,500 lbs. or less.

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

[a] 1 liter = 61.02 cubic inches.

The production-weighted curb weight of cars declined almost 550 lbs. from 1975 to 2015, while car SUVs declined by 97 lbs.

Table 4.15
Production-Weighted Curb Weight of New Domestic and Import Cars, Model Years 1975–2015
(pounds)

Model Year	Car	Car SUV
1975	4,058	4,000
1976	4,059	3,986
1977	3,944	4,000
1978	3,588	4,000
1979	3,485	3,271
1980	3,101	4,000
1981	3,076	4,000
1982	3,054	2,630
1983	3,112	3,124
1984	3,099	3,487
1985	3,093	3,469
1986	3,041	3,479
1987	3,031	3,492
1988	3,047	3,495
1989	3,099	3,497
1990	3,176	3,518
1991	3,154	3,733
1992	3,240	3,713
1993	3,207	3,848
1994	3,250	3,735
1995	3,263	3,763
1996	3,282	3,710
1997	3,274	3,549
1998	3,306	3,824
1999	3,365	3,831
2000	3,369	3,870
2001	3,380	3,765
2002	3,391	3,747
2003	3,417	3,716
2004	3,462	3,854
2005	3,463	3,848
2006	3,534	3,876
2007	3,507	3,935
2008	3,527	3,902
2009	3,464	3,846
2010	3,474	3,949
2011	3,559	3,890
2012	3,452	3,915
2013	3,465	3,966
2014	3,497	3,865
2015	3,509	3,903
Annual average percentage change		
1975–2015	-0.3%	-0.1%
2005–2015	0.1%	0.1%

Source:
U.S. Environmental Protection Agency, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2015*, December 2015. (Additional resources: www.epa.gov/fueleconomy/fetrends/1975-2015/420r15016.pdf)

The average light vehicle in 2014 contained more than 2,000 pounds of steel, most of it conventional steel. High and medium strength steel, however, made up more than 16% of the vehicle. The use of aluminum grew from 1995 to 2014, while the use of iron castings declined.

Table 4.16
Average Material Consumption for a Domestic Light Vehicle[a], Model Years 1995, 2000, and 2014

	1995		2000		2014	
Material	Pounds	Percentage	Pounds	Percentage	Pounds	Percentage
Regular steel	1,630	44.1%	1,655	42.4%	1,379	34.5%
High and medium strength steel	324	8.8%	408	10.5%	649	16.2%
Stainless steel	51	1.4%	62	1.6%	73	1.8%
Other steels	46	1.2%	26	0.7%	32	0.8%
Iron castings	466	12.6%	432	11.1%	271	6.8%
Aluminum	231	6.3%	268	6.9%	398	10.0%
Magnesium castings	4	0.1%	8	0.2%	11	0.3%
Copper and brass	50	1.4%	52	1.3%	71	1.8%
Lead	33	0.9%	36	0.9%	36	0.9%
Zinc castings	19	0.5%	13	0.3%	8	0.2%
Powder metal parts	29	0.8%	36	0.9%	46	1.2%
Other metals	4	0.1%	4	0.1%	4	0.1%
Plastics and plastic composites	240	6.5%	286	7.3%	329	8.2%
Rubber	149	4.0%	166	4.3%	197	4.9%
Coatings	23	0.6%	25	0.6%	28	0.7%
Textiles	42	1.1%	44	1.1%	49	1.2%
Fluids and lubricants	192	5.2%	207	5.3%	224	5.6%
Glass	97	2.6%	103	2.6%	96	2.4%
Other materials	64	1.7%	71	1.8%	93	2.3%
Total	3,694	100.0%	3,902	100.0%	3,994	100.0%

Source:
Ward's Communications, *Ward's Motor Vehicle Facts and Figures, 2015*, Detroit, MI, 2015, p. 52 and updates.

[a] Percentages may not sum to totals due to rounding.

The number of franchised dealerships which sell new light-duty vehicles (cars and light trucks) has declined 46% since 1970. This decline, along with increasing light vehicle sales, caused the average number of vehicles sold per dealer to be at an all-time high of 1,034 vehicles per dealer.

Table 4.17
New Light Vehicle Dealerships and Sales, 1970–2015

Calendar year	Number of franchised new light vehicle dealerships[a]	New light vehicle sales (thousands)	Light vehicle sales per dealer
1970	30,800	9,856	320
1975	29,600	10,677	361
1976	29,300	12,829	438
1977	29,100	14,292	491
1978	29,000	14,788	510
1979	28,500	13,518	474
1980	27,900	10,909	391
1981	26,350	10,235	388
1982	25,700	10,019	390
1983	24,725	11,669	472
1984	24,725	13,579	549
1985	24,725	14,667	593
1986	24,825	15,998	644
1987	25,150	14,802	589
1988	25,025	15,347	613
1989	25,000	14,389	576
1990	24,825	13,851	558
1991	24,200	12,307	509
1992	23,500	12,842	546
1993	22,950	13,869	604
1994	22,850	15,024	657
1995	22,800	14,673	644
1996	22,750	14,998	659
1997	22,700	15,014	661
1998	22,600	15,384	681
1999	22,400	16,711	746
2000	22,250	17,164	771
2001	22,150	16,950	765
2002	21,800	16,675	765
2003	21,725	16,494	759
2004	21,650	16,737	773
2005	21,640	16,774	775
2006	21,495	16,336	760
2007	21,200	15,867	748
2008	20,770	13,015	627
2009	20,010	10,236	512
2010	18,460	11,394	617
2011	17,700	12,539	708
2012	17,540	14,219	811
2013	17,665	15,278	865
2014	16,396	16,173	986
2015	16,545	17,103	1,034
	Average annual percentage change		
1970–2015	-1.4%	1.2%	2.6%
2005–2015	-2.6%	0.2%	2.9%

Source:
Number of dealers - National Automobile Dealers Association website, www.nada.org. (Additional resources: www.nada.org/Publications/NADADATA/) Light-duty vehicle sales - See tables 4.5 and 4.6.

[a] As of the beginning of the year.

In 2010 the number of conventional refueling stations fell below 160,000 for the first time in the series history and continued to decline through 2013. The number of vehicles fueling at those stations fell in 2009 for the first time in several years but began rising slowly in 2011. In 2013, there were 0.61 fueling stations per thousand vehicles or 1.65 thousand vehicles per station.

Table 4.18
Conventional Refueling Stations, 1993-2013

Year	Number of retail outlets	Vehicles in operation (thousands)	Stations per thousand vehicles	Thousand vehicles per station
	Conventional fuels			
1993	207,416	186,315	1.11	0.90
1994	202,878	188,714	1.08	0.93
1995	195,455	193,441	1.01	0.99
1996	190,246	198,294	0.96	1.04
1997	187,892	201,071	0.93	1.07
1998	182,596	205,043	0.89	1.12
1999	180,567	209,509	0.86	1.16
2000	175,941	213,299	0.82	1.21
2001	172,169	216,683	0.79	1.26
2002	170,018	221,027	0.77	1.30
2003	167,571	225,882	0.74	1.35
2004	167,346	232,167	0.72	1.39
2005	168,987	238,384	0.71	1.41
2006	167,476	244,643	0.69	1.46
2007	164,292	248,701	0.66	1.51
2008	161,068	249,813	0.64	1.55
2009	162,350	248,972	0.65	1.53
2010	159,006	248,231	0.64	1.56
2011	157,393	248,932	0.63	1.58
2012	156,065	251,497	0.62	1.61
2013	152,995	252,715	0.61	1.65

Notes: The County Business Patterns (CBP) data published by the Bureau of the Census tells the number of establishments by North American Industry Classification System (NAICS). NAICS is an industry classification system that groups establishments into industries based on the activities in which they are primarily engaged. NAICS 447 represents gasoline stations. However, the CBP gasoline station data differ from the National Petroleum News Survey data by as much as 30% (117,189 stations in 2005); the CBP may not include every gasoline retail outlet due to the classification of the primary activity of the business.

Alternative Fuel Refueling Stations are listed in Chapter 6.

Sources:
Conventional refueling stations: National Petroleum News Survey, 2013. (Source discontinued after 2013.)
Conventional vehicles: IHS Automotive, Detroit, MI, **FURTHER REPRODUCTION PROHIBITED**.

The National Highway Traffic Safety Administration and the Environmental Protection Agency issued joint rulemaking to establish a new National Program to regulate fuel economy and greenhouse gas emissions for model year 2012-2025 cars and light trucks.

Table 4.19
Fuel Economy and Carbon Dioxide Emissions Standards, MY 2012-2025

Year	Cars	Light trucks	Combined cars and light trucks
	Average required fuel economy (miles per gallon)		
2012	33.3	25.4	29.7
2013	34.2	26.0	30.5
2014	34.9	26.6	31.3
2015	36.2	27.5	32.6
2016	37.8	28.8	34.1
2017	40.1	29.4	35.4
2018	41.6	30.0	36.5
2019	43.1	30.6	37.7
2020	44.8	31.2	38.9
2021	46.8	33.3	41.0
2022	49.0	34.9	43.0
2023	51.2	36.6	45.1
2024	53.6	38.5	47.4
2025	56.2	40.3	49.7
	Average projected emissions compliance levels under the footprint-based carbon dioxide standards (grams per mile)		
2012	263	346	295
2013	256	337	286
2014	247	326	276
2015	236	312	263
2016	225	298	250
2017	212	295	243
2018	202	285	232
2019	191	277	222
2020	182	269	213
2021	172	249	199
2022	164	237	190
2023	157	225	180
2024	150	214	171
2025	143	203	163

Note: The required fuel economy, along with projections of CO_2 emissions, shown here use a model year 2008 baseline. The presented rates of increase in stringency for NHTSA CAFE standards are lower than the Environmental Protection Agency (EPA) rates of increase in stringency for greenhouse gas (GHG) standards. One major difference is that NHTSA's standards, unlike EPA's, do not reflect the inclusion of air conditioning system refrigerant and leakage improvements, but EPA's standards would allow consideration of such improvements which reduce GHGs but generally do not affect fuel economy. The 2025 EPA GHG standard of 163 grams/mile would be equivalent to 54.5 mpg, if the vehicles were to meet this level all through fuel economy improvements. The agencies expect, however, that a portion of these improvements will be made through reductions in air conditioning leakage, which would not contribute to fuel economy.

Source:
Federal Register, Vol. 77, No. 199, October 15, 2012. (Additional resources: www.nhtsa.gov/fuel-economy)

The target levels for the fuel economy and carbon dioxide emission standards for vehicles manufactured in model years 2012-on are assigned based on a vehicle's "footprint." Each footprint has a different target. The vehicle footprint is calculated as:

footprint = track width × wheelbase,

where

track width = lateral distance between the centerlines of the base tires at ground, and
wheelbase = longitudinal distance between the front and rear wheel centerlines.

Table 4.20
Fuel Economy and Carbon Dioxide Targets for Model Year 2025

Vehicle type	Example models	Example model footprint (square feet)	CO_2 emissions target (grams per mile)	Fuel economy target (miles per gallon)
		Example Passenger Cars		
Compact car	Honda Fit	40	131	61.1
Midsize car	Ford Fusion	46	147	54.9
Fullsize car	Chrysler 300	53	170	48.0
		Example Light-Duty Trucks		
Small SUV	4WD Ford Escape	44	170	47.5
Midsize crossover	Nissan Murano	49	188	43.4
Minivan	Toyota Sienna	55	209	39.2
Large pickup truck	Chevy Silverado	67	252	33.0

Note: Examples use model year 2012 vehicle specifications. The fuel economy from this table will not match the fuel economy listed on the window sticker of a new vehicle. Window sticker fuel economy is calculated by a different methodology than the Corporate Average Fuel Economy.

Source:
Federal Register, Vol. 77, No. 199, October 15, 2012. (Additional resources: www.nhtsa.gov/fuel-economy)

The Corporate Average Fuel Economy standards were established by the U.S. Energy Policy and Conservation Act of 1975 (PL94-163). These standards must be met at the manufacturer level. Some manufacturers fall short of meeting the standards while others exceed them. Legislation passed in December 2007 changed the CAFE standards beginning in the 2011 model year (MY). Some two-wheel drive sport utility vehicles are classified as cars under the final standards for MY 2011-2021.

Table 4.21
Car Corporate Average Fuel Economy (CAFE) Standards versus Sales-Weighted Fuel Economy Estimates, 1978–2016[a]
(miles per gallon)

Model year[b]	Cars				CAFE estimates
	CAFE standards		CAFE estimates[c]		Cars and light trucks combined
	Domestic	Import	Domestic	Import	
1978	18.0	18.0	18.7	27.3	19.9
1980	20.0	20.0	22.6	29.6	23.1
1985	27.5	27.5	26.3	31.5	25.4
1990	27.5	27.5	26.9	29.9	25.4
1991	27.5	27.5	27.3	30.1	25.6
1992	27.5	27.5	27.0	29.2	25.1
1993	27.5	27.5	27.8	29.6	25.2
1994	27.5	27.5	27.5	29.6	24.7
1995	27.5	27.5	27.7	30.3	24.9
1996	27.5	27.5	28.1	29.6	24.9
1997	27.5	27.5	27.8	30.1	24.6
1998	27.5	27.5	28.6	29.2	24.7
1999	27.5	27.5	28.0	29.0	24.5
2000	27.5	27.5	28.7	28.3	24.8
2001	27.5	27.5	28.7	29.0	24.5
2002	27.5	27.5	29.1	28.8	24.7
2003	27.5	27.5	29.1	29.9	25.1
2004	27.5	27.5	29.9	28.7	24.6
2005	27.5	27.5	30.5	29.9	25.4
2006	27.5	27.5	30.3	29.7	25.8
2007	27.5	27.5	30.6	32.2	26.6
2008	27.5[d]	27.5	31.2	31.8	27.1
2009	27.5[d]	27.5	32.1	33.8	29.0
2010	27.5[d]	27.5	33.1	35.2	29.3
2011	30.0	30.4	32.7	33.7	29.0
2012	32.7	33.4	34.8	36.0	30.8
2013	33.2	33.9	36.1	36.8	31.6
2014	34.0	34.7	36.3	37.7	31.5
2015	35.3[e]	35.6[e]	37.4[e]	37.0[e]	32.2[e]
2016	36.5[e]	37.3[e]	37.0[e]	37.8[e]	32.5[e]

Source:
U.S. Department of Transportation, NHTSA, "Summary of Fuel Economy Performance," Washington, DC, December 2014 and updates 2016. (Additional resources: www.nhtsa.gov)

[a] Only vehicles with at least 75 percent domestic content can be counted in the average domestic fuel economy for a manufacturer.
[b] Model year as determined by the manufacturer on a vehicle by vehicle basis.
[c] All CAFE calculations are sales-weighted.
[d] Unreformed standards, which were an option from 2008-2010. See Table 4.19 for reformed standards.
[e] Projected required average fuel economy standards value based on pre-model year reports.

The Corporate Average Fuel Economy standards for light trucks are lower than the car standards. Light trucks include pickups, minivans, sport utility vehicles and vans. New legislation passed in December 2007 changed the CAFE standards beginning in the 2011 model year (MY). Some two-wheel drive sport utility vehicles are classified as cars under the final standards for MY 2011-2021.

Table 4.22
Light Truck Corporate Average Fuel Economy (CAFE) Standards versus Sales-Weighted Fuel Economy Estimates, 1978–2016[a]
(miles per gallon)

Model year[c]	Light trucks[b]				CAFE estimates
	CAFE standards	CAFE estimates[d]			Cars and light trucks combined
		Domestic	Import	Combined	
1978	[e]	[f]	[f]	[f]	19.9
1980	[e]	16.8	24.3	18.5	23.1
1985	19.5	19.6	26.5	20.7	25.4
1990	20.0	20.3	23.0	20.8	25.4
1991	20.2	20.9	23.0	21.3	25.6
1992	20.2	20.5	22.7	20.8	25.1
1993	20.4	20.7	22.8	21.0	25.2
1994	20.5	20.5	22.1	20.8	24.7
1995	20.6	20.3	21.5	20.5	24.9
1996	20.7	20.5	22.2	20.8	24.9
1997	20.7	20.1	22.1	20.6	24.6
1998	20.7	20.5	23.0	21.0	24.7
1999	20.7	20.4	22.5	20.9	24.5
2000	20.7	21.1	19.7	21.3	24.8
2001	20.7	20.6	21.8	20.9	24.5
2002	20.7	20.6	21.9	21.4	24.7
2003	20.7	21.8	22.4	21.8	25.1
2004	20.7	20.7	22.3	21.5	24.6
2005	21.0	[f]	[f]	22.1	25.4
2006	21.6	[f]	[f]	22.5	25.8
2007	22.2	[f]	[f]	23.1	26.6
2008	22.4[g]	[f]	[f]	23.6	27.1
2009	23.0[g]	[f]	[f]	24.8	29.0
2010	23.4[g]	[f]	[f]	25.2	29.3
2011	24.3	[f]	[f]	24.7	29.0
2012	25.3	[f]	[f]	25.0	30.8
2013	25.9	[f]	[f]	25.7	31.6
2014	26.3	[f]	[f]	26.5	31.5
2015	27.4[h]	[f]	[f]	27.0[h]	32.2[h]
2016	28.8[h]	[f]	[f]	27.6[h]	32.5[h]

Source:
U.S. Department of Transportation, NHTSA, "Summary of Fuel Economy Performance," Washington, DC, December 2014 and updates 2016. (Additional resources: www.nhtsa.gov)

[a] Only vehicles with at least 75% domestic content can be counted in the average domestic fuel economy for a manufacturer.

[b] Represents two- and four-wheel drive trucks combined. Gross vehicle weight of 0-6,000 pounds for model year 1978-1979 and 0-8,500 pounds for subsequent years.

[c] Model year as determined by the manufacturer on a vehicle by vehicle basis.

[d] All CAFE calculations are sales-weighted.

[e] Standards were set for two-wheel drive and four-wheel drive light trucks, but no combined standard was set in this year.

[f] Data are not available.

[g] Unreformed standards, which were an option from 2008-2010. See Table 4.19 for reformed standards.

[h] Projected required average fuel economy standards value based on pre-model year reports.

Manufacturers of cars and light trucks whose vehicles do not meet the CAFE standards are fined. Data from the National Highway Traffic Safety Administration show CAFE fine in the year in which the money was collected, which may not be the same year in which it was assessed. A manufacturer can also use CAFE credits to offset fines. Fines for recent model years are still being collected.

Table 4.23
Corporate Average Fuel Economy (CAFE) Fines Collected, 1983-2013[a]

Model year	Current dollars	2013 constant dollars[b]
1983	$57,970	$135,588
1984	$5,958,020	$13,358,638
1985	$15,564,540	$33,697,663
1986	$29,871,815	$63,493,142
1987	$31,260,530	$64,105,275
1988	$43,470,545	$85,602,432
1989	$48,549,420	$91,209,091
1990	$48,308,615	$86,104,285
1991	$42,243,030	$72,252,640
1992	$38,286,565	$63,571,798
1993	$28,688,380	$46,250,235
1994	$31,498,570	$49,512,904
1995	$40,787,498	$62,347,331
1996	$19,301,930	$28,658,507
1997	$36,211,850	$52,559,526
1998	$21,739,774	$31,070,138
1999	$27,516,451	$38,476,289
2000	$51,067,038	$69,084,924
2001	$35,507,412	$46,706,381
2002	$20,041,533	$25,952,281
2003	$15,225,419	$19,276,456
2004	$30,411,986	$37,504,950
2005	$25,057,126	$29,888,545
2006	$40,933,954	$47,300,848
2007	$37,385,941	$42,004,595
2008	$11,619,696	$12,572,465
2009	$9,148,425	$9,933,903
2010	$23,803,412	$25,430,033
2011	$40,013,270	$41,439,552
2012	$14,962,382	$15,181,545
2013	$19,036,963	$19,036,963

Source:
U.S. Department of Transportation, National Highway Traffic Safety Administration, Office of Vehicle Safety Compliance, Washington, DC, December 2014 and updates, 2016. (Additional resources: www.nhtsa.gov)

[a] These are fines which are actually collected. Fines which are assessed in certain year may not have been collected in that year.

[b] Adjusted using the Consumer Price Inflation Index.

Consumers must pay the Gas Guzzler Tax when purchasing a car that has an Environmental Protection Agency (EPA) fuel economy rating (combined city and highway) less than that stipulated in the table below. The Gas Guzzler Tax doubled in 1991 after remaining constant from 1986 to 1990. The tax has not changed since 1991. This tax does not apply to light trucks such as pickups, minivans, sport utility vehicles, and vans.

Table 4.24
The Gas Guzzler Tax on New Cars
(dollars per vehicle)

Vehicle fuel economy (mpg)	1980	1981	1982	1983	1984	1985	1986–90	1991 - on
Over 22.5	0	0	0	0	0	0	0	0
22.0–22.5	0	0	0	0	0	0	500	1,000
21.5–22.0	0	0	0	0	0	0	500	1,000
21.0–21.5	0	0	0	0	0	0	650	1,300
20.5–21.0	0	0	0	0	0	500	650	1,300
20.0–20.5	0	0	0	0	0	500	850	1,700
19.5–20.0	0	0	0	0	0	600	850	1,700
19.0–19.5	0	0	0	0	450	600	1,050	2,100
18.5–19.0	0	0	0	350	450	800	1,050	2,100
18.0–18.5	0	0	200	350	600	800	1,300	2,600
17.5–18.0	0	0	200	500	600	1,000	1,300	2,600
17.0–17.5	0	0	350	500	750	1,000	1,500	3,000
16.5–17.0	0	200	350	650	750	1,200	1,500	3,000
16.0–16.5	0	200	450	650	950	1,200	1,850	3,700
15.5–16.0	0	350	450	800	950	1,500	1,850	3,700
15.0–15.5	0	350	600	800	1,150	1,500	2,250	4,500
14.5–15.0	200	450	600	1,000	1,150	1,800	2,250	4,500
14.0–14.5	200	450	750	1,000	1,450	1,800	2,700	5,400
13.5–14.0	300	550	750	1,250	1,450	2,200	2,700	5,400
13.0–13.5	300	550	950	1,250	1,750	2,200	3,200	6,400
12.5–13.0	550	650	950	1,550	1,750	2,650	3,200	6,400
Under 12.5	550	650	1,200	1,550	2,150	2,650	3,850	7,700

Source:
Internal Revenue Service, Form 6197, (Rev. 10-05), "Gas Guzzler Tax." (Additional resources: www.irs.ustreas.gov)

Consumers who purchased these 2015 model year vehicles paid the Gas Guzzler tax.

Table 4.25
List of Model Year 2015 Cars with Gas Guzzler Taxes[a]

Manufacturer	Model(s)	Size class	Unadjusted combined city/highway fuel economy	Adjusted combined city/highway fuel economy
Aston Martin	DB9	Minicompact Cars	19	15
Aston Martin	Rapide S	Subcompact Cars	21	17
Aston Martin	V12 Vantage S	Two Seaters	18	14
Aston Martin	V8 Vantage	Two Seaters	19	15
Aston Martin	V8 Vantage	Two Seaters	21	16
Aston Martin	V8 Vantage S	Two Seaters	19	15
Aston Martin	V8 Vantage S	Two Seaters	21	16
Aston Martin	Vanquish	Minicompact Cars	20	16
Aston Martin	Vantage GT	Two Seaters	19	15
Aston Martin	Vantage GT	Two Seaters	21	16
Audi	A8L	Large Cars	21	17
Audi	R8	Two Seaters	17	14
Audi	R8	Two Seaters	19	16
Audi	R8	Two Seaters	21	17
Audi	R8 Spyder	Two Seaters	17	14
Audi	R8 Spyder	Two Seaters	19	16
Audi	R8 Spyder	Two Seaters	21	17
Bentley	Continental GT	Compact Cars	19	15
Bentley	Continental GT Convertible	Subcompact Cars	18	15
Bentley	Continental GT Convertible	Subcompact Cars	22	17
Bentley	Continental GT3-R	Two Seaters	21	17
Bentley	Flying Spur	Midsize Cars	18	15
Bentley	Flying Spur	Midsize Cars	22	17
Bentley	Mulsanne	Midsize Cars	16	13
BMW	760Li	Large Cars	19	15
BMW	M5	Midsize Cars	21	16
BMW	M5	Midsize Cars	22	17
BMW	M6 Convertible	Subcompact Cars	21	16
BMW	M6 Convertible	Subcompact Cars	22	17
BMW	M6 Coupe	Subcompact Cars	21	16
BMW	M6 Coupe	Subcompact Cars	22	17
BMW	M6 Gran Coupe	Compact Cars	21	16
BMW	M6 Gran Coupe	Compact Cars	22	17
Bugatti	Veyron	Two Seaters	12	10
FCA	Challenger	Midsize Cars	22	17
FCA	Challenger SRT8	Midsize Cars	20	16
FCA	Challenger SRT8	Midsize Cars	22	17
FCA	Charger SRT8	Large Cars	20	16
FCA	Viper SRT	Two Seaters	19	15
Ferrari	458 Italia	Two Seaters	18	14
Ferrari	458 Italia	Two Seaters	19	15
Ferrari	458 Speciale	Two Seaters	18	14
Ferrari	458 Speciale	Two Seaters	19	15
Ferrari	458 Speciale Spider	Two Seaters	18	14
Ferrari	458 Speciale Spider	Two Seaters	19	15
Ferrari	458 Spider	Two Seaters	18	14

Table 4.25 (Continued)
List of Model Year 2015 Cars with Gas Guzzler Taxes[a]

Make	Model(s)	Size class	Unadjusted combined city/highway fuel economy	Adjusted combined city/highway fuel economy
Ferrari	458 Spider	Two Seaters	19	15
Ferrari	F12	Two Seaters	17	13
Ferrari	FF	Midsize Cars	16	13
Ferrari	FF	Midsize Cars	17	13
GM	Camaro	Compact Cars	18	14
GM	Camaro	Compact Cars	19	15
GM	Camaro	Compact Cars	20	16
GM	Corvette	Two Seaters	21	16
GM	CTS	Midsize Cars	18	14
GM	CTS	Midsize Cars	20	16
GM	SS	Large Cars	21	17
GM	XTS Hearse	Special Purpose Vehicle 2WD	21	17
GM	XTS Limo	Special Purpose Vehicle 2WD	22	17
Lamborghini	Aventador Coupe	Two Seaters	16	13
Lamborghini	Aventador Roadster	Two Seaters	14	12
Lamborghini	Huracan	Two Seaters	20	16
Lamborghini	Veneno Roadster	Two Seaters	16	13
Maserati	Granturismo	Subcompact Cars	20	16
Maserati	Granturismo Convertible	Subcompact Cars	20	15
Maserati	Quattroporte GTS	Large Cars	21	16
Mercedes-Benz	C 63 AMG Coupe	Subcompact Cars	20	15
Mercedes-Benz	S 600	Large Cars	20	15
Mercedes-Benz	S 65 AMG	Large Cars	19	15
Mercedes-Benz	S 65 AMG (coupe)	Compact Cars	19	15
Mercedes-Benz	SL 65 AMG	Two Seaters	21	17
Mercedes-Benz	SLS AMG GT Coupe	Two Seaters	19	15
Mercedes-Benz	SLS AMG GT Roadster	Two Seaters	19	15
Porsche	911 GT3	Two Seaters	22	17
Rolls-Royce	Ghost	Large Cars	19	15
Rolls-Royce	Ghost EWB	Large Cars	19	15
Rolls-Royce	Phantom	Large Cars	17	14
Rolls-Royce	Phantom Coupe	Compact Cars	17	14
Rolls-Royce	Phantom Drophead Coupe	Compact Cars	17	14
Rolls-Royce	Phantom EWB	Large Cars	17	14
Rolls-Royce	Wraith	Midsize Cars	19	15
Roush	Roush Stage 3 Mustang	Midsize Cars	20	16

Source:
U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Guide database, www.fueleconomy.gov

[a] Tax is based on unadjusted combined fuel economy; adjusted combined fuel economy is used on window stickers.

The IRS collected $48.2 million in 2014 from those buying cars with combined city/highway fuel economy less than 22.5 miles per gallon. This tax does not apply to light trucks such as pickups, minivans, sport utility vehicles, and vans. It is worthy to note that total revenue from fines paid by consumers to purchase gas-guzzling vehicles greatly exceeds the overall fines paid by manufacturers whose vehicles fail to meet CAFE standards (see Table 4.21).

Table 4.26
Tax Receipts from the Sale of Gas Guzzlers, 1980–2014
(thousands)

Model year	Current dollars	2014 constant dollars[a]
1980	740	2,126
1981	780	2,031
1982	1,720	4,220
1983	4,020	9,555
1984	8,820	20,096
1985	39,790	87,544
1986	147,660	318,946
1987	145,900	304,047
1988	116,780	233,694
1989	109,640	209,320
1990	103,200	186,925
1991	118,400	205,797
1992	144,200	243,317
1993	111,600	182,836
1994	64,100	102,394
1995	73,500	114,174
1996	52,600	79,365
1997	48,200	71,095
1998	47,700	69,278
1999	68,300	97,053
2000	70,800	97,334
2001	78,200	104,533
2002	79,700	104,880
2003	126,700	163,013
2004	140,800	176,455
2005	163,800	198,553
2006	201,700	236,853
2007	178,700	204,034
2008	172,428	189,593
2009	99,300	109,575
2010	85,226	92,527
2011	68,905	72,519
2012	73,500	75,786
2013	61,300	62,294
2014	48,200	48,200

Source:
Ward's Communications, Detroit, MI, 2016. Original data source: Internal Revenue Service. (Additional resources: www.epa.gov/fueleconomy/guzzler)

[a] Adjusted using the Consumer Price Inflation Index.

Autonomie is a system simulation tool for vehicle energy consumption and performance analysis. It is used to evaluate the energy consumption and cost of multiple advanced powertrain technologies. Autonomie was used to develop data on the relationship between steady-state vehicle speed and fuel economy.

Table 4.27
Fuel Economy by Speed, Autonomie Model Results

	Gasoline conventional			Diesel conventional			Hybrid vehicle
Speed (mph)	Midsize car	Small SUV	Large SUV	Midsize car	Small SUV	Large SUV	Midsize Car
			(miles per gallon)				
45	43	37	35	57	48	48	55
55	45	36	31	55	45	40	46
65	38	30	29	45	36	35	38
75	32	26	25	37	30	29	33
			Fuel economy loss				
55 - 65 mph	15%	16%	7%	18%	19%	13%	18%
65 - 75 mph	15%	16%	15%	18%	18%	17%	12%
55 - 75 mph	28%	29%	21%	33%	34%	27%	28%

Source:
Argonne National Laboratory, Autonomie model, August 2016, www.autonomie.net. (Additional resources: www.anl.gov/energy/transportation)

The latest study of vehicle fuel economy by speed indicated higher fuel economy around 40 miles per hour, as did the 1973 and 1984 studies. Engineers at Oak Ridge National Laboratory believe that the lowest speed in the vehicle's highest gear is where the best fuel economy is typically obtained. That speed will be different for individual vehicles.

Table 4.28
Fuel Economy by Speed, 1973, 1984, 1997, and 2012 Studies
(miles per gallon)

Speed (miles per hour)	1973[a] (13 vehicles)	1984[b] (15 vehicles)	1997[c] (9 vehicles)	2012[d] (74 vehicles)
15	[e]	21.1	24.4	[e]
20	[e]	25.5	27.9	[e]
25	[e]	30.0	30.5	[e]
30	21.1	31.8	31.7	[e]
35	21.1	33.6	31.2	[e]
40	21.1	33.6	31.0	33.2
45	20.3	33.5	31.6	[e]
50	19.5	31.9	32.4	31.9
55	18.5	30.3	32.4	[e]
60	17.5	27.6	31.4	27.9
65	16.2	24.9	29.2	[e]
70	14.9	22.5	26.8	24.1
75	[e]	20.0	24.8	[e]
80	[e]	[e]	[e]	20.5
		Fuel economy loss		
50–60 mph	10.3%	13.5%	3.1%	12.5%
60–70 mph	14.9%	18.5%	14.6%	13.6%
50–70 mph	23.6%	29.5%	17.3%	24.5%

Sources:

1973- U.S. Department of Transportation, Federal Highway Administration, Office of Highway Planning, *The Effect of Speed on Automobile Gasoline Consumption Rates*, Washington, DC, October 1973.

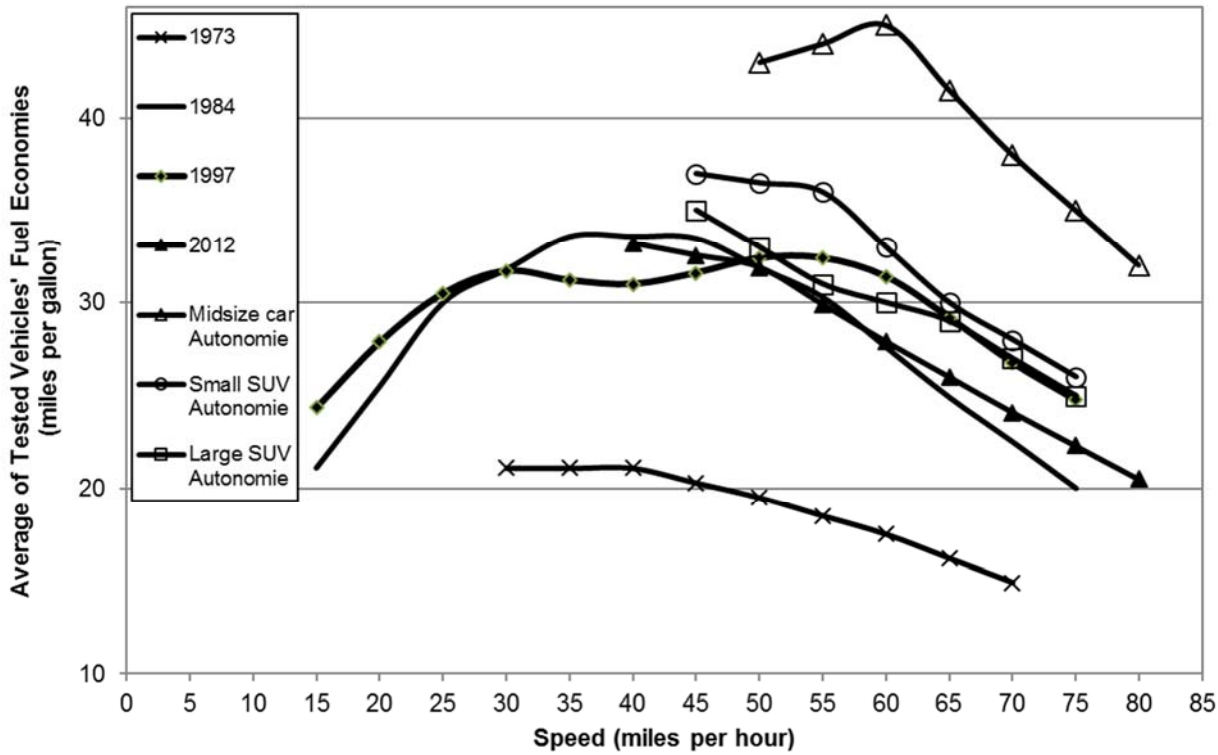
1984 - U.S. Department of Transportation, Federal Highway Administration, *Fuel Consumption and Emission Values for Traffic Models*, Washington, DC, May 1985.

1997 - West, B.H., R.N. McGill, J.W. Hodgson, S.S. Sluder, and D.E. Smith, *Development and Verification of Light-Duty Modal Emissions and Fuel Consumption Values for Traffic Models*, FHWA-RD-99-068, U.S. Department of Transportation, Federal Highway Administration, Washington, DC, March 1999.

2012 - U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy Guide website: www.fueleconomy.gov. The Green Car Congress, "ORNL researchers quantify the effect of increasing highway speed on fuel economy." February 8, 2013.

[a] Model years 1970 and earlier cars.
[b] Model years 1981–84 cars and light trucks.
[c] Model years 1988–97 cars and light trucks as shown in Table 4.29.
[d] Model years 2003-2012 cars and light trucks.
[e] Data are not available.

Figure 4.2. Fuel Economy by Speed, 1973, 1984, 1997, and 2012 Studies and Autonomie Model Results



Source:
See Tables 4.27 and 4.28.

This table shows the driving cycles for the new methodology that the Environmental Protection Agency (EPA) used to determine fuel economy ratings for new vehicles beginning in model year 2008. In addition to the Urban Driving Cycle and the Highway Driving cycle, the EPA will also use three additional tests to adjust fuel economy ratings to account for higher speeds, air conditioner use, and colder temperatures. Though the EPA uses a complex combination of these five cycles to determine the fuel economy that will be posted on a new vehicle window sticker, the manufacturer's Corporate Average Fuel Economy is still calculated using only the city and highway driving cycles. To know more about new vehicle fuel economy ratings, visit www.fueleconomy.gov.

Table 4.29
Driving Cycle Attributes

	Test schedule				
	City	Highway	High speed	Air conditioner (AC)	Cold temp
Trip type	Low speeds in stop-and-go urban traffic	Free-flow traffic at highway speeds	Higher speeds; harder acceleration & braking	AC use under hot ambient conditions	*City* test w/colder outside temperature
Top speed	56 mph	60 mph	80 mph	54.8 mph	56 mph
Average speed	20 mph	48 mph	48 mph	22 mph	20 mph
Max. acceleration	3.3 mph/sec	3.2 mph/sec	8.46 mph/sec	5.1 mph/sec	3.3 mph/sec
Simulated distance	11 mi.	10 mi.	8 mi.	3.6 mi.	11 mi.
Time	31 min.	12.5 min.	10 min.	9.9 min.	31 min.
Stops	23	None	4	5	23
Idling time	18% of time	None	7% of time	19% of time	18% of time
Engine startup[a]	Cold	Warm	Warm	Warm	Cold
Lab temperature	68-86° F	68-86° F	68-86° F	95° F	20° F
Vehicle air conditioning	Off	Off	Off	On	Off

Source:
U.S. Department of Energy and U.S. Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

[a] A vehicle's engine doesn't reach maximum fuel efficiency until it is warm.

These driving cycles simulate the performance of an engine while driving in the city and on the highway. Once the city cycle is completed, the engine is stopped, and then started again for the 8.5-minute hot start cycle. Three additional cycles also influence new vehicle fuel economy ratings beginning with the 2008 model year.

Figure 4.3. City Driving Cycle

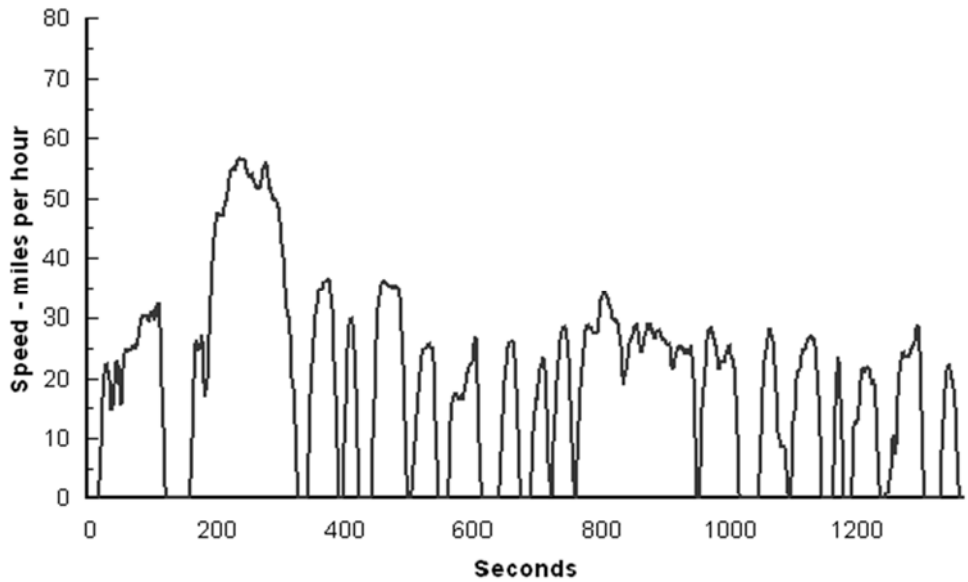
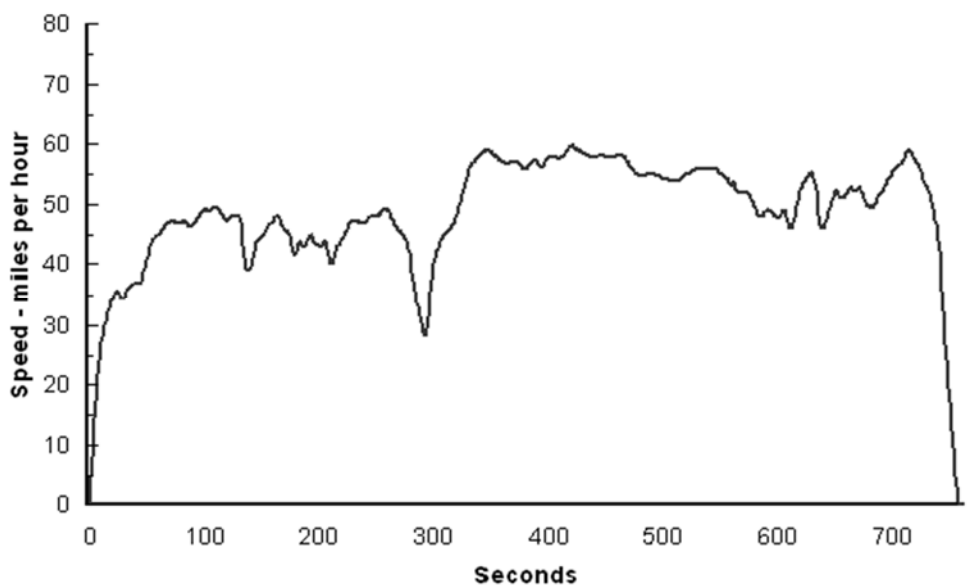


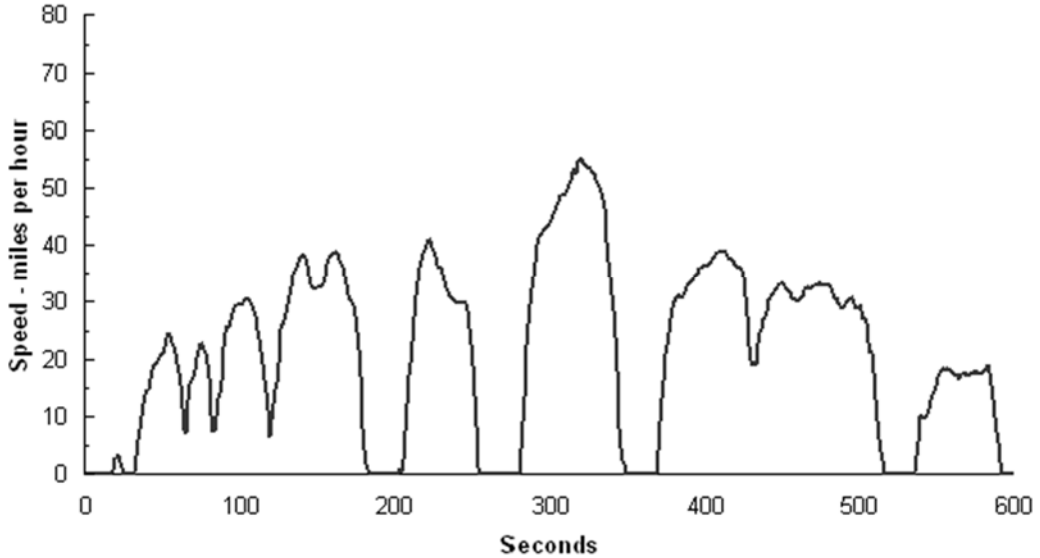
Figure 4.4. Highway Driving Cycle



Source:
Code of Federal Regulations, 40CFR, "Subpart B - Fuel Economy Regulations for 1978 and Later Model Year Automobiles - Test Procedures," July 1, 1988 edition, p. 676.

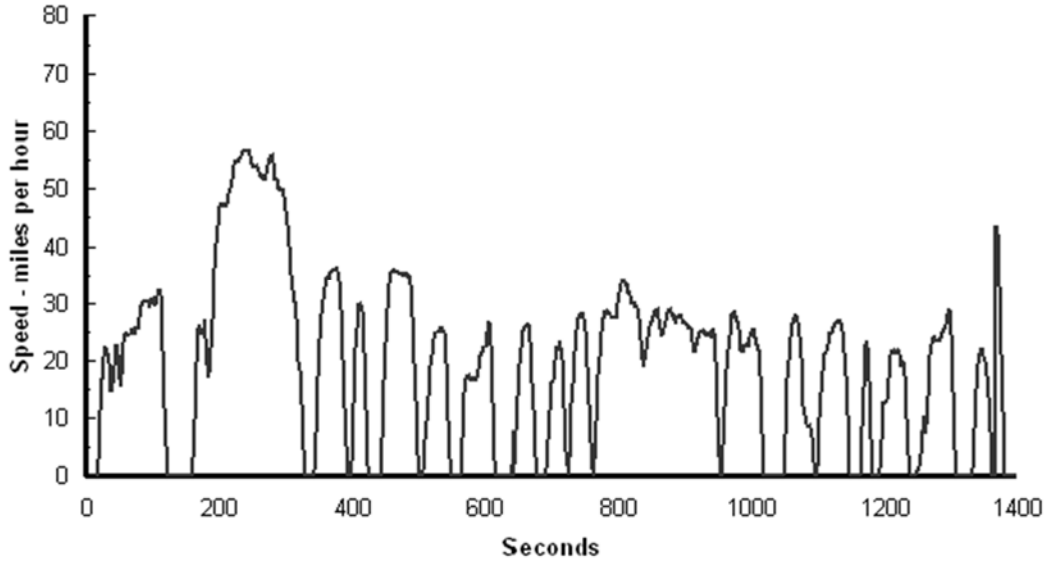
Beginning with the 2008 model year, these cycles influence the new vehicle fuel economy ratings.

Figure 4.5. Air Conditioning (SC03) Driving Cycle



Source:
U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

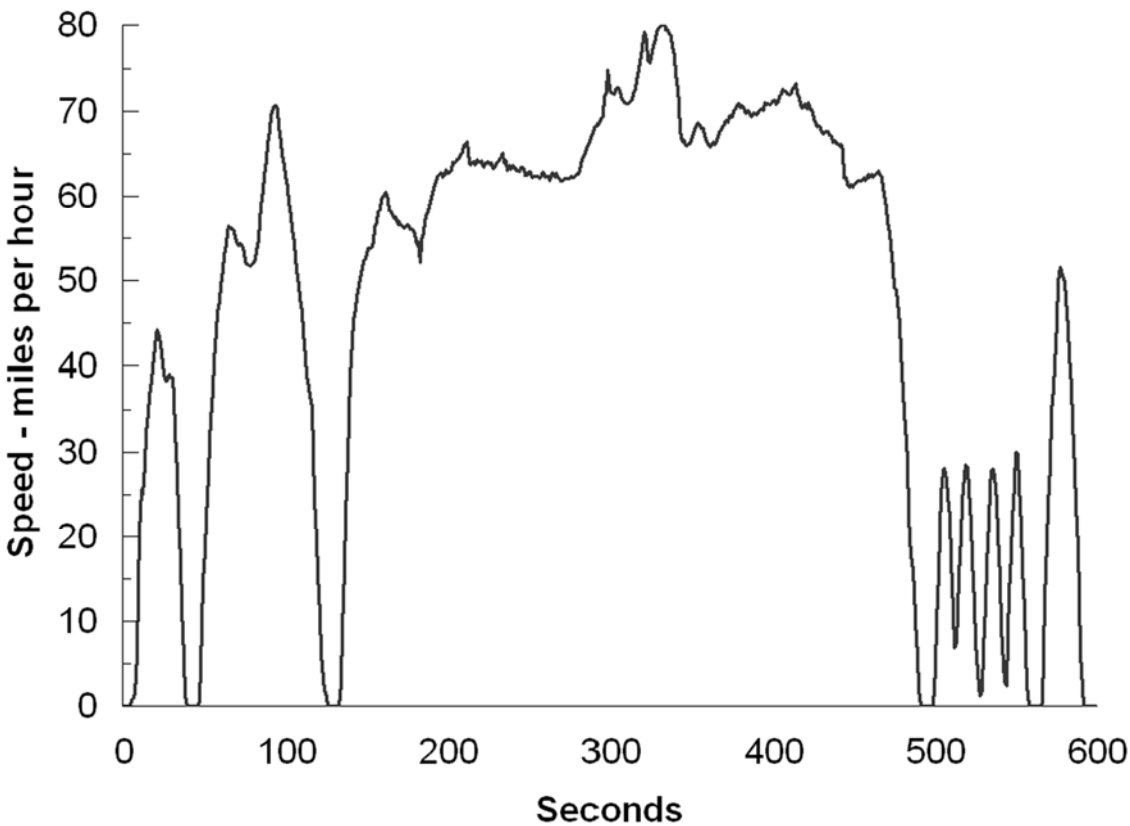
Figure 4.6. Cold Temperature (Cold FTP) Driving Cycle



Source:
U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

Beginning with the 2008 model year, this cycle influences the new vehicle fuel economy ratings. The US06 driving cycle was originally developed as a supplement to the Federal Test Procedure. It is a short-duration cycle (600 seconds) which represents hard-acceleration driving.

Figure 4.7. High-Speed (US06) Driving Cycle



Source:
U.S. Department of Energy and Environmental Protection Agency, Fuel Economy website, www.fueleconomy.gov.

The Environmental Protection Agency also uses other driving cycles to test new vehicles (although these do not affect the fuel economy ratings). The New York Test Cycle was developed in the 1970's in order to simulate driving in downtown congested areas. The Representative Number Five Test Cycle was developed in the 1990's to better represent actual on-road driving by combining modern city and freeway driving.

Figure 4.8. New York City Driving Cycle

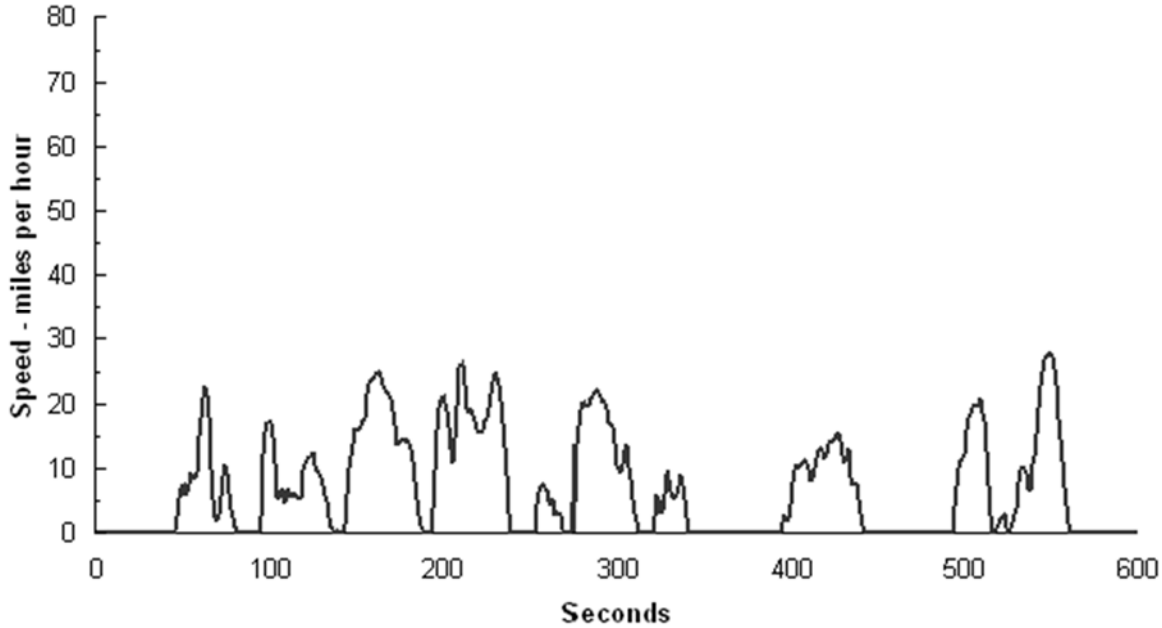
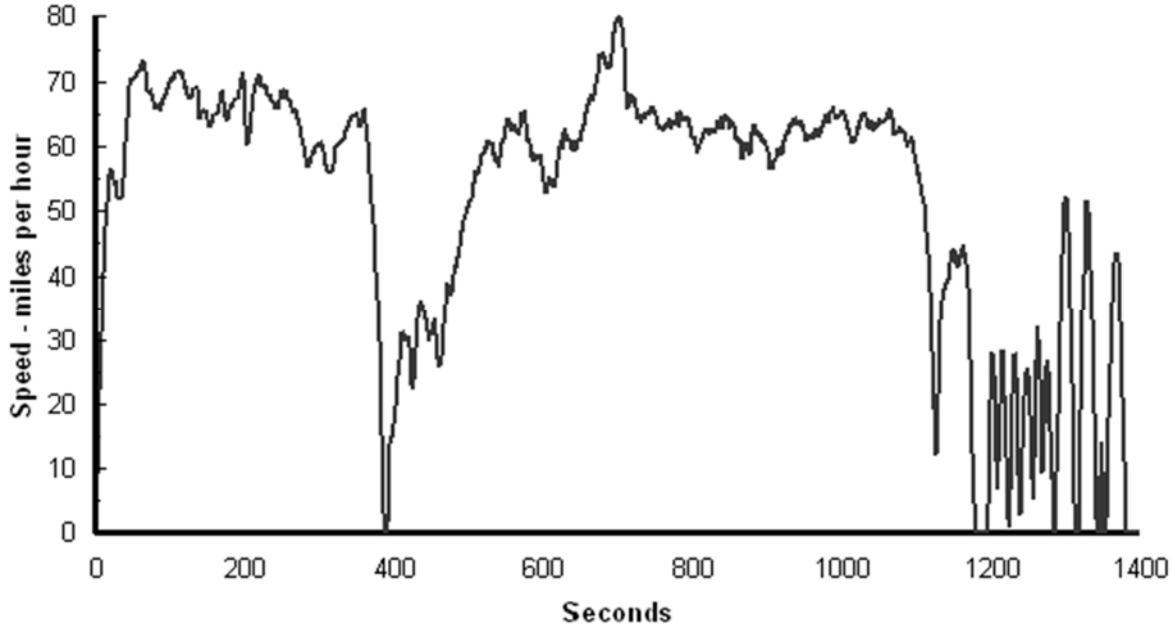


Figure 4.9. Representative Number Five Driving Cycle



Source:
Data obtained from Michael Wang, Argonne National Laboratory, Argonne, IL, 1997.

Testing cycles to determine vehicle fuel economy and emissions vary by country. The United States currently uses five different drive cycles to determine vehicle fuel economy. In Europe, the NEDC cycle is being replaced by the WLTC, but the NEDC continues to be used in China. The ARTEMIS cycles are not used in vehicle certification, but are used to represent real world driving in Europe.

Table 4.30
Comparison of U.S., European, and Japanese Driving Cycles Attributes

Cycle	Time (seconds)	Distance (miles)	Average Speed (mph)	Maximum Speed (mph)	Maximum Acceleration (mph/s)
United States					
City	1,872	11.0	21.2	56.0	3.3
Highway	765	10.3	48.3	60.0	3.2
High-Speed	594	8.0	48.4	80.0	8.5
Air Conditioner Use	594	3.6	21.2	54.8	5.1
Cold Temperatures	1,872	11.0	21.2	56.0	3.3
World Light Vehicle Test Cycle (WLTC)					
Low	589	1.9	11.7	35.1	3.6
Medium	433	3.0	24.5	47.6	3.6
High	455	4.4	35.1	60.5	3.7
Extra High	323	5.1	57.0	81.6	2.3
Total WLTC	1,800	14.5	28.9	81.6	3.7
Japan					
JC08	1,204	5.1	15.2	50.7	3.8
New European Driving Cycle (NEDC)					
Urban Driving Cycle (UDC)	780	2.5	11.8	31.1	2.3
Extra Urban Driving Cycle (EUDC)	400	4.3	38.9	74.6	1.9
Total NEDC	1,180	6.8	20.9	74.6	2.3
ARTEMIS					
Urban	993	3.0	11.0	35.9	6.4
Rural Road	1,082	10.7	35.7	69.3	5.3
Motorway	1,068	17.9	60.1	81.9	4.3
Total ARTEMIS	3,143	31.6	36.2	81.9	6.4

Source:
United States - U.S. Department of Energy, Fuel Economy Guide website,
www.fueleconomy.gov/feg/fe_test_schedules.shtml
All other - Compiled from public sources by Aymeric Rousseau, Argonne National Laboratory, September 2016.

Testing cycles to determine vehicle fuel economy and emissions vary by country and therefore it is difficult to make a direct comparison. Simulation results show up to a 28% difference in the test cycles for each vehicle type. Note that the differences in these cycle results also vary with each individual vehicle tested.

Table 4.31
Example of Differing Results Using the U.S., European, and Japanese Driving Cycles

	Miles per gallon			Percentage difference from	
Vehicle type	U.S. Corporate Average Fuel Economy (CAFE) cycle	New European Driving Cycle (NEDC)	Japan JC08 cycle	CAFE to NEDC	CAFE to JC08
Small car	34.8	32.4	27.6	-7%	-21%
Large car	26.6	24.7	21.5	-7%	-19%
Minivan	23.9	20.5	17.2	-14%	-28%
Sport-utility vehicle	20.2	17.6	14.6	-13%	-28%
Pickup	18.8	15.9	13.5	-15%	-28%

Note: Simulation results for identical gasoline vehicles (i.e., results for the same small car on each of the three cycles).

Source:
The International Council on Clean Transportation, *Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update*, July 2009.