Before the
Environmental Protection Agency

In the Matter of Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation	**)**	**EPA-HQ-OAR-2015-0827**

COMMENTS OF THE THE CONSUMER FEDERATION OF AMERICA

MARK COOPER,
DIRECTOR OF RESEARCH

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THE CONSUMER FEDERATION OF AMERICA

The Consumer Federation of America[1] has participated in dozens, if not hundreds, of efficiency rulemakings, regulatory negotiations, and legislative hearings involving large and small energy using durables, ranging from automobiles to heavy duty trucks, air conditioners, furnaces, water heaters, computers, and light bulbs.[2] We have participated in every round of the rulemaking for fuel economy standards since the passage of the Energy Independence and Security Act, which rebooted and reformed the CAFE program. We appreciate the opportunity to share our views on the current state and future prospects for the National Program.

Our technical expertise is not in the design and production of these durables, it is in the design and implementation of minimum energy standards. We believe that knowing how to build an effective standard is at least as important to arriving at a successful outcome as knowing how to build a consumer durable. Moreover, we conduct extensive polling of public opinion, review the technical economic studies prepared by others and analyze evidence on the market performance of consumer products to determine whether there are significant potential consumer savings that would result from a higher standard.

$100 BILLION IN LAST MINUTE CONSUMER BENEFITS

The Determination by the Environmental Protection Agency (EPA)[3] that the standards set by the National Program for model years (MY) 2022 – 2025 should remain in place is fully supported by a massive evidentiary record.

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[1] The Consumer Federation of America is an association of more than 250 nonprofit consumer groups that was established in 1968 to advance the consumer interest through research, advocacy, and education.

[2] The CFA website (http://www.consumerfed.org/issues/energy) lists over 100 pieces of legislative testimony and regulatory comments in home energy and motor vehicles, most of which involve energy use and efficiency standards.

[3] Environmental Protection Agency, *Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Greenhouse Gas Emission Standards under the Midterm Evaluation,* EPA, 420-R-16-020, November 2016.

- The hearing record and analysis that originally set the standards fully complies with the legislative mandates laid down in the enabling statutes that govern regulation by EPA (the Clean Air Act) and the National Highway Traffic Safety Administration (NHTSA).[4]
- Subsequent analyses in the Technical Assessment Report (TAR) and in the Determination not only support the same conclusion, they reinforce it.[5]
- Given the new approach to standard setting, the industry is meeting and exceeding the standard, while consumers have the full range of choices of models.[6]

Opponents of economic, public health and safety regulation, including fuel economy standards, have adopted a simple and catchy, but fundamentally misleading approach to criticizing standards – they calculate the cost of the regulation, but not the benefits. They have become particularly vocal in their outrage over so-called "midnight burdens,"[7] claiming that dozens of regulations have created about $50 billion in burdens. The estimate includes the proposed Determination that the fuel economy standards should not be lowered.

These comments show that the analysis of the opponents is fundamentally flawed and wrong. When you do the correct math of cost benefit analysis, you must include both the benefits and the cost. For energy efficiency standards, in particular, which reduce energy consumption and lower energy bills, there are direct, immediate and substantial pocketbook benefits. In the case of the fuel economy standards for MY 2022-2025, careful and complete analysis leads to a very different conclusion than the one put forward by the critics of the fuel economy standards. Far from $50 billion of "midnight burdens" this one proposed rule delivers $100 billion of last

[4] Our initial analysis is contained in: Comments of Consumer Groups on Proposed Rule 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Docket Nos.EPA-HQ-OAR-2010-0799; FRL-9495-2NHTSA–2010–0131, February 13, 2012.

[5] Our analysis of the TAR is contained in: Comments of the Consumer Federation of America, Evaluation Draft Technical Assessment Report for Model Year, 2022–2025 Light Duty Vehicle GHG, Emissions and CAFE Standards, EPA–HQ–OAR–2015–0827; 0068; FRL–9949–54–OAR, Department Of Transportation NHTSA–2016– RIN 2060–AS97; RIN 2127–AL76, September 26, 2016.

[6] Our extensive review of performance standards can be found in: Energy Efficiency Performance Standards: The Cornerstone of Consumer-Friendly Energy Policy, October 2013. Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, Mark Cooper, Director of Research, California Energy Commission's Energy Academy, February 20, 2014,

[7] American Action Forum, based on the sum of two "midnight burden" estimates, December 2 and 12, 2016.

minute benefits. The decision to continue the march toward more fuel-efficient vehicles delivers significant net benefits to consumers and the nation.[8]

The benefits of the proposed rule include:

- $134 billion total and almost $100 billion net of costs.
- Two thirds of the total benefits – over $90 billion – are direct pocketbook savings that consumers will enjoy because the cost of new fuel savings technologies is smaller than the value of the fuel saved.
- For the typical consumer who finances the purchase of a vehicle with a five year auto loan, the investment in more fuel saving technology is cash flow positive from the first month.
- For those who pay cash, the payback period is less than five years and the lifetime fuel savings are valued at almost $1650.
- The benefit cost ratio is more than two to one.
- The return on investment is three times the cost of capital, compared to the return on low risk investments available to consumers, and more than twice the opportunity cost of capital compared to the cost of borrowing.
- Public health and environmental benefits make the total social benefits much larger and those social benefits are ultimately enjoyed by the public, with benefit cost ratios in the range of 3-to1 to 4-to-1.
- When indirect macroeconomic benefits are included, the benefit cost ratio in the EPA analysis would be close to 6-to-1.

THE IMPORTANCE OF RIGOROUS BENEFIT-COST ANALYSIS

That proper cost benefit analysis must include both costs and benefits should be obvious to anyone who has taken Economics 101. In fact, an introductory economics text written by John B. Taylor,[9] who holds prestigious named appointments at Stanford University and the conservative Hoover Institute and served as an Under Secretary of the Treasury in the George W. Bush administration,[10] defines cost benefit analysis as follows:

[8] See notes 4 and 5 above.

[9] Mary and Robert Raymond Professor of Economics at Stanford University, and the George P. Shultz Senior Fellow in Economics at Stanford University's Hoover Institution.

[10] He was a member of the President's Council of Economic Advisors during the George H. W. Bush Administration and Senior Economist at the Council of Economic Advisors during the Ford and Carter Administrations.

> Cost-Benefit Analysis: an appraisal of a project based on the costs and benefits from it.[11]

A more advanced text on *The Economics of Regulation and Antitrust,*[12] calls it benefit-cost analysis and explains the obvious need to include costs and benefits as follows:

> From an economic efficiency standpoint, the rationale for a benefit-cost approach seems quite compelling. At a very minimum, it seems reasonable that society should not pursue policies that do not advance our interests. If the benefits of a policy are not in excess of the costs, then clearly it should not be pursued, because such efforts do more harm than good. Ideally, we want to maximize the net gain that policies produce…
>
> The requirement that benefits exceed costs for sound regulatory policies has also given rise to a simple shorthand. The ratio of benefits to costs, or the benefit-cost ratio, must exceed 1.0 for a policy to be potentially attractive. This requirement serves as the minimum tests for policy efficacy, as our overall objective should be to maximize the spread between benefits and costs.[13]

MARKET IMPERFECTIONS AND THE NEED FOR STANDARDS

It is possible, in a post-truth, fact-free world, to make the benefits disappear by arguing that the market for energy efficiency works perfectly. Assuming the market outcome is exactly "right," the costs imposed by the inclusion of new technology represent costs without benefits that reduce consumer surplus and waste producer resources. [14]

The empirical evidence in this proceeding shows that this effort to resurrect the faulty argument against the program in this way fails as well. The evidence on the record is overwhelming that there are a host of market failures that lead automakers to underinvest in technologies that reduce the fuel consumption of vehicles. The EPA has carefully reviewed and incorporated this evidence on the market failures. We have documented and discussed these at great length in our earlier comments in this proceeding. We need not repeat them here. Table 1

[11] John, B. Taylor, *Economics* (Houghton Mifflin, 11998, pp. 410, 896.
[12] W. Kip Viscusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (MIT, 2001).
[13] Id., pp. 28-29.
[14] The Mercatus Center offered a similarly misguided response to the analysis underlying the National Program, which CFA rebutted earlier at the time. CFA, 2013, Performance Standards.

summarizes the intersection of our broad analysis of imperfections in the market for energy efficiency and the evidence presented in the TAR.

BENEFIT-COST METHODOLOGY

Properly Counting Benefits and Costs

Doing the math of benefits and costs requires several tools to ensure that the analysis yields relevant and useful information. One obvious step is to take inflation into account. Another important step is to take the time value of money into account. Viscusi, et al., describe the process of discounting benefits and costs as follows.

> Even if one ignores the role of inflation, it is important to take the temporal distribution of benefits and costs into account. If one could earn a riskless real rate of interest *r* on one's own money, then the value of a dollar today is $(1+r)^{10}$ ten years from now. Thus resources have an opportunity cost, and one must take this opportunity cost into account when assessing the value of benefits and cost stream over time…
>
> Although a substantial literature exist on how one should approach the discount rate issue and estimate the appropriate rate of discount, these approaches can be simplified into two schools of thought. One approach relies on the opportunity cost of capital… a simple but not too unreasonable approximation to this measure is simply the real rate of return on federal bonds. The alternative is the social rate of time preference approach under which society's preference for allocating social resources across time may be quite different from the time rate expressed in private markets.[15]

Taylor frames the same concept a little differently. Looking to individuals that are asked to make the investment, he concentrates on alternative uses of funds.

> What discount rate should be used…? A private firm deciding whether to invest in a project would use the interest rate on other alternative investments. If the benefits and costs of a public investment have been measured accurately, then the discount rate on alternative uses of funds for the citizens in the community might be the appropriate discount rate.[16]

TABLE 1:
IMPERFECTIONS POTENTIALLY ADDRESSED BY STANDARDS[1]

[15] Viscusi, et al., 2001, pp. 31-32.
[16] Taylor, 1998, p. 412.

Societal Failures[2]	Structural Problems[3]	Endemic Flaws	Transaction Costs	Behavioral[4]
Externalities[5]	Scale[6]	Agency[7]	Sunk Costs, Risk[8]	Motivation[9]
Information[10]	Bundling[11]	Asymmetric Information	Risk & Uncertainty[12]	Perception[13]
	Cost Structure[14]	Moral Hazard	Imperfect Information[15]	Calculation[16]
	Product Cycle			Execution[17]
	Availability[18]			
	Produce differentiation[19]			
	Incrementalism[20]			

Source: Framework developed in Comments of the Consumer Federation of America, Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, Environmental Protection Agency 40 CFR Parts 86 and 600, Department of Transportation 49 CFR Parts 531,633, 537, et al., November 28, 2009. Italicized references are additional factors added by the Technical Assessment Review. Page references are to the TAR.

1 The efficiency gap persists, P. 6-5, despite these developments and uptake of energy efficiency technologies, lags behind adoption that might be expected under these circumstances." Quoting the National Academy of Sciences, P. 6-7, [T]here is a good deal of evidence that the market appears to undervalue fuel economy relative to its expected present value."
2 P. 6-7, the nature of technological invention and innovation.
3 P. 6-7, Consumers cannot buy technologies that are not produced; some of the gap in energy efficiency may be explained from the producers' side.
4 P. 6-5, behaviors on the part of consumers and/or firms that appear not be in their own best interest (behavioral anomalies).
5 P. 6-8, dynamic increasing returns. network effects; p.4-35, the potential existence of ancillary benefits of GHG-reducing technologies… These can arise due to major innovation enabling new features and systems that can provide greater comfort, utility, or safety.
6 P. 6-8, the structure of the automobile industry may inefficiently allocate car attributes.
7 P. 6-7, product differentiation carves out corners of the market for different automobile brands.
8 P. 6-6, Consumers may be accounting for uncertainty in future fuel savings
9 P. 6-6, Consumers may... not optimize (instead satisficing).
10 P. 6-5 lack of perfect information.
11 P. 6-6 Fuel-saving technologies may impose hidden costs.
12 P. 6-6, Consumers might be especially averse to short-term loses….relative to long term gains.
13 P. 6-5, Consumers might be "myopic" and hence undervalue future fuel savings; p. 6.6 Consumers may focus on visible attributes... and pay less attention to attributes such as fuel economy that typically do not visibly convey status.
14 P. 6-8, First mover disadvantages, p. 4-33, Thus, instead of the first-mover disadvantage, there is a regulation-driven disincentive to "wait and see."
15 P. 6-6, consumers might lack the information necessary,
16 P. 6-6, consumers might... not have a full understanding of this information.
17 P. 6-6, selecting a vehicle is a complex undertaking... consumers may use simplified decision rules.
18 P. 6-7, the role of business strategies.
19 P. 6-7, separating product into different market segment… may reduce competition.
20 P. 6-8, Automakers are likely to invest in small improvements upon existing technologies

Attributes of Effective Standards

Viscusi, et al., go on to describe a number of attributes of regulation that improve its efficacy, including "performance-oriented regulation," "give firms some discretion in terms of

the means of their compliance," "utilization of unbiased estimates of benefits and costs," and "avoid… regulation of prices and production."[17]

In our earlier analysis CFA explained why the National Program has the key attributes of an effective performance standard.[18] In our testimony on the TAR, we describe the National Program as a good example of "command but not control" regulation, as shown in Table 2. These standards work best when they embody six principles,[19] which are clearly at the core of the National Program.

In our House testimony, we pointed to the positive results for consumers and the fact that automakers are not only complying with the early standards, but over-complying, as indicators of the success of the National Program. We attribute this success to the fact that it is driven by the careful design of the standards and the rational response of the automakers. [20]

- As we noted and advocated, the original standards were responsible, and did not seek to push fuel economy/pollution reduction to the limit of technology. The original goals were "inframarginal" with respect to the capabilities of the industry.
- The standards remain inframarginal, with many combinations of technologies available to comply.
- While the biggest potential game changer in terms of compliance – electric vehicles – are not necessary to meet the standards, the evidence continues to grow that they could play a

[17] Viscusi, et al., 2001, pp. 35-37.
[18] CFA, 2012, National Program Comments, Technical Appendix, pp. 28-31.
[19] Mark Cooper, "Energy Efficiency Performance Standards: Driving Consumer and Energy Savings in California, February 20, 2014), slide 22.
[20] See CFA analyses of success of the standards and the ability of the industry to comply: Dr. Mark Cooper, Director of Research, Jack Gillis, Director of Public Affairs, Consumer Federation of America, A Key Step to Ending America's Oil Addiction: Policymakers, Consumers and Automakers are Shifting, New Vehicles to Higher Fuel Economy, July 2012; Statement of Dr. Mark Cooper, Director of Research. Consumer Federation of America, "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; Jack Gillis, Mark Cooper, On the Road to 54.5 Mpg: A Progress Report on Achievability, April; 29, 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; 2015 Cars Gain MPGSs. CAFE Goals In Reach If Gains Continue: However, New Data Shows Some Companies Are Backsliding, May 19. 2015; Dr. Mark Cooper, Staying on the Road to 54.5 Mpg by 2025: Riding the Gasoline Roller Coaster, February 15, 2015.

much larger part in the vehicle fleet.[21]

TABLE 2:
ATTRIBUTES OF EFFECTIVE, COMMAND BUT NOT CONTROL PERFORMANCE STANDARDS

- **Long-Term:** Setting an increasingly rigorous standard over a number of years that covers several redesign periods fosters and supports a long-term perspective. The long term view lowers the risk and allows producers to retool their plants and provides time to re-educate the consumer.
- **Product Neutral:** Attribute based standards accommodate consumer preferences and allow producers flexibility in meeting the overall standard.
- **Technology-neutral:** Taking a technology neutral approach to the long term standard unleashes competition around the standard that ensures that consumers get a wide range of choices at that lowest cost possible, given the level of the standard.
- **Responsive to industry needs:** The standards must recognize the need to keep the target levels in touch with reality. The goals should be progressive and moderately aggressive, set at a level that is clearly beneficial and achievable.
- **Responsive to consumer needs:** The approach to standards should be consumer-friendly and facilitate compliance. The attribute-based approach ensures that the standards do not require radical changes in the available products or the product features that will be available to consumers.
- **Procompetitive:** All of the above characteristics make the standards pro-competitive. Producers have strong incentives to compete around the standard to achieve them in the least cost manner, while targeting the market segments they prefer to serve.

Sources: Testimony of Dr. Mark Cooper, Director of Research, Consumer Federation of America, on "Midterm Review and an Update on the Corporate Average Fuel Economy Program and Greenhouse Gas Emissions Standards for Motor Vehicles," Before the *Committee on Energy and Commerce Subcommittee on Commerce, Manufacturing, and Trade Subcommittee on Energy and Power,* U.S. House of Representatives, September 22, 2016.

As our historical analysis showed, the industry has responded as market theory and past experience predicts, a process that is observable at both the macro and micro levels.

- The industry has found lower cost ways of complying with the standards than originally thought.
- The mix of technologies likely to be chosen has shifted due to different speeds of

[21] We have monitored the development of the EV market. Knowledge Affects Consumer Interest in EVs, New EVs Guide to Address Info Gap: New Survey Shows Nearly One-Third Are Willing to Consider Buying an EV for their Next Car, October 29, 2015**;** New Data Shows Consumer Interest in Electric Vehicles Is Growing: Prices Are Down; Number of Models Is Up; Free New Guide to EVs Available as Year over Year Sales Increase, September 19, 2016**.**

development in knowledge and cost.

- One of the most popular approaches to meeting the standards, the Atkinson-2 engine was not even considered in the initial analysis and would never have been applied widely, but for the standards.
- There is no evidence that the costs of compliance are disrupting the auto market in any way and consumers are having no difficulty in finding the vehicles that they prefer at prices that are affordable.

THE BOTTOM LINE FOR CONSUMERS AND THE NATION

Is correcting the pervasive imperfections in the market for fuel economy a good use of consumer's money? Positive cost benefit ratios, rapid paybacks and significant life cycle cost savings suggest that it is. Table 3 presents several economic measures of the effect of the fuel economy program.

The Long-Term Performance of Fuel Economy Standards

David Greene, a leading analyst of automotive fuel economy has prepared and placed in the record a groundbreaking study of the effect of fuel economy since the beginning of the CAFE program.[22] It is based on data from the Consumer Expenditure Survey conducted by the Bureau of Labor Statistics. It involves reported expenditures on gasoline and automobiles combined with estimates of national fuel prices and estimates of the cost of energy saving technology. The analysis is adjusted for inflation (results are stated in real, 2015 dollars), but it does not discount.

The top line of the Table 3 presents the results of that comprehensive evaluation of fuel economy improvements over the period from 1980 to 2014. To render the results of the backward -looking analysis comparable to the forward-looking analysis, we state all dollar amounts in 2015 dollars. We also estimate the implicit rate of return on the investment, i.e. we

[22] David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016.

calculate the return on the average cost of technology yielded by the average savings over the life of the vehicle.

TABLE 3:
ECONOMIC METRICS FOR EVALUATING THE PERFORMANCE OF FUEL ECONOMY STANDARDS

Program/Type of Benefit/Period		Source	Benefit/Cost Ratio	Internal Rate of Return %, Undiscounted
Direct Pocketbook (Fuel Savings				
CAFE Program (MY 1980-2014)		Greene[23]	2.7 - 4.2	3.3 - 4.9
Forward Looking				
National Program (MY 2017-2025)[24]		EPA	3.2	6.9
		NHTSA	2.3	5.7
TAR, MY 2022-2025[25]		EPA	2.5	6.1
		NHTSA	1.3	3.9
Determination (MY 2022-2025)[26]		EPA	2.4	6.0
Total Benefits (Pocketbook + Individual + Social)				
National Program (MY 2017-2025)		EPA	4.0	8.0
		NHTSA	4.3	8.0
TAR, MY 2022-2025		EPA	3.1	6.9
		NHTSA	2.0	5.2
Determination (MY 2022-2025)		EPA	3.8	7.5
Opportunity Cost of Consumer Capital[27]				
Savings/	Bank Account			1
Investing	5-year Interest rates	CD		2
	Home value	1996-2016		3.2
		2006-2016		-1.9
	Municipal Bonds	1-year		1
		2-year		1.2
		5-year		1.8
		10-year		2.4
		30-year		3.2
	Inflation Protected Treasury	5-year		0
	(TIPS)	10-year		0.5
		20-year		0.7
		30-year		1
Borrowing	5-year Interest rates	New Car		2.4
		Used Car		2.7
	15-year fixed Refi	Home		2.9

[23] David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016.

[24] Derived from National Program, Federal Register Notice, 62663,63119,

[25] Derived from TAR, Executive Summary, Chapter 12, Chapter 13.

[26] Derived from Determination, p. 44,

[27] Auto loans: Bankrate.com boot screen, Rate of return, homes, Stocks, Bonds: http://money.cnn.com/calculator/pf/home-rate-of-return/, Saving account: http://www.money-rates.com/savings.htm, 5-7ear CD http://www.interest.com/cd-rates/news/5-year-cd-rates/

We then show at the bottom of the table a variety of estimates of the opportunity cost of consumer capital. Here we show current estimates for how much consumers earn on relatively low risk investments, and how much they pay to borrow money. We include borrowing as an alternative use of consumer credit. These capture the essence of the idea of the discount rate by proving metrics for the "alternative investments".

It is clear that figure is in the range of 1-3%. While federal agencies are required to consider 3% and 7%, this data shows that the 3% figure is a far better (perhaps even to high) proxy for the opportunity cost of consumer capital. Reflecting this analysis, we have always focused on the agency analyses based on the 3% discount rate. The table reflects the 3% discount rate for the agency analyses.

We also show the mid-point estimates (preferred or reference cases) for the agency analyses. Greene and Welch did not provide a mid-point. The range we show is for their estimated high and low cost of technology. They did caution that even the low cost attributed to technology they derived from the literature is probably too high.

Greene's backward looking analyses of the impact of fuel economy standards over three and a half decades of its existence, which is almost its entire operating life, is extremely important in the context of the current Determination. It provides a grounding for the forward looking analyses. It shows that the forward looking analyses are consistent with the past performance of the fuel economy standards, particularly when one focuses on the high end of the results, which Greene and Welch think is the estimate that better describes the standards in the past. Their best case scenario is for average annual benefits of just over $400 per year for 35 years. The worst case scenario is for benefits of just over $200 per year.

Estimated Economics of the National Program

The middle of the table reflects the forward looking analysis of the National Program prepared by the agencies. We find that the forward looking analyses of the program indicate it is beneficial both from the consumer pocket book and the national points of view. The benefit cost ratio is substantially greater than one. At the pocketbook level, it is in the range of 2-to-1 to 3-to-1. From the societal point of view, the benefit cost ratio is even more positive, in the range of 3-to-1 to 4-to-1. We also find that the rate of return is generally 3 to 4 times higher than the amount consumers can earn on their money and twice what they pay to borrow money.

For the typical household that purchases a vehicle with a 5-year auto loan and holds the vehicle for 10 years, the average annual savings is close to $300, discounted at 3%.

A household that pays cash for the vehicle would realize almost $1650 of net savings.

Another way to look at the cost effectiveness of the program is to calculate how much it costs to save a gallon of gasoline by including more fuel saving technology in vehicles. EPA estimates that over 50 billion gallons of oil will be saved at a cost of $36 billion. That works out to just over $0.70 per gallon. Under NHTSA's base case assumption the cost is close to $1.30/gallon. Both are far less than even the low cost EIA price projections.

Table 4 shows that there were differences between EPA and NHTSA in the estimates of costs and benefits. However, the topline results of the launch and early implementation of the National Program are quite simply, a very positive bottom line. Table 4 identifies key measures of the performance of the National Program projected for the MY2022-2025 standards by both EPA and NHTSA from the consumer point of view. EPA and NHTSA focus on the lifecycle consumer savings, the payback period and total national benefits (in addition to reduction in CO2

emissions and oil consumption). We add monthly cash flow analysis and cost per gallon saved as they are as more relevant to consumers.

While there are differences between the two agencies in their assessments as described below, we believe EPA's analysis, which stayed much closer to the original framework, is stronger and NHTSA will have to provide better justification for the changes it proposes to that methodology. We also believe the monthly cash flow analysis is more relevant to consumers and the cost per gallon saved is a simple measure of the consumer impact.

- Notwithstanding the differences, the bottom line for both agencies is clear. The benefits of the program far exceeds the costs.
- Cash flow benefits exceed costs incurred to reduce gasoline consumption early in the asset life (the first year).

TABLE 4:
CONSUMER POCKETBOOK IMPACTS

	Monthly			Cost per gallon saved	Payback in years	Lifecycle savings		Total National ($, billion)	
	Cost	first year savings	Net			Consumer	Total	Cost	Benefit
EPA									
Mark-up (ICM)	$16.07	$19.92	$3.85	$0.70	5-5.5	$1,620	$2,365	$36	$130
Retail Price Equivalent (RPE)	18.66	19.93	1.27	0.78	6	1,460	2,131	40	129
NHTSA									
Incremental Cost Mark-up (ICM)	18.00	25.10	6.90	1.18	6	800	1.168	89	175
Retail Price Equivalent (RPE)	20.00	24.79	4.79	1.29	6.5	600	876	79	178

Source: TAR, ES-11, ES-12 for cost/vehicle, total cost, total oil savings. First year cash flow and payback analysis is based on TAR 12-41 – 12-46, in which EPA presents year-by-year data for cash flows in the payback approach. The basic approach is applied to NHTSA first year VMT with direct calculation of savings, TAR 13-11 – 13-14. For the combined fleet, first year VMT is assumed to be 25% higher (increasing the first year net benefit, but in the long term NHTSA projections, survival weighted VMT is 20% lower, decreasing the lifecycle cost savings and increasing the cost per gallon saved).

- The cost per gallon saved is far below the projected cost of gasoline, even in the low cost scenarios.
- Payback is less than half the asset life.
- There are substantial total savings measured at the consumer and national levels.

Macroeconomic Benefits

The bottom line findings are strikingly clear. Since its inception, the fuel economy standards program has yielded substantial consumer pocketbook savings. The level adopted by the National Program and affirmed in the Proposed Determination is consistent with that track record and will extend consumer savings far into the future. Environmental and public health benefits increase the total benefits by 50%.

However, there is an even larger benefit that these analyses do not take into account. As the cost of driving declines, consumers drive a little more, but they still have a great deal of additional disposable income left over. The gasoline savings calculations are net of the rebound effect at the societal level, but not the individual level. If a consumer chooses to spend the economic savings on more gasoline, that constitutes a net benefit to the consumer in the form of increased utility and increases the economic output of the economy, as shown in Table 5.

TABLE 5:
BENEFIT-COST RATIOS FOR EACH SOURCE OF BENEFIT

	Base Case Markup		NHTSA High Markup	
	EPA	NHTSA	EPA	NHTSA
Pocketbook	2.5	1.5	2.2	1.4
Environmental/Other	1.1	.7	1	.6
Macroeconomic	2.2	1.2	1.8	1.1
Total	5.8	3.4	5.0	3.1

Source: TAR, pp. ES-12. Macroeconomic based on MEMORANDUM TO: Docket EPA-HQ-OAR-2009-0472

The multiplier effect of having more disposable income to spend on other goods and services depends on the nature of the activities that are increased and decreased. The primary area where activity is reduced is the petroleum sector, which has a particularly low multiplier.

Estimating the indirect macroeconomic effect of policy changes using general equilibrium input/output models is a common part of much policy analysis.[28]

In 2012 EPA ran such a model to assess the effect of reducing gasoline consumption and increasing expenditure of automotive technology. It found that for every $1 of consumer pocketbook savings, there was an increase in GDP of about $0, 80. It also showed a net increase in employment. These benefits could push the total benefits to almost six times the cost, as shown in Table 6.

The above pocketbook analysis helps to explain one of the major findings of our survey research. In a dozen public opinion polls over the past decade, we consistently find substantial support for the standards. Generally, about three quarters of the respondents express support. As shown in Figure 1, in our post-election poll in 2016, we found a similar high level of support. The support is not only broad, it is bipartisan. Two-thirds of those who voted for Donald Trump support the standards. Two-thirds of Republicans and Independents who lean Republican support the program. Support is stronger among Democrats, Independent leaning Democrats and those who voted for Hillary Clinton, with over four fifths supporting the program.

CONSUMER SUPPORT FOR FUEL ECONOMY STANDARDS

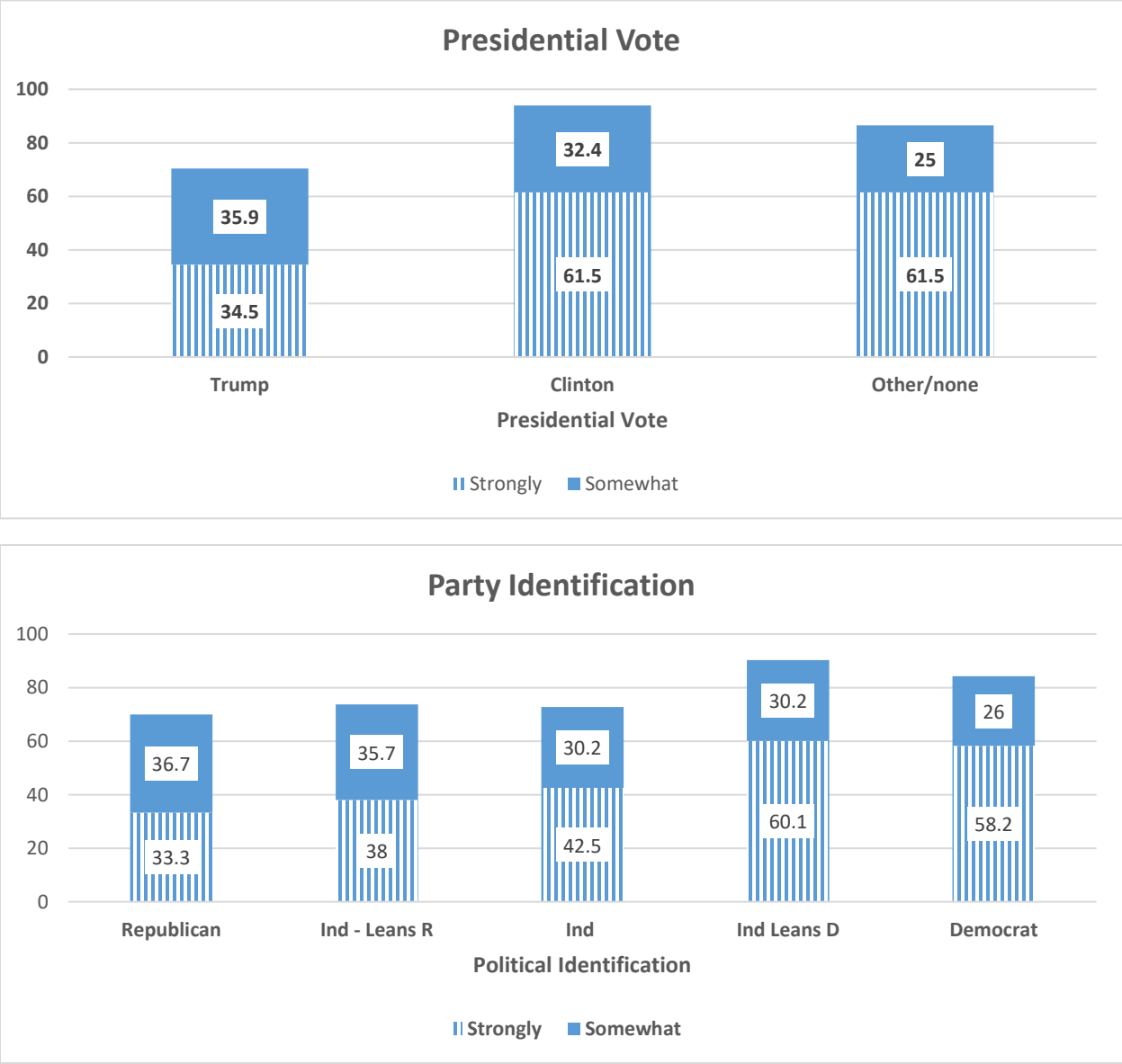
Support for Standards Post-2016 Presidential Election

Over the course of a decade CFA has examined public opinion about regulatory policy to increase the fuel economy of the light duty vehicle fleet. The questions have been varied to deal with the policy issue of the moment, but the responses have all supported greater fuel economy

[28] MEMORANDUM TO: Docket EPA-HQ-OAR-2009-0472, SUBJECT: Economy-Wide Impacts of Greenhouse Gas Tailpipe Standards; March 4, 2010; The fuel savings and lower world oil prices that result from this rule lead to lower prices economy-wide, even when the impact of higher vehicle costs are factored into this analysis. Lower prices allow for additional purchases of investment goods which, in turn, lead to a larger capital stock. These price reductions also allow higher levels of real government spending while improving U.S. competitiveness thus promoting increased exports relative to the growth driven increase in imports. As a result, GDP is expected to increase as a result of this rule.

through regulation. Before the Energy Independence and Security Act (EISA) rebooted and reformed the Corporate Average Fuel Economy (CAFE) program, we focused on the general proposition that fuel economy should be increased.

FIGURE 1:
PUBLIC SUPPORT FOR FUEL ECONOMY STANDARDS ACROSS THE POLITICAL SPECTRUM POST-2016 ELECTION



Source: CFA commissioned public opinion poll conducted by ORC, December 8-11, 2016.

Long Term Support for Fuel Economy Standards

In April 2007 we asked about legislation "that would require auto manufacturers to increase their new car fuel mileage by about one mile per gallon a year for ten years.[29]

- Support for the increase stood at 81%.

We followed that up with a question that pointed out that the cost of vehicles would go up, but be completely offset by lower costs for less gasoline consumption (although we could have stated that there would be substantial net savings).

- Support for the increases stood at 73%.

In September 2007, we asked about support for the broad goals of EISA in a question that began with fuel economy but also mentioned greater reliance on renewables and ethanol.

- Support for the legislation stood at 84%.

We followed that up with a question that laid out the arguments for passage (lower consumer spending on energy, dependence on imports, and global warming emissions) and against (rising prices and lost jobs).

- Support for the legislation stood at 75%.

After the passage of EISA we shifted our questioning to the level of standards being considered in rulemakings.

In March 2008, we asked consumers about the U.S. oil situation (share of global reserves and level of consumption) and split the sample. We noted that regulations were being considered to increase fuel economy from 25 mpg to 35 mpg by 2016 and asked about support for raising that target to 50 mpg by 2025. Among those who gave correct answers to the questions on the U.S. oil situation,

[29] All of the surveys were conducted for the Consumer Federation by ORC, based on a national random sample of 1,000 households with a margin of error of + 3

- Support for the increase stood at 73%.

Among those who did not give correct answers, without being provided the correct information,

- Support for the increase was 65%.

After correct information was provided,

- support for the increase rose to 69%.

In September 2010, we asked about a much larger increase, in addition to going from 25 mpg to 35 mpg by 2016, we asked about going to 60 mpg by 2025.

- Support for the increase stood at 59%.

In May 2012, we shifted to evaluating the standard that had been adopted for 2025, with the lab test goal of approximately 55 mpg.

- Support for the standard stood at 74%.

In April 2013, we repeated the survey question.

- Support for the standard stood at 85%.

In June 2014, we again surveyed on the proposed standard.

- Support for the standard stood at 83%.

The previous surveys relied on the laboratory miles per gallon estimates used in the regulatory documents, but the economic analysis of the CAFE standards and the EPA stickers on vehicles have always relied on the estimated on-road mileage that consumers are likely to see. As the mpg increases, the difference between the lab tests and on-road mpg grows. In our recent surveys we have shifted to using the on road numbers, since that is more familiar to consumers.

In our April, 2016 survey we shifted to the projected on-road mileage of about 42 mpg.

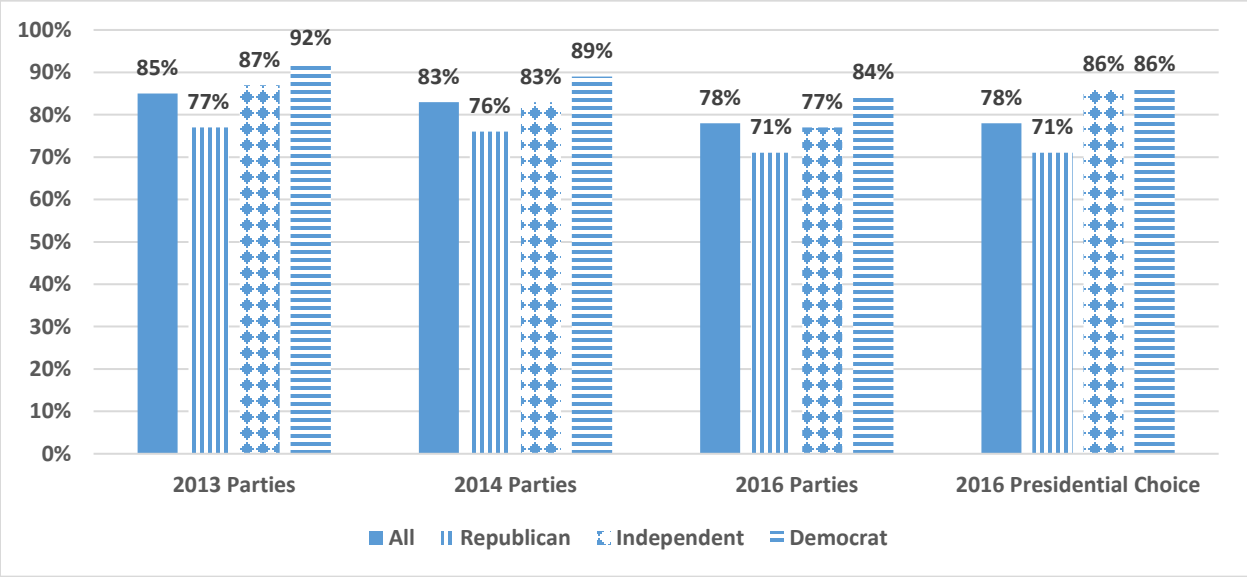
- Support for the standard stood at 81%.

The December 2016 survey analyzed above also reflects this change.

- Support for the standard stands at 76%.

We have occasionally analyzed the issue of support across the political spectrum. The results were similar in the past few years. A large majority supports the standards across the political spectrum with a slight decline in support in recent years, as shown in Figure 2.

FIGURE 2:
SUPPORT FOR THE CURRENT STANDARD



Source: CFA commissioned public opinion polls conducted by ORC.

CONSUMER ATTITUDES V. AUTOMAKER CLAIMS

These findings that the program has delivered substantial consumer savings and enjoys substantial public support touches on several of the important issues of the recent election campaign. One of the major themes is the consumer pocket impact of policies. While much of the debate focused on big macro policies, like taxes and wage rates, it is important to recognize that many discrete micro policies, like the fuel economy of vehicles, are important as well.

One of the major macro level issues of the recent campaign was a debate about regulation and deregulation. While the general sentiment that we need less regulation tends to gain

majority support, when asked about specific pocketbook and public health and safety regulations, we frequently find strong support.[30] Fuel economy standards are a good example of this.

Automaker Effort to Roll Back the Standards

The automakers were quick to seize on the election outcome to demand a rollback in the standards – sending the President-elect a letter barely 48 hours after the winner was declared.[31] This rush by the industry to catch the ear of the President-elect clearly was intended to influence any decision about the future of the standards and establishes the context in which the rigorous analysis of the National Program should be evaluated.

Given the broad public support for fuel economy standards, juxtaposed by the rapid push by the automakers for a rollback of the program, we thought it would be instructive to test public opinion about the automakers demands. Very much in the style of election year survey instruments, we tested how knowledge about the automaker actions would affect opinions about policy.

We stated two facts about the current situation in our survey and asked consumers how this would affect their attitude toward the standard. The question sequence is presented in Table 6.[32]

Figure 3 shows the responses to this question. It indicates that, when presented with the two salient and somewhat contradictory facts – that the automakers are currently meeting the

[30] As an example, the Glover Park Group, 2016, *GPG/Morning Consult Poll: Trump voters show support for federal spending in break with traditional conservative cuts*, December 16. Automotive regulation is deemed to be just right or too lenient by almost two thirds of the respondents; three-quarters supported requiring manufacturers to make appliances more efficient, and 61% support requiring U.S. companies to reduce carbon emissions. Similarly, The Pew Research Center provides similar results. In a mid-2015 poll (Beyond Distrust: How Americans View Their Government) they found only 19% agreeing with the proposition that government should be trusted always or most of the time, three-quarters of the respondents said it should have a major role in protecting the environment and strengthening the economy, with majorities saying it was doing a good job.

[31] 7 Reasons Why the Trump Administration Won't Put the Brakes on Fuel Economy Standards, November 14, 2016

[32] Source: CFA commissioned public opinion poll conducted by ORC, December 8-11, 2016.

standard and they want to roll them back – respondents are more likely to support the standard. Respondents were three times as likely to support the program (57%), compared to a small minority (17%) who said it would make them oppose the program. About one quarter said it did not matter. The shift in attitude was even greater when we consider strong changes, with 35% more strongly supporting v. 9% more strongly opposing.

TABLE 6
SEQUENCE OF QUESTIONS ON AUTOMAKER EFFORTS TO ROLL BACK STANDARDS

Federal and state standards now require automobile manufacturers to increase the fuel economy of the new cars they sell to an on-road average of 42 miles per gallon by 2025. What is your view of this increase in fuel economy standards? Would you say you…

(READ ENTIRE LIST BEFORE RECORDING ONE ANSWER)

01 Support strongly
02 Support somewhat
03 Oppose somewhat
04 Or, oppose strongly
99 DON'T KNOW

In the past several years, automobile manufacturers have made good progress increasing the fuel economy of their vehicles and are on schedule to meet the 42 miles per gallon requirement, which varies by type of vehicle. But now some auto manufacturers are objecting to the standard and are asking the new administration in Washington to scale it back.

Knowing this, are you more likely to support or oppose the federal and state standards that require automobile manufacturers to increase the fuel economy of the new cars they sell to an on-road average of 42 miles per gallon by 2025? Would you say you are…

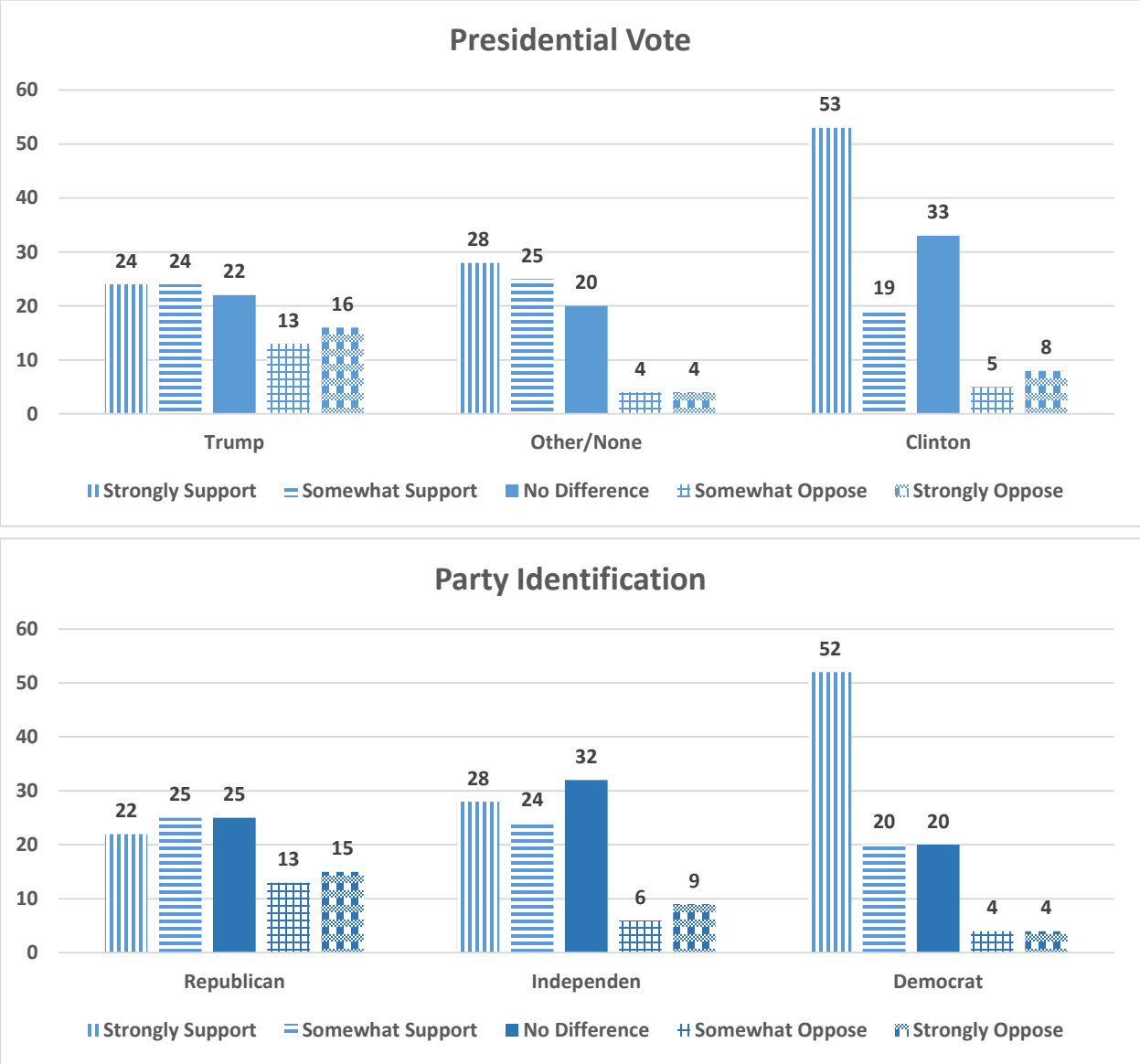
(READ ENTIRE LIST BEFORE RECORDING ONE ANSWER)

01 Much more likely to support
02 Somewhat more likely to support
03 Somewhat more likely to oppose
04 Much more likely to oppose
05 Or, does it make no difference
99 DON'T KNOW

All across the political spectrum, those who were more likely to support the standard, given the two facts, outnumber those who were more likely to oppose it by a wide market. There

were differences between the groups, as shown in Figure 3. The biggest increase in support was among those who voted for Clinton, the smallest among those who voted for Trump. The remainder of respondents fell between these two extremes. The results across party identification are almost identical to the results across presidential-voting.

FIGURE 3:
LIKELIHOOD OF SUPPORT FOR STANDARDS WITH INFORMATION ON AUTOMAKERS



Source: CFA commission public opinion poll conducted by ORC, December 8-11, 2016.

The introduction of this information can shift attitudes significantly. Among those who expressed strong support for the standard, 6 percent indicated the information "weakened" their support. Among those who strongly opposed the standard, two-and-a-half times as many (15%) indicated the information "weakened" their opposition. The results are similar in the middle. Among those who reported moderate (somewhat) support or opposition, 47% demonstrated the information shifted their view in a direction that was favorable to the standard (more support), whereas less than half as many (21%) shifted their view toward less support.

Conflict between Consumer Needs and Automaker Wants

These survey results put the automakers' efforts to roll back the standards at odds with public opinion. In our comments in response to the Technical Analysis Report we showed that the automakers are out of step with consumers in another way. While the automakers claim that what they want to do with vehicles is "just what consumers want," we showed that their own survey results contradicted that claim. Because we believe this misreading of consumers has been persistent and their erroneous portrayal of consumer attitudes will likely play an important part of the debate over the standard, some of our earlier analysis bears repeating.

The AAM analysis makes a remarkable series of erroneous assumptions and misleading comparisons and claims.[33]

The first slide claims that "only OEMs have real skin in the game."[34] In fact, since the consumer pocketbook benefits exceed the technology costs by a substantial amount, consumers have a great deal of "skin in the game." As noted above, environmental, public health and macroeconomic benefits should also be included. In other words, consumers and

[33] Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, Consumers & Fuel Economy, CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England)

[34] Id., p. 2.

society have as much as four to six times as much "skin in the game" as the automakers.[35] The claims ignore the fact that the agency analyses show that the total cost of driving declines.

The automakers present numerous nonsensical comparisons. For example, on the list of public concerns they note that terrorism, race relations and a weak economy are a greater concern to the public.[36] Improving fuel economy does not detract from policies to address these bigger problems. Indeed, it can be argued that reducing oil consumption and imports helps to undermine the leverage of terrorists, while the resulting macroeconomic growth improves the economy.

Even when they present bogus choices, their arguments do not work. They state that the global threat of climate change "requires government regulations…[37] that raise the price on new cars… pricing new cars out of the reach of many American families." In spite of this introduction, more respondents opt for more regulation (42% to 41%).

Similarly they point out that 69% of respondents want to encourage mobility, vs. 16% that want to discourage mobility.[38] Since the standards lower the cost of driving (and have a rebound effect to increase driving), they obviously encourage mobility.

The key question on regulation reported by the AAM is extremely biased.[39] First, the question uses the laboratory standard of 54.5 miles per gallon, while EPA/NHTSA do all their economic analysis at the adjusted, real world mileage of about 42 MPG. Survey respondents live in the real world and 42 MPG would certainly seem more realistic than 54.5. Second, in presenting the choice, the AAM survey presents only one side – the automakers' side. "OEMs say that under the new standard, consumers will have to pay more for cars and buy more hybrids

[35]Id., p. 35.
[36] Id., p. 7.
[37] Id., p. 7.
[38] Id., p. 8.
[39] Id., p. 10.

and EVs." Remarkably, even with this double barreled bias, while 47% of the respondents said the target of 54.5 was too aggressive, 46% said it was about right or too lenient.

The public is not as enamored of gasoline powered muscle cars and trucks as the automakers claim.

The automaker spend a great deal of time complaining about policies to promote electric vehicles (EVs), claiming they will drive up the cost of the National Program. We have shown that the EV program will have little impact on the cost of compliance for three reasons.

First, electric vehicles are projected to make up a very small part of the fleet in the targeted compliance period.

Second, the cost of electric vehicles is plummeting, with a number of cost-competitive, consumer-friendly vehicles planned for the market long before the compliance period.

Third, as frequently happens in efficiency programs, the cost of compliance declines as producers learn and volumes rise. This is the powerful intersection of "command but not control" regulation and the market forces on which it relies.

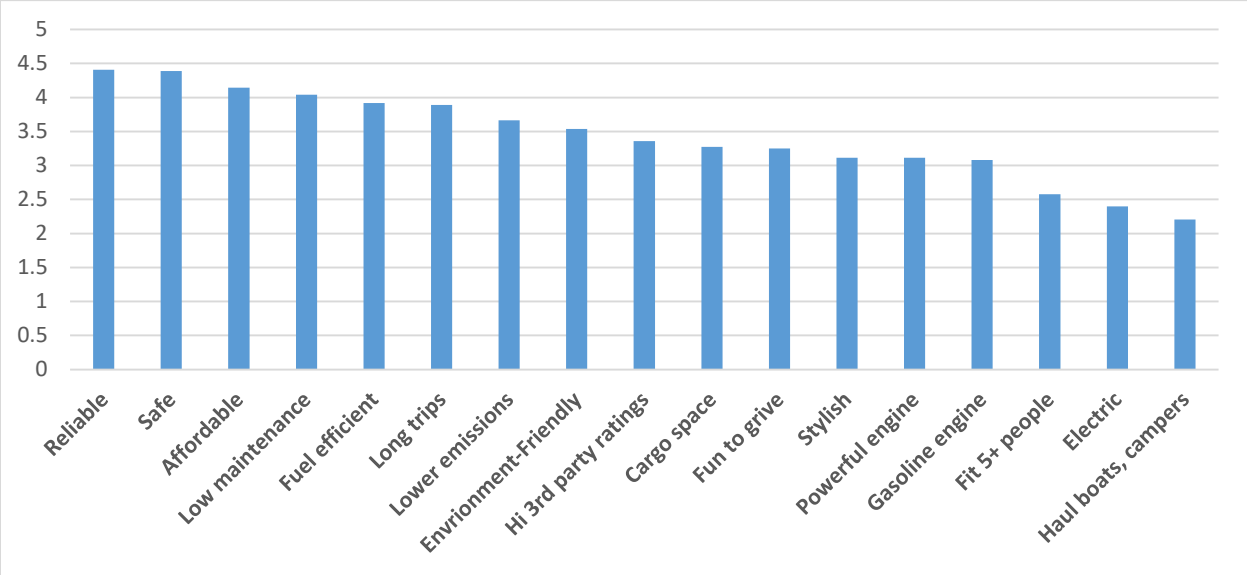
As we pointed out during the House hearing, this was the experience with hybrid vehicles. California's leadership in the LEV program created the global market for those vehicles. With respect to EV's, the global market is rapidly emerging. In this case, California's leadership will help to ensure that the U.S. automakers are not left behind.

Moreover, the automakers' survey evidence does not support their claim. If an EV and gasoline vehicle were matched on cost and travel length[40], more would prefer the electric vehicles (48% to 43%) and a clear majority (57%) are willing to pay more for an electric vehicle. As Figure 4 shows, the analysis of desirable vehicle attributes shows that consumers want

[40] Id., p. 9).

reliable, safe, affordable and low maintenance vehicles.[41]. There is no reason to believe that fuel efficient gasoline engines or electric vehicles (EVs) cannot fill the bill and automakers are working hard to achieve that goal.

FIGURE 4:
ALLIANCE OF AUTOMOBILE MANUFACTURERS, VEHICLE ATTRIBUTE SURVEY



Source and Notes: Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers, *Consumers & Fuel Economy,* CAR Management Briefing Seminars, Traverse City, Michigan, August 2016, p. 10. The winter related question, specific to the North East, has been discarded. It would rank 12th of 18, low in California, high in New England).

As Figure 4 shows, after the big four attributes, respondents care as much about fuel efficiency as the ability to take long trips and the automakers are working on that too. Beyond these big six attributes, the valuation of others falls off, but even here the message for EVs is positive. Environmental impacts rank a lot higher (8th and 9th) than powerful engines (13th) or engine type (gasoline power =14th, electricity = 16th). Fitting more than 5 people (15th) or hauling boats and campers don't matter much (ranks dead last).

If you watch the TV ads and go into the showrooms, you would have to conclude that the automakers are pushing the wrong vehicles. More importantly, there is nothing in this data that

[40] Id., p. 10.

suggests EVs cannot be a big success. Our survey results, this data and automaker investments can be interpreted to mean that EVs are on the early part of the adoption curve and there is a very strong basis to expect success.

Additional Evidence on Automaker Misunderstanding of Consumers and Misrepresentation of the Impact of Standards

Although our primary focus has been on analyzing the standards, rather than arguing with the industry, over the years, we have asked questions that reinforce the evidence of the automaker misunderstanding of consumers. We find that consumers have consistently expressed a desire for vehicles that get about 20% high fuel economy than the sales weighted average of new vehicles sold. Until recently, when the standards changed automaker behavior, the show rooms did not have vehicles to meet consumer efficiency demands.

In 2006, when automakers were having difficulties, long before the financial meltdown and the bankruptcy of two of the Big Three U.S. automakers, we asked consumers what role fuel economy might be playing: "Both Ford and General Motors are having well-publicized financial problems. To what extent do you think these problems have resulted from their emphasis on producing and marketing SUVs and pick-up trucks with relatively low miles per gallon?" Two-thirds said that it was playing a part.

OVERESTIMATION OF COSTS IN REGULATORY PROCEEDINGS

While CFA has not made it a practice of arguing with the automakers, there have been other moments when their actions have raised our concerns. Of particular concern to us is the tendency of the automakers to vastly overstate the costs meeting the standards. In June 2011, we thoroughly rebutted a fundamentally flawed analysis from the Center for Automotive Research

that claimed the new standards would do severe harm to the industry.[42] The real world experience since then shows how far off the mark they were. The historical analysis shows that such dire predictions are unfounded. Unfortunately, the industry is at it again with gloom and doom projections that policymakers should reject.

In the automaker analysis discussed above, the beneficial effect of a reduction in the total cost of driving is hidden behind cost estimates that are 2 to 10 times higher than the agency estimates and benefits that are underestimated by 50 percent.

One of the most important areas in which the automakers have erred in the past and are likely to err in the present is the estimation of costs. This becomes a key point of conflict in the regulatory debate.

Policies to reduce the efficiency gap, like performance standards, will improve market performance. By overcoming barriers and imperfections, well-designed performance standards will stimulate investment and innovation in new energy efficient technologies. A natural outcome of this process will be to lower not only the level of energy consumption, but also the cost of doing so. The efficiency gap literature addresses the question of how "learning curves" will affect the costs of new technologies as they are deployed. There are processes in which producers learn by experience to lower the cost of new technologies dramatically. The strong focus on the supply-side and innovation underlies the observation above that aggressive policies to stimulate innovation and direct technological change can speed the transition and lower the ultimate costs.

In the efficiency gap area, the issue of declining costs driven by technological change has received significant examination as a natural extension of the effort to project technology costs.

[42] *Setting the Record Straight on Increases in Fuel Economy Standards: Higher Fuel Economy Standards Will Lower the Cost of Driving, Increase Auto Sector Employment, Keep U.S. Car Companies Competitive, and Reduce Our Dependence on Foreign Oil,* June 2011.

One of the strongest findings of the empirical literature is to support the theoretical expectation that technological innovation will drive down the cost of improving energy efficiency and reducing greenhouse gas emissions. A comprehensive review of *Technology Learning in the Energy Sector* found that energy efficiency technologies are particularly sensitive to learning effects and policy.

> For demand-side technologies the experience curve approach also seems applicable to measure autonomous energy efficiency improvements. Interestingly, we do find strong indications that in this case, policy can bend down (at least temporarily) the experience curve and increase the speed with which energy efficiency improvements are implemented.
>
> 1. For the past several decades, the retail price of appliances has been steadily falling while efficiency has been increasing.
> 2. Past retail price predictions made by the DOE analysis of efficiency standards, assuming constant price over time, have tended to overestimate retail prices.
> 3. The average incremental price to increase appliance efficiency has declined over time. DOE technical support documents have typically overestimated the incremental price and retail prices.
> 4. Changes in retail markups and economies of scale in production of more efficient appliances may have contributed to declines in prices of efficiency appliances.[43]

The findings on learning curve analysis are extremely important because decisions to implement policies that promote efficiency and induce technological change are subject to intensive, *ex ante* cost-benefit analysis. Analyses that fail to take into account the powerful process of technological innovation that lowers costs will overestimate costs, undervalue innovation, and perpetuate the market failure. Detailed analysis of major consumer durables including vehicles, air conditioners, and refrigerators find that technological change and pricing strategies of producers lowers the cost of increasing efficiency in response to standards.

> The more specific point here is that, while regulatory compliance costs have been substantial and influential, they have not played a significant role in the pricing of vehicles. Vehicle prices have steadily increased over time, far exceeding the costs of emission control and safety equipment…
> These cost increases, to the extent they are substantial, are dealt with in the short run by

[43] Larry Dale, et al., "Retrospective Evaluation of Appliance Price Trends," *Energy Policy* 37, 2009. p. 1.

> a variety of pricing and marketing strategies and by allocating R&D costs further into the future and over more future models. As with any new products or technologies, with time and experience, engineers learn to design the products to use less space, operate more efficiently, use less material, and facilitate manufacturing. They also learn to build factories in ways that reduce manufacturing cost. This has been the experience with semiconductors, computers, cellphones, DVD players, microwave ovens – and also catalytic converters.
> Experience curves, sometimes referred to as "learning curves," are a useful analytical construct for understanding the magnitude of these improvements. Analysts have long observed that products show a consistent pattern of cost reduction with increases in cumulative production volume. …
> In the case of emissions, learning improvements have been so substantial, as indicated earlier, that emission control costs per vehicle (for gasoline internal combustion engine vehicles) are no greater, and possibly less, than they were in the early 1980s, when emission reductions were far less.[44]

A comparative study of European, Japanese and American automakers prepared in 2006, before the recent reform and reinvigoration of the U.S. fuel economy program, found that standards had an effect on technological innovation. The U.S. had lagged because of the long period of dormancy of the U.S. standards program and the fact that the U.S. automakers did not compete in the world market for sales, (i.e. they did not export vehicles to Europe or Japan).

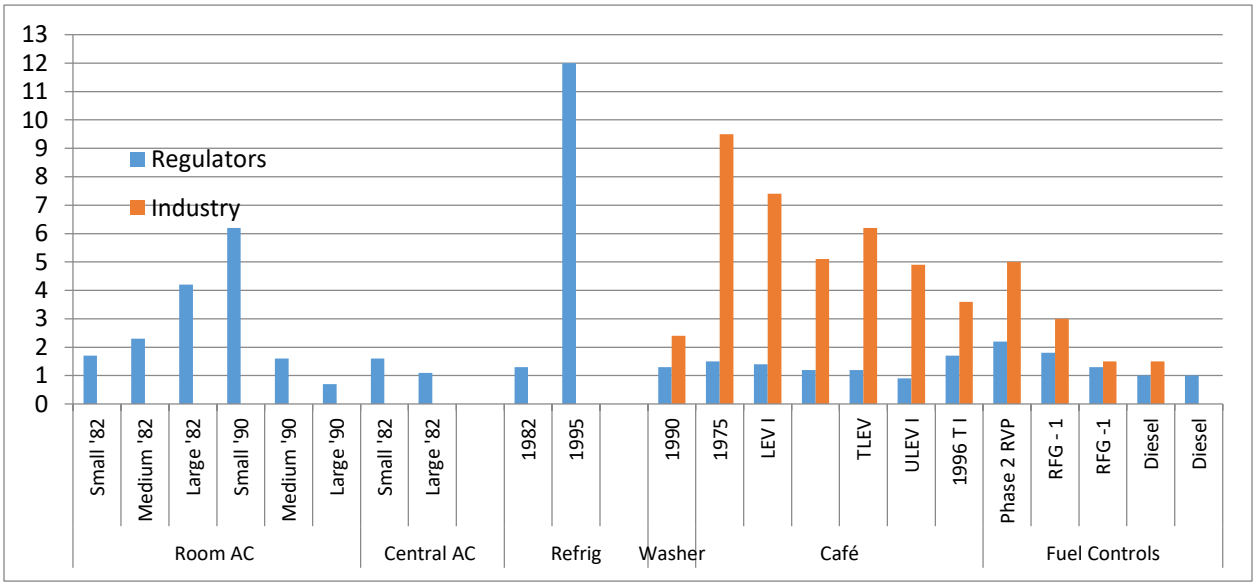
> The European car industry is highly dynamic and innovative. Its R&D expenditures are well above average in Europe's manufacturing sector. Among the most important drivers of innovation are consumer demand (for comfort, safety and fuel economy), international competition, and environmental objectives and regulations… One element of success of technology forcing is to build on one or more existing technologies that have not yet been proven (commercially) in the area of application. For improvements in the fuel economy of cars, many technological options are potentially available…
> With respect to innovation, the EU and Japanese policy instruments perform better than the US CAFE program. This is not surprising, given the large gap between the stringency of fuel-efficiency standards in Europe and Japan on the one hand and the US on the other…
> One of the reasons for the persistence of this difference is that the US is not a significant exporter of cars to the European and Japanese markets.[45]

[44] Sperling, Dan et al., 2004, Analysis of Auto Industry and Consumer Responses to Regulation and Technological Change and Customization of Consumer Response Models in Support of AB 1493 Rulemaking, Institute of Transportation Studies, UC Davis, June 14, pp. 10-15.

[45] Kuok, On, *Environmental Innovation Dynamics in* the *Automotive Industry:* Project Assessing Innovation Dynamics Induced by Environmental Policy, November 3, 2006.

Figure 5 shows the systematic overestimation by regulators of the cost of efficiency improving regulations in consumer durables. The cost for household appliance regulations was overestimated by over 100% and the costs for automobiles were overestimated by about 50 percent. The estimates of the cost from industry were even farther off the mark, running three

FIGURE 5:
THE PROJECTED COSTS OF REGULATION EXCEED THE ACTUAL COSTS: RATIO OF ESTIMATED COST TO ACTUAL COST BY SOURCE



Sources: Winston Harrington, Richard Morgenstern and Peter Nelson, "On the Accuracy of Regulatory Cost Estimates," *Journal of Policy Analysis and Management* 19(2) 2000, *How Accurate Are Regulatory Costs Estimates?,* Resources for the Future, March 5, 2010; Winston Harrington, *Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews,* Resources for the Future, 2006; Roland Hwang and Matt Peak, *Innovation and Regulation in the Automobile Sector: Lessons Learned and Implications for California's CO_2 Standard,* Natural Resources Defense Council, April 2006; Larry Dale, et al., "Retrospective Evaluation of Appliance Price Trends," *Energy Policy,* 37, 2009.

times higher for auto technologies.[46] Broader studies of the cost of environmental regulation find a similar phenomenon, with overestimates of cost outnumbering underestimates by almost five to one with industry numbers being a "serious overestimate."[47]

[46] Roland Hwang and Matt Peak, Innovation and Regulation in the Automobile Sector: Lessons Learned and Implications for California's CO_2 Standard, Natural Resources Defense Council, April 2006.
[47] Winston Harrington, Grading Estimates of the Benefits and Costs of Federal Regulation: A Review of Reviews, Resources for the Future, 2006; p. 3.

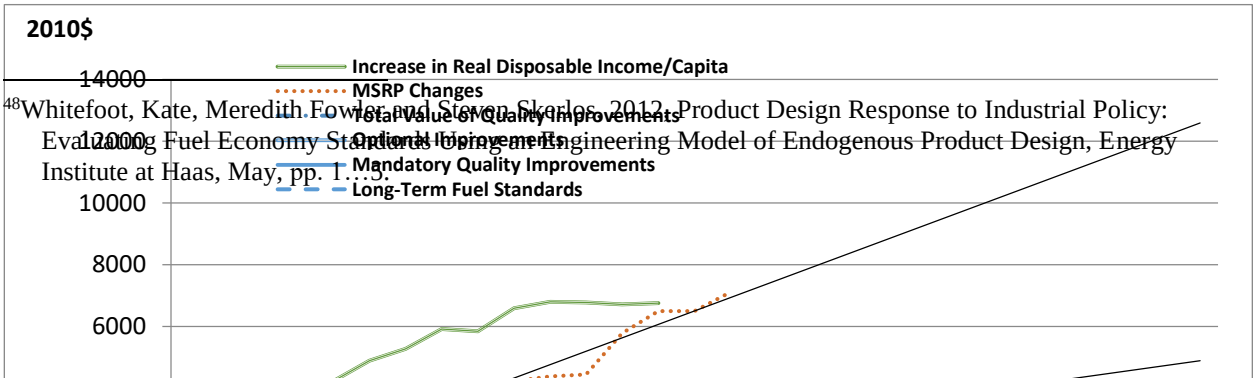
While the very high estimates of compliance costs offered by the auto manufacturers can be readily dismissed as self-interested political efforts to avoid regulation, they can also be seen as a worst case scenario in which the manufacturers take the most irrational approach to compliance under an assumption that there is no possibility of technological progress or strategic response. A simulation of the cost of the 2008 increase in fuel economy standards found that a technologically static response was 3 times more costly than a technologically astute response.

> We perform counterfactual simulation of firms' pricing and medium-run design responses to the reformed CAFE regulation. Results indicate that compliant firms rely primarily on changes to vehicle design to meet the CAFE standards, with a smaller contribution coming from pricing strategies designed to shift demand toward more fuel-efficient vehicles... Importantly, estimated costs to producers of complying with the regulation are three times larger when we fail to account for tradeoffs between fuel economy and other vehicle attributes.[48]

There may be a number of factors that produce this result, beyond an upward bias in the original estimate and learning in the implementation, including pricing and marketing strategies. Sperling et al, 2004, emphasized the adaptation of producers in the analysis of auto fuel economy standards.

As shown in Figure 6, in comments on the light duty truck and auto standards, CFA presented a historical analysis of cost increases associated with mandates that reflects the ability and strategy of producers to keep cost increases within the broad limits of industry practices. We used an estimate of the cost of technology (25%) of the total increase that is quite close to the "preferred estimate of Green and Welch (27%, which they believe is a little high).

FIGURE 6:
GRADUAL IMPROVEMENT IN FUEL ECONOMY CAUSES A SLOW AND STEADY PRICE INCREASE WHILE THE INDUSTRY HAS HANDLED QUALITY IMPROVEMENT WITH MUCH GREATER COSTS



[48] Whitefoot, Kate, Meredith Fowlie and Steven Skerlos, 2012, Product Design Response to Industrial Policy: Evaluating Fuel Economy Standards Using an Engineering Model of Endogenous Product Design, Energy Institute at Haas, May, pp. 1…5.

Source: Bureau of Labor Statistics, Quality Changes for Motor Vehicles, various years; Consumer Price Index database; Sources: Office of Regulatory Analysis and Evaluation, *Regulatory Impact Analysis, Corporate Average Fuel Economy,* 2011, 2012-2016, 2017-2025.

Many of the factors that are cited as causes of the declining cost, such as learning, standardization and homogenization of components, competitive outsourcing of components, and technological improvements in broader socio-economic environment) represent market factors or externalities that are difficult for individual firms to control or profit from (appropriate), so they constitute externalities that policy must address, if the externalities are to be internalized in transactions. At the same time, performance standards simply shift the baseline of competition to a higher level of energy efficiency. To the extent that markets are competitive, normal competitive processes drive down the costs of innovation such as competition driven technological change, declining markups, and economies of scale.

Even more fundamentally, there is evidence that the decision to increase energy efficiency can stimulate broader innovation and productivity growth.

> The case-study review suggests that energy efficiency investments can provide a significant boost to overall productivity within industry. If this relationship holds, the description of energy-efficient technologies as opportunities for larger productivity improvements has significant implications for conventional economic assessments…This examination shows that including productivity benefits explicitly in the modeling parameters would double the cost-effective potential for energy efficiency

improvement, compared to an analysis excluding those benefits.[49]

We noted above that the implementation of the standards in the early years already exhibit clear signs of this process.

LOW INCOME CONSUMERS

CFA's Seminal Analysis

Automakers, dealers and flawed think tank analyses frequently claim that increases in fuel economy driven by performance standards drive lower income households out of the market. We responded to the claims that higher fuel economy standards will harm low income households, which were emphasized by the National Association of Auto Dealers.[50] This rebuttal was part of the record and the object of the extensive analysis offered by Greene in the TAR proceeding.

We have argued that, since low income households are generally not in the new car market and operating costs are a much larger share of their cost of driving, the standards do not harm them. The TAR recognized this argument, reviewed the literature and concluded that the evidence supported our point of view.[51] The study by Greene and Welch discussed above looks at this issue in greater detail than any previous study and strongly supports our conclusion.

Since the issue receives such attention from the opponents of standards, it merits a reexamination. Our argument can be summarized in three points. These are demonstrated in Figure 7 with data from the Consumer Expenditure Survey of 2015 broken down by deciles of income.

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[49] Worrell, Ernst, et al., 2003, "Productivity Benefits of Industrial Energy Efficiency measures," *Energy*, 28(11).p. 1081.

[50] CFA responded to these claims in *Top 10 Reasons Consumers Want 54.5 MPG by 2025,* May 22, 2012, as well as in comments on the proposed Rule, 2012.

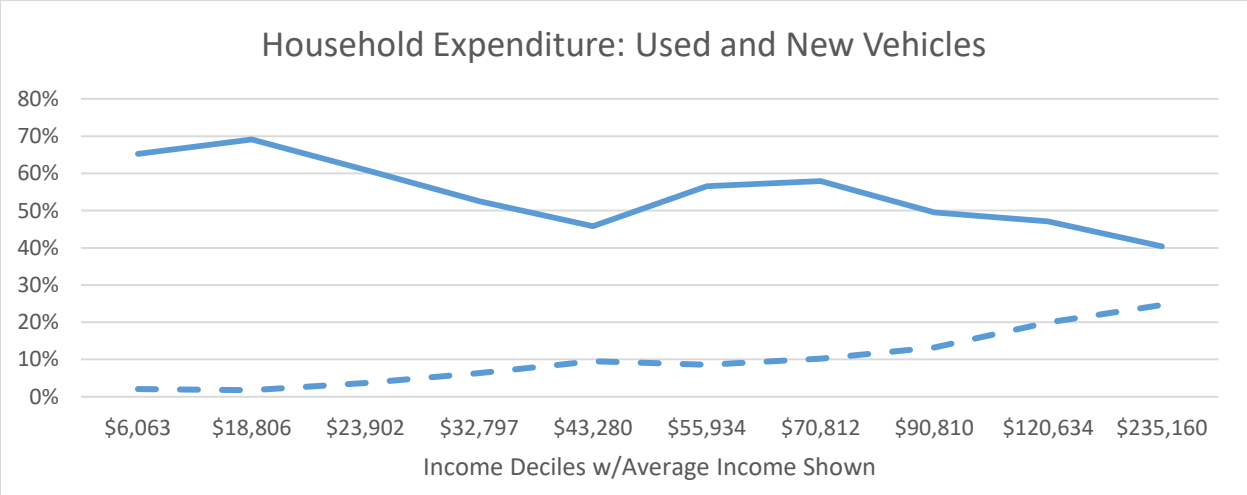
[51] TAR, pp. 6-16 to 6-22.

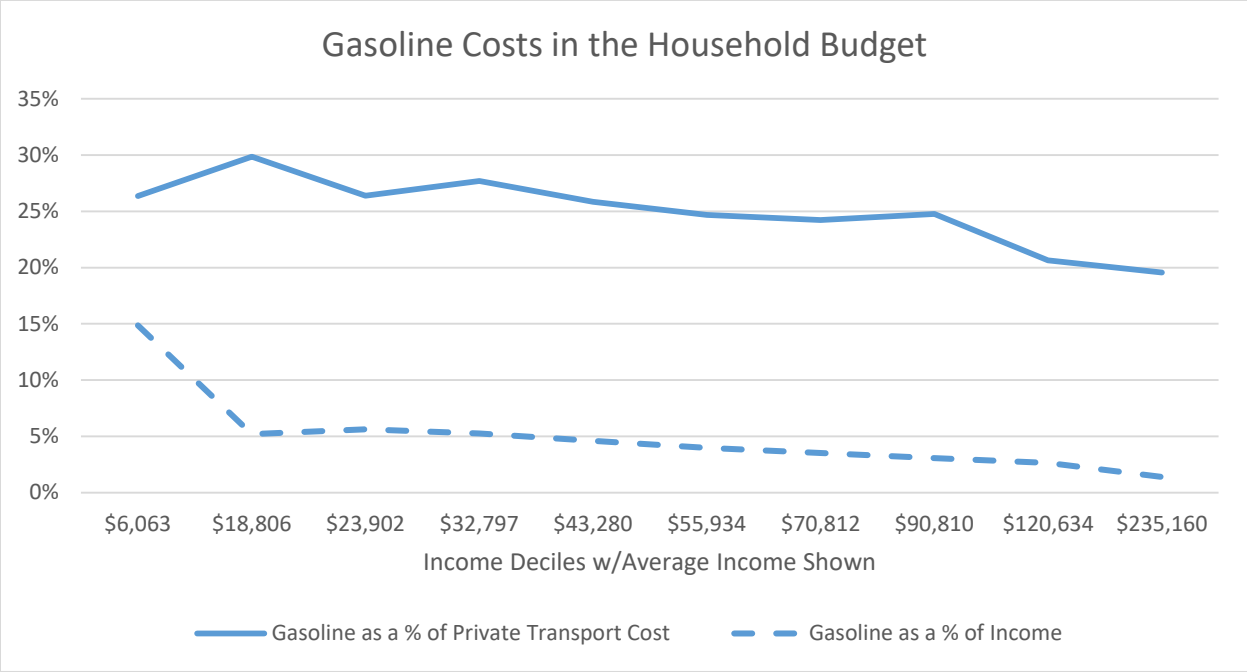
First, low income households make up a much smaller part of the new vehicle market than their share in the overall population. The upper graph of Figure 7 shows that the two lowest income categories –bottom 20% of households -- account for less than 4% of the expenditures on new vehicles. The share of low income households in expenditures on used vehicles is above the national average. The percentage of used vehicle costs in total ownership costs declines steadily as income rises. Therefore, as shown in the lower graph, the operating cost of vehicles makes up a much larger part of their total cost of driving than the average household, and fuel economy standards reduce operating costs. The operating cost share of private transportation costs and household income decline steadily as income rises.

Second, because low income households buy used cars, they tend to benefit from the fact that the economic value of future fuel savings is only partially reflected in the resale price of used vehicles. Low income households get a disproportionate share of the operating cost reduction.

Third, low income households are likely to be disproportionate beneficiaries of the indirect benefits. Low income households are likely to suffer most from environmental and public health externalities associated with the operation of vehicles. They are likely to suffer most in a weak economy and benefit from policies that strengthen it. Therefore, they are likely to benefit most from reductions in those impacts.

FIGURE 7:
OWNERSHIP AND OPERATING COSTS ACROSS INCOME DECILES





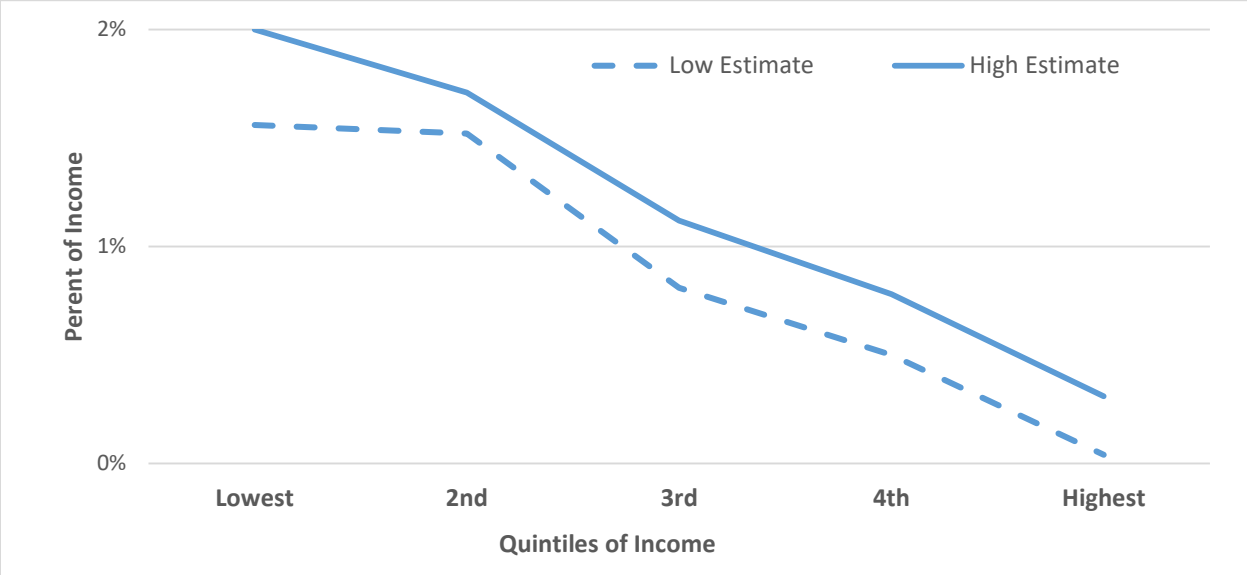
Source: Bureau of Labor Statistics, Consumer Expenditure Survey, 2015.

Confirmation of the Key CFA Argument

The Greene and Welch study strongly supports our view, as shown in Figure 8. Using the Consumer Expenditure Survey, the study can directly measure many of the key elements in our argument. Low income households are much less likely to buy new automobiles, so ownership costs are relatively less important than operating (primarily fuel costs). As more fuel efficient vehicles pass through the used car market into the hands of lower income households, their operating cost expenditures decline. One of the big questions is "how much of the value of fuel savings is captured in the price of the used vehicle?" Based on a review of the literature and

examination of the CES data, Greene and Welch find that about four-fifths of the value of fuel economy is passed on to low income purchasers of used vehicles. This finding is consistent with our conclusion that the auto market is imperfect with respect to fuel economy. Many of the imperfections that afflict the new car market would also affect the used car market.

FIGURE 8:
PERCENTAGE OF INCOME SAVED IN DUE TO FUEL ECONOMY IMPROVEMENTS 1980-2014



Source: David Greene and Jilleah G. Welch, *The Impact of Increased Fuel Economy for Light-Duty Vehicles on the Distribution of Income in the United States*, Oak Ridge National Laboratory and the Energy Foundation, September 2016, p. 56.

The fact that lower income households receive a disproportionate share of the fuel savings interacts with the fact that operating costs are a larger part of their private transportation costs and the fact that they have lower income produce a powerful progressive effect of the program, as shown in Figure 8.

The two lowest quartiles (bottom 40%) enjoyed a reduction in household expenditures of 1.5% to 2% of income. The two middle income quartiles enjoyed a reduction in the range of 0.5% to 1%. The upper income quartile had the smallest net saving (0% to .3%).

CONCLUSION

In the scheme of things, given the strong track record and current projections of significant consumer pocketbook savings combined with clear public support for the program across the political spectrum, the fuel economy standards program is one set of consumer-friendly regulations that should be allowed to proceed on the course that was set in 2012. It is strongly supported by the volumes of evidence in the record. If rigorous analysis and facts matter in policy choices, as they should, the decision of the EPA to maintain the level of standards passes the public interest test with flying colors.