



**Consumer Federation of America**

**STAYING ON THE ROAD TO 54.5 MPG BY 2025  
RIDING THE GASOLINE ROLLER COASTER**

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## EXECUTIVE SUMMARY

**Section I:** Since the start of the 21<sup>st</sup> century, gasoline prices have been on a roller coaster. Starting with 1999, the average annual price in current dollars has varied from \$1.22/gallon to \$3.68 per gallon, with a mean of \$2.50 and a standard deviation of \$0.86. Household expenditures on gasoline have increased by as much as \$1,500 per year, making them one of the largest items in the household budget. In some years the cost of gasoline has equaled the cost of car ownership. The general pattern of increase and the volatility has major implications for consumers and policymakers.

**Section II:** The survey evidence reviewed in this document shows that consumers recognize the underlying trend and attach great importance to fuel economy in their consideration of vehicle purchases (86% say it is important, 57% very much so). They want vehicles with substantially higher gasoline mileage – approximately 30 miles per gallon, which represents an increase of about 6 MPG.

**Section III:** According to our analysis, the impact of fuel inefficiency is substantial. Looking backward, a consumer who was misled by the dip of gasoline prices in late 2008 into thinking that the dip was permanent and chose to purchase a low mileage vehicle (15 MPG) instead of a high mileage vehicle (25 MPG), would have paid dearly. Gasoline expenditures in current dollars would have over \$6,400 more over five years (the typical length of an auto loan) and \$7,800 more over 6 years (about average length of time new cars were owned over this period).

**Section IV:** The last decade has witnessed a profound shift in gasoline consumption that reflects the fundamental shift in economics and the commensurate adjustment of consumer attitudes. Miles driven have declined and mileage has increased, which has cushioned the blow of rising gasoline prices somewhat by lowering household consumption. Improved mileage accounts for about two-thirds of the reduction in expenditures on gasoline. A multiple regression model shows that increasing fuel economy standards adopted as a result of the revamping of the CAFE program in 2007 are the most important factor in rising mileage.

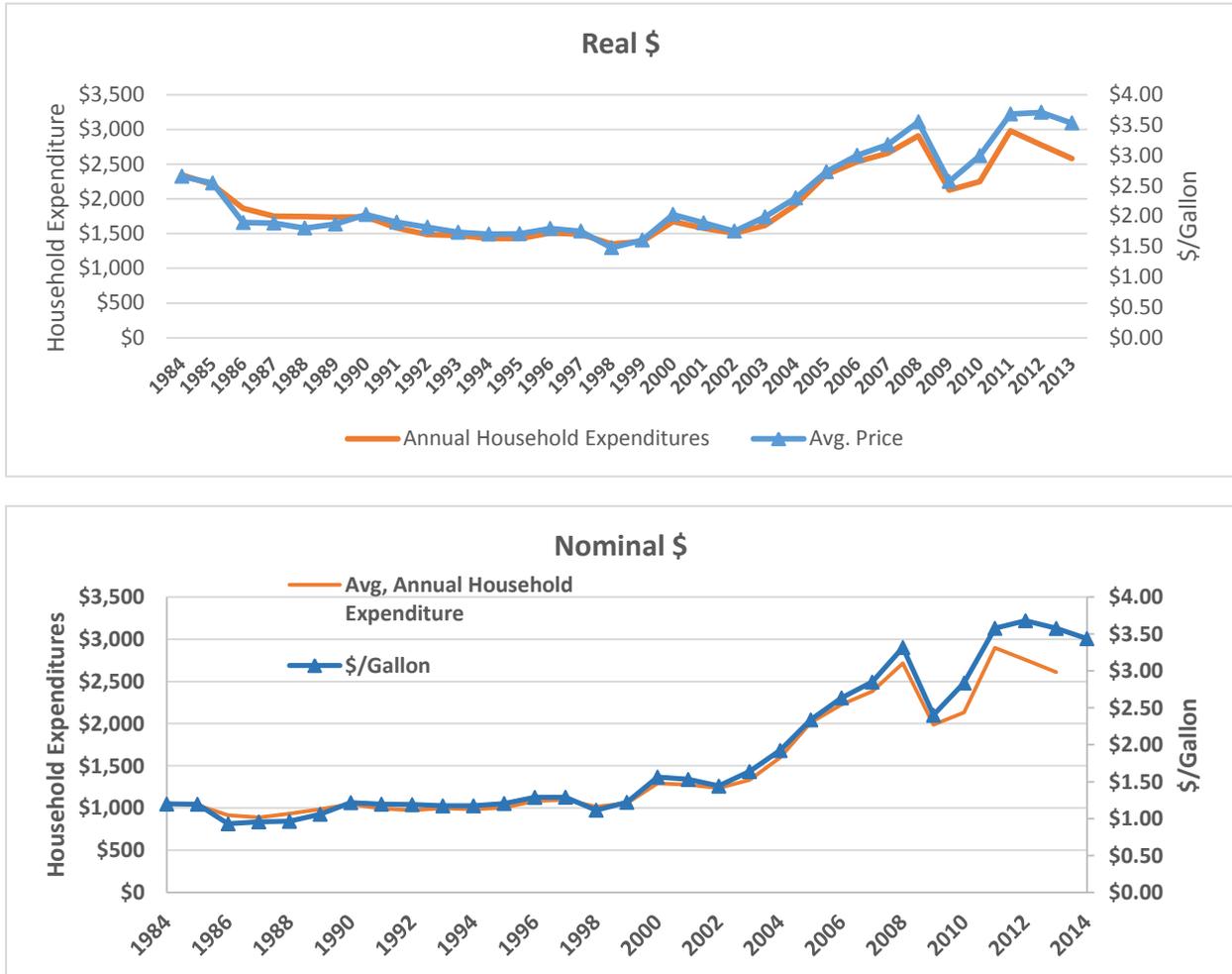
Consumers' attitudes about gasoline prices, their desire for higher mileage and support for fuel economy standards are well-grounded in their experience and in pocketbook economics and clearly manifested in their behavior. The message is simple, consumers will not and should not be fooled by temporary gyrations of gasoline and policy makers should follow their lead and keep a steady eye on road to the gradual increase to 54.5 mpg by 2025.

## I. INTRODUCTION

### Gasoline Prices, Household Expenditures and Fuel Economy Policy

Over the course of the past two decades the price of gasoline has been on a roller coaster, as shown in Figure 1.<sup>1</sup> Since the start of the 21<sup>st</sup> century, gasoline prices have been on a roller coaster. Since 1999, the price has varied from \$1.22/gallon to \$3.68 per gallon, with a mean of \$2.50 and a standard deviation of \$0.86.

**FIGURE 1: GASOLINE PRICES AND HOUSEHOLD EXPENDITURES ON GASOLINE (REAL 2014\$)**



Source: Energy Information Administration, Data Base, Bureau of Labor Statistics, Consumer Expenditure Survey.

While gasoline supply and price have received policy and public attention for many reasons, Figure 1 shows at least one reason for the huge impact it has on household budgets. With household expenditures rising from around \$1,500 (in real 2014\$) in the late 1990s to well over \$3,000 (in nominal \$ the increase was even larger) a decade later, expenditures on gasoline became one of the largest single items in the household budget and it is an expenditure incurred on a continuous basis.<sup>2</sup> In fact, in the years when gasoline prices were highest, fuel costs became

the largest component in the cost of driving, larger than the cost of ownership, insurance or maintenance, which had not typically been the case.<sup>3</sup>

This has had major implications for U.S. policy and consumer pocketbooks.

- After two decades of relatively stable prices, the small price spike at the turn of the century got automakers and policy makers thinking about the fuel consumption of cars and trucks.<sup>4</sup> The much larger price spike after the 2001-2002 recession rekindled interest in fuel economy.<sup>5</sup>
- In his 2006 State of the Union Address,<sup>6</sup> President Bush, who hails from the leading U.S. oil state, declared that America was addicted to oil and called for vigorous efforts to end that addiction.
- In 2007, Congress legislated changes in the CAFE program which sets fuel economy standards,<sup>7</sup> after a long period in which the standards had not been raised, and the first increase in standards was proposed in 2008.
- Almost a decade after Bush's declaration about our oil addiction problem, in the 2015 State of the Union Address,<sup>8</sup> President Obama applauded the progress that had been made.

Figure 1 also suggests in a simple explanation for how the effort to increase the fuel economy of vehicles can claim success. After 2011, household expenditures did not track gasoline prices nearly as closely as they had in the past. They became uncoupled as the lock step march of gasoline prices and household gasoline expenditures was broken.

## **Purpose and Outline**

As the roller coaster ride of gasoline prices continues, many questions arise as to how it can, or should affect policy and consumer behavior. How do consumers and automakers react to these price swings? How do they affect consumer pocketbooks?

For the past ten years, CFA's survey analysis has shown that consumers are quite consistent in their attitudes.<sup>9</sup> Regardless of price fluctuations, they remain concerned about oil imports and gasoline prices and steadfastly support the fuel economy standards program. Moreover, our economic analysis of proposed standards has shown that increases in fuel economy yield substantial benefits to consumers.<sup>10</sup> With gasoline prices again bouncing around and a mid-course review of the long term standards approaching, this paper examines a number of important issues that might affect the future of fuel economy and fuel economy standards.

Section II examines consumer expectations about gasoline prices over the next five years and attitudes and expectations about the fuel economy of their next vehicle.

Section III presents an analysis of the pocketbook costs of inefficiency.

Section IV analyzes shifts in gasoline consumption and expenditures caused by changes in vehicle mileage and miles driven.

## II. CONSUMER ATTITUDES

As has frequently been our approach, we start by analyzing the results of a national public opinion poll and combine this with an analysis of the economics of vehicle fuel economy to assess the fit between consumer attitudes and economic reality. As has been the case in the past, we find that in the aggregate, consumers are quite savvy about prices and fuel economy.

The survey analyzed in this paper was a national random sample survey of 1009 adults conducted by telephone (wireline and cellular) from January 29 to February 2, 2015. For the full sample, the confidence interval is  $\pm 3.1\%$ , at the 95% level.

### Gasoline Price Projections

One of the questions we have consistently asked consumers is where they think prices are headed. Needless to say, this is an important influence on their behavior. The expectations about prices take on particular importance when they are on one of their steeper slopes of the roller coaster.

In our most recent survey we asked consumers what they expected prices to be in two and five years.

*Over the past several years, gasoline prices have varied widely. Speculating about the future, what would be your best guess about the average price per gallon in your area...*

- A. After two years' time
- B. After five years' time

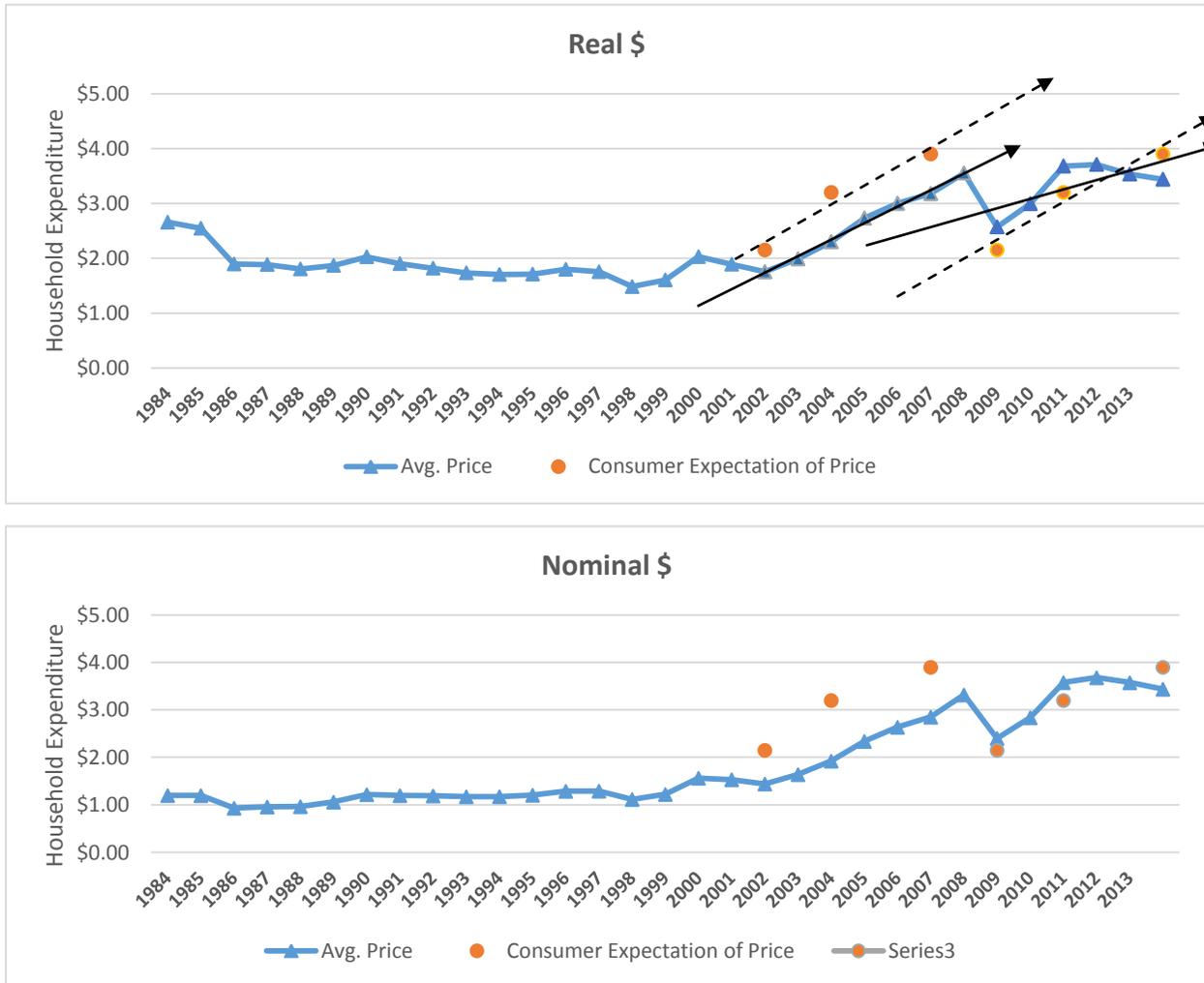
As a key reference point, the average price of gasoline in the period when the questions were asked was approximately \$2.14/gallon.<sup>11</sup> Consumers expect prices to increase substantially to \$3.20 per gallon in two years, with a standard deviation of \$1.20, and to \$3.90 in five years, with a standard deviation of \$1.60.

Figure 2 plots these projected price increases against the pattern of prices since they stabilized after the second oil price shock (in 1979). It uses the actual price during the week of the survey as the base point to compare consumer expectations about price to the two major price spikes that took place after the turn of the century. It shows the current projections against prices expressed in both nominal and real terms. While the absolute level of the difference between past price spikes and projections differs somewhat, the directionality is quite close. The rate of increase expected (i.e. the slope of the lines) are similar. Simply put, consumer expectations are consistent with past experience.

### Attitudes Towards Fuel Economy

Given consumer projections for sharp gasoline price increases, we would expect them to express an interest in the fuel economy of the vehicles they purchase. The survey included three questions about fuel economy that enabled us to examine the respondents' interest in fuel economy in three ways:

**FIGURE 2: FUEL PRICE EXPECTATION IN HISTORICAL PERSPECTIVE**



Source: Energy Information Administration, Data Base; CFA/ORC Survey, January 2015.

- General level of interest, on a four point scale.
- Target fuel economy for the next vehicle purchased in miles per gallon.
- Increase in fuel economy (subtracting the current fuel economy from the target fuel economy.)

The questions utilized to develop these three measures of interest are below. All analysis conducted using these questions are based on respondents who said they expected to purchase a vehicle. For each question, the “don’t know/refused” responses were also excluded.

*Thinking about the next motor vehicle you will purchase, how important will gas mileage – that is, how many miles to the gallon it will get – be in your decision about the type of vehicle you will purchase?*

*Very important*

*Somewhat important*  
*Not very important*  
*Not at all important*

*What is your best guess as to the gas mileage of the next vehicle you purchase, that is, how many miles to the gallon will it get?*

*What is the gas mileage of the motor vehicle you are currently driving? That is, about how many miles to the gallon does this vehicle get?*

As shown in Figure 3, over half of all consumers (57%) who say they expect to purchase a vehicle say that gas mileage will be very important in their decision about the type of vehicle they will purchase. Another 29% say it is somewhat important.

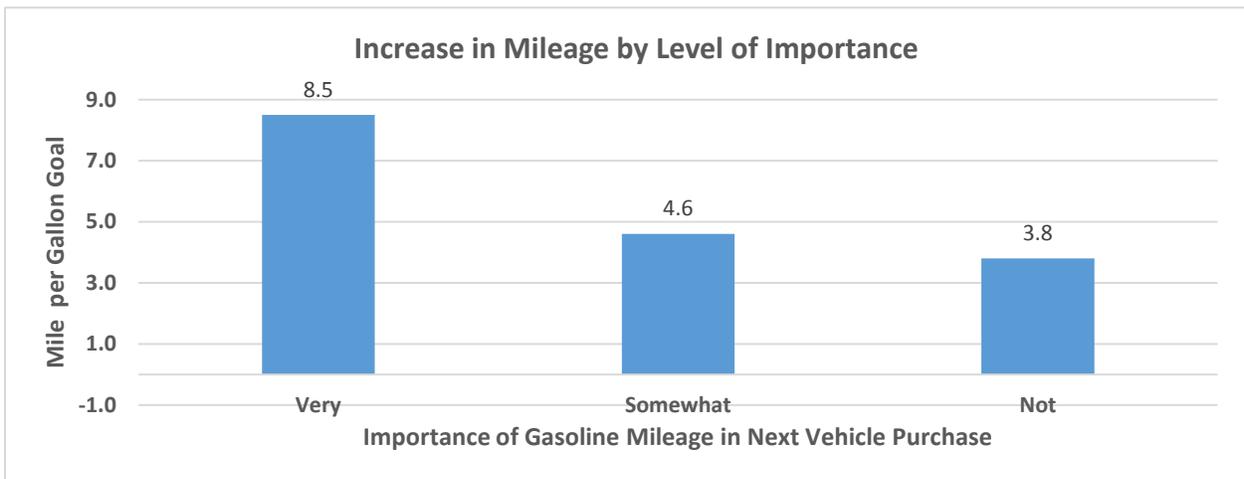
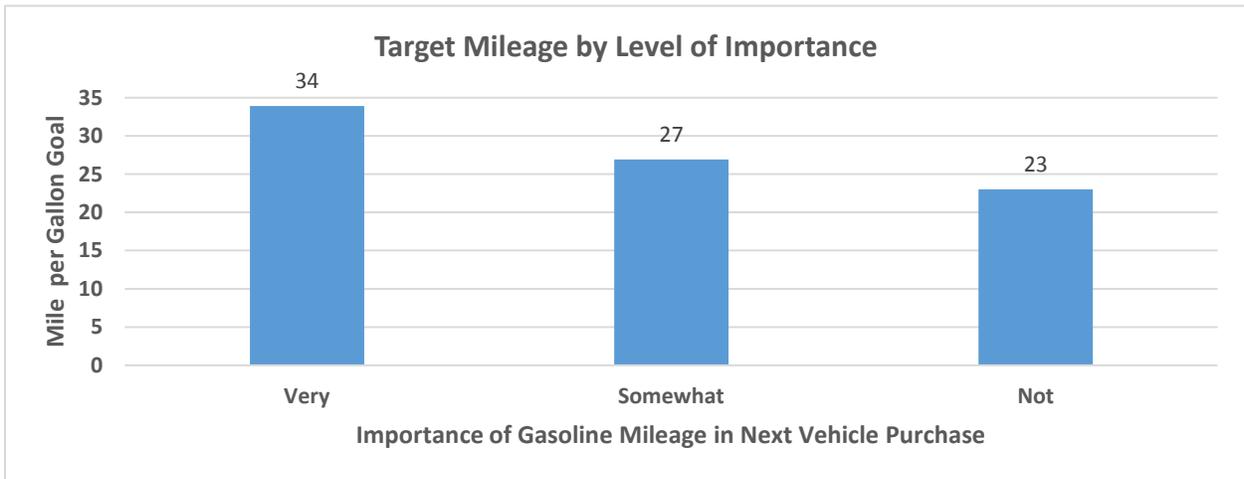
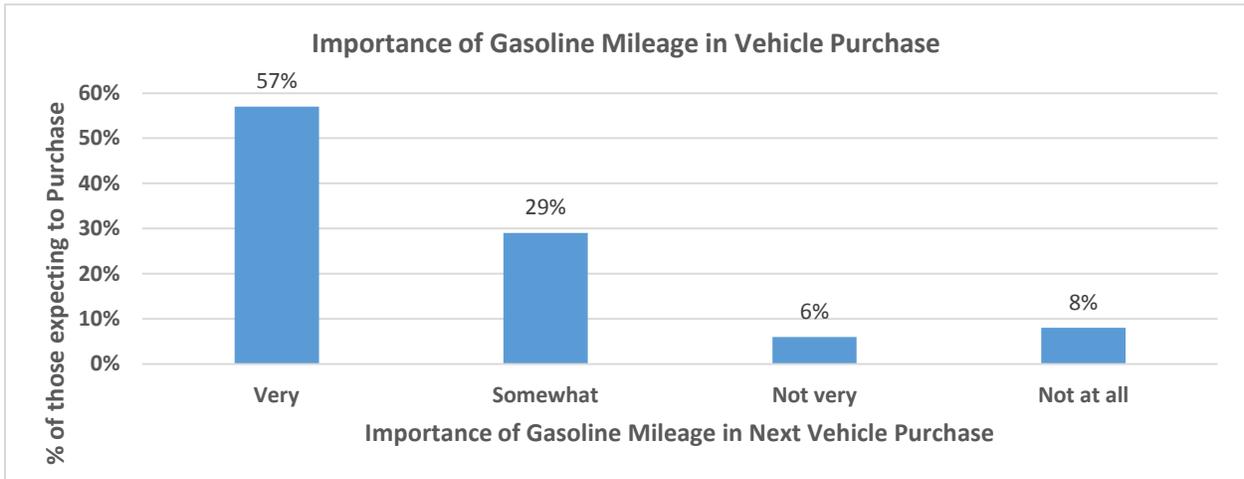
The average mileage the respondents say they get with their current vehicle is 24.2. This seems consistent with the national average for all light duty vehicles at present.<sup>12</sup>

The target mileage consumers say they will get with their next vehicle is 29.9 MPG, with a standard deviation of 9.7 MPG.

The simple average increase in fuel economy expected is 5.7 MPG. However, when we exclude those who do not expect to purchase a vehicle, or did not provide an answer to one of the two questions, the 966 complete responses yields an average increase in mileage of 6.4 MPG.

We observe statistically significant and substantial differences between expected mileage and the importance respondents place on fuel economy. In this analysis we combine the 'not very' and 'not at all' responses into one category due to the small number of respondents. Those who say fuel economy is 'very important' have a target MPG that is almost 50% higher than those who say it is not important (34 v. 23). Their desired increase in fuel economy is over twice as high (8.5 v. 3.8 MPG).

**FIGURE 3: MEASURES OF THE IMPORTANCE OF FUEL ECONOMY**



Source: CFA/ORC Survey, January 2015.

### III. THE POCKETBOOK COSTS OF INEFFICIENCY

Given the dramatic increase in household expenditures on gasoline and the consumer predictions about fuel prices, which appear to be well-grounded in historical experience, it is useful to explain the importance of fuel economy and to justify their interest in purchasing vehicles with greater fuel economy. In this section we examine this from the individual level by constructing a hypothetical “back-cast” in which we ask:

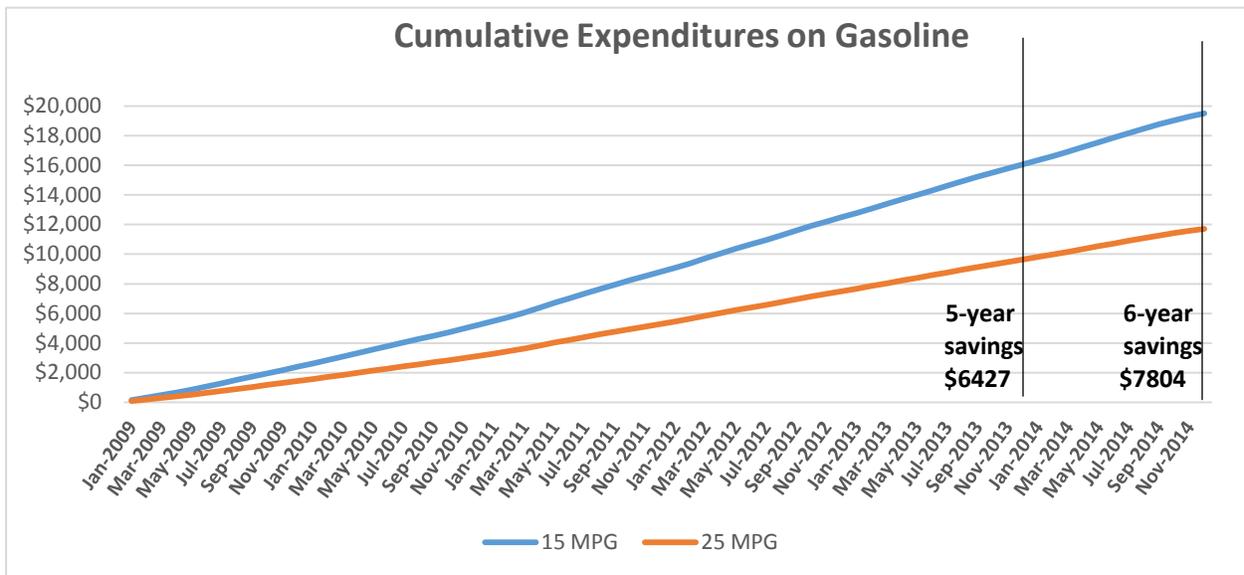
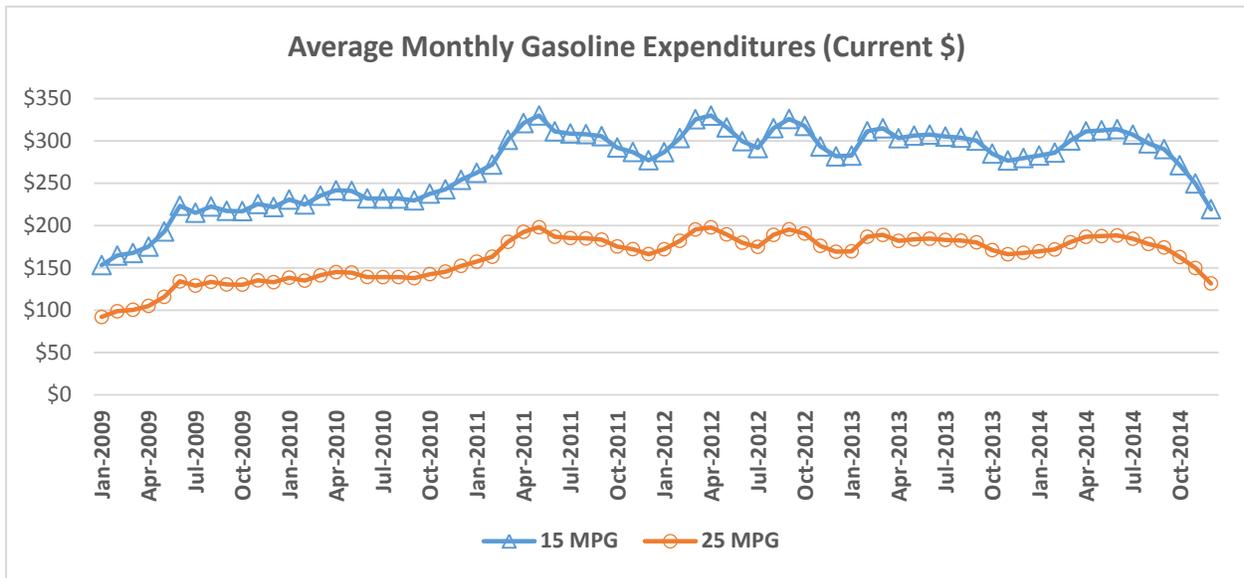
- How would consumers, who might have been misled by the temporary fall of gasoline prices in late 2008 to think that gasoline price would continue to be low, have fared if they had purchased a low fuel economy vehicle.
- Would it have been a good idea to forego a more fuel efficient vehicle?

To construct the backward looking analysis, we examine the potential purchase of two vehicles in January 2009, one that gets 15 MPG compared to one that gets 25 MPG.<sup>13</sup> We assume 15,000 miles per year of driving.<sup>14</sup>

Figure 4 shows the impact on the consumer pocketbook of purchasing an inefficient vehicle would have been substantial. We show the difference in gasoline expenditures at five years, which is the typical length of an auto loan, and six years, which is about the length of time consumers hold onto their vehicles. Over five years, the owner of the more fuel efficient vehicle would have saved over \$6,400 in gasoline expenditures. Over six years the gasoline savings were over \$7,800.

To be sure the cost of a much more fuel efficient vehicle would have been greater, but the economic analysis of the fuel economy standards published just prior to this period and our analysis of cost increases for more fuel efficient vehicles show that costs of raising fuel economy are much lower than these savings. In fact, the benefits were projected to be twice the costs, based on estimated gasoline prices that were much lower than those actually observed. It is also the case that regulatory analysis has historically overestimated the cost of compliance by a least a factor of two.<sup>15</sup> In other words, we believe the benefit cost ratio would be closer to four-to-one and consumers would be foolish to be misled by temporarily low gasoline prices, a mistake that the survey evidence suggests they are not likely to make.<sup>16</sup>

**FIGURE 4: CONSUMER EXPENDITURE SAVINGS FROM 10 MPG INCREASED FUEL ECONOMY**



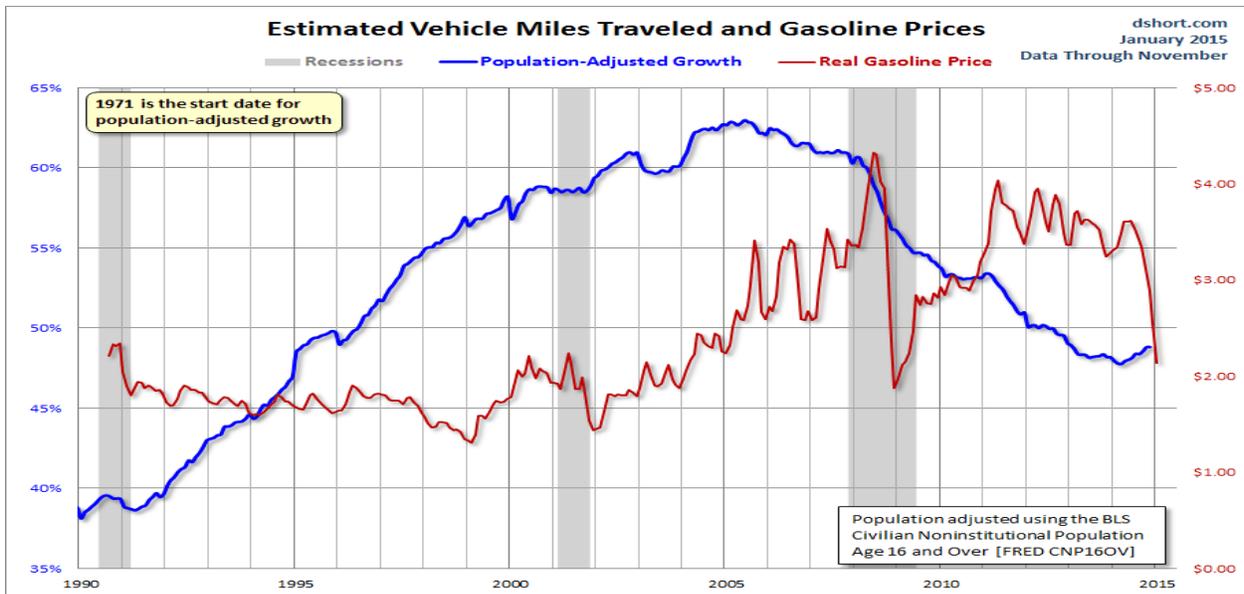
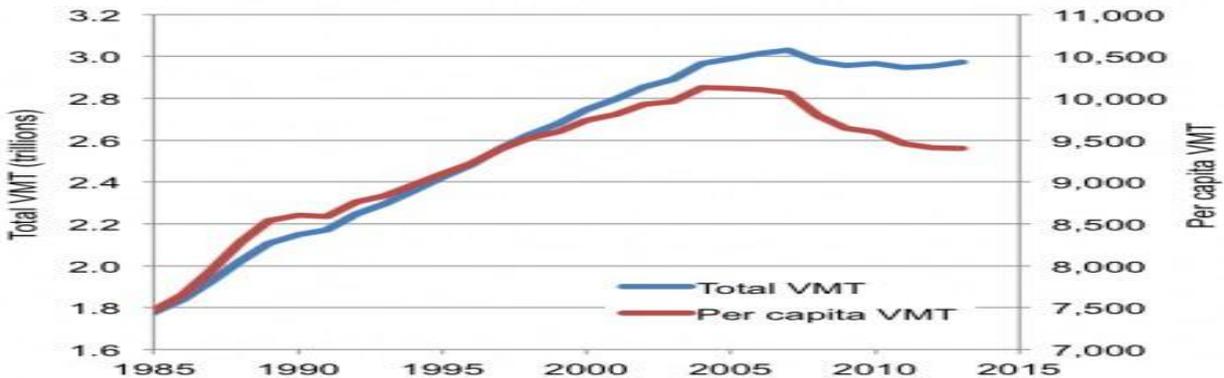
Sources and Notes: 15,000 miles per year, nominal prices from Energy Information Administration, Data Base.

#### IV. A STRUCTURAL SHIFT IN GASOLINE CONSUMPTION

Figure 1 above showed an uncoupling of the price of gasoline and household expenditures in the recent past. While it is still early in that process, the above analysis provides clues to the origin of this phenomenon. As the cost of driving is driven up by rising gasoline prices, we would expect people to drive less and use more fuel efficient vehicles. The survey research discussed above certainly supports the latter hypothesis. In fact, the shift in driving has attracted considerable attention among those responsible for transportation planning (see Figure 5).

**FIGURE 5: THE DRAMATIC SHIFT IN DEMAND FOR DRIVING AND FUEL ECONOMY**

#### No Growth in Total Miles Driven, Declining Per Capita Driving

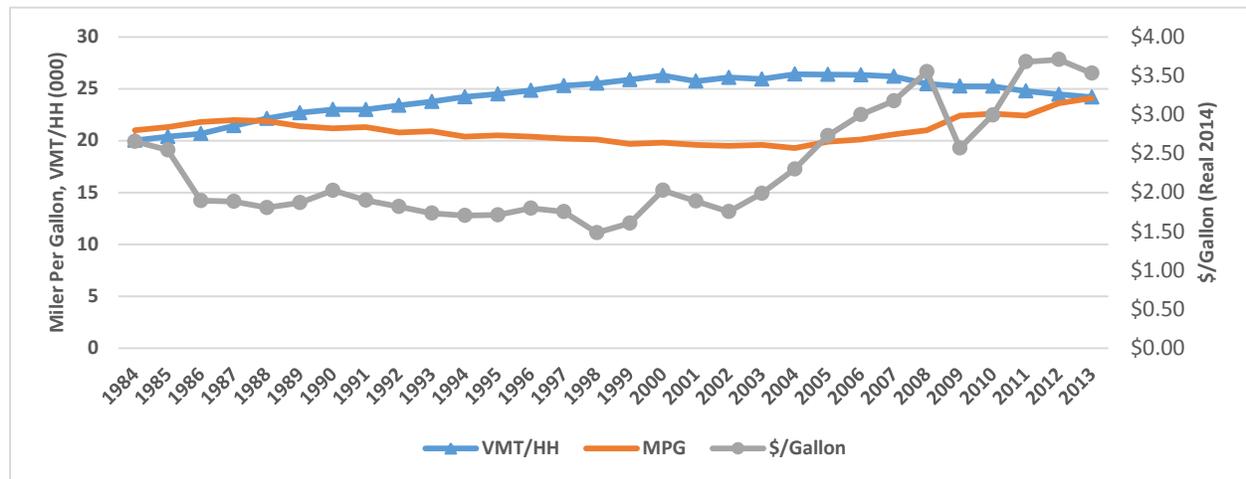


Source: Top graph *Chris McCahill, “Per capita VMT drops for ninth straight year; DOTs taking notice,” State Smart Transportation Initiative, February 24, 2014; Bottom graph: Doug Short Vehicle Miles Traveled: A Structural Change in Our Behavior, January 21, 2015.*

The two graphs show changes in total driving adjusted for population growth. Figure 6 restates those figures on a per household basis since that is the unit of analysis for consumer

expenditures and income. Nine years of declining increases in driving and ten years of increases in fuel economy suggest a significant shift in the structure of driving.<sup>17</sup> Figure 6 shows that the miles driven and mileage effects have been operating. In the later years of the first decade of the 21<sup>st</sup> century, average miles traveled per household flattened and began to decline, while vehicle mileage began to rise. There does seem to have been a significant lag in the response to rising prices of about half a decade. This would be consistent with the production cycle of the auto industry, where it takes three to five years to refresh and redesign models.

**FIGURE 6: CHANGING STRUCTURE OF DRIVING, PRICES, MILEAGE AND MILES TRAVELLED/HOUSEHOLD**



Source: TopEnergy Information Administration, Data Base; Federal Highway Administration, Travel Volume Trends.

We can apportion the reduction in household expenditures on gasoline by calculating the amount of gasoline that would have been consumed if miles traveled per household had not declined and if miles per gallon had not increased. If we start the analysis in 2008, after which there was a steady decline in vehicle miles driven per household and a sharp increase in mileage (caused by the increase in car mileage, rather than pickup/SUV mileage increases) the increase in fuel economy is much more important. If no change had taken place in miles driven, households would have consumed 50 more gallons per year. If no change had taken place in mileage, given the change in miles driven, households would have consumed an additional 111 gallons of gasoline. In other words, mileage accounted for close to two-thirds of the reduction.<sup>18</sup>

Some of the reduction in vehicle miles traveled was a function of the recession and declining real median household income, which declined steadily from 2007 forward. However, the trends began before the recession and continued after it. In fact, in 2014, real household income was equal to 1997, but vehicle miles driven were 3.5% below 1997 levels and 7.5% below the peak of 2007.

The above discussion highlights the overlap (covariation in statistical terms) between several factors that affect household spending on gasoline directly and indirectly. Treating mileage and miles driven as the dependent variables, we would like to assess the relative importance of price, regulation, household income. Multivariate regression modeling is the technique typically used to do so.

Table 1 shows the results of a simple model the three independent variables. For the purpose of this analysis, we have lagged the price variable by two years. This reflects that fact that the reform of the fuel economy standards program requires the regulatory authorities to finalize their standards 18 months in advance, which is intended to give the auto makers time to refresh and redesign their product line. This is both a negotiated outcome and the new reality. Regulation imposes this deadline. Also, for the latter part of the period, automakers knew full well that standards were rising long in advance and were given a long time horizon, which should have accelerated planning and development of more fuel efficient vehicles.

**TABLE 1: MULTIVARIATE MODELS OF MILES PER GALLON**

| <u>Variable</u> | <u>MPG</u> | <u>VMT</u> |
|-----------------|------------|------------|
| Regulation      |            |            |
| Beta            | .262       | 165.5      |
| Std. error      | .042       | 94.3       |
| t               | 6.17       | 1.76       |
| Price           |            |            |
| Beta            | .923       | -500.4     |
| Std. error      | .187       | 4.26       |
| t               | 4.94       | 1.21       |
| HH Income       |            |            |
| Beta            | -.0002     | .626       |
| Std. error      | .0004      | .074       |
| t               | 4.06       | 8.50       |
| R <sup>2</sup>  | .86        | .74        |

We find that the models account for five-sixths of the variance in MPG ( $R^2 = .85$ ) and three quarters of the variance in VMT ( $R^2 = .74$ ). All signs are in the expected direction. In the MPG model all coefficients are highly significant. Regulation is the most highly significant and accounts for the largest part of the variance in MPG - (it enters the equation first). Price enters second. In the VMT model, household income is highly significant, while regulation is significant only at the 10% level. Price is not significant in this model, although the sign is correct.

In conclusion, consumer attitudes about gasoline prices, their desire for higher mileage and support for fuel economy standards are well-grounded in their experience and in pocketbook economics and clearly manifested in their behavior. The message is simple, consumers will not and should not be fooled by temporary gyrations of gasoline and policy makers should follow their lead and keep a steady eye on road to the gradual increase to 54.5 mpg by 2025.

## ENDNOTES

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- <sup>1</sup> Economic analysis invariably relies on real prices. However, it is not clear that consumers focus on real rather than nominal prices. Moreover, economic analysis tends to focus on marginal prices, but it appears that consumers place a lot of weight on average prices. Throughout this analysis, we report both prices in nominal and real dollars, when it covers a significant period of time. However, for short periods or recent years, the rate of inflation has been very low (with a significant number of months of deflation). In these cases we report only real numbers, which do not vary much from the nominal numbers.
- <sup>2</sup> CFA identified this as a central issue in the fuel economy debate a decade ago. See Consumer Federation of America, *The Impact Of Rising Prices On Household Gasoline Expenditures*, September 2005; *A Consumer Pocketbook and National Cost-Benefit Analysis of “10 in 10: Increasing CAFE Standard 10 Miles Per Gallon Over 10 Years will Save Consumers Money and Help Cure the National Oil Addiction,”* June 2007; *Gasoline prices and expenditures in 2011: Record High Levels Drive Consumer Concerns And Increased Support For A 60 miles Per Gallon Fuel Economy Standard*, March, 2011.
- <sup>3</sup> In 2008, 2010 and 2011, fuel costs equaled net vehicle outlays. Bureau of Labor Statistics, Consumer Expenditure survey, 2006-2012; Consumer Expenditures – 2013, September 9, 2014.
- <sup>4</sup> National Research Council, *Effectiveness and impact of corporate average fuel economy*, 2002.
- <sup>5</sup> In 2005, Paul Portnoy, who served as Chair of the Committee on Effectiveness and Impact of the Corporate Average Fuel Economy (CAFE) Standards of the National Research Council (NRC), stated in testimony before the House Science Committee, “Since the 2001 report was written, gasoline prices in the United States have risen roughly 20 percent. If consumers perceive this increase to be permanent, it will begin to affect their new-vehicle purchases. In fact, there is some anecdotal evidence to suggest that it already has.”
- <sup>6</sup> January 31, 2006.
- <sup>7</sup> [http://en.wikipedia.org/wiki/Energy\\_Independence\\_and\\_Security\\_Act\\_of\\_2007](http://en.wikipedia.org/wiki/Energy_Independence_and_Security_Act_of_2007)
- <sup>8</sup> January 20, 2015.
- <sup>9</sup> CFA has examined the progress and ability of automakers to meet the goals in a number of reports beginning shortly after the new standards went into effect. See *A Key Step To Ending America’s Oil Addiction: Policymakers, Consumers And Automakers Are Shifting New Vehicles To Higher Fuel Economy*, July 2012; *Will They or Won’t They? Consumer Adoption of High Fuel Economy Vehicles, 1999-2012, and the Role of the 2025 Standards in Speeding Diffusion of Advanced Technology*, Panel on Consumer Acceptance of Advanced Technology Vehicles Mobile Sources Technical Review Subcommittee, December 13, 2012; *On The Road To 54 Mpg: A Progress Report On Achievability*, April 2013; *For First Time Over 50 Percent of Current Year Models Get More Than 23 MPG; Over 11 Percent Get 30 MPG, Carmakers are on the road to 54.5 by 2025*, April 29, 2014; *New Findings: Americans Purchasing More Efficient Vehicles, Will Increase Fuel Economy with Next Vehicle Purchase: Car Manufacturers Responding To Demand & New Fuel Economy Standards, Mazda, Subaru, and Honda Standouts*, June 23, 2014.
- <sup>10</sup> *Comments of the Consumer Federation of America on National Highway Traffic Safety Administration Notice of Proposed Rulemaking*; Docket No. NHTSA 2008-0089, RIN 2127-AK29; *Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015*, July 1, 2008; Consumer Federation of America, et al., *Comment on Notice of Proposed Rulemaking; Average Fuel Economy Standards, Passenger Cars and Light Trucks; Model Years 2011-2015*, National Highway Traffic Safety Administration, Docket No. NHTSA 2008-0060, August 18, 2009; *Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, Department of Transportation, Environmental Protection Agency, 40 CFR Parts 86 and 600, 49 CFR Parts 531, 633, 537, et al., November 28, 2009; *Comments Of The Consumer Federation Of America , In the Matter of Notice of Upcoming Establish 2017 and Later Model Year Light Duty Vehicle GHG Emissions and CAFE Standards*, Before the Environmental Protection Agency Department of Transportation Joint Rulemaking to Docket ID No. EPA-HQ-OAR-0799 Docket ID No. NHTSA-2010-0131, October 29, 2010; *Comments of Consumer Federation of America and Consumer Groups, Proposed Rule 2017 and Later Model Year*, Docket Nos. Light-Duty Vehicle Greenhouse Gas Emissions, EPA-HQ-OAR-2010-0799; FRL-9495-2 and Corporate Average Fuel Economy Standards, NHTSA–2010–0131, February 13, 2011; Consumer Federation of America, et al., 2012, *Comments on the Proposed Rule 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas*

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*Emissions and Corporate Average Fuel Economy Standards*, Docket Nos. EPA-HQ-OAR-2010-0799; FRL-9495-2, NHTSA-2010-0131, February 13, 2012.

- <sup>11</sup> The Energy Information Administration gives a price of \$2.133 for the week of January 26 and \$2.154 for the week of February 2. The questions were asked from January 29 to February 1, 2015.
- <sup>12</sup> Official statistics on the fleet-wide average lag considerably, with the EIA reporting 23.3 for cars and 17.1 for trucks in 2012. Given the significant increase in new vehicle fuel economy and the retirement of the least fuel efficient vehicles, those figures are certain to rise for 2014. Some press accounts put the overall average well above 24 MPG by 2014. Brad Plummer, Brad, "Cars in the U.S. are more fuel-efficient than ever. Here's how it happened," *Washington Post*, December 13, 2013, Antony Ingram, Anthony, "Average fuel economy of US cars reaches an all-time high: Average fuel economy of all cars in the US reached 24.6 miles per gallon – not high for your average hybrid, but the highest it's ever been," *Christian Science Monitor*, April 6, 2013.
- <sup>13</sup> The average car got 23.9 MPG in 2008, while the average pickup truck got 17.8 MPG. The weighted average was 21.5 MPG. Given the standard deviation of the current expectations/aspirations, we concluded that the 15-25 MPG comparison was reasonable for the purpose of the backward looking analysis.
- <sup>14</sup> New cars tend to be driven somewhat more than 15,000 miles in the early years with mileage declining. EPA uses 15,000 miles in its analysis.
- <sup>15</sup> Consumer Federation of America, *Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California*, California Energy Commission's Energy Academy, February 20, 2014.
- <sup>16</sup> For example, in the 2008 analysis of fuel economy standards for 2011-2016, a scenario that would have targeted increases of about ten miles per gallon had a cost benefit ratio of 1.5 to one (See Comments of the Consumer Federation of America, July 1, 2008). With gasoline prices that were assumed to be almost \$0.70 per gallon less than were actually paid. Increasing the value of the consumer benefits by that amount would raise the cost benefit ratio to 2.0 to 1. Similarly, in Consumer Federation of America, June 2007, we presented a forward looking analysis of a ten mile per gallon increase with a much higher target (18-28 MPG). Applying the same methodology to the backward looking analysis of a ten mile per gallon increase at a lower level of mileage (15-25 MPG), increases the fuel savings by 20 percent. ( $10/18 = .555$ ;  $10/15 = .667$ ;  $.667/.555 = 1.20$ ) We also underestimated gasoline prices, by 10 percent, having used \$3.00 gallon, compared to the \$3.30 observed in 2008-2014. Thus, we underestimated the pocketbook benefits by one-third. Adjusting that earlier analysis, the benefit-cost ratio is 2-to-1 in five years and 3-to-1 over the full life of the vehicle. Since the estimate of costs were off by at least a factor of two, the benefit-cost ratio is in the range of 3 or 4 to-1.
- <sup>17</sup> With nine years of declining growth in driving and ten years of increases in mileage, some argue that it is taking federal agencies too long to recognize the fundamental shift in consumer behavior. Phineas Baxandall, "The Feds Quietly Acknowledge the Driving Boom Is Over," *Streetsblog.org*, January, 7, 2015.
- <sup>18</sup> If we start the analysis in 2004, the results are only slightly different, with miles driven accounting for a somewhat larger share of the drop in gasoline consumptions. If no change in driving patterns had taken place from the peak in 2004, households would have consumed 103 gallons more per year. If no change in mileage had taken place, given the change in driving, households would have consumed 164 gallons of gasoline.