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RECENT FUEL ECONOMY TRENDS FOR NEW VEHICLES IN THE U.S.

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16. Abstract

This report documents the improvements in fuel economy of new light-duty vehicles in the U.S. from 2008 to 2012. The analyses were performed both unweighted (based only on the range of vehicle models offered for sale) and weighted by sales (based on actual consumer purchases). The information is presented both in terms of miles per gallon (mpg) and gallons per 100 miles (gphm).

The results show that, overall, there was an increase of 1.7 miles per gallon for newly purchased vehicles during the period examined. The report presents detailed breakdowns of fuel-economy changes by the following vehicle characteristics and subcategories: cars versus light trucks, vehicle size class, transmission type, number of engine cylinders, drive type, fuel type, and hybrid versus conventional vehicles. The report also discusses the nonlinear relationship between improvements in fuel economy and fuel saved.

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Introduction

The recent economic downturn, coupled with rising gas prices, has led to an increased interest in purchasing more fuel-efficient vehicles by drivers in the U.S. (Sivak and Schoettle, 2011a). For example, the sales-weighted fuel economy of purchased new vehicles increased by 2.5 miles per gallon (mpg) from October 2007 through February 2011 (Sivak and Schoettle, 2011a), more than double the increase in on-road fuel economy of the entire fleet in the preceding 23 years, from 1973 through 2006 (Sivak and Tsimhoni, 2009). (For real-time, monthly updates of the current sales-weighted fuel economy of new vehicles in the U.S., see Sivak and Schoettle [2012].)

A recent review of drivers' strategic, tactical, and operation decisions that influence vehicle fuel economy concluded that the selection of a specific vehicle model is the most important factor (Sivak and Schoettle, 2011b). Consequently, it is of interest to better understand in which areas the various improvements in fuel economy have occurred in recent years. This report examines recent fuel-economy trends both for all vehicles combined, and for several characteristics and subcategories of new vehicles available for sale in the U.S.

Method

Approach

The EPA Combined fuel-economy values[1], published in the *Fuel Economy Guide* for each model year (EPA, 2012a), were analyzed for vehicles sold in the U.S. for model years 2008 through 2012. The complete EPA data files were downloaded so that additional attributes for each vehicle could be included in the analyses (EPA, 2012a). Sales-weighted mean mpg values were calculated by weighting the mpg value for each vehicle by its respective sales data (Automotive News, 2012).

The following annual trends in fuel economy were examined:

- By model year (unweighted; based on the range of models offered for sale)
- By model year (weighted by actual sales)
- By calendar year (weighted by actual sales)

Model-based trends across model years (for individual models available for sale during both compared model years) were also examined. Additionally, fuel-economy trends across model years (unweighted) were compared for the following categories of vehicle attributes (as defined by the EPA and included in the downloaded data files):

- Cars versus light trucks
- Vehicle size class
- Transmission type
- Drive type
- Number of engine cylinders
- Fuel type
- Hybrid versus conventional vehicles

Finally, a comparison of changes in fuel economy to changes in fuel consumption was discussed.

[1] The EPA Combined fuel-economy estimate is a weighted average that assumes 55% city driving and 45% highway driving (EPA, 2012b).

Vehicle model years

Model years 2008 through 2012 were examined. The 2008 model year was selected as the starting year because the EPA changed the methodology for calculating fuel-economy estimates starting with the 2008 model year, preventing direct comparisons between the pre-2008 and the more recent fuel-economy ratings. (However, sales for model year 2006 and 2007 vehicles are also included, for the purposes of calculating the calendar year 2007 and 2008 values, respectively.) It was assumed that sales for each model year began in October of the prior calendar year, then ended the following September (e.g., model year 2008 sales occurred from October 2007 through September 2008).

All vehicle models available for sale were included in the analyses except those not specifically covered by Automotive News sales data. The excluded vehicles were those manufactured by Bugatti, Mahindra & Mahindra, Roush Performance, Saleen Performance, Shelby American, Spyker, Tecstar, and Vehicle Production Group.

Results

Model year trends

Overall, there were consistent increases in fuel economy across model years for both the unweighted analysis (a measure of general vehicle availability; Table 1) as well as for the sales-weighted analysis (a measure of consumer purchasing behavior; Table 2). In the unweighted analysis, mean fuel economy increased by 2.6 mpg from model year 2008 to 2012. The sales-weighted mean fuel economy increased by 1.7 mpg from model year 2008 to 2011[2].

The sales-weighted mean fuel economy for each year was better than the unweighted fuel economy. These results imply that consumers tend to choose vehicle models with better fuel economy than the average of all vehicles available.

Table 1
Mean fuel economy (unweighted), by model year.

Model year	Available models*	Mean mpg
2008	1227	18.9
2009	1178	19.0
2010	1097	20.7
2011	1081	21.2
2012	894	21.5

* Corresponds to the number of entries in the downloaded EPA data file for each year.

Table 2
Mean fuel economy (sales weighted), by model year.

Model year	Vehicles sold	Mean mpg
2008	14,525,764	20.8
2009	10,272,669	21.3
2010	11,229,302	22.1
2011	12,468,650	22.5

[2] Model year 2012 was not included because only three months of sales have been completed to date.

Calendar year trends

As with the model-year analysis, there were consistent increases in fuel economy across calendar years (also sales-weighted, thus a measure of consumer purchasing behavior; Table 3). The sales-weighted mean fuel economy increased by 1.6 mpg from calendar year 2008 to 2011, similar to the sales-weighted model year increase. (Each calendar year includes three months of sales for the subsequent model year, accounting for the slightly higher mean mpg values each year when compared to the sales-weighted model year results.)

Table 3
Mean fuel economy (sales weighted), by calendar year.

Calendar year	N (sales)	Mean mpg
2008	13,206,137	20.9
2009	10,418,894	21.6
2010	11,581,398	22.1
2011	12,749,521	22.5

Model-based trends across model years

Year-to-year comparisons of the fuel economy for identical make-model combinations are presented in Table 4. For inclusion in this analysis, a specific make-model combination (e.g., Ford F-150) must have been available for purchase in both model years being compared. The total number of vehicle models in Table 4 indicates the total number of make-model combinations meeting this criterion in each comparison. For the final comparison (bottom row in Table 4), there were 223 make-model combinations that were available for purchase across all five model years.

There were improvements in each model year from 2008 to 2011. The smallest year-to-year change occurred from 2008 to 2009, with an increase of 0.1 mpg in the mean fuel economy. The largest increase occurred the following year (2009 to 2010), with an increase of 0.6 mpg. Overall, from 2008 to 2012, there was an increase of 1.5 mpg. That is to say, on average, the same vehicle make-model improved by 1.5 mpg over this period. One implication is that if a driver purchased both a model year 2008 and a model year 2012 vehicle of the same make and model, the newer one would have had, on average, an improvement of 1.5 mpg.

Table 4
Year-to-year comparisons (unweighted) of the make-model combinations available across model years.

Model years	Mean change in mpg	Largest increase in mpg	Largest decrease in mpg	Number of vehicle models			
				Increased mpg	Decreased mpg	No change in mpg	Total
2009 vs. 2008	+0.1	+3.3	-2.8	92	50	141	283
2010 vs. 2009	+0.6	+5.5	-1.0	141	20	120	281
2011 vs. 2010	+0.4	+6.3	-2.3	112	49	118	279
2012 vs. 2011	+0.2	+4.8	-4.3	70	39	157	266
2012 vs. 2008	**+1.5**	**+7.0**	**-3.4**	**179**	**18**	**26**	**223**

Vehicle size class

Fuel-economy trends by vehicle size class are presented in Table 5 (unweighted; based only on models offered for sale). Vehicle size class is defined by the EPA for cars based on interior passenger and cargo volume, and for light trucks based on gross vehicle weight rating (EPA, 2012c). There were improvements in all vehicle size classes between the 2008 and 2012 model years. The smallest increase was 0.2 mpg for full-size vans, which also had the lowest mean 2012 rating of 13.4 mpg. The largest increase was 4.1 mpg for station wagons, which also had the highest mean 2012 rating of 26.0 mpg.

Table 5
Mean fuel economy (mpg, unweighted), by vehicle size class
(sorted by size, smallest to largest).

Size class	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Two-seater car	18.8	17.1	19.2	22.2	20.4	+1.6
Minicompact car	20.4	21.3	21.6	21.8	22.2	+1.8
Subcompact car	21.2	21.7	21.9	22.4	23.8	+2.6
Compact car	21.8	22.0	23.7	24.7	25.6	+3.8
Mid-size car	21.1	21.3	22.5	23.9	24.0	+2.9
Large car	17.9	18.1	18.5	19.2	19.6	+1.7
Station wagon (all sizes)	21.9	23.1	24.0	24.7	26.0	+4.1
Small pick-up truck	18.2	18.4	18.6	18.5	18.6	+0.4
Standard pick-up truck	14.5	14.8	16.1	16.3	16.3	+1.8
Minivan	18.4	18.7	19.5	20.5	21.2	+2.8
Van (passenger and cargo)	13.2	13.2	14.6	13.5	13.4	+0.2
Sport Utility Vehicle	17.7	17.8	19.4	19.8	19.7	+2.0

Cars versus light trucks

Fuel-economy trends (unweighted) for cars versus light trucks are presented in Table 6. The category *cars* includes all cars and station wagons; *light trucks* includes all pick-up trucks, vans, and sport utility vehicles. There were improvements for both vehicle types from the 2008 to 2012 model years. Cars improved more, with an increase of 2.8 mpg compared to 1.6 mpg for light trucks, and are more fuel efficient (currently at 23.4 mpg and 18.6 mpg, respectively).

Table 6
Mean fuel economy (mpg, unweighted), by vehicle type.

Vehicle power source	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Cars	20.6	21.0	22.0	23.1	23.4	+2.8
Light trucks	17.0	17.1	18.7	18.8	18.6	+1.6

Calendar year sales trends by vehicle type

Figure 1 shows the sales trends for cars (higher overall mpg) and light trucks (lower overall mpg) from 2007 to 2011 (Automotive News, 2012). While overall fuel economy has increased during this time, a consistent trend toward the higher mpg cars and away from the lower mpg light trucks is not the cause. Specifically, cars accounted for 49% of sales in 2007, 53% in 2008, 55% in 2009, 52% in 2010, and 50% in 2011. Thus, it appears that the annual improvements in fuel economy are the result of both a shift from light trucks to cars in 2008 through 2010, and an overall improvement in fuel economy for both vehicle types.

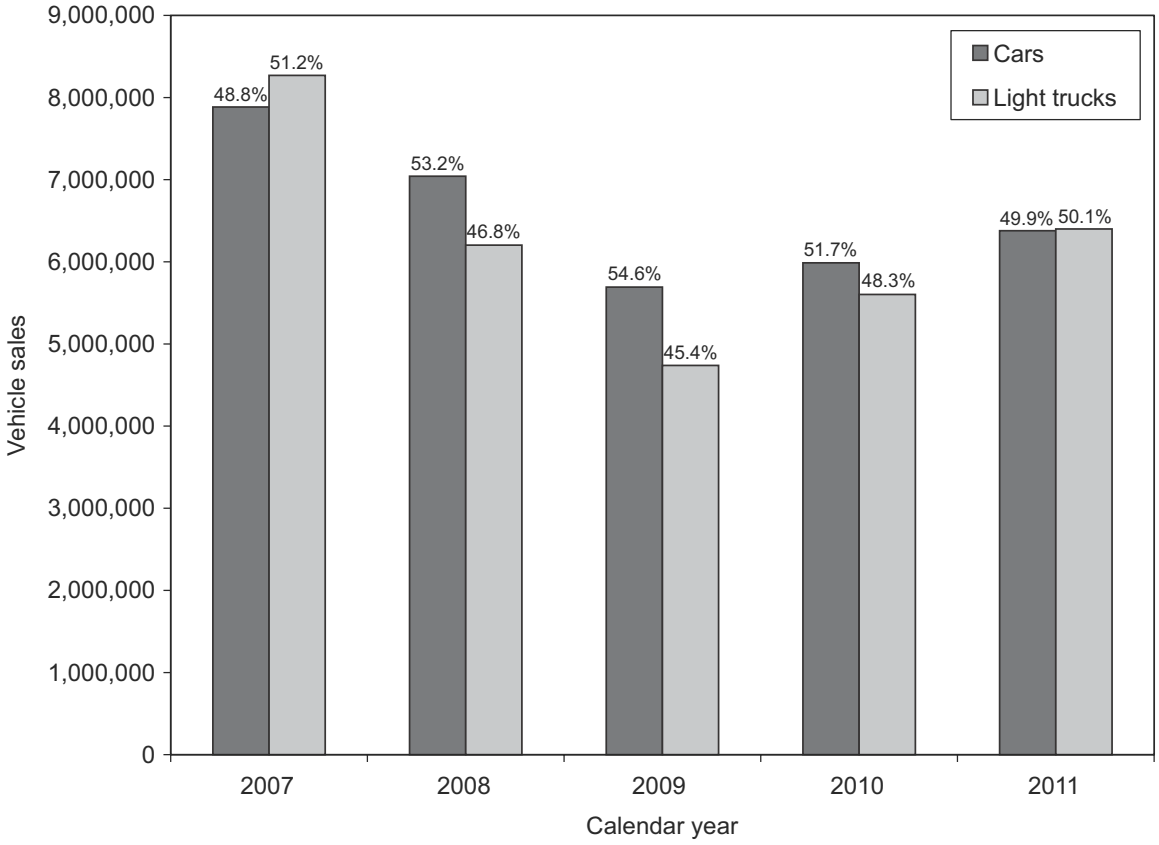

Figure 1. Total sales for cars and light trucks in the U.S. by calendar year. The percentages above each bar represent the relative proportion of annual sales for each vehicle type.

Transmission type

There were overall increases in fuel economy in each model year for the two basic transmission types, as shown in Table 7. While both types showed similar increases (2.5 and 2.8 mpg), the fuel economy for automatic transmissions in 2012 equals that for manual transmissions in 2008 (20.8 mpg). (Additional analyses of recent fuel-efficient transmission technologies, such as continuously variable, semi-automatic, and automated manual were not possible because these features were only available in the EPA data files for the 2010 and 2011 model years.)

Table 7
Mean fuel economy (mpg, unweighted), by transmission type.

Transmission type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Automatic	18.3	18.3	20.1	20.7	20.8	+2.5
Manual	20.8	21.6	22.3	23.1	23.6	+2.8

Number of engine cylinders

Generally, there were increases in fuel economy each year for engines of all cylinder counts, and all showed increases overall from 2008 to 2012, as displayed in Table 8.[3] The smallest increase occurred for 10-cylinder engines, improving by 0.1 mpg, while the largest increase was for 4-cylinder engines, gaining 2.3 mpg. Current mean fuel economy generally decreases as the number of engine cylinders increases (an inverse relationship). The highest mean rating is for 4-cylinder engines at 26.4 mpg, while the lowest rating is for 10 cylinders at 14.0 mpg.

Table 8
Mean fuel economy (mpg, unweighted), by number of engine cylinders.

Number of cylinders	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
4	24.1	24.4	25.3	25.9	26.4	+2.3
5	20.6	21.0	21.4	21.7	21.7	+1.1
6	19.0	19.0	19.7	20.1	20.4	+1.4
8	14.9	15.0	16.2	16.1	16.1	+1.2
10	13.9	14.2	14.5	14.4	14.0	+0.1
12	12.5	12.6	12.8	14.0	14.1	+1.6

[3] There were only five vehicle models comprising the 2- and 3-cylinder categories; they were excluded due to the extremely low counts.

Drive type

As shown in Table 9, there were fuel-economy increases in each model year for all drive types, with the exception of rear-wheel drive (decreased in 2009 and 2012; increased in 2010 and 2011). Overall, the smallest increase occurred for rear-wheel drive, improving by 1.2 mpg, while the largest increase was for front-wheel drive, gaining 3.4 mpg. In addition to showing the largest increase, front-wheel drive currently also has the highest overall fuel economy at 26.3 mpg. Rear-wheel drive has the lowest mean rating at 18.4 mpg.

Table 9
Mean fuel economy (mpg, unweighted), by drive type.

Drive type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Four- or all-wheel drive*	17.1	17.3	18.5	18.9	19.1	+2.0
Front-wheel drive	22.9	23.4	24.8	25.9	26.3	+3.4
Rear-wheel drive	17.2	16.8	18.4	18.8	18.4	+1.2

* Four-wheel drive and all-wheel drive were not differentiated in the EPA data files for all model years, so they were combined in this analysis.

Fuel type

Fuel-economy trends by fuel type are presented in Table 10. There were improvements for most fuel types from the 2008 to 2012 model years. For the two predominant fuels in the U.S., gasoline engines showed the smaller increase, gaining 2.3 mpg; diesel engines showed a much larger improvement, gaining an average of 9.8 mpg.

Currently, gasoline engines have a mean rating of 21.2 mpg while diesel engines have a mean rating of 30.4 mpg. For comparison, current battery-electric and hydrogen-fuel-cell technologies are rated as approximately two to four times as efficient as gasoline and diesel.

There were five or fewer vehicle models per model year in the battery-electric, compressed-natural-gas, and hydrogen-fuel-cell categories; they were included in Table 10 only to show the existing range of alternative fuel technologies. (Hydrogen-fuel-cell vehicles were not available prior to 2010, and battery-electric vehicles were not available prior to 2011.)

Table 10
Mean fuel economy (mpg, unweighted), by fuel type.

Fuel type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Battery electric*	-	-	-	91.0	112.0	n/a
Compressed natural gas	28.0	28.0	28.0	28.0	-	n/a
Diesel	20.6	27.4	27.6	27.6	30.4	+9.8
Gasoline	18.9	18.9	20.5	20.9	21.2	+2.3
Hydrogen fuel cell*	-	-	60.0	53.0	52.0	n/a

* Fuel economy rated in miles per gallon equivalent (mpge) (EPA, 2012d).
– For battery electric: 1 gallon of gasoline = 33.7 kW·h
– For hydrogen fuel cell: 1 gallon of gasoline = approx. 1 kg of hydrogen

Hybrid versus conventional vehicles

Table 11 shows the fuel-economy trends for hybrids versus conventional (i.e., internal-combustion engine [ICE] only) vehicles. The fuel economy of hybrid vehicles fluctuated during the period examined, while conventional-vehicle fuel economy improved each year. From 2008 to 2012, hybrids lost an average of 3.0 mpg, while conventional vehicles gained an average of 2.6 mpg. However, hybrids generally have better overall fuel economy when compared to conventional vehicles (in 2012, 25.2 mpg versus 21.4 mpg, respectively).

Table 11
Mean fuel economy (mpg, unweighted), by vehicle power source.

Vehicle power source	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Hybrid	28.2	26.6	27.3	26.4	25.2	-3.0
Conventional (ICE only)	18.8	18.9	20.5	21.0	21.4	+2.6

Discussion

Improvements in fuel consumption rate versus mpg

An improvement in fuel economy by a given mpg amount will affect fuel consumed by high mpg and low mpg vehicles differently (Larrick and Soll, 2008; Sivak and Tsimhoni, 2009). This is the case because fuel consumption is not a linear function of vehicle fuel economy, but a power function (see Figure 2). The relationship can be expressed as follows:

$$gallons\ of\ fuel\ consumed = (miles\ driven) \times (mpg)^{-1}$$

As overall vehicle fuel economy increases, the effect of an improvement by a given mpg amount on fuel saved decreases. Therefore, a given improvement will benefit vehicles with lower mpg ratings more than vehicles with higher mpg ratings in terms of fuel consumption rate and overall fuel consumed. From this point of view, fuel economy improvements are more desirable for the lower mpg vehicles than for the higher mpg vehicles.

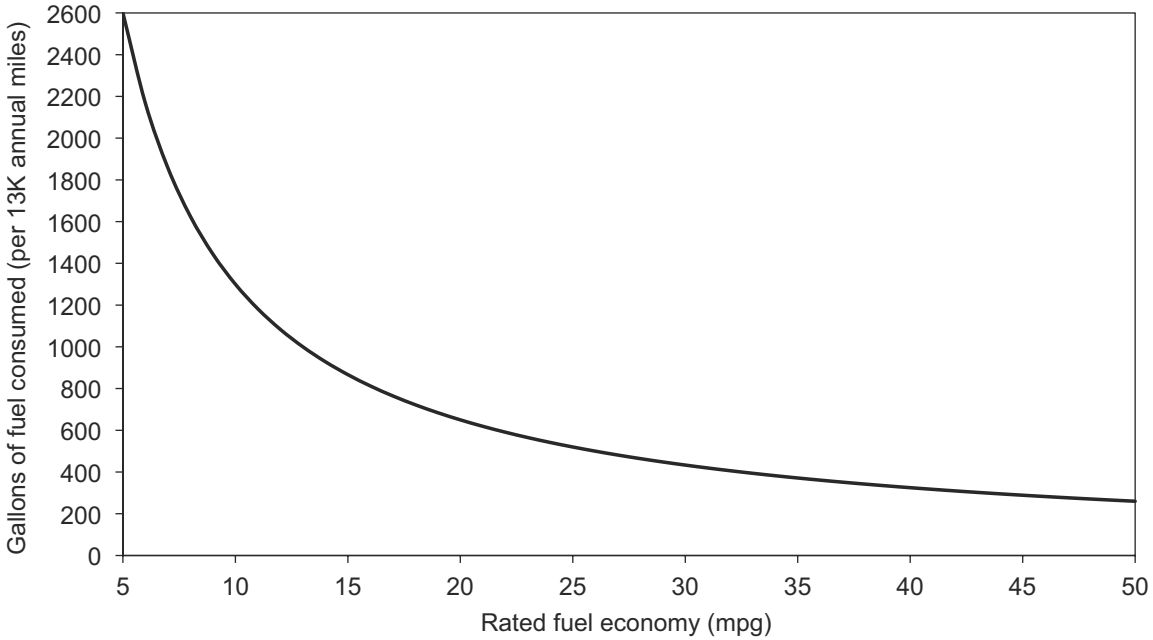

Figure 2. Fuel consumption as a function of fuel economy for 13,000 miles of driving.

Let's consider the following example based on driving 13,000 miles—the mean annual distance for U.S. drivers (Santos, McGuckin, Nakamoto, Gray, and Liss, 2011). The 4-cylinder engines improved by 2.3 mpg from 2008 to 2012 (reaching 26.4 mpg overall), while 8-cylinder engines improved less, by 1.2 mpg (reaching 16.1 mpg). Yet, the 8-cylinder engines will save about 1.4 times more gasoline during 13,000 miles of driving from these improvements (67 gallons saved, versus 48 gallons saved for the 4-cylinder engines). This effect is illustrated in Figure 3.

Although the fuel-economy improvements result in greater *savings* for lower mpg vehicles, higher mpg vehicles still consume less fuel overall. In the above example, vehicles with 4-cylinder engines currently use about 28% less fuel per distance driven than 8-cylinder engines.

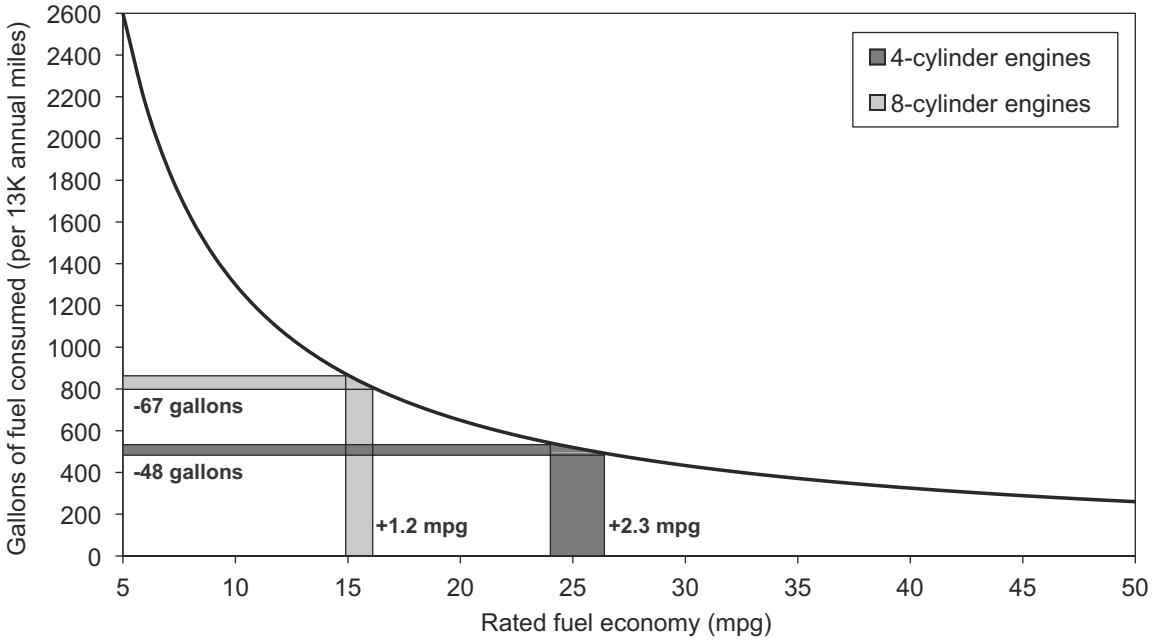

Figure 3. An example of the fuel saving effects of improvements in fuel economy, based on number of engine cylinders, for 13,000 miles of driving.

Another example of larger gains in fuel economy resulting in smaller fuel savings is evident when comparing compact cars and standard pick-up trucks. While the mean improvement for compact cars was more than double that found for standard pick-up trucks (3.8 mpg and 1.8 mpg, respectively), the standard pick-up trucks would save an additional 10 gallons annually over compact cars (99 gallons saved, versus 89 gallons saved for compact cars; see Figure 4).

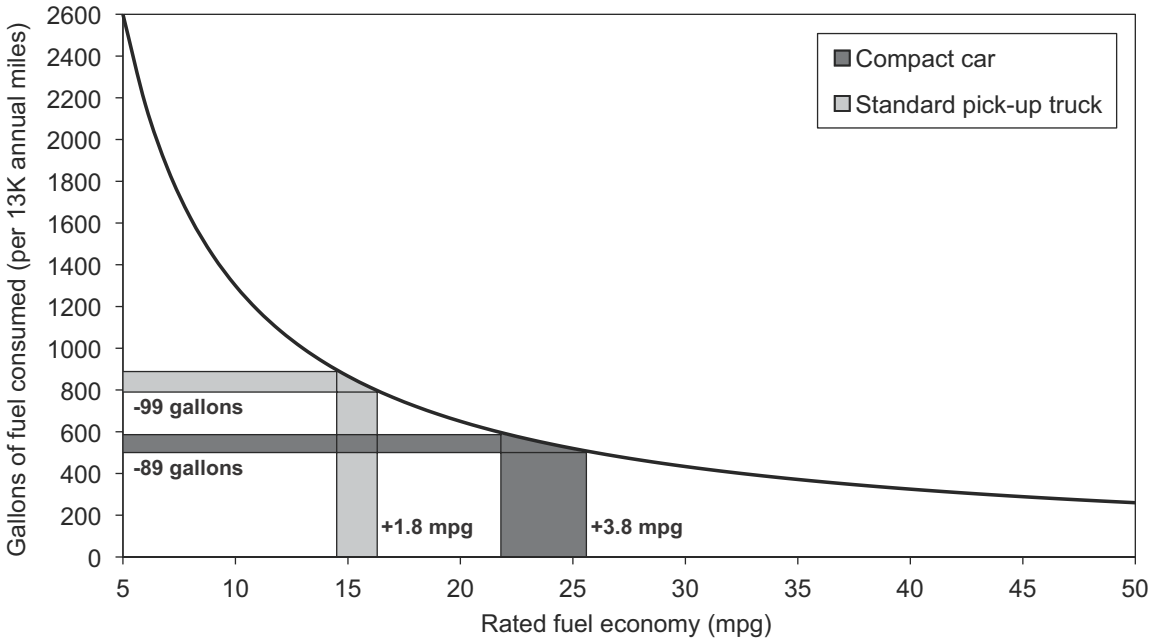

Figure 4. An example of the fuel saving effects of improvements in fuel economy, based two examples of vehicle size class, for 13,000 miles of driving.

In acknowledging the nonlinear relationship between changes in general fuel economy and changes in fuel consumption rate, the EPA will require new Fuel Economy and Environment Labels for model year 2013 vehicles (EPA, 2012d). In addition to the information traditionally shown on these labels, displaying the fuel consumption rate (expressed in gallons per 100 miles) is one of several new requirements. With this in mind, Tables 1 through 11 have been converted from mpg to gallons per 100 miles (gphm), and are presented in the Appendix as Tables A1 through A11.

Summary

This report documented the improvements in fuel economy of new light-duty vehicles in the U.S. from 2008 to 2012. The analyses were performed both unweighted (based only on the range of vehicle models offered for sale) and weighted by sales (based on actual consumer purchases). The information was presented both in terms of miles per gallon (mpg) and gallons per 100 miles (gphm).

The results showed that, overall, there was an increase of 1.7 miles per gallon for newly purchased vehicles during the period examined. The report presented detailed breakdowns of fuel-economy changes by the following vehicle characteristics and subcategories: cars versus light trucks, vehicle size class, transmission type, number of engine cylinders, drive type, fuel type, and hybrid versus conventional vehicles. The report also discussed the nonlinear relationship between improvements in fuel economy and fuel saved.

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Appendix

Table A1
Mean fuel consumption rate (unweighted), by model year.

Model year	Available models	Mean gphm
2008	1227	5.3
2009	1178	5.3
2010	1097	4.8
2011	1081	4.7
2012	894	4.7

Table A2
Mean fuel consumption rate (sales weighted), by model year.

Model year	Vehicles sold	Mean gphm
2008	14,525,764	4.8
2009	10,272,669	4.7
2010	11,229,302	4.5
2011	12,468,650	4.4

Table A3
Mean fuel consumption rate (sales weighted), by calendar year.

Calendar year	N (sales)	Mean gphm
2008	13,206,137	4.8
2009	10,418,894	4.6
2010	11,581,398	4.5
2011	12,749,521	4.4

Table A4
Year-to-year comparisons (unweighted) of the make-model combinations available across model years. The comparison between the first and last model years is in bold.

Model years	Mean change in gphm	Largest increase in gphm	Largest decrease in gphm	Number of vehicle models			
				Increased gphm	Decreased gphm	No change in gphm	Total
2009 vs. 2008	-0.0	+0.6	-1.0	50	92	141	283
2010 vs. 2009	-0.2	+0.3	-1.5	20	141	120	281
2011 vs. 2010	-0.1	+1.2	-1.5	49	112	118	279
2012 vs. 2011	-0.1	+1.3	-1.5	39	70	157	266
2012 vs. 2008	**-0.4**	**+1.2.**	**-2.0**	**18**	**179**	**26**	**223**

Table A5
Mean fuel consumption rate (gphm, unweighted), by vehicle size class (sorted by size, smallest to largest).

Size class	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Two-seater car	5.3	5.9	5.2	4.5	4.9	-0.4
Minicompact car	4.9	4.7	4.6	4.6	4.5	-0.4
Subcompact car	4.7	4.6	4.6	4.5	4.2	-0.5
Compact car	4.6	4.5	4.2	4.0	3.9	-0.7
Mid-size car	4.7	4.7	4.5	4.2	4.2	-0.5
Large car	5.6	5.5	5.4	5.2	5.1	-0.5
Station wagon (all sizes)	4.6	4.3	4.2	4.0	3.8	-0.8
Small pick-up truck	5.5	5.4	5.4	5.4	5.4	-0.1
Standard pick-up truck	6.9	6.8	6.2	6.1	6.1	-0.8
Minivan	5.4	5.4	5.1	4.9	4.7	-0.7
Van (passenger and cargo)	7.6	7.6	6.9	7.4	7.5	-0.1
Sport Utility Vehicle	5.7	5.6	5.2	5.0	5.1	-0.6

Table A6
Mean fuel consumption rate (gphm, unweighted), by vehicle type.

Vehicle power source	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Cars	4.9	4.8	4.5	4.3	4.3	-0.6
Light trucks	5.9	5.9	5.3	5.3	5.4	-0.5

Table A7
Mean fuel consumption rate (gphm, unweighted), by transmission type.

Transmission type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Automatic	5.5	5.5	5.0	4.8	4.8	-0.7
Manual	4.8	4.6	4.5	4.3	4.2	-0.6

Table A8
Mean fuel consumption rate (gphm, unweighted), by number of engine cylinders.

Number of cylinders	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
4	4.2	4.1	4.0	3.9	3.8	-0.4
5	4.9	4.8	4.7	4.6	4.6	-0.3
6	5.3	5.3	5.1	5.0.	4.9	-0.4
8	6.7	6.7	6.2	6.2	6.2	-0.5
10	7.2	7.1	6.9	7.0	7.1	-0.1
12	8.0	7.9	7.8	7.2	7.1	-0.9

Table A9
Mean fuel consumption rate (gphm, unweighted), by drive type.

Drive type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Four- or all-wheel drive	5.8	5.8	5.4	5.3	5.2	-0.6
Front-wheel drive	4.4	4.3	4.0	3.9	3.8	-0.6
Rear-wheel drive	5.8	6.0	5.4	5.3	5.4	-0.4

Table A10
Mean fuel consumption rate (gphm, unweighted), by fuel type.

Fuel type	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Battery electric*	-	-	-	1.1	0.9	n/a
Compressed natural gas	3.6	3.6	3.6	3.6	-	n/a
Diesel	4.9	3.7	3.6	3.6	3.3	-1.6
Gasoline	5.3	5.3	4.9	4.8	4.7	-0.6
Hydrogen fuel cell*	-	-	1.7	1.9	1.9	n/a

* Fuel consumption rate based on miles per gallon equivalent (mpge) (EPA, 2012d).
– For battery electric: 1 gallon of gasoline = 33.7 kW·h
– For hydrogen fuel cell: 1 gallon of gasoline = approx. 1 kg of hydrogen

Table A11
Mean fuel consumption rate (gphm, unweighted), by vehicle power source.

Vehicle power source	Model year					Change from 2008 to 2012
	2008	2009	2010	2011	2012	
Hybrid	3.5	3.8	3.7	3.8	4.0	+0.5
Conventional (ICE only)	5.3	5.3	4.9	4.8	4.7	-0.6