

Chapter 6

Light Vehicles and Characteristics

Summary Statistics

Table		
6.1	Passenger cars, 1996	
	<i>Registrations (thousands)</i>	129,728
	<i>Vehicle miles (million miles)</i>	1,467,703
	<i>Fuel economy (miles per gallon)</i>	21.3
6.8	Two-axle, four tire trucks, 1996	
	<i>Registrations (thousands)</i>	68,934
	<i>Vehicle miles (million miles)</i>	815,302
	<i>Fuel economy (miles per gallon)</i>	17.3
6.3	Automobile sales, 1997 sales period	
	<i>Minicompact</i>	39,519
	<i>Subcompact</i>	1,510,050
	<i>Compact</i>	2,937,064
	<i>Midsized</i>	2,531,196
	<i>Large</i>	1,162,290
	<i>Two-seater</i>	80,921
6.10	Light truck sales, 1997 sales period	
	<i>Small pickup</i>	520,834
	<i>Large pickup</i>	2,051,144
	<i>Small van</i>	1,215,776
	<i>Large van</i>	386,563
	<i>Small utility</i>	1,715,259
	<i>Large utility</i>	637,140
6.12	Corporate average fuel economy	(mpg)
	<i>Automobile standard, MY 1998</i>	27.5
	<i>Automobile fuel economy, MY 1998</i>	28.8
	<i>Light truck standard, MY 1998</i>	20.7
	<i>Light truck fuel economy, MY 1998</i>	20.8
6.17	Average fuel economy loss from 55 to 70 mph	17.1%



The Federal Highway Administration released revised historical data in their "Highway Statistics Summary to 1995" report. As a result, the data in this table have been revised. The data in this table **DO NOT** include minivans, pickups, or sport utilities.

Table 6.1
Summary Statistics for Passenger Cars, 1970-96

Year	Registrations ^a (thousands)	Vehicle travel (million miles)	Fuel use (million gallons)	Fuel economy ^b (miles per gallon)
1970	89,244	916,700	67,820	13.5
1971	92,718	966,330	71,346	13.5
1972	97,082	1,021,365	75,937	13.5
1973	101,985	1,045,981	78,233	13.4
1974	104,856	1,007,251	74,229	13.6
1975	106,706	1,033,950	74,140	13.9
1976	110,189	1,078,215	78,297	13.8
1977	112,288	1,109,243	79,060	14.0
1978	116,573	1,146,508	80,652	14.2
1979	118,429	1,113,640	76,588	14.5
1980	121,601	1,111,596	69,981	15.9
1981	123,098	1,133,332	69,112	16.4
1982	123,702	1,161,713	69,116	16.8
1983	126,444	1,195,054	70,322	17.0
1984	128,158	1,227,043	70,663	17.4
1985	127,885	1,246,798	71,518	17.4
1986	130,004	1,270,167	73,174	17.4
1987	131,482	1,315,982	73,308	18.0
1988	133,836	1,370,271	73,345	18.7
1989	134,559	1,401,221	73,913	19.0
1990	133,700	1,408,266	69,568	20.2
1991	128,300	1,358,185	64,318	21.1
1992	126,581	1,371,569	65,436	21.0
1993	127,327	1,374,709	67,047	20.5
1994	127,883	1,406,089	67,874	20.7
1995	128,387	1,438,294	68,072	21.1
1996	129,728	1,467,703	68,897	21.3
		<i>Average annual percentage change</i>		
1970-96	1.4%	1.8%	0.1%	1.8%
1986-96	0.0%	1.5%	-0.6%	2.0%

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 1996*, Washington, DC, 1997, Table VM-1, p. V-94, and annual.

(Additional resources: <http://www.fhwa.dot.gov>)

^a This number differs from R.L. Polk's estimates of "number of automobiles in use." See Table 3.3.

^b Fuel economy for automobile population.



Table 6.2
New Retail Automobile Sales in the United States, 1970-97

Calendar year	Domestic ^a	Import ^b	Total	Percentage imports	Percentage transplants ^c	Percentage imports and transplants	Percentage diesel
	(thousands)				on model year basis		
1970	7,119	1,285	8,404	15.3%	d	d	d
1971	8,681	1,568	10,249	15.3%	d	d	0.06%
1972	9,327	1,623	10,950	14.8%	d	d	0.05%
1973	9,676	1,763	11,439	15.4%	d	d	0.06%
1974	7,454	1,399	8,853	15.8%	d	d	0.20%
1975	7,053	1,571	8,624	18.2%	d	d	0.31%
1976	8,611	1,499	10,110	14.8%	0.0%	14.8%	0.22%
1977	9,109	2,074	11,183	18.5%	0.0%	18.5%	0.34%
1978	9,312	2,002	11,314	17.7%	0.0%	17.7%	1.02%
1979	8,341	2,332	10,673	21.8%	1.3%	23.1%	2.54%
1980	6,581	2,398	8,979	26.7%	2.1%	28.8%	4.31%
1981	6,209	2,327	8,536	27.3%	1.8%	29.1%	6.10%
1982	5,759	2,223	7,982	27.9%	1.4%	29.3%	4.44%
1983	6,795	2,387	9,182	26.0%	1.3%	27.3%	2.09%
1984	7,952	2,439	10,391	23.5%	2.0%	25.5%	1.45%
1985	8,205	2,838	11,043	25.7%	2.2%	27.9%	0.82%
1986	8,215	3,238	11,453	28.3%	2.8%	31.1%	0.37%
1987	7,081	3,197	10,278	31.1%	5.2%	36.3%	0.16%
1988	7,526	3,099	10,626	29.2%	5.8%	35.0%	0.02%
1989	7,073	2,825	9,898	28.5%	7.3%	35.8%	0.13%
1990	6,897	2,404	9,301	25.8%	11.2%	37.0%	0.08%
1991	6,137	2,038	8,175	24.9%	13.7%	38.6%	0.10%
1992	6,277	1,937	8,213	23.6%	14.1%	37.7%	0.06%
1993	6,742	1,776	8,518	20.9%	14.9%	35.8%	0.03%
1994	7,255	1,735	8,990	19.3%	16.5%	35.8%	0.04%
1995	7,129	1,506	8,635	17.4%	18.9%	36.3%	0.04%
1996	7,254	1,273	8,527	14.9%	d	d	0.10%
1997	6,917	1,355	8,272	16.4%	d	d	d
<i>Average annual percentage change</i>							
1970-97	-0.1%	0.2%	-0.1%				
1987-97	-0.2%	-8.2%	-2.1%				

Source:

Domestic and import data - American Automobile Manufacturers Association, *Motor Vehicle Facts and Figures 1997*, Detroit, MI, 1997, p. 15, and annual. 1997 data from *Economic Indicators, 4th Quarter 1997*.

Diesel data - H. A. Stark (ed), Ward's Communications, Inc., *Ward's Automotive Yearbook*, Detroit, MI, 1997, p. 39, and annual.

Transplant data - Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares Data System, Oak Ridge, TN, 1996. (Additional resources: <http://www.aama.com>, <http://www.wardsauto.com>)

^a North American built.

^b Does not include import tourist deliveries.

^c A transplant is an automobile which was built in the U.S. by a foreign firm. Also included are joint ventures which are built in the U.S.

^d Data are not available.



Table 6.3
Period Sales, Market Shares, and Sales-Weighted Fuel Economies
of New Domestic and Import Automobiles, Selected Sales Periods 1976-97^a

	1976	1980	1984	1988	1990	1992	1993	1994	1995	1996	1997
MINICOMPACT											
Total sales, units		428,346	41,368	84,186	76,698	107,634	84,345	57,198	44,752	34,234	39,519
Market share, %		4.7	0.4	0.8	0.8	1.3	1.0	0.6	0.5	0.4	0.5
Fuel economy, mpg		29.4	29	37.8	26.4	30.6	29.9	27.8	27.0	27.2	26.3
SUBCOMPACT											
Total sales, units	2,625,929	3,441,480	2,510,929	1,983,353	2,030,226	2,074,351	1,944,892	2,015,280	1,518,209	1,315,281	1,510,050
Market share, %	27.1	37.8	24.6	19.1	22	25.6	23.2	22.6	17.4	15.2	18.3
Fuel economy, mpg	23.5	27.3	30.5	31.7	31.3	31.8	31.9	31.3	31.7	32.1	32.6
COMPACT											
Total sales, units	2,839,603	599,423	2,768,056	4,199,638	3,156,481	2,451,498	2,655,378	3,077,203	3,289,735	3,492,957	2,937,064
Market share, %	29.3	6.6	27.1	40.5	34.2	30.2	31.7	34.5	37.7	40.4	35.6
Fuel economy, mpg	17.1	22.3	30.6	29.8	28.9	28.7	29.3	29.8	30.2	30.4	30.0
MIDSIZE											
Total sales, units	1,815,505	3,073,103	3,059,647	2,550,964	2,511,503	2,249,553	2,445,842	2,359,898	2,498,521	2,487,880	2,531,196
Market share, %	18.7	33.8	30	24.6	27.2	27.7	29.2	26.5	28.6	28.8	30.6
Fuel economy, mpg	15.3	21.3	24.1	26.9	25.9	25.8	25.7	25.6	25.9	26.4	26.3
LARGE											
Total sales, units	2,206,102	1,336,190	1,502,097	1,368,717	1,279,092	1,140,775	1,186,991	1,339,863	1,320,608	1,259,266	1,162,290
Market share, %	22.8	14.7	14.7	13.2	13.9	14.1	14.2	15.0	15.1	14.6	14.1
Fuel economy, mpg	13.9	19.3	20.2	24.2	23.5	23.7	24.0	24.2	24.1	24.2	24.5
TWO SEATER											
Total sales, units	199,716	215,964	328,968	186,127	170,465	83,192	70,480	67,020	53,045	62,231	80,921
Market share, %	2.1	2.4	3.2	1.8	1.8	1.0	0.8	0.8	0.6	0.7	1.0
Fuel economy, mpg	20.1	21	26.5	27.3	28	25.9	24.8	23.9	24.7	25.4	26.3
TOTAL											
Total sales, units	9,686,855	9,094,506	10,211,06	10,372,98	9,224,465	8,107,003	8,387,928	8,916,462	8,724,870	8,651,849	8,261,040
Market share, %	100	100	100	100	100	100	100	100	100	100	100
Fuel economy, mpg	17.2	23.2	26.3	28.5	27.6	27.7	27.8	27.8	28.0	28.3	28.3

Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998. (Additional resources: <http://www-cta.ornl.gov>)

^a These figures represent only those sales that could be matched to corresponding EPA fuel economy values.



Table 6.4
Sales-Weighted Engine Size of New Domestic and Import Automobiles by Size Class,
Sales Periods 1976-97
(liters^a)

Model year	Minicompact	Subcompact	Compact	Midsize	Large	Two seater	Fleet
1976	^b	2.67	5.00	5.85	6.79	2.89	4.89
1977	1.98	2.73	4.79	5.47	6.02	2.81	4.56
1978	2.06	2.67	3.95	4.89	6.17	3.01	4.33
1979	1.86	2.39	3.74	4.41	5.56	2.77	3.78
1980	1.90	2.10	3.03	3.90	5.12	2.79	3.22
1981	1.57	2.04	2.20	3.63	5.00	2.49	2.98
1982	1.53	2.08	2.12	3.47	4.73	2.41	2.89
1983	1.60	2.19	2.20	3.45	4.95	2.52	2.98
1984	2.17	2.22	2.21	3.40	4.87	2.50	2.97
1985	1.95	2.29	2.27	3.37	4.65	2.47	2.92
1986	1.45	2.19	2.21	3.19	4.38	2.83	2.76
1987	1.48	2.19	2.20	2.99	4.36	2.57	2.68
1988	1.52	2.05	2.21	3.00	4.32	2.75	2.66
1989	2.54	2.08	2.11	3.01	4.31	2.81	2.68
1990	2.42	1.96	2.25	3.13	4.33	2.57	2.72
1991	2.17	1.97	2.23	3.16	4.40	2.67	2.72
1992	1.89	2.01	2.33	3.16	4.34	3.01	2.76
1993	1.96	2.07	2.28	3.16	4.27	3.47	2.78
1994	2.21	2.27	2.23	3.15	4.17	3.82	2.79
1995	2.42	2.26	2.23	3.12	4.12	3.76	2.79
1996	2.49	2.23	2.19	2.98	4.09	3.67	2.71
1997	2.62	2.13	2.28	3.02	4.03	3.08	2.74
<i>Average annual percentage change</i>							
1976-97	1.4% ^c	-1.1%	-3.7%	-3.1%	-2.5%	0.3%	-2.7%
1987-97	5.9%	0.3%	0.4%	0.1%	-0.8%	1.8%	0.2%

Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998.
 (Additional resources: <http://www-cta.ornl.gov>)

^a 1 liter = 61.02. cubic inches.

^b There were no minicompact automobiles sold in 1976.

^d Average annual percentage change begins with 1977.



Table 6.5
Sales-Weighted Curb Weight of New Domestic and Import Automobiles by Size Class,
Sales Periods 1976-97
(pounds)

Model year	Minicompact	Subcompact	Compact	Midsize	Large	Two seater	Fleet
1976	^a	2,577	3,609	4,046	4,562	2,624	3,608
1977	2,228	2,586	3,550	3,900	4,026	2,608	3,424
1978	2,200	2,444	3,138	3,427	3,956	2,763	3,197
1979	2,120	2,367	3,048	3,287	3,763	2,699	3,000
1980	2,154	2,270	2,813	3,081	3,667	2,790	2,790
1981	1,920	2,370	2,382	2,996	3,672	2,744	2,744
1982	2,002	2,302	2,422	2,992	3,703	2,525	2,730
1983	2,072	2,334	2,441	3,027	3,779	2,663	2,788
1984	2,376	2,380	2,454	2,990	3,734	2,559	2,788
1985	2,211	2,392	2,464	2,954	3,575	2,539	2,743
1986	2,120	2,415	2,432	2,857	3,451	2,575	2,675
1987	1,960	2,423	2,474	2,857	3,483	2,602	2,689
1988	1,933	2,346	2,558	2,880	3,487	2,693	2,717
1989	2,576	2,357	2,517	2,985	3,496	2,735	2,760
1990	2,651	2,368	2,637	3,065	3,594	2,656	2,828
1991	2,584	2,406	2,652	3,085	3,650	2,707	2,848
1992	2,395	2,444	2,674	3,131	3,670	2,770	2,879
1993	2,449	2,478	2,659	3,142	3,615	2,967	2,894
1994	2,719	2,571	2,639	3,171	3,657	3,035	2,921
1995	2,831	2,552	2,647	3,179	3,648	2,947	2,937
1996	2,847	2,533	2,667	3,203	3,671	2,985	2,950
1997	2,997	2,489	2,737	3,241	3,653	2,863	2,977
	<i>Average annual percentage change</i>						
1976-97	1.5% ^b	-0.2%	-1.3%	-1.1%	-1.1%	0.4%	-0.9%
1987-97	4.3%	0.3%	1.0%	1.3%	0.5%	1.0%	1.0%

Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998.
 (Additional resources: <http://www-cta.ornl.gov>)

^a There were no minicompact automobiles sold in 1976.

^c Average annual percentage change begins with 1977.



Table 6.6
Sales-Weighted Interior Space of New Domestic and Import Automobiles by Size Class,
Sales Periods 1976-97
(cubic feet)

Model year	Minicompact (< 85)	Subcompact (85-99)	Compact (100-109)	Midsize (110-119)	Large (> 120)	Fleet ^a
1977	78.8	89.8	107.1	113.0	128.0	107.9
1978	79.4	89.8	105.3	112.9	128.5	107.9
1979	80.0	90.2	105.8	113.4	130.1	106.9
1980	82.4	89.9	105.4	113.5	130.8	104.9
1981	83.3	90.2	103.6	113.7	130.6	105.5
1982	83.1	91.3	102.9	113.9	130.4	106.0
1983	82.7	93.3	103.0	113.1	131.3	107.3
1984	77.0	93.8	103.0	113.3	130.4	108.0
1985	77.8	94.1	103.1	113.5	129.7	107.9
1986	80.1	94.5	102.8	113.8	127.6	107.0
1987	81.6	93.1	103.0	113.9	127.5	106.9
1988	81.0	93.5	103.3	113.6	127.2	107.0
1989	75.0	93.3	102.7	113.8	127.4	107.5
1990	79.9	93.9	103.2	113.8	127.8	107.3
1991	79.6	94.4	103.2	113.8	128.3	107.1
1992	79.1	94.0	104.2	114.0	129.2	107.5
1993	79.2	94.5	104.0	114.0	128.9	108.0
1994	79.4	94.4	103.8	113.8	128.8	108.0
1995	78.5	93.8	103.9	114.3	128.1	108.7
1996	76.7	94.9	103.4	114.2	128.0	108.8
1997	77.2	95.6	103.2	114.6	128.0	108.7
<i>Average annual percentage change</i>						
1977-97	-0.1%	0.3%	-0.2%	0.1%	0.0%	0.0%
1987-97	-0.6%	0.3%	0.1%	0.0%	0.0%	0.2%

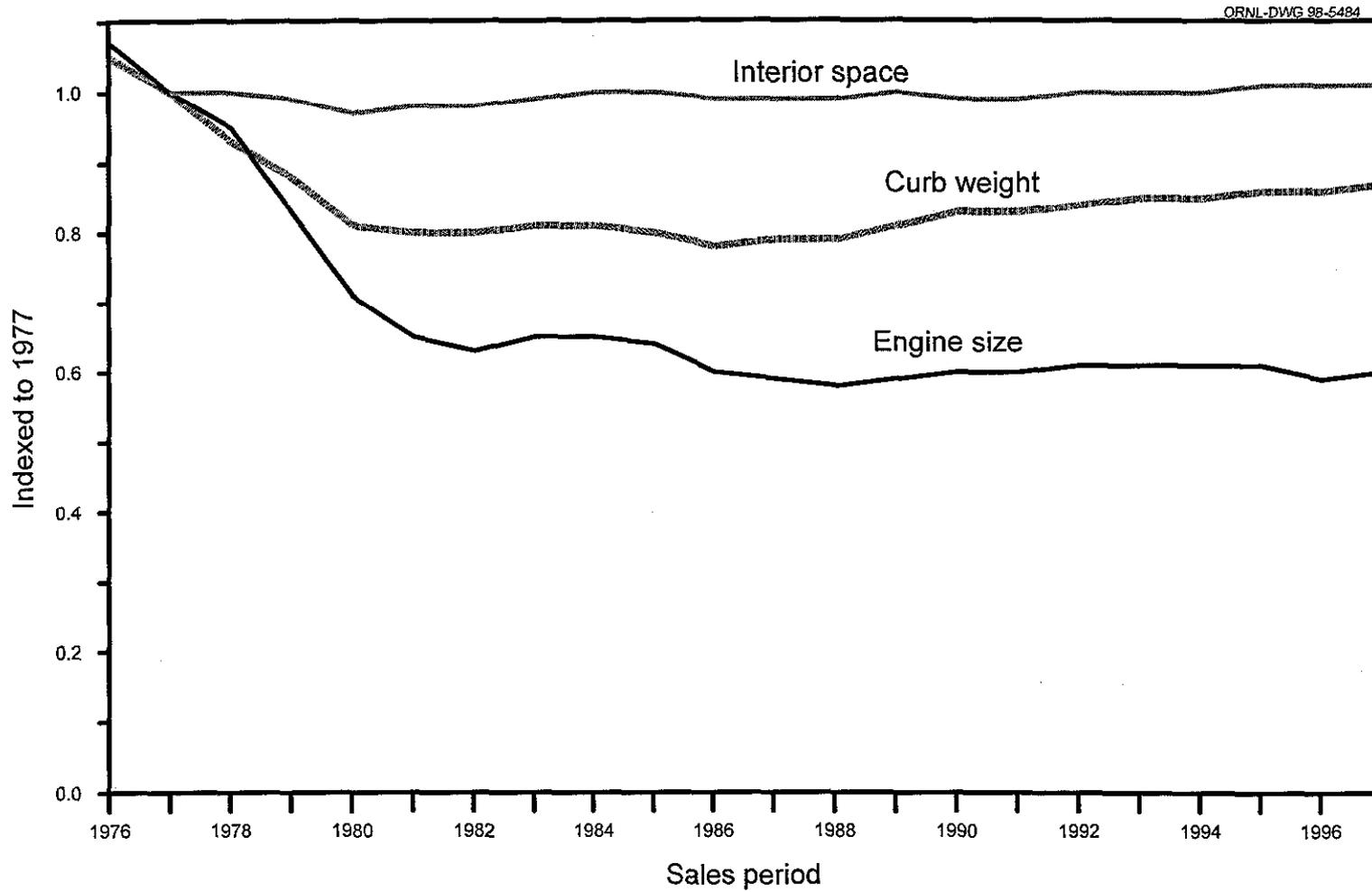
Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998.
 (Additional resources: <http://www.cta.ornl.gov>)

^a Interior volumes of two seaters are not reported to EPA.



Figure 6.1. Engine Size, Curb Weight, and Interior Space of New Domestic and Import Automobiles, 1976-96



Source: See Tables 6.4, 6.5, and 6.6.



The average auto lost over 300 pounds from 1978 to 1985, but gained a few pounds back since then. Much of the weight reduction was due to the declining use of conventional steel and iron and the increasing use of aluminum and plastics. Conventional steel, however, remained the predominant component of automobiles in 1997 with a 43.4% share of total materials. As conventional steel use has been decreasing, use of high-strength steel has increased.

Table 6.7
Average Material Consumption for a Domestic Automobile,
1978, 1985, and 1997

Material	1978		1985		1997	
	Pounds	Percentage	Pounds	Percentage	Pounds	Percentage
Conventional steel ^a	1,880.0	53.8%	1,481.5	46.5%	1,411.0	43.4%
High-strength steel	127.5	3.6%	217.5	6.8%	295.5	9.1%
Stainless steel	25.0	0.7%	29.0	0.9%	47.5	1.5%
Other steels	56.0	1.6%	54.5	1.7%	36.0	1.1%
Iron	503.0	14.4%	468.0	14.7%	378.0	11.6%
Aluminum	112.0	3.2%	138.0	4.3%	206.0	6.3%
Rubber	141.5	4.1%	136.0	4.3%	138.5	4.3%
Plastics/composites	176.0	5.0%	211.5	6.6%	242.0	7.5%
Glass	88.0	2.5%	85.0	2.7%	96.5	3.0%
Copper	39.5	1.1%	44.0	1.4%	46.5	1.4%
Zinc die castings	28.0	0.8%	18.0	0.5%	14.0	0.4%
Powder metal parts	16.0	0.5%	19.0	0.6%	31.0	1.0%
Fluids & lubricants	189.0	5.4%	184.0	5.8%	197.5	6.1%
Other materials	112.5	3.2%	101.5	3.2%	102.0	3.1%
Total	3,494.0	100.0%	3,187.5	100.0%	3,248.0	100.0%

Source:

H. A. Stark (ed.), Ward's Communications, Inc., *Wards Automotive Yearbook*, Detroit, MI, 1997, p. 19, and annual.
(Additional resources: <http://www.wardsauto.com>)

^a Includes cold-rolled and pre-coated steel.



The Federal Highway Administration released revised historical data in 1997 which better reflected two-axle, four-tire trucks. The definition of this category includes vans, pickup trucks, and sport utility vehicles.

Table 6.8
Summary Statistics for Two-Axle, Four-Tire Trucks, 1970-96

Year	Registrations (thousands)	Vehicle travel (million miles)	Fuel use (million gallons)	Fuel economy (miles per gallon)
1970	14,211	123,286	12,313	10.0
1971	15,181	137,870	13,484	10.2
1972	16,428	156,622	15,150	10.3
1973	18,083	176,833	16,828	10.5
1974	19,335	182,757	16,657	11.0
1975	20,418	200,700	19,081	10.5
1976	22,301	225,834	20,828	10.8
1977	23,624	250,591	22,383	11.2
1978	25,476	279,414	24,162	11.6
1979	27,022	291,905	24,445	11.9
1980	27,876	290,935	23,796	12.2
1981	28,928	296,343	23,697	12.5
1982	29,792	306,141	22,702	13.5
1983	31,214	327,643	23,945	13.7
1984	32,106	358,006	25,604	14.0
1985	37,214	390,961	27,363	14.3
1986	39,382	423,915	29,074	14.6
1987	41,107	456,870	30,598	14.9
1988	43,805	502,207	32,653	15.4
1989	45,945	536,475	33,271	16.1
1990	48,275	574,571	35,611	16.1
1991	53,033	649,394	38,217	17.0
1992	57,091	706,863	40,929	17.3
1993	59,994	745,750	42,851	17.4
1994	62,904	764,634	44,112	17.3
1995	65,738	790,029	45,605	17.3
1996	68,934	815,302	47,133	17.3
<i>Average annual percentage change</i>				
1970-96	6.3%	7.5%	5.3%	2.1%
1986-96	5.8%	6.8%	4.9%	1.7%

Source:

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 1996*, Washington, DC, 1997, Table VM-1, p. V-94, and annual.

(Additional resources: <http://www.fhwa.dot.gov>)



Table 6.9
New Retail Sales of Trucks 10,000 Pounds GVW and Less in the United States, 1970-96

Calendar year	Light truck sales ^a (thousands)	Percentages					
		Import ^b	Transplants ^c	Diesel	Four-wheel drive of domestic light trucks	Light trucks of light-duty vehicle sales ^d	Light trucks of total truck sales
1970	1,463	4.5%	e	f	e	14.8%	80.4%
1971	1,757	4.8%	e	f	e	14.6%	83.4%
1972	2,239	6.4%	e	f	e	17.0%	83.3%
1973	2,745	8.5%	e	f	e	19.4%	84.2%
1974	2,338	7.5%	e	f	18.0%	20.9%	84.2%
1975	2,281	10.0%	e	f	23.4%	20.9%	87.9%
1976	2,956	8.0%	0.0%	f	23.8%	22.6%	89.8%
1977	3,430	9.4%	0.0%	f	24.6%	23.5%	89.7%
1978	3,808	8.8%	0.0%	1.0%	28.5%	25.2%	89.2%
1979	3,311	14.1%	0.0%	1.0%	29.4%	23.7%	88.7%
1980	2,440	19.7%	0.9%	3.2%	20.7%	21.4%	88.9%
1981	2,189	20.3%	0.0%	3.3%	18.6%	20.4%	89.8%
1982	2,470	16.5%	0.0%	5.0%	16.8%	23.6%	92.8%
1983	2,984	15.6%	0.0%	4.0%	28.5%	24.5%	93.6%
1984	3,863	15.7%	2.0%	3.8%	27.0%	27.1%	93.0%
1985	4,458	17.2%	2.6%	3.3%	29.1%	28.8%	93.6%
1986	4,594	20.1%	2.3%	2.6%	27.0%	28.6%	94.3%
1987	4,610	17.9%	1.7%	2.3%	32.0%	31.0%	93.9%
1988	4,800	12.6%	2.4%	2.0%	32.1%	31.1%	93.2%
1989	4,610	10.9%	2.6%	2.1%	31.4% ^g	31.8%	93.3%
1990	4,548	13.2%	3.4%	2.2% ^g	31.6% ^g	32.8%	93.9%
1991	4,123	12.8%	4.5%	2.2% ^g	34.4% ^g	33.5%	94.5%
1992	4,629	8.6%	5.5%	2.5% ^g	31.6% ^g	36.0%	94.4%
1993	5,351	6.8%	7.1%	2.3% ^g	32.6% ^g	38.6%	94.2%
1994	6,033	6.5%	8.1%	2.7% ^g	34.4% ^g	40.2%	94.0%
1995	6,053	6.5%	7.5%	3.8% ^g	39.1% ^g	41.2%	93.4%
1996	6,519	6.6%	e	3.7% ^g	35.7% ^g	43.3%	94.1%
<i>Average annual percentage change</i>							
1970-96	5.8%						
1985-96	3.6%						

Source:

Four-wheel drive - 1970-88: H. A. Stark (ed.), Ward's Communications, Inc., *Ward's Automotive Yearbook*, Detroit, MI, 1989, p. 168, and annual. 1989-96: H. A. Stark (ed.), Ward's Communications, Inc., *Ward's Automotive Yearbook*, Factory Installation Reports, Detroit, MI, 1997.

Transplants - Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1996.

All other - American Automobile Manufacturers Association, *Motor Vehicle Facts and Figures 1997*, Detroit, MI, 1997, pp. 8, 19, 20, 21, and annual. (Additional resources: <http://www.aama.com>, <http://www.wardsauto.com>)

^a Includes all trucks of 10,000 pounds gross vehicle weight and less sold in the U.S.

^b Excluding transplants.

^c Based on model year data. A transplant is a light truck which was built in the U.S. by a foreign firm. Also included are joint ventures built in the U.S.

^d Light-duty vehicles include automobiles and light trucks.

^e Data are not available.

^f Indicates less than 1 percent.

^g Based on factory installations or factory sales.



Table 6.10
Period Sales, Market Shares, and Sales-Weighted Fuel Economies
of New Domestic and Import Light Trucks, Selected Sales Periods 1976-97^a

	1976	1980	1984	1988	1990	1992	1993	1994	1995	1996	1997
SMALL PICKUP											
Total sales, units	170,351	516,412	1,012,298	1,026,551	678,488	586,752	332,470	365,322	356,856	574,930 ^b	520,834
Market share, %	7.1	23.3	28.0	21.6	15.0	13.4	6.6	6.4	6.0	9.2	8.0
Fuel economy, mpg	23.9	25.5	27.2	26.1	25.2	25.0	24.9	25.3	25.6	25.6	24.6
LARGE PICKUP											
Total sales, units	1,586,020	1,115,248	1,218,972	1,453,255	1,573,729	1,452,192	1,877,806	2,199,224	2,183,793	2,042,179	2,051,144
Market share, %	66.4	50.3	33.7	30.6	34.9	33.1	37.1	38.4	36.8	32.7	31.4
Fuel economy, mpg	15.1	17	17.5	18.5	18.9	18.9	19.6	20.1	19.4	18.9	19.4
SMALL VAN											
Total sales, units	18,651	13,649	222,798	851,384	932,693	968,361	1,129,459	1,263,933	1,257,116	1,229,650	1,215,776
Market share, %	0.8	0.6	6.2	18.0	20.7	22.0	22.3	22.1	21.2	19.7	18.6
Fuel economy, mpg	19.5	19.6	25.0	22.9	23.1	22.5	22.9	22.1	22.8	22.8	22.9
LARGE VAN											
Total sales, units	574,745	328,065	545,595	486,981	398,877	350,013	388,435	407,737	401,056	370,126	386,563
Market share, %	24.1	14.8	15.1	10.3	8.8	8.0	7.7	7.1	6.8	5.9	5.9
Fuel economy, mpg	15.4	16.3	16.3	17.0	16.9	16.9	17.3	17.4	17.1	17.2	17.8
SMALL UTILITY											
Total sales, units	4,716	75,875	398,000	701,005	738,294	867,934	948,797	1,042,584	1,225,131	1,378,696	1,715,259
Market share, %	0.2	3.4	11.0	14.8	16.4	19.8	18.8	18.2	20.6	22.1	26.3
Fuel economy, mpg	15.5	16.9	23.0	22.4	21.9	20.9	21.3	20.7	20.8	21.1	19.6
LARGE UTILITY											
Total sales, units	32,427	167,288	215,271	223,824	192,544	167,199	378,710	445,601	509,914	641,280	637,140
Market share, %	1.4	7.5	6.0	4.7	4.3	3.8	7.5	7.8	8.6	10.3	9.8
Fuel economy, mpg	14.7	14.6	15.7	16.2	16.1	16.9	17.5	17.8	17.4	18.2	18.2
TOTAL											
Total sales, units	2,386,910	2,216,537	3,612,934	4,743,000	4,514,625	4,392,451	5,055,677	5,724,401	5,933,866	6,236,861	6,526,716
Market share, %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Fuel economy, mpg	15.6	18.1	20.0	20.7	20.5	20.4	20.5	20.4	20.2	20.4	20.1

Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998. (Additional resources: <http://www-cta.ornl.gov>)

^a These figures represent only those sales that could be matched to corresponding EPA fuel economy values.

^b Some four-wheel drive pickups previously classified as large pickups were correctly reclassified as small pickups.

Table 6.11
Sales-Weighted Engine Size of New Domestic and Import Light Trucks by Size Class
Sales Periods 1976-97
(liters^a)

Model year	Small pickup	Large pickup	Small van	Large van	Small utility	Large utility	Fleet
1976	1.91	5.57	1.97	5.39	5.39	4.97	5.23
1977	2.01	5.48	1.97	5.32	5.46	4.95	5.03
1978	2.03	5.45	1.97	5.29	5.09	5.40	5.02
1979	2.05	5.15	1.97	5.13	4.52	5.30	4.62
1980	2.05	5.05	1.97	5.03	4.29	5.39	4.33
1981	2.14	4.82	1.97	4.84	3.94	5.15	4.15
1982	2.34	4.99	1.79	4.92	3.88	5.27	4.24
1983	2.35	4.97	1.87	5.06	3.05	5.34	4.00
1984	2.38	4.95	2.23	5.06	2.81	5.39	3.87
1985	2.38	4.77	2.65	5.12	2.83	5.37	3.77
1986	2.43	4.68	2.78	5.13	2.78	5.55	3.65
1987	2.44	4.69	2.96	5.21	2.80	5.42	3.65
1988	2.56	4.68	3.15	5.21	3.14	5.51	3.82
1989	2.64	4.70	3.11	5.22	3.50	5.45	3.93
1990	2.90	4.49	3.29	5.21	3.38	5.48	3.93
1991	2.91	4.57	3.29	5.23	3.62	5.40	3.94
1992	3.07	4.57	3.32	5.28	3.69	5.47	4.00
1993	3.25	4.32	3.30	5.21	3.80	5.58	4.02
1994	3.10	4.45	3.48	5.31	3.77	5.54	4.10
1995	2.95	4.44	3.40	5.15	3.75	5.49	4.06
1996	2.83	4.72	3.41	5.21	3.68	5.11	4.12
1997	2.90	4.62	3.36	5.04	3.98	4.97	4.14
<i>Average annual percentage change</i>							
1976-97	2.0%	-0.9%	2.6%	-0.3%	-1.4%	0.0%	-1.1%
1987-97	1.7%	-0.2%	1.3%	-0.3%	3.6%	-0.9%	1.3%

Source:

Oak Ridge National Laboratory, Light-Duty Vehicle MPG and Market Shares System, Oak Ridge, TN, 1998.
 (Additional resources: <http://www-cta.ornl.gov>)

^a 1 liter = 61.02 cubic inches.



Table 6.12
Corporate Average Fuel Economy (CAFE)
Standards versus Sales-Weighted Fuel Economy Estimates
for Automobiles and Light Trucks, 1978-98^a
(miles per gallon)

Model Year	Automobiles				Light Trucks ^b			
	CAFE Standards	CAFE Estimates ^c			CAFE Standards	CAFE Estimates ^c		
		Domestic	Import	Combined		Domestic	Import	Combined
1978	18.0	18.7	27.3	19.9	d	e	e	e
1979	19.0	19.3	26.1	20.3	d	17.7	20.8	18.2
1980	20.0	22.6	29.6	24.3	d	16.8	24.3	18.5
1981	22.0	24.2	31.5	25.9	d	18.3	27.4	20.1
1982	24.0	25.0	31.1	26.6	17.5	19.2	27.0	20.5
1983	26.0	24.4	32.4	26.4	19.0	19.6	27.1	20.7
1984	27.0	25.5	32.0	26.9	20.0	19.3	26.7	20.6
1985	27.5	26.3	31.5	27.6	19.5	19.6	26.5	20.7
1986	26.0	26.9	31.6	28.2	20.0	20.0	25.9	21.5
1987	26.0	27.0	31.2	28.5	20.5	20.5	25.2	21.7
1988	26.0	27.4	31.5	28.8	20.5	20.6	24.6	21.3
1989	26.5	27.2	30.8	28.4	20.5	20.4	23.5	20.9
1990	27.5	26.9	29.9	28.0	20.0	20.3	23.0	20.8
1991	27.5	27.3	30.0	28.4	20.2	20.9	23.0	21.3
1992	27.5	27.0	29.2	27.9	20.2	20.5	22.7	20.8
1993	27.5	27.8	29.6	28.4	20.4	20.7	22.8	21.0
1994	27.5	27.5	29.6	28.3	20.5	20.5	22.0	20.7
1995	27.5	27.7	30.3	28.6	20.6	20.3	21.5	20.5
1996	27.5	28.3	29.7	28.7	20.7	20.5	22.1	20.7
1997	27.5	27.9	29.8	28.6	20.7	20.1	22.1	20.4
1998	27.5	28.1	28.1	28.8	20.7	20.4	23.0	20.8

Source:

U.S. Department of Transportation, NHTSA, "Summary of Fuel Economy Performance," Washington, DC, March 1998. (Additional resources: <http://www.nhtsa.dot.gov>)

^aOnly vehicles with at least 75 percent domestic content can be counted in the average domestic fuel economy for a manufacturer.

^bRepresents 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.

^cAll CAFE calculations are sales-weighted.

^dStandards were set for two-wheel drive and four-wheel drive light trucks separately, but no combined standard was set in this year.

^eData are not available.



Table 6.13
Corporate Average Fuel Economy (CAFE) Fines Collected, 1983-96^a
 (thousands)

Model year	Current dollars	1990 constant dollars ^b
1983	58	76
1984	5,958	7,496
1985	15,565	18,908
1986	29,872	35,603
1987	31,261	35,945
1988	44,519	49,181
1989	47,381	49,946
1990	48,449	48,449
1991	42,243	40,511
1992	38,287	35,645
1993	28,688	25,963
1994	31,478	27,764
1995	40,788	34,955
1996	^c	^c
Total	404,547	410,442

Source:

U.S. Department of Transportation, National Highway Traffic Safety Administration, Office of Vehicle Safety Compliance, Washington, DC, March, 1998.
 (Additional resources: <http://www.nhtsa.dot.gov>)

Table 6.14
Tax Receipts from the Sale of Gas Guzzlers, 1980-96
 (thousands)

Fiscal year	Current dollars	1990 constant dollars ^b
1980	740	1,174
1981	780	1,121
1982	1,720	2,329
1983	4,020	5,273
1984	8,820	11,097
1985	39,790	48,336
1986	147,660	175,987
1987	145,900	167,759
1988	116,780	129,008
1989	109,640	115,575
1990	103,200	103,200
1991	118,400	113,546
1992	144,200	134,250
1993	111,600	100,998
1994	64,100	56,536
1995	73,500	62,990
1996	52,600	43,816

Source:

Motor Vehicle Manufacturers Association, *Motor Vehicle Facts and Figures 1997*, Detroit, MI, 1997, p. 82.
 (Additional resources: <http://www.aama.com>)

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

^b Adjusted using the Consumer Price Inflation Index.

^c No CAFE fines have been collected for MY 1996.



Consumers must pay the Gas Guzzler Tax when purchasing an automobile that has an Environmental Protection Agency (EPA) fuel economy rating less than that stipulated in the table below. The Gas Guzzler Tax doubled in 1991 after remaining constant from 1986 to 1990.

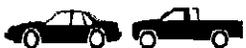
Table 6.15
The Gas Guzzler Tax on New Cars
(dollars per vehicle)

Vehicle fuel economy (mpg)	1980	1981	1982	1983	1984	1985	1986-90	1991+
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. 1-91), "Gas Guzzler Tax."

(Additional resources: <http://www.irs.ustreas.gov>)



New Data by Vehicle Speed

ORNL has developed fuel consumption and emissions lookup tables for the Federal Highway Administration, for use in their TRAF series of traffic models (NETSIM, CORSIM, FRESIM), although more generic uses are also possible. To develop the data-based models, vehicles are tested both on-road and on a chassis dynamometer. Engine parameters are measured on-road under real-world driving conditions that cover the vehicle's entire operating envelope. Emissions and fuel consumption are then measured on the chassis dynamometer as functions of engine conditions. The two data sets are merged to produce the final three-dimensional maps as functions of vehicle speed and acceleration. Eight well-functioning, late-model vehicles, and one 1997 model vehicle, have been tested thus far in fully warmed-up conditions.

Similar continuing work is planned for the Department of Energy as well as FHWA, which will include more well-functioning, late-model vehicles, pre-control (1960's) vehicles, malfunctioning high-emitter vehicles, light-duty diesel vehicles (cars and pickup trucks), alternative fuel vehicles, and possibly heavy-duty diesel vehicles. ORNL will also be developing cold-start algorithms to enhance the existing models, since emissions and fuel economy generally improve as vehicles warm up to normal operating temperatures.

For further information regarding this study please contact:

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email: sluders@ornl.gov



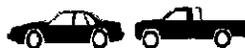
Table 6.16
Vehicle Specifications for Tested Vehicles

Vehicle	Curb weight	Engine	Fuel delivery system ^a	Transmission	EPA fuel economy	
					City	Highway
1988 Chevrolet Corsica	2,665	2.8 liter V6	PFI	M5	19	29
1994 Olds Cutlass Supreme	3,290	3.4 liter V6	PFI	L4	17	26
1994 Oldsmobile 88	3,433	3.8 liter V6	PFI	L4	19	29
1994 Mercury Villager	4,020	3.0 liter V6	PFI	L4	17	23
1995 Geo Prizm	2,359	1.6 liter I-4	PFI	L3	26	30
1994 Jeep Grand Cherokee	3,820	4.0 liter I-6	PFI	L4	15	20
1994 Chevrolet Pickup	4,020	5.7 liter V8	TBI	L4	14	18
1993 Subaru Legacy	2,800	2.2 liter H4	PFI	L4	22	29
1997 Toyota Celica	2,395	1.8 liter I4	PFI	L4	27	34

Source:

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*, Washington, DC, April 1997 and additional project data, April 1998.

^a PFI = port fuel injection. TBI = throttle-body fuel injection.



The two earlier studies by the Federal Highway Administration (FHWA) indicate maximum fuel efficiency was achieved at speeds of 35 to 40 mph. The recent FHWA study indicates greater fuel efficiency at higher speeds. Note that the 1973 study did not include light trucks.

Table 6.17
Fuel Economy by Speed, 1973, 1984, and 1997
 (miles per gallon)

Speed (miles per hour)	1973 ^a (13 vehicles)	1984 ^b (15 vehicles)	1997 ^c (9 vehicles)
15	d	21.1	24.4
20	d	25.5	27.9
25	d	30.0	30.5
30	21.1	31.8	31.7
35	21.1	33.6	31.2
40	21.1	33.6	31.0
45	20.3	33.5	31.6
50	19.5	31.9	32.4
55	18.5	30.3	32.4
60	17.5	27.6	31.4
65	16.2	24.9	29.2
70	14.9	22.5	26.8
75	d	20.0	24.8
<i>Fuel economy loss</i>			
55-65 mph	12.4%	17.8%	9.7%
65-70 mph	8.0%	9.6%	8.2%
55-70 mph	19.5%	25.7%	17.1%

Source:

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 Report (in press), Washington, DC, April 1997, and additional project data, April 1998.

(Additional resources: <http://www.fhwa-tsis.com>)

^aModel years 1970 and earlier automobiles.

^bModel years 1981-84 automobiles and light trucks.

^cModel years 1988-97 automobiles and light trucks.

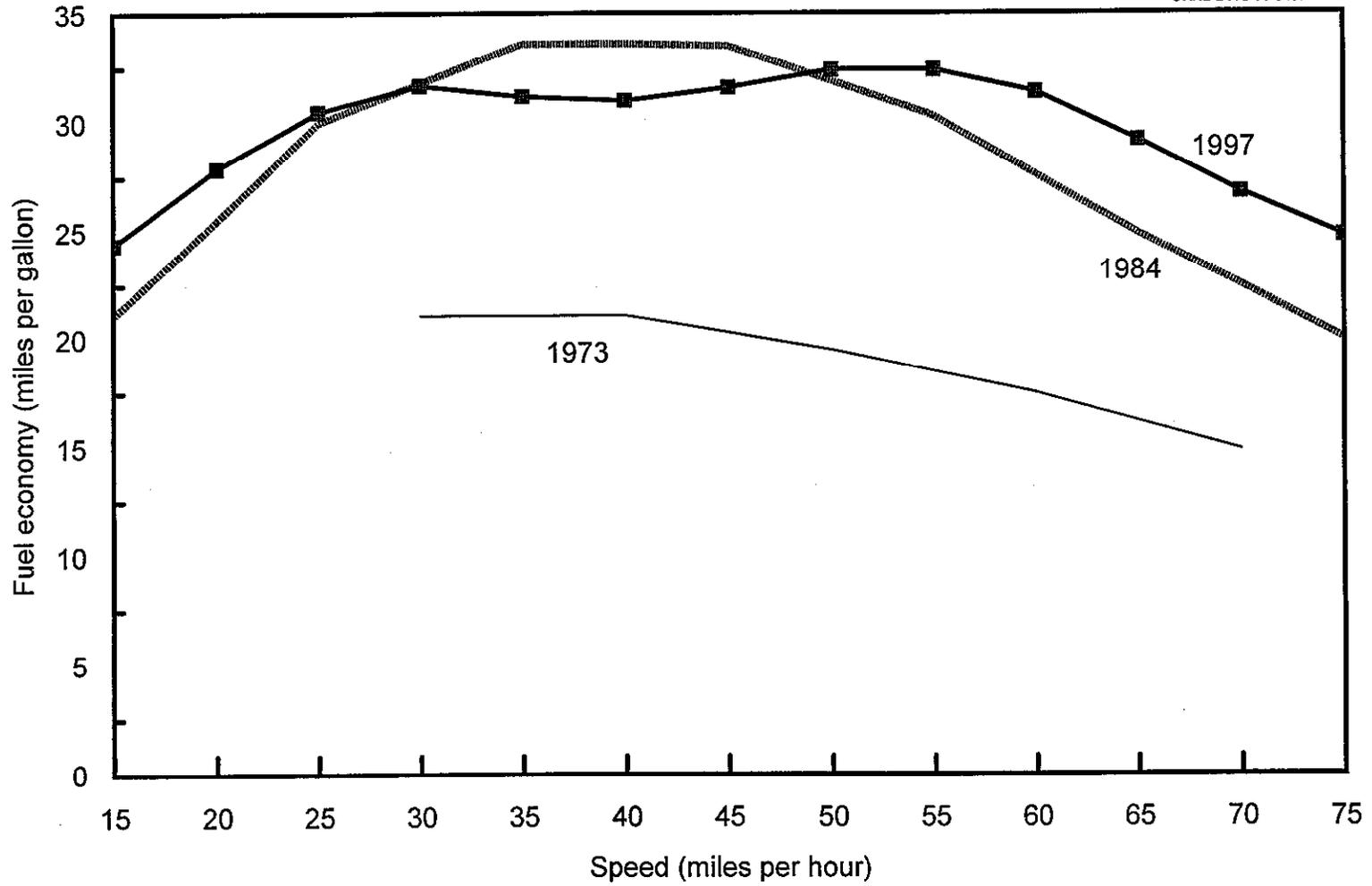
^dData are not available.





Figure 6.4. Fuel Economy by Speed, 1973, 1984, and 1997

ORNL-DWG 98-5487



Source: See Table 6.17.

Table 6.18
Steady Speed Fuel Economy for Tested Vehicles
(miles per gallon)

Speed (mph)	1988 Chevrolet Corsica	1993 Subaru Legacy	1994 Oldsmobile Olds 88	1994 Oldsmobile Cutlass	1994 Chevrolet Pickup	1994 Jeep Grand Cherokee	1994 Mercury Villager	1995 Geo Prizm	1997 Toyota Celica
5	10.0	14.5	10.5	5.1	7.9	8.2	12.3	18.1	19.1
10	16.8	24.7	14.9	7.9	16.0	11.2	19.0	23.1	34.1
15	17.7	31.9	22.2	11.4	16.3	17.5	22.4	38.9	41.7
20	21.7	34.4	26.3	12.5	19.9	24.7	25.8	39.4	46.0
25	23.9	37.4	28.3	15.6	22.7	21.8	30.8	41.7	52.6
30	28.7	39.7	29.0	19.0	26.3	21.6	30.3	40.0	50.8
35	28.6	38.0	30.9	21.2	24.3	25.0	26.1	39.1	47.6
40	29.2	37.0	33.2	23.0	26.7	25.5	29.0	38.9	36.2
45	28.8	33.7	32.4	23.0	27.3	25.4	27.8	42.3	44.1
50	31.2	33.7	34.2	27.3	26.3	24.8	30.1	39.1	44.8
55	29.1	37.7	34.6	29.1	25.1	24.0	31.7	37.7	42.5
60	28.2	35.9	32.5	28.2	22.6	23.2	27.3	36.7	48.4
65	28.7	33.4	30.0	25.0	21.8	21.3	25.3	34.1	43.5
70	26.1	31.0	26.7	22.9	20.1	20.0	23.9	31.7	39.2
75	23.7	28.8	24.0	21.6	18.1	19.1	22.4	28.3	36.8
	<i>Fuel economy loss</i>								
55-65 mph	1.4%	11.4%	13.3%	14.1%	13.1%	11.3%	20.2%	9.5%	9.7%
65-75 mph	17.4%	13.8%	20.0%	13.6%	17.0%	10.3%	11.5%	17.0%	15.3%
55-75 mph	18.6%	23.6%	30.6%	25.8%	27.9%	20.4%	29.3%	24.9%	23.6%

Source:

B.H. West, R.N. McGill, J.W. Hodgson, S.S. Sluder, D.E. Smith, *Development and Verification of Light-Duty Modal Emissions and Fuel Consumption Values for Traffic Models*, Washington, DC, April 1997, and additional project data, April 1998.
 (Additional resources: <http://www.fhwa-tsis.com>)

Note:

For specifications of the tested vehicles, please see page 6-21.



The Environmental Protection Agency (EPA) tests new vehicles to determine fuel economy ratings. The city and highway fuel economies that are posted on the windows of new vehicles are determined by testing the vehicle during these driving cycles. The driving cycles simulate the performance of an engine while driving in the city and on the highway. Once the urban cycle is completed, the engine is stopped, then started again for the 8.5 minute hot start cycle.

Figure 6.5. Urban Driving Cycle

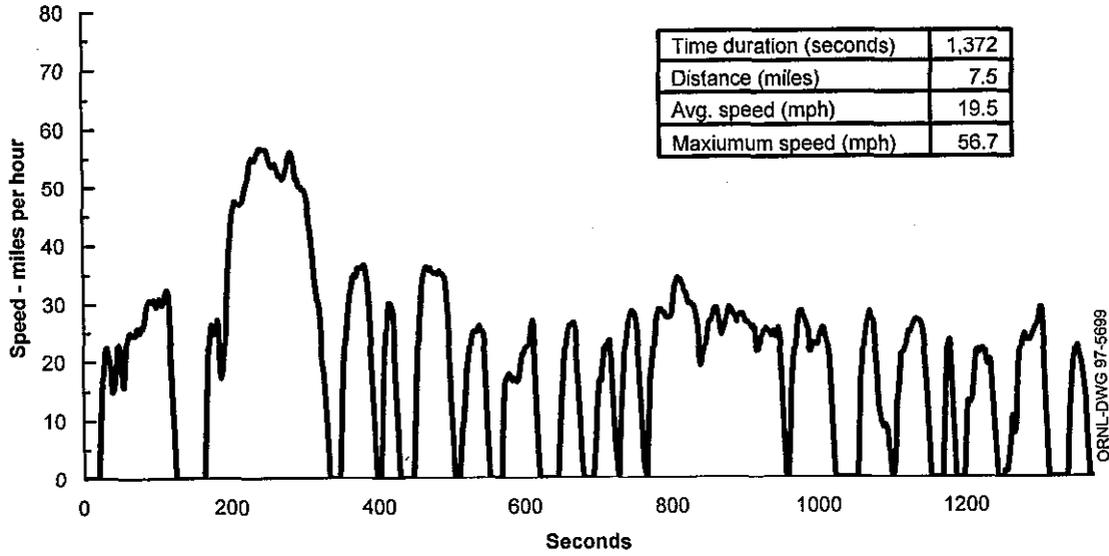
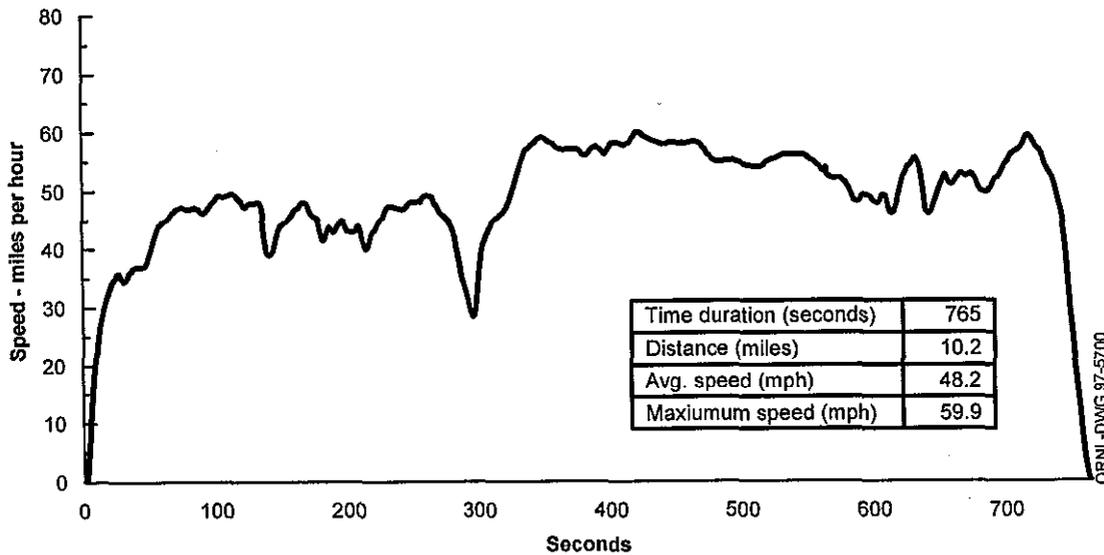


Figure 6.6. Highway Driving Cycle



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.



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 recently to better represent actual on-road driving by combining modern urban and freeway driving.

Figure 6.7. New York City Driving Cycle

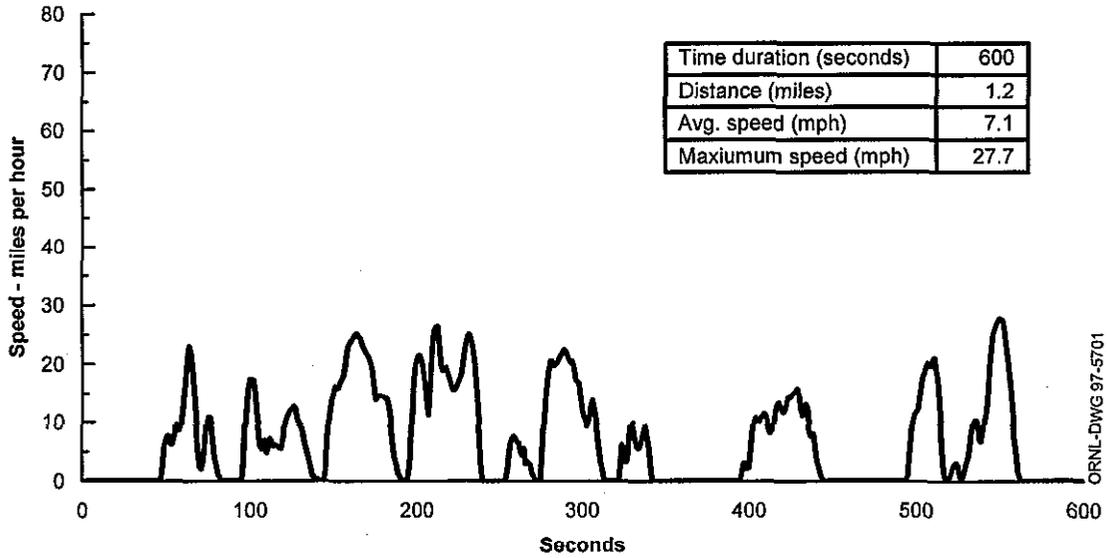
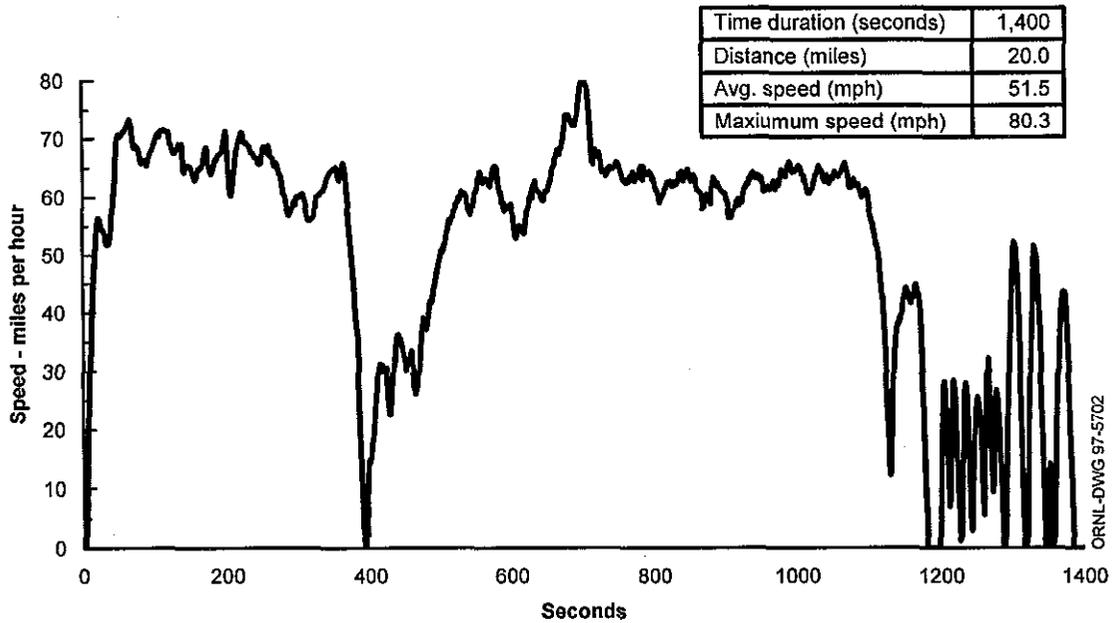


Figure 6.8. Representative Number Five Driving Cycle



Source:

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



