Proposed Rulemaking to Establish)	**Environmental Protection Agency**
Light-Duty Vehicle Greenhouse Gas)	**40 CFR Parts 86 and 600**
Emission Standards and Corporate)	**Department of Transportation**
Average Fuel Economy Standards)	**49 CFR Parts 531,633, 537, et al.**

Comments of the Consumer Federation of America

November 27, 2009

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TABLE OF CONTENTS

LIST OF EXHIBITS

I. INTRODUCTON AND SUMMARY OF ANALYSIS

A. OVERVIEW

This overview summarizes the key conclusions and policy recommendations from the comments of the Consumer Federation of America (CFA)[1] in response to the National Highway Traffic Safety Administration (NHTSA) and Environmental Protection Agency (EPA) Notice of Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards.

Our analysis of opinion polls and purchase decisions over the past half-decade shows that consumers want a great deal more fuel economy than automakers have been willing to supply (see Sections II and IV). The recent economic analysis of fuel economy by NHTSA/EPA suggests why consumers want more fuel economy. The cost of increasing fuel economy to 38.1 miles per gallon by putting more fuel saving technology in cars and trucks is well below the amount consumers are willing to pay and the cost of gasoline.

- It costs only $1.28 to save a gallon of gasoline, far below the current cost of gasoline (see Exhibit I-1).
- The increase in the monthly loan payment to purchase that more fuel-efficient vehicle is less than the reduction in expenditures for gasoline, making it cash flow positive from the beginning, and the vehicle would have higher value at resale. As an investment, it would yield a 9% real rate of return and increase the

EXHIBIT I-1: ECONOMIC, NATIONAL SECURITY AND ENVIRONMENTAL BENEFITS OF VARIOUS ALTERNATIVE STANDARD LEVELS

Conceptual Basis of the Standard	MPG 2016	Economic Benefit (Billion $, Net NPV) Societal	Consumer Pocketbook	National Security Reduced Gasoline Consumption (Billion Gallons)	Cost per gallon saved	Environmental Greenhouse Gas Reduction (Billion Tons)
Proposed	**34.1**	**141**	**106**	**62**	**$0.98**	**29**
Max. Environmental/ Economic Benefit	**38.1**	**191**	**143**	**95**	**$1.28**	**42**

Sources and notes: National Highway Traffic Safety Administration and Environmental Protection Agency, *Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Preliminary Regulatory Impact Analysis*, Tables 1b, 7, 8, 9, and 10. The 3 percent discount rate scenario is used. The consumer pocketbook calculation subtracts the cost of meeting the standard (technology cost) from the fuel savings (lifetime fuel expenditures) and adds in the reduction in the price of gasoline (the petroleum market externality). These are the direct, monetary impacts affecting consumer pocketbooks. Fuel savings and market externalities are assumed to scale with the quantity of gasoline consumption reduction.

1 The Consumer Federation of America is an advocacy, research, education and service organization established in 1968. CFA has as its members some 280 nonprofit organizations from throughout the nation with a combined membership exceeding 50 million people. As an advocacy group, CFA works to advance pro-consumer policy on a variety of issues before Congress, the White House, federal and state regulatory agencies, state legislatures, and the courts.

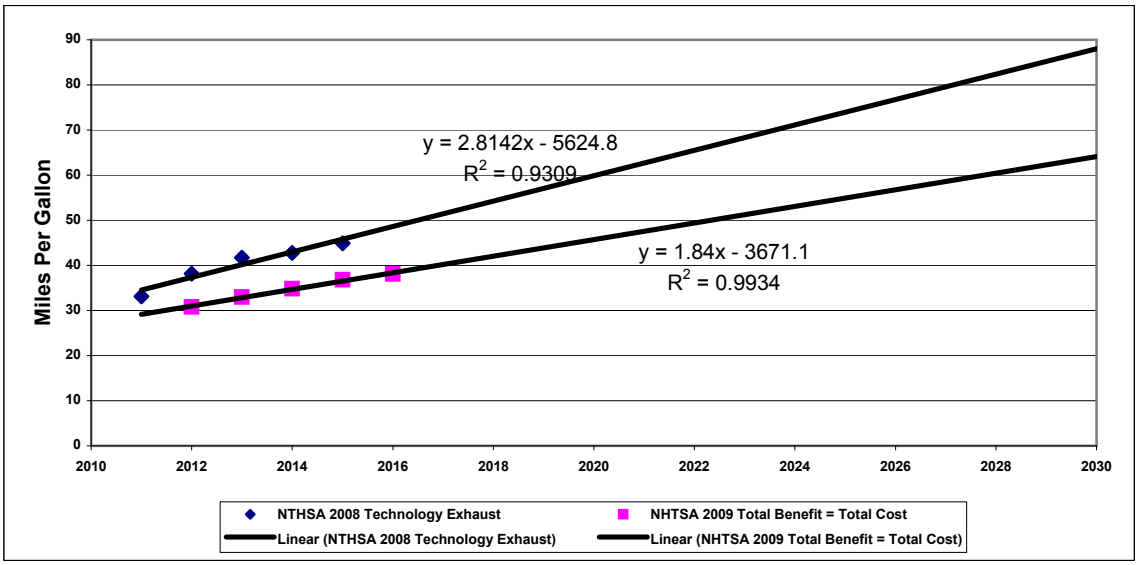
Setting fuel economy standards at this high level helps to solve the nation's energy and environmental problems.

- It can reduce gasoline consumption by 95 billion gallons and yields consumer pocketbook savings of over $140 billion. Total societal benefits are over $190 billion while it reduces greenhouse gas emissions by over 42 billion tons.

The existence of these large potential benefits for consumers, the nation and the environment indicates a major market failure in the automobile sector and that is the primary focal point of our analysis. The cost of owning and operating a vehicle is more than it should be because consumers are using vehicles that consume more gasoline than they should.

- The first step in setting the industry on a path to a stable, high fuel economy future should be to establish a high rate of improvement in fuel economy aimed at a target of 45 miles per gallon by 2020 with a continuing commitment to a sustained improvement at that rate of growth for the long term (see Exhibit I-2).

EXHIBIT I-2: POTENTIAL FOR LONG TERM IMPROVEMENT IN FUEL ECONOMY STANDARDS



Sources and notes: National Highway Traffic Safety Administration and Environmental Protection Agency Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. *Preliminary Regulatory Impact Analysis,* Tables 1b; National Highway Traffic Safety Administration, *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis*, 2008 Table 1b.

Our analysis of the failure of the market to yield an efficient outcome with respect to energy efficiency presented in Section III has four critical purposes in these comments and implications for the process of standard setting for both fuel economy and tailpipe emissions.

First, it demonstrates that the consumer welfare gains, which account for almost 80 percent of the total societal welfare gains, should be included in the cost-benefit analysis. Without these gains, a benefit cost framework would justify little if any increase in fuel

economy standards. The nature and extent of the market failure dictates the degree of confidence in the consumer welfare gains.

Second, the law and practice of setting fuel economy standards at NHTSA under the Energy Policy Conservation Act (ECPA) have resulted in forcing NHTSA to confine standard setting to a short period and give the behavior and plans of the automakers a prominent role in determining the level of the standard. This retards the ability of the NHTSA to set standards that promote the public interest (see Exhibit I-3).

EXHIBIT I-3: INSTITUTIONAL REASONS FOR EPA TO LEAD IN STANDARD SETTING

Institutional Context of standard Setting	NHTSA (under the Energy Policy Conservation Act)	EPA (under the Clean Air Act)
Mandate	**Permissive above 35 mpg, maximum feasible subject to constraints**	**Obligatory: to protect the Public health and welfare**
Time Frame	**Limited to a short 18-60 month period**	**Unlimited**
Economic Constraint	**Practicable, restricted by industry capacity**	**Costs considered**
Technological Innovation	**Restrained by industry plans**	**Technology forcing**
Implementation	**Existing regulatory apparatus No responsibility for measurement**	**Existing regulatory apparatus Responsibility for measurement**

Third, the explanation of why the vehicle fleet is less efficient than it should be is critical to understanding why fuel economy standards are the right policy to address the problem and how those standards should be set. Our analysis shows that setting fuel economy standards is an ideal approach to addressing the market imperfections, barriers, flaws and obstacles that underlie the failure of the market to deliver economically efficient \levels of fuel economy. Exhibit I-4 highlights the specific market failures operating on fuel economy in the automobile market that are addressed by fuel economy standards.

Fourth, because there is a direct link between carbon emissions and fuel economy and because EPA has a strong mandate to protect the public health and welfare, it can take a long-term view to promote technological progress and therefore should be the focal point of standard setting.

EXHIBIT I-4: CAUSES OF ENERGY MARKET FAILURE AND THE ROLE OF STANDARDS IN CLOSING THE "EFFICIENCY GAP"

Neo-classical and Traditional Industrial Organization

SOCIETAL FLAWS

Externalities:
- Environmental
- Energy Security

Public Goods
- Basic research
- **Information**
  - Learning by doing
  - Learning-by-using

Other

INDUSTRY STRUCTURAL PROBLEMS

Imperfect Competition
- Concentration
- Barriers to Entry
- **Scale**
- Vertical Leverage
- Collusion

Marketing
- **Bundling: Multi-attribute**
- Gold Plating
- Inseparability
- Purchase Method
- Advertising

Regulation & Policy
- Price Distortion Avg-cost
- Permitting
- Other Distortions

Cost Structure
- **Product cycle**
- Disaggregated/ fragmented Mkt.

Elasticity
- Own-price
- Cross-price
- Income

Availability
- Lack
- Emergency replacement

Quality
- Improper installation
- Lack of enforcement

Challenges from Keynesian, New Institutional and Behavioral Economics

ENDEMIC IMPERFECTIONS

Ownership
- Agency
- Transfer
  - Limited payback
  - Lack of premium

Capital
- Illiquidity

Asymmetric Information

Perverse Incentives/ Conflict of Interest

Moral Hazard

TRANSACTION COST/ NEW INSTITUTIONAL ECONOMICS

Friction
- Sunk costs
- Lifetime

Risk & Uncertainty
- Technology
- Marketplace
- Policy
- Financial
- Liability

Imperfect Info.
- Availability
- Accuracy
- Search Cost

Organizational Structure

BEHAVIORAL FACTORS

Motivation
- Preference
- Custom
- Values & Commitment
- Social group & status

Perception
- Prospect
  - Framing
    - Loss Avoidance
    - Status Quo
    - Salience
    - Social Influence
  - Awareness
    - Attention
    - Low priority

Calculation
- Bounded rationality
  - Ability to process info
  - Limited understanding
- Heuristic Decision Making
  - Rules of thumb
  - Information
  - Discounting
  - Low Probability Events
  - Long-Term
  - Small Outcomes

Implementation
- Improper use & maintenance

B. THE IMPORTANCE OF THIS GROUNDBREAKING RULEMAKING

In many ways, this is the most important change in the Corporate Average Fuel Economy (CAFE) program since its inception three and a half decades ago.

- This rulemaking unifies the regulation of the energy and environmental standards for motor vehicles in the U.S.
- It embodies one of the largest increases in fuel economy over a four-year period in the history of the program.
- It resolves a major dispute over federal and state shared authority by ordering improvements in the environmental impact of automobiles, and thereby preserving the most important dynamic characteristics of federalism.
- It is based on a consensus agreement that includes the automakers.
- It incorporates new methodology for analyzing potential CAFE and greenhouse gas emissions standards that is more transparent, replicable, and accurate than the prior methodology.

At the same time, this rulemaking reflects the fact that it is a transition regulation that demands a more effective process for setting fuel economy standards in the future.

- The transition requires the Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) to harmonize and reconcile their statutes.
- The rulemaking recognizes the dire circumstances of the auto industry and allows it some breathing space to redefine itself and retool before a more rigorous and demanding regime of fuel economy improvement is required.

Thus, the ultimate success of this landmark rulemaking will be in the framework of standard setting that it creates for the future. There are many critical issues that will have to be resolved in order to ensure that the standard setting process provides the maximum benefits for consumers, the nation and the environment.

C. THE BENEFIT OF HIGHER FUEL ECONOMY

The nation's effort to reduce energy consumption and greenhouse gas emissions is urgent and this proceeding provides an ideal opportunity to build a platform for a dynamic, consumer-friendly, environment-friendly automobile industry in the U. S. that accomplishes those goals.

- The nation needs a long-term vision for the steady and dramatic improvement in the fuel economy and environmental footprint of the light duty vehicles fleet (cars and trucks).
- The technology exists in the near term to decrease their emissions of greenhouse gasses and sharply increase the fuel economy of cars and trucks -– to as much as 45 miles per gallon by 2020.

- Shifting the focal point of regulation of automobiles to the EPA would provide the best path to accomplishing these goals.

The stakes are huge, as shown in Exhibit I-1 above and discussed in Section II of these comments. Compared to the business-as-usual baseline, if standards were set at the level that achieved the maximum benefit to the environment at no net cost to society, the highest level considered by NHTSA/EPA in this rulemaking (38.1 mpg), the vehicles produced in the five-year period covered by the standard (2012-2016) would produce the savings below.

- Consumers would spend $131 billion less on gasoline.
- The nation would consume 95 billion fewer gallons of gasoline.
- Vehicles would emit 42 billion fewer tons of carbon dioxide and other greenhouse gases.
- The consumer, national security and environmental benefits would total over $190 billion.

Exhibit I-1 also shows the large benefits that have been left on the table as a result of the dire circumstances of the industry. The proposed rule delivers far smaller benefits than could be achieved if the condition of the industry were not holding the agencies back.

- The societal benefit would be $50 billion larger.
- The consumer pocketbook savings would be $37 billion larger.
- Gasoline consumption would be 32 billion gallon lower.
- Greenhouse gas emissions would be 13 billion tons lower.

Our analysis of opinion polls and purchase decisions over the past half-decade show that consumers want a great deal more fuel economy than automakers have been willing to supply. The NHTSA/EPA analysis shows that the cost of higher fuel economy is well below the amount consumers are willing to pay given the cost of gasoline. The cost of saved energy, a concept frequently used in the analysis of energy efficiency, is also far below the current cost of gasoline.

Setting standards at the level of 38.1 miles per gallon in 2016 would be good deal for consumers. Although the more fuel-efficient vehicles cost more, they are

- cash flow positive in the first month, assuming a five year auto loan at 7 percent interest;
- yield a 9 percent rate of return as an investment;
- pay for themselves in 4 years;
- add substantially to the resale value of the vehicle.

The existence of these large potential benefits for consumers, the nation and the environment indicates a major market failure in the automobile sector. That market failure is the primary focal point of our analysis in Section III of these comments. Even if there were no

national security or environmental costs associated with fuel economy, the automobile market has failed to deliver the optimum level of fuel economy for decades and NHTSA has failed to set standards to achieve the optimal level of fuel economy. The cost of owning and operating a vehicle is more than it should be because consumers are using vehicles that consume more gasoline than they should. Standard setting should move quickly to address this problem when the crisis in the automobile sector passes. NHTSA/EPA project sales at non-crisis levels by 2016. Therefore, 2017 should mark the beginning of a move to more aggressive effort to increase fuel economy.

D. AS THE FIRST STEP IN THE LONG TERM APPROACH, EPA SHOULD SET THE TARGET FOR 2020 AT 45 MILES PER GALLON

While the current state of the auto industry has led the Federal agencies to set low standards for 2012-2016, the technical potential exists to achieve much higher levels of fuel economy as Exhibit I-2 above shows. In the 2008 CAFE proceeding, NHTSA examined a potential standard it called Technology Exhaustion, which is the point where the maximum usage of available technologies to reduce energy consumption is reached, disregarding the cost impacts. The standard would have been set just under 45 miles per gallon in 2015. This suggests technology exists to reach a standard of 45 miles per gallon by 2020. Using the vehicle mix that NHTSA/EPA now projects and projecting a continuous improvement in fuel economy at the same rate of growth in the maximum standard level considered by NHTSA/EPA, we find that a target of 45 miles per gallon could be achieved by 2020.

The limit should advance over time as the cost of technologies declines, as the automakers become more adept at incorporating new technologies and as technologies move from the research and development phase into the deployment phase. Projecting longer-term possibilities is uncertain, but the commitment to a continuous improvement could raise average fuel economy for the overall fleet to much higher levels, in the range of 70 to 90 miles per gallon by 2030, especially with electric vehicles.

E. SHIFTING THE FOCUS OF STANDARD SETTING

These comments show that shifting the responsibility for standard setting to the EPA creates a much greater possibility of delivering large benefits to the consumer, the nation and the environment. NHTSA has failed to deliver these benefits because it is unduly constrained by law and practice. This is the third CAFE rulemaking in less than a decade, and the constraints on the approach taken by NHTSA to standard setting that limit its ability to promote the consumer and public interest have been clear in each. In our 2008 comments on the CAFE rulemaking, we criticized NHTSA's approach on many grounds. Unfortunately, given the transitional nature of this proceeding, many of those flaws have been brought forward into this Notice and supporting materials. Indeed, the dire circumstances of the auto industry have made matters worse. The agencies have been forced to set standards far below the level that makes economic and environmental sense and leave very large sums of potential consumer, national security, energy and environmental benefits unrealized because the industry is in such a fragile state.

As a legal and practical matter, NHTSA faces important impediments that inhibit its ability to achieve the above goals that the EPA does not. Shifting the focal point of standard

setting to EPA is consistent with legal mandates and makes perfect sense from a policy point of view. The reasons for this shift in focus are summarized in Exhibit I-3 above.

First, NHTSA is required to achieve only a 35-mile per gallon standard by 2020, but beyond that there is no mandate to achieve higher levels of fuel economy. In contrast, as a result of a recent Supreme Court ruling, EPA is obligated under the Clean Air Act (CAA) to regulate the tailpipe emissions of pollutants like carbon dioxide to protect the public health and welfare.

Second, NHTSA is severely constrained in the time frame for which it can set standards. It must give the automakers at least 18 months advance notice of what the standard will be and it cannot set standards more than 5 years in advance. This narrow window for standard setting is too short for effective long term planning. The rulemaking period barely covers a full product design cycle in the auto industry. NHTSA has repeatedly said that the time frame is too short to ask the industry to do too much. The short time horizon shortchanges the public. EPA is not under this time constraint. Therefore, it can give the industry a long-term trajectory that promotes energy efficiency and environmental clean-up. In other words, NHTSA has neither the legal mandate nor the ability to take a long-term view of fuel economy, but EPA has the ability to do so for tailpipe emissions.

Third, because there is a direct physical relationship between the amount of greenhouse gasses a vehicle emits and the amount of gasoline it uses, by fulfilling its obligation to protect the public health and welfare under the Clean Air Act, EPA will also be effectively establishing fuel economy standards.

Fourth, the economic constraint under which NHTSA operates is more restrictive than EPA's. NHTSA is bound to do what is "economically practicable," while EPA must consider cost.

Fifth, NHTSA has interpreted its mandate under the statute to be largely constrained by what the industry capabilities are. It hesitates to be technology forcing, repeatedly finding that the industry has not planned and therefore cannot make significant changes. What the industry "can" do is largely a function of what it "wants" to do, not what is in the public interest. The lack of fuel economy becomes a self-fulfilling prophecy, or, in light of recent developments in the industry, a self-inflicted wound. EPA is not bound by this practice.

Finally, NHTSA has chosen to assume that vehicle attributes remain constant. In recent years, consumers have proven to be willing to change their preferences, a shift that caught automakers by surprise. EPA has more flexibility to envision and promote changes in vehicle attributes in response to emissions standards.

F. STANDARDS ARE THE RIGHT WAY TO CLOSE THE EFFICIENCY GAP

Our lengthy discussion of the failure of the market to yield an efficient outcome with respect to energy efficiency in Section III has four critical purposes in these comments and for the process of standard setting for both fuel economy and tailpipe emissions.

First, the explanation of why the vehicle fleet is less efficient than it should be is critical to understanding why fuel economy standards are the right policy to address the problem and how those standards should be set. The explanation of the "efficiency gap" (the gap between the optimal level of efficiency and the level the marketplace yields) involves a host of market imperfections, barriers and obstacles on both the supply and the demand side. Our analysis shows that setting fuel economy standards is an ideal approach to addressing the market imperfections, barriers, flaws and obstacles that underlie the market failure. Exhibit I-4 above summarizes the results of the discussion of market failure. It identifies a large set of causes of market failure that have been identified in three different literatures – the general economic literature, the broad energy efficiency literature and the literature on fuel economy. Exhibit I-4 above also highlights the specific market failures operating to depress fuel economy in the automobile market that are addressed by fuel economy standards.

Second, the Notice requests comment on the inclusion of consumer welfare gains in the benefit cost analysis. Since consumer welfare gains represent almost 80 percent of the total societal welfare gains, this issue is immensely important. Without these gains, a benefit cost framework would justify little if any increase in fuel economy standards. The nature and extent of the market failure dictates the degree of confidence in the consumer welfare gains.

Third, and more importantly, the law and practice of setting fuel economy standards at NHTSA under the Energy Policy Conservation Act (EPCA) have resulted in giving the behavior and plans of the automakers a prominent role in determining the outcome. Because the concept of economic practicability has been interpreted to rest substantially on the contemporary capabilities of the industry, it sets the primary constraints on progress. To the extent that automakers are deficient economic actors and market structures are imperfect, the reliance on the outputs of these two, which governs what NHTSA can do undermines the ability of the agency to write rules that are in the public interest. Thus, the discussion of market failure provides a conceptual and empirical basis to prefer a regulatory approach that is not hampered by the dependence of the regulatory process on the flawed industry behavior and market structure.

Fourth, the framework for analyzing market failure teaches that we must look to the institutional structure of organization to understand how they will behave. We apply this insight to assess the constraints on the agencies involved in setting standards for automobiles. It is precisely because EPA's mandate and capacity under the Clean Air Act does not suffer from the afflictions of EPCA that public policy should prefer EPA and the CAA as the platform for regulation. Thus, the overwhelming evidence of market failure combined with the legal framework makes a compelling case that EPA should set tailpipe CO2 emission standards as an indirect way of setting fuel economy performance.

Thus, EPA and NHTSA have the opportunity in the current rulemaking to establish a platform on which a dynamic, innovative automobile manufacturing sector can be built in America – one which meets the transportation needs of our continental economy in a manner that saves consumers money, enhances national security through reduced oil imports, and ensures that the transportation sector makes its full contribution to meeting the challenge of global warming. Shifting the focal point of standard setting to EPA will set the stage for standards that are economically efficient and environmentally effective.

G. OUTLINE OF THE COMMENTS

The remainder of these comments is organized as follows:

Section II examines the analysis presented in the Notice and supporting materials.

Section III presents a review of literature on the under investment in energy efficiency resulting from market imperfections to asses the benefits and costs of various potential levels at which standards could be set.

Section IV presents the results of CFA analyses documenting changes in consumer attitudes and purchasing patterns and analyses documenting the failure of automakers to provide energy efficient vehicles.

II. EFFICIENCY GAPS IN THE MARKET AND THE STANDARDS

A. MARKET FAILURE AND THE RESPONSE

The very large potential efficiency gains estimated by the engineering/economic analysis conducted by NHTSA/EPA, which can be most easily summarized by nothing that, even at the highest and most expensive level, the cost of saved energy is about one-third of the price to consume energy, are at the core of a decades long debate over fuel economy standards. In a capitalist economy, when problems are serious, like rising energy prices and imports, and a solution is inexpensive and potentially widely available, one would expect people to seize it. The existence of the "efficiency gap" immediately raises the question:

"Why don't people buy more of it?

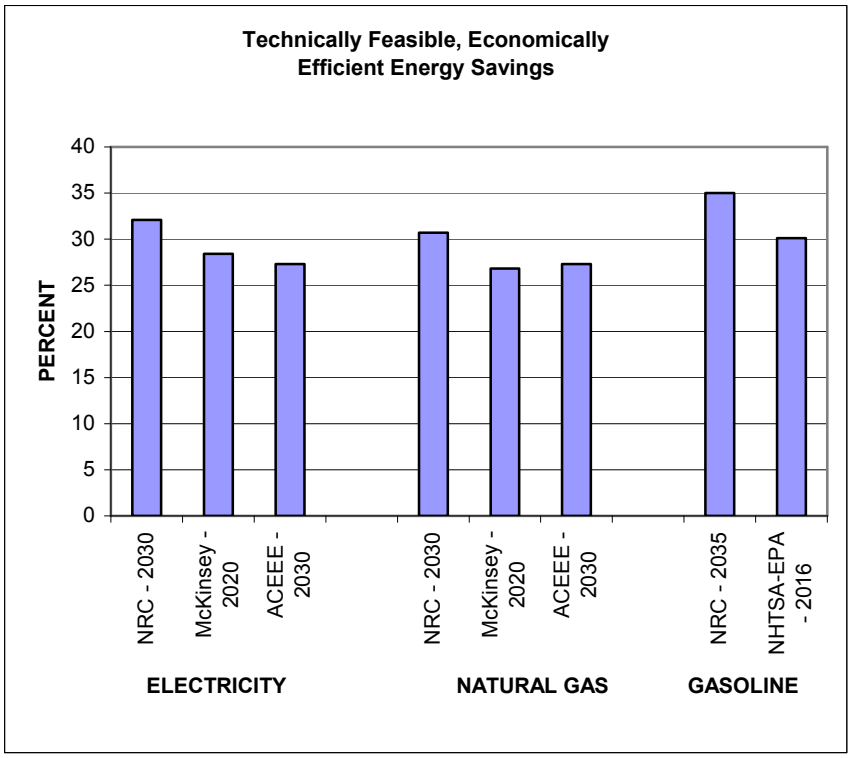
The efficiency gap is not new, nor is it confined to the transportation sector. A similar efficiency gap is found in building sector energy consumption. As Exhibit I-1 shows, the magnitude of the problem is similar across sectors. In the past few months, four major national research institutions have released reports that document the huge potential for investments in energy efficiency to lower consumers' bills and greenhouse gas emissions, creating a win-win for consumers and the environment. The National Research Council of the National Academy of Sciences has estimated the potential reduction in electricity, natural gas and gasoline at approximately 30 percent, similar to the estimates of NHTSA/EPA. McKinsey and Company and the American Council for Energy Efficient Economy have reached a similar conclusion on electricity and natural gas. Across these three sectors, saving energy costs about one third of the price of consuming it.

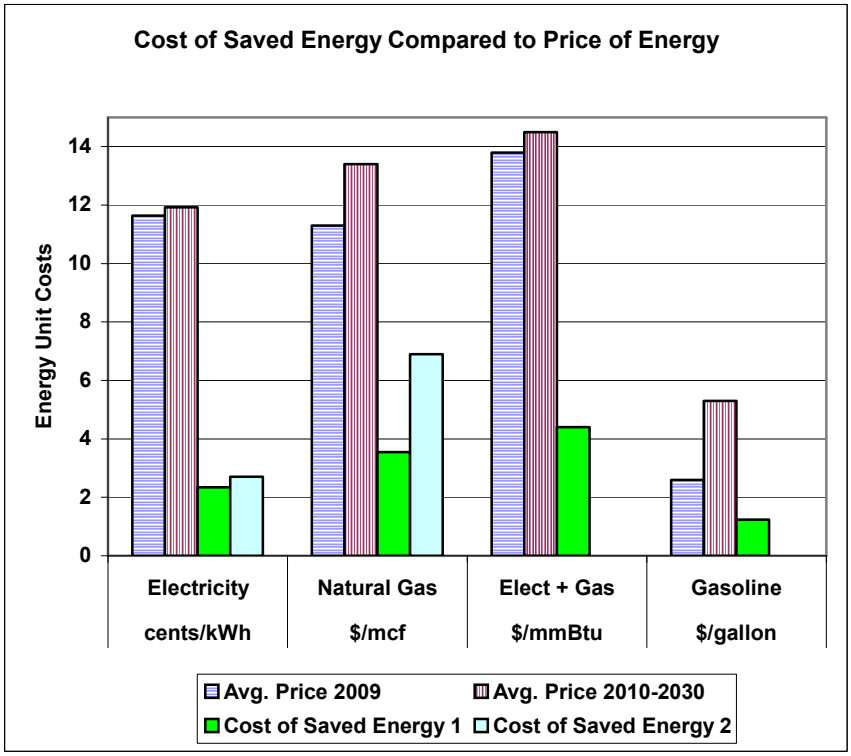
There is a second gap that the NHTSA/EPA analysis reveals. Comparing the costs and benefits that would result from the standard that NHTSA/EPA propose to adopt to a standard set at the highest level of it considered, we observe that a great deal more gasoline could be saved and benefit achieved at the higher level. That leads to a second question:

"Why did NHTSA choose to leave such a large quantity of benefits on the table?"

The answer to both of these questions is essentially the same: the failure of the automobile market to produce economically attractive levels of energy efficiency. NHTSA/EPA have been prevented from setting the standard for energy efficiency at a higher level because of the current dire circumstances in the auto industry. The current dire circumstances are the result, in part, of the failure of the auto industry to deliver energy efficient products to the public. In recent years, as gasoline prices rose and consumers shifted their buying toward more fuel-efficient cars, U.S. auto makers failed to respond quickly to deliver the vehicles the public was demanding. Stuck with the wrong products, they had to slash prices to try to prop up demand. Ultimately, they were unable to do so, and two of the big three ended up in bankruptcy. Sales of the more fuel-efficient vehicles, in which non-U.S. manufacturers specialized, held up much better and the market share of U.S. automakers declined. While the mistake on fuel efficiency was only one of the causes of the plight of the industry, it is important and symbolic of a broader problem in the U.S. auto sector. The cycle of failure can be broken by setting standards at a level that increases consumer welfare while reducing environmental harm.

EXHIBIT II-1:
THE EFFICIENCY GAP ACROSS ENERGY MARKETS





Sources and Notes:

Gold, Rachel, Laura, et. al., *Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation*, American Council for an Energy Efficient Economy, September 2009),

McKinsey Global Energy and Material, *Unlocking Energy Efficiency in the U.S. Economy* (McKinsey & Company, 2009).

National Highway Traffic Safety Administration, *Corporate Average Fuel Economy for MY2012-MY 2016 Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis*, Tables 1b, and 10. The 7 percent discount rate scenario is used for the total benefit = total cost scenario..

National Research Council of the National Academies, *America's Energy Future: Technology and Transformation, Summary Edition* (Washington, D.C.: 2009). The NRC relies on a study by Lawrence Berkeley Laboratory for its assessment (Richard Brow, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential* (Lawrence Berkeley National Laboratory, September 2008).

2009 average prices are from the Energy Information Administration, Short-Term Outlook, while 2010-2030 Prices are from the *Annual Energy Outlook: 2009. Adjusted.*

This section examines the issues surrounding the two efficiency gaps that are raised by the NHTSA/EPA empirical analysis. We dissect the discussion in the Notice and supporting materials to understand the implications of the approach the agencies took to standard setting. That analysis reveals that consumers are willing to buy more efficiency than automakers want to sell. Since the automakers are a substantial part of the problem, a solution must help them see the right things to do. It must be technology forcing. This leads to the conclusion that EPA should take the lead in setting standards for automobiles.

B. THE IMPORTANCE OF MAXIMIZING ECONOMIC AND ENVIRONMENTAL BENEFITS AFTER THE TRANSITION

The transitional nature of this proceeding has led EPA/NHTSA to leave a large quantity of consumer economic, societal and environmental gains unrealized. The standard has been set to meet the level agreed upon by the federal and state officials, but that level falls far short of the level that would be justified by the benefits that consumers and the nation would reap if standards were set at a level that maximizes economic efficiency and the need to conserve energy or environmental benefits.

The standard chosen by the agreement between the federal and state authorities was the tailpipe standard set a half decade ago by California and adopted by over a dozen other states. It results in a higher level of fuel economy than would have been set under the standards NHTSA proposed in implementing the Energy Independence and Security Act. Even though California standard was higher, and regardless of whether it was the "right" level when set, things have changed. The analysis shows that higher levels of reduction in tailpipe emissions and improvement in fuel economy are now justified. Therefore, the approach to standard setting must change to ensure that future standards are set at levels that promote the public interest.

To understand the impact of various constraints on and choices made by the agencies, we identify four different levels of the standard. They are defined as follows:[2]

The **proposed or preferred standard** is the level at which NHTSA/EPA proposes to set the standard. The central characteristic of this standard is a marginal cost/benefit test, at a 7% discount rate.

The **maximum economic benefit** standard would be set at the point where the marginal benefit of adding a new technology to the vehicle just equals the marginal cost (MB=MC). Adding more technology might lower consumption, but the cost of that marginal technology is greater than the value of the energy saved.

The **maximum environmental/economic benefit** would occur at the point where total benefit = total cost (TB=TC). As one adds more and more technology, the costs rise and the savings decline until the point where the total cost just equals the total savings. At this point, the maximum reduction in energy consumption would be achieved at no net cost to society.

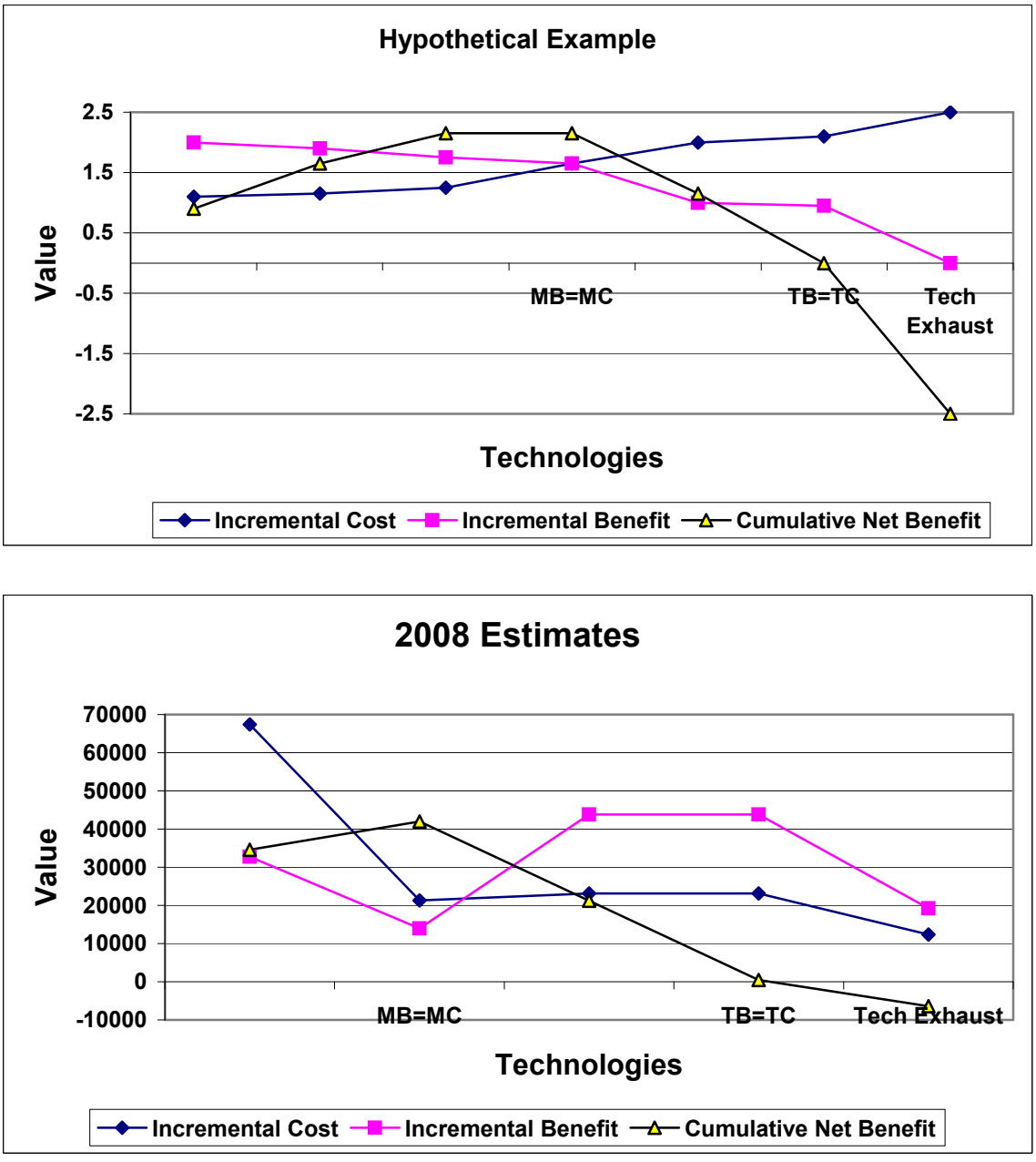
Technology Exhaustion is the point where the maximum usage of available technologies to reduce energy consumption is reached, disregarding the cost impacts. At this point, there are no

[2] National Highway Traffic Safety Administration, *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis*, 2008 (hereafter, PRIA, 2008) , pp. I-ii; *Draft Environmental Impact Statement,* pp. 2-13-2-14.

available technologies to further reduce energy consumption. NHTSA identified this level in the 2008 proceeding, but not the 2009 proceeding.

Exhibit II-2 identifies the key characteristics of these levels that are analytically important. The top graph in Exhibit II-2 shows a hypothetical example of the three key points in the range of potential alternative levels for the standard based on the economics and technology.

EXHIBIT II-2: THE ECONOMICS OF VARIOUS LEVELS OF FUEL ECONOMY STANDARDS



Source: National Highway Traffic Safety Administration, *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis*, 2008 Table 1b.

The bottom graph shows the actual numbers from the 2008 proceeding. We use 2008 because NHTSA/EPA did not provide the technology exhaust level in the 2009 Notice.

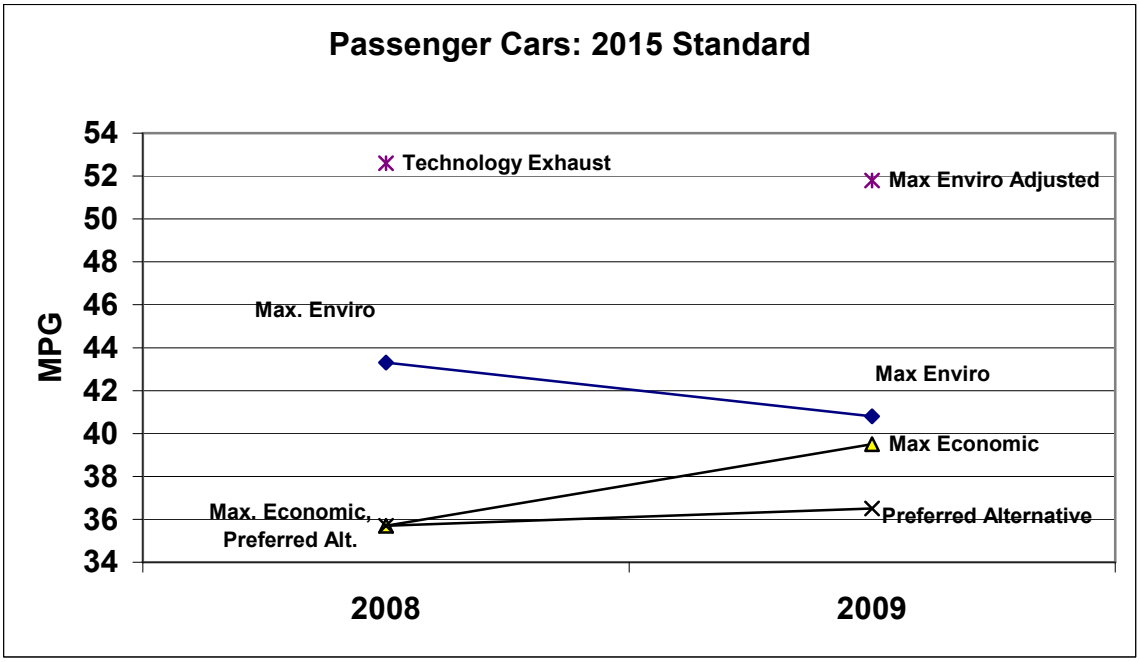
The maximum cumulative net economic benefit occurs where marginal benefit equals marginal cost. As investments in efficiency are made beyond that point, cost rises and the benefits decline until society "breaks even," where total benefit equals total cost. It should be noted that these calculations include a discount rate to reflect the opportunity cost of money. That is, at the point where total benefit equals total cost, the investment would yield a return equal to the discount rate. Lower or higher discount rates will move the points around but not change the underlying concepts. Of course, one could continue to add investments to save energy even though it costs more than the economic value of the benefits. At some point, no more technology is available to lower consumption. Technology is exhausted.

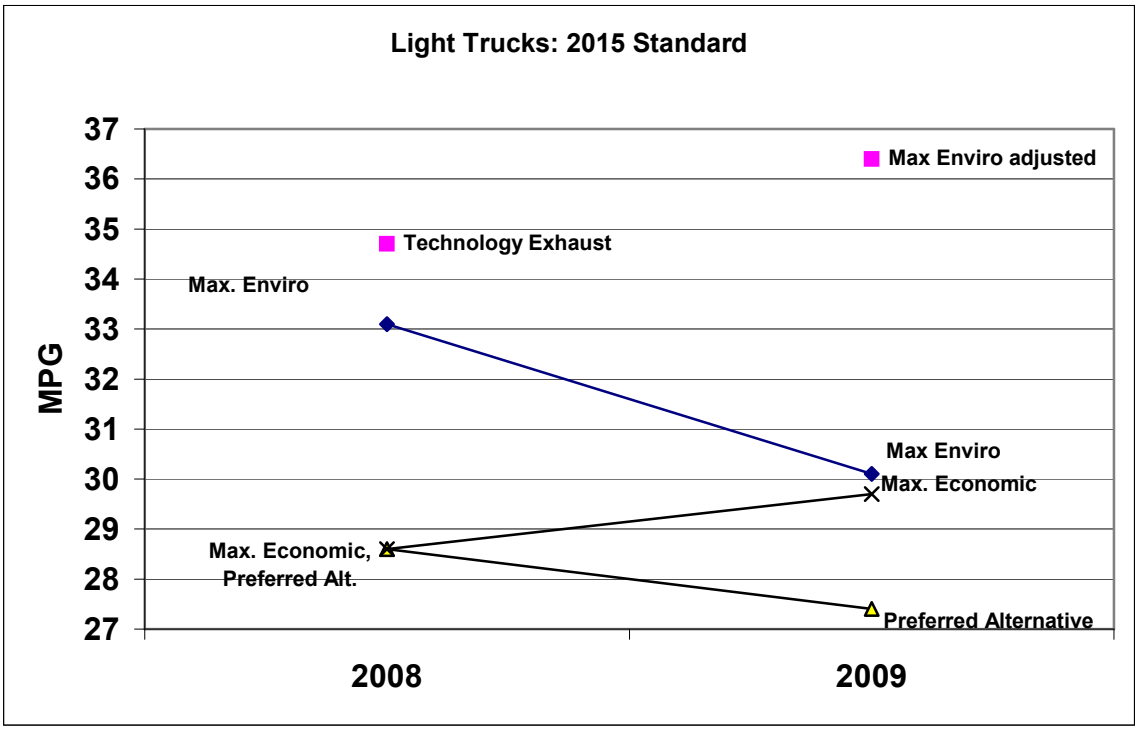
Having outlined these key levels in the range of possible standards, we can easily see the large impact that the dire circumstances of the industry has had on the proposed standard, as depicted in Exhibit II-3.

In the 2008 proceeding, the Bush Administration proposed to set the standard at the level of maximum economic benefits. Since 2008, the cost of technologies to improve fuel efficiency has come down. The value of the fuel savings has increased (because gasoline prices are projected to be higher, among other things). As a result, the level of the standard where the economic benefit is maximized has increased dramatically. However, because of the difficult circumstances in the auto industry, the agencies have set the standard well below the point of maximum economic value. Although the 2009 proposed standard for cars is higher than 2008, it is still well below the level that would reflect maximum economic benefit. For trucks, the 2009 standard is lower than the 2008 standard and the standard has been set much lower than the level of maximum economic benefits.

One other notable point in Exhibit II-3 is the difference between the maximum economic and maximum environmental/economic levels. This gap has narrowed greatly. One explanation would be that in the short term, as the costs of technologies declines and the benefits rise, more technologies "prove in" on economic grounds, but the stock of available technologies does not expand as rapidly as technologies prove in. Another explanation would be that NHTSA/EPA has mislabeled the standard levels. Table 5 in the *Preliminary Regulatory Impact Assessment* clearly shows that the scenario labeled "maximum net benefits" is not the maximum. The scenario labeled "total cost=total benefit" actually has the highest net benefit. Moreover, the 7% standard, which carries the fuel economy standard to a higher level in 2016, has a lower net benefit for the five year total. That means the scenario labeled "total benefit=total cost" is the inflection point. Moreover, the total benefit=total cost scenario should have a net benefit near zero, as was the case in the 2008 analysis. It does not. To avoid confusion, we have accepted and discussed the scenarios as labeled. The numbers in Table 5 suggest that there is a great deal more technology that could be applied to reduce fuel consumption before the net benefits would go to zero. Exhibit II-3 shows a projection of what the maximum environmental/economic level would be if it had increased as much as the maximum economic level did over the 2008-2009 period.

EXHIBIT II-3: COMPARING THE 2008 AND 2009 ANALYSIS AND PROPOSED STANDARDS





Source: National Highway Traffic Safety Administration and Environmental Protection Agency, ***Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Preliminary Regulatory Impact Analysis, 2009,*** Table 1b. National Highway Traffic Safety Administration, ***Average Fuel Economy Standards, Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis***, 2008 Table1b;

Exhibit II-4 describes the benefits that would be realized at two critically important levels. Unfortunately, NHTSA/EPA did not analyze the technology exhaust scenario in the 2009 proceeding, although it did so in the 2008 proceeding, which will be discussed below.

EXHIBIT II-4: ECONOMIC, NATIONAL SECURITY AND ENVIRONMENTAL BENEFITS OF VARIOUS ALTERNATIVE STANDARD LEVELS

Conceptual Basis of the Standard	MPG 2016	Economic Benefit (Billion $, Net NPV) Societal	Consumer Pocketbook	National Security Reduced Gasoline Consumption (Billion Gallons)	Cost per gallon saved	Environmental Greenhouse Gas Reduction (Billion Tons)
Proposed	**34.1**	**141**	**106**	**62**	**$0.98**	**29**
Max. Environmental/ Economic Benefit (Total Benefit=Total Cost)	**38.1**	**191**	**143**	**95**	**$1.28**	**42**

Sources and notes: National Highway Traffic Safety Administration and Environmental Protection Agency, *Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Preliminary Regulatory Impact Analysis, 2009*, Tables 1b, 7,8,9, and 10. The 3 percent discount rate scenario is used. The consumer pocketbook calculation subtracts the cost of meeting the standard (technology cost) from the fuel savings (lifetime fuel expenditures) and adds in the reduction in the price of gasoline (the petroleum market externality). These are the direct, monetary impacts that will affect the consumer pocketbook. The analysis assumes that the fuel savings and market externalities scale with the quantity of gasoline consumption reduction.

Thus, Exhibit II-4 compares the proposed standard to the highest levels that NHTSA/EPA considered and rejected.[3] Whereas the proposed standard sets the mileage level at 34.1 miles per gallon for the entire light duty (combined car and truck) vehicle fleet in 2016, a standard that achieved the maximum reduction in consumption at no net cost to society, which we call the maximum environmental/economic level, would have been set at 38.1 miles per gallon.

Setting the standard at the proposed level yields large gains for consumers ($106 billion), society ($141 billion), national energy policy (by cutting gasoline consumption by 62 billion gallons) and the environment (by reducing greenhouse gas emissions by 29 million tons). However, setting the standard at the level of maximum environmental/economic benefit would yield much higher gains than the proposed standard.

- It would reduce gasoline consumption by 33 billion gallons more than the proposed standard.
- The consumer pocketbook savings would be $31 billion higher.
- The net present value of to societal savings would be $50 billion higher.
- The reduction in carbon dioxide emissions would be 13 billion tons greater.

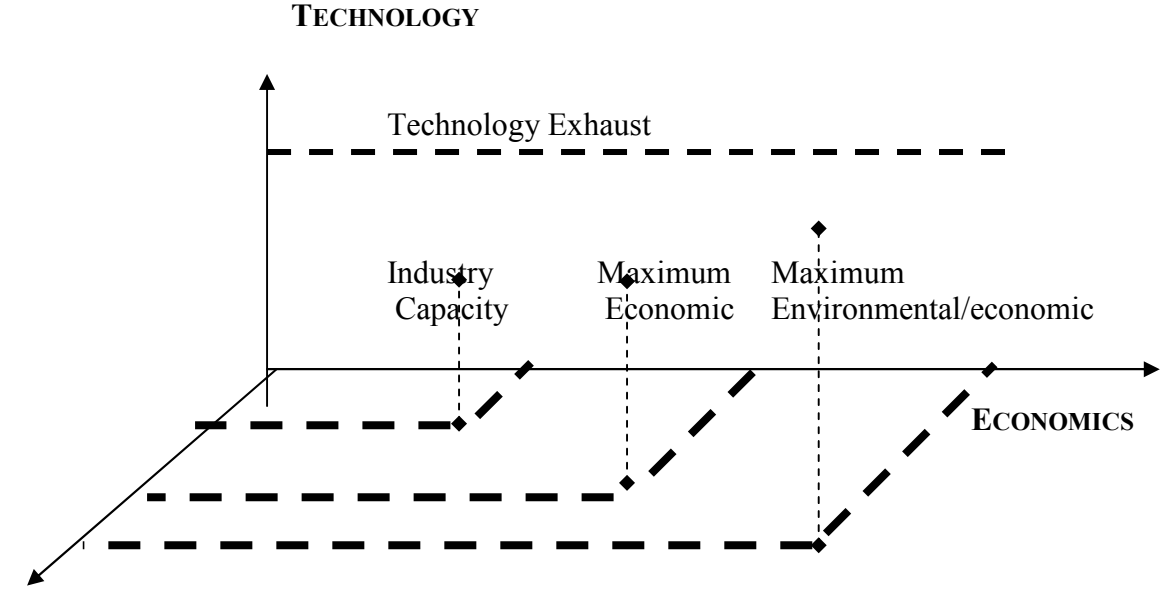
[3] The 7% standard achieves a higher level in the final year than the standard labeled total benefit=total cost, but not throughout the period. Therefore, total benefit=total cost yields higher average mileage and higher benefits.

In short, setting the standards at the higher level is a win-win-win for consumers, the nation and the environment. That is why EPA/NHTSA must not let the transition extend past the 2016 model year. Each year of delay in moving to setting standards at the appropriate levels imposes severe harm on consumers, the nation and the environment.

The easiest way to summarize this huge consumer welfare gain, and one that has a long tradition in the policy and academic literature on energy efficiency, is to calculate the cost of conserved energy.[4] This is done by dividing the amount of money invested in energy-saving technologies (properly adjusted for the time value of money), by the total number of gallons saved. The two levels of standards included in Exhibit II-4 produce energy savings at very low costs, compared to the cost of energy consumption. With gasoline prices projected to be well over $3.00 per gallon over the life of the vehicles produced under the standard and costs of gasoline around $1.00, it is easy to see why the projected consumer expenditure savings are so large.

NHTSA could have set the standard at the point where total benefits equal total costs. At that point, the rule would maximize fuel savings, subject to the constraint that society is not worse off than it would have been in the base case, as depicted graphically in Exhibit II-5. NHTSA/EPA felt compelled to set the standard at a much lower level due to the condition of the industry.

EXHIBIT II-5:
INDUSTRY CAPACITY SEVERELY LIMITS THE BENEFITS FUEL ECONOMY STANDARDS DELIVER TO CONSUMERS



[4] National Academy of Engineering, Institute of Medicine, *Policy Implications of Greenhouse Gas Warming: Mitigation, Adaptation, and the Science Base* (Natioal Acadamy Press, 1992), p. 294 for the early cost of saved energy for light duty vehicles.

C. Creating a Framework for Analyzing Industry Capacity

The fact that the Administration, the State of California and even the automakers agree on a target standard does not mean that the standard is legal. It must still comply with the letter and intent of the law. In our opinion, but for the claim that the auto industry is in such dire straits that it could not comply with a higher standard, the proposed standards would fail to pass legal muster. The amount of consumer and societal benefits that the proposed standards have failed to realize is so large that the standard would not comply with Congress' clear intent that the agency recognize the great need to conserve energy under the Energy Policy Conservation Act. Similarly, the proposed rule fails to realize such large environmental benefits that it fails to comply with Congress' intent to protect the environment under the Clean Air Act.

Moreover, while it may be obvious that the industry's current, uniquely dire straits preclude it from achieving a higher standard, the agencies have not articulated a clear and transparent analytic framework for assessing the state of the industry that would enable it to meet the higher standard that is clearly justified by consumer, energy and environmental benefits.

NHTSA/EPA have not laid out any criteria by which one could objectively determine how the capability of the industry to "meet" the standard was determined. Exhibit II-6 shows a number of measures of the performance and impact of various levels of the standards. There is no pattern to indicate why one standard level was chosen rather than another. It gets harder for automakers to meet higher standards, but the negative effects of higher standards are not strikingly more difficult and it is not apparent why one level is harder than another. Interestingly, in all three scenarios, the analysis projects increases in sales and employment.

If the standard were set at the level of maximum economic benefit, about half of the manufacturers would have been compliant, but only a quarter of total sales would be compliant. On average, the vehicles would have missed by 1.4 miles per gallon, so fines would have been paid. However, the improvement in the achieved level of the fleet that would result from moving from the proposed rule to the maximum economic level would have been much larger (3.1 miles per gallon on average) than the increase in the average deficit (1 mile per gallon). There would still be substantial gains in sales and employment. Moving to the higher level of maximum environmental benefit is more challenging. While the percentage of manufacturers who are non-compliant increases slightly, the change in the percentage of the fleet that is compliant is rounding error because two very small truck manufacturers fall out of compliance. The margin by which the fleet misses the standard grows by 1-mile per gallon, which is larger than the improvement in the achieved level of fuel economy.

The analysis of who is and is not compliant occurs in the context of case law that makes it clear that the agency cannot let the worst performers pull the statute down. In the past, in contemplating moving beyond the proposed level, NHTSA gave no weight to the incentive value of fines as a motivator to do better (find new technologies or adopt existing technologies) more quickly.

EXHIBIT II-6:
INDICATORS OF PERFORMANCE UNDER ALTERNATIVE SCENARIOS

Impact Criteria	Standards Scenarios Proposed	Max Economic	Max Environmental
Miles Per Gallon			
Proposed Standard	34.1	36.8	38.1
Achieve Level	33.0	36.1	36.9
Cost benefit			
Net Societal Benefit (Billion 2009$)	141.5	181.9	190.5
Gallons Saved	61.6	89.5	95.4
Industry Impact			
Sales (000)	454.5	328.6	282.9
Employment (000)	40.2	29.1	25.1
Compliance			
Cars			
% of Mfcts. Non-Compliant	35	47	47
% of Sales Compliant	14	14	13
Average margin (mpg)	-1.2	-2.2	-3.6
Trucks			
% of Mfcts. Non-Compliant	41	53	65
% of Sales Compliant	58	36	36
Average margin (mpg)	0.6	-0.4	-0.8
Combined (Weighted Avg.)			
% of Sales Compliant	33	23	23
Average margin (mpg)	-0.4	-1.4	-2.4

Sources: National Highway Traffic Safety Administration and Environmental Protection Agency Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. ***Preliminary Regulatory Impact Analysis*****, Tables 1a, 1b, 8, VII-6c, VII-8, VI-2, VI-4, VI-6, VI-8.**

> In the more stringent alternatives, the Volpe model predicts that an increasing number of manufacturers will run out of technology to apply and, theoretically, resort to penalty payments. Setting standards this high is not technologically feasible, nor does it serve the need of the nation to conserve fuel. Paying a CAFE penalty does not result in any fuel savings.[5]

This statement is overly simplistic and incorrect. There are higher levels of standards where the standard does result in substantial fuel savings. Under all scenarios considered, some manufacturers can comply with all levels of the standard, so the payment of fines reflects manufacturer preferences and capabilities (and NHTSA's assumptions about them) rather than the absolute possibility of meeting the standard. Moreover, at the maximum economic level, about half of the manufacturers are projected to comply. The possibility that the threat of fines might give manufacturers incentives to try harder should not be dismissed. NHTSA's own

[5] PRIA, 2008, p. II-13.

analysis shows it is factually incorrect to say that setting higher standards does not serve the need of the nation to conserve fuel or to suggest that setting higher standards does not result in any fuel savings. In fact, every higher level of standard results in more fuel savings.

There is discretion here, but the court has warned against being overly protective of the industry.

> *Determination of maximum feasible average fuel economy should not be keyed to the single manufacturer which might have the most difficulty achieving a given level of average fuel economy. Instead the agency is compelled "to weigh the benefits to the nation of a higher fuel economy standard against the difficulties of individual automobile manufacturers." The law permits CAFE standards exceeding the projected capability of any particular manufacturer as long as the standard is economically practicable for the industry as a whole.*[6]

Based on a proper conceptualization of the supply-side constraint NHTSA **can** set the standard much higher. Based on a proper conceptualization and balancing of economic considerations and the need to conserve energy, NHTSA **should** set the standard much higher. When the current dire straits have been navigated by the industry, NHTSA must not be overly protective of the industry. EPA can approach this analysis with greater flexibility.

D. CONSUMER WELFARE ANALYSIS IN THE NOTICE

Literature Review

The statement that there is an energy "efficiency gap" caused by market failure has triggered considerable debate. EPA and NHTSA have briefly outlined the debate over market imperfections in the energy sector.

> Yet fuel-efficient cars are currently offered for sale, and consumers' purchasing decisions may suggest a preference for lower fuel economy than the proposed rule mandates. Assuming full information and perfect foresight, standard economic theory suggests that the private gains to consumers, large as they are, must therefore be accompanied by a consumer welfare loss. This calculation assumes that consumers accurately predict all the benefits they will get from a new vehicle, even if they underestimated fuel savings at the time of purchase. Even if there is some such loss, EPA believes that under realistic assumptions, the private gains from the proposed rule, together with the social gains [in the form of reduction of externalities] significantly outweigh the costs.[7]

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[6] National Highway Traffic Safety Administration, *Average Fuel Economy Standards, Passenger Cars and Light Trucks, Notice of Proposed Rulemaking, 2008* (hereafter, NPRM, 2008), p. 45

[7] National Highway Traffic Safety Administration and Environmental Protection Agency, *Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Notice of Proposed Rulemaking, 2009,* (hereafter NPRM 2009), p. 49603; see also National Highway Traffic Safety Administration and Environmental Protection Agency Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. *Preliminary Regulatory Impact Analysis, 2009* (Hereafter, PRIA, 2009), p. 346.

> A number of consumer vehicle choice models make the assumption that auto producers provide as much fuel economy in their vehicles as consumers are willing to purchase, and consumer are satisfied with the current combination of vehicle fuel economy and price in the marketplace. If this assumption is true, then consumers will not benefit from required improvements in fuel economy, even if the fuel savings that they receive exceed the additional costs from the fuel savings technology.[8]

The model of perfect competition assumes that consumer willingness to pay for fuel economy, as observed in the marketplace, reflects the "correct trade-offs between high initial cost for purchasing more fuel-efficient vehicles and subsequent reductions in their operating costs."[9] Once the market is assumed to be perfect, there is no place for fuel economy standards since, "If this assumption is accurate… no net private benefits can result from requiring high fuel economy, since doing so will alter both the purchase prices of new cars and their lifetime stream of operating costs in ways that will inevitably reduce consumers' well-being."[10]

The Notice recognizes there are strong arguments and a great deal of evidence that the assumptions underlying the perfect competition model do not fit reality. Exhibit II-7 summarizes some of the market imperfections in the behavioral realm that were noted in the agencies' literature review. This is tip of the iceberg of market failure, compared to the factors that the agencies do not identify.

EXHIBIT II-7:
BEHAVIORAL CAUSES OF MARKET FAILURE IDENTIFIED IN THE AGENCY MATERIAL

Behavioral Factor	Efficient Market Assumption	Imperfect Market Reality
Motivation	**Little willingness to pay** **Myopia (short horizon)** **High discount rate**	**Loss aversion** **Lack of salience of efficiency** **Higher willingness to pay**
Perception	**Perfect foresight**	**Incorrect estimate of technology cost**
Calculation	**Accurate Prediction**	**Lack of information** **Inability to calculate** **Rules of thumb (bounded rationality)**
	Simple rate of return	**Uncertainty and sunk costs** **Fuel prices** **Vehicle life**

The problem is that consumers appear not to purchase products that are in their economic self-interest. There are strong theoretical reasons why this might be so.

[8] NPRM, 2009, p. 49603; PRIA, p. 346.
[9] PRIA, 2009, p. 346
[10] PRIA, 2009, p. 347

> Consumers might be myopic and hence undervalue the long-term; they might lack information or a full appreciation of information even when it is presented; they might be especially averse to the short-term losses associated with energy efficient products (the behavioral phenomenon of "loss aversion"); even if consumers have relevant knowledge, the benefits of energy efficient vehicles might not be sufficiently salient to them at the time of purchase.[11]

> As noted, lack of information is one possible reason for the variation. Consumers face difficulty in predicting the fuel savings that they are likely to get from a vehicle, for a number of reasons. For instance, the calculation of fuel savings is complex, and consumers may not make it correctly. In addition, future fuel price (a major component of fuel savings) is highly uncertain. Consumer fuel savings also vary across individuals, who travel different amounts and have different driving styles.[12]

> Finally, it is possible that the apparent Energy Efficiency Paradox is in fact not a paradox at all when one considers the uncertainty surrounding future fuel prices and a vehicles expected lifetime and usage… [P]urchasing higher fuel economy requires buyers to weight known, up-front costs that are essentially irreversible (that is, they have a relatively low salvage value if the return never materializes) against an unknown future stream of fuel savings… uncertainty surrounding the future price of gasoline is less important than uncertainty surrounding the expected lifetime of new vehicles.[13]

There are also hints of problems that arise on the supply-side of the market in the Notice and supporting materials.

> Some have also linked consumer choice models with information on vehicle technologies and costs, to estimate an integrated system of consumer and automaker response…

> Other vehicle choice models, in contrast, find that consumers are willing to pay more for additional fuel economy than the costs to auto producers of installing that technology. This result leaves open the question why auto producers do not follow the market incentive to provide more fuel economy, and why consumers do not seek out more fuel-efficient vehicles.[14]

Empirical Evidence

NHTSA/EPA lament the fact that the existing empirical literature does not allow them to measure with more precision the consumer welfare impact of the rule. However, the existing empirical evidence clearly suggests that NHTSA need not be so concerned about its inability to pin down the consumer welfare benefit analysis precisely. The consumer welfare benefits vastly

[11] NPRM, 2009, p. 49609; PRIA, 2009, p. 347.
[12] NPRM, 2009, p. 49609.
[13] PRIA, 2009, p. 349.
[14] NPRM, 2009, p. 49603.

exceed the willingness to pay estimates. Consumers will be much better off if the fuel economy standards are established at much higher levels than are currently observed in the marketplace.

NHTSA cites two strands of empirical literature, which are summarized in Exhibit II-8, along with the results of the analysis of various levels for the fuel economy standard in 2016. Exhibit II-8 shows the values NHTSA cites from the literature and compares them to critical values from the proposed rule. The first line shows that the value that the proposed rule delivers to consumers exceeds the mid-point of the range of estimates of the value that consumers want to receive from money invested in fuel economy by 52 percent at a 3 percent discount rate and 12 percent at a 7 percent discount rate. The NHTSA/EPA analyses based on total spending for increased mpg shows that the proposed rule increases fuel economy above the adjusted baseline by approximately 5.2 percent at a cost of $1076 per vehicle. Consumers are willing to pay a lot more than that to raise fuel economy by that much. Therefore, the rule delivers a large net benefit.

EXHIBIT II-8:
WILLINGNESS TO PAY COMPARED TO THE COST OF HIGHER FUEL ECONOMY

	Study Findings	NPRM Values
Willingness to pay measures		
$1 per year reduction in operating costs	$0.74 - $25.97	$8.78 -$11.94
$ Investment to raise fuel economy by 1 mpg		
Literature		
At $2.30 per gallon	$578	
Luxury Car at $2/gallon	$820	
SUV at $3.50/gallon,	$4112	
NHTSA/EPA Estimates		
Proposed standard		$141
Proposed to Max. Economic		$304
Max Econ to Max Enviro/Economics		$208

Sources: National Highway Traffic Safety Administration and Environmental Protection Agency, *Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Notice of Proposed Rulemaking, 2009,* p. 49603; Walter McManus, *Can Proactive Fuel Economy Strategies Help Automakers Mitigate Fuel Price Risk?,* University of Michigan Transportation Research Institute, September 14, 2006, p. 2.

In the remainder of Exhibit II-8, NHTSA/EPA find that studies of the willingness to pay for specific increases in miles per gallon vary widely. For example, two studies "find that consumers are willing to pay nearly $600 extra to purchase a vehicle that achieves 1 additional mile per gallon... consumers' willingness to pay for an increase from 25 mpg to 30 mpg varies between $4100 (for luxury cars when gasoline is costs $2/gallon) to $20560 (for SUVs when gasoline costs $3.50 per gallon)."[15] The proposed rule would increase fuel economy by just over 5 miles per gallon at a cost of $1076. Exhibit II-8 shows these estimates converted to a standardized willingness to pay for a 1-mile per gallon improvement. We find that consumers are willing to pay a lot more than it would cost to improve fuel economy. The benefit the

[15] NPRM, 2009, p. 49603.

proposed rule would deliver far exceeds that value that consumers seem to demand in the marketplace.

We have included the cost and benefit of moving from the proposed rule to the level of maximum economic benefit (where marginal benefit equals marginal cost) to test whether the higher level of fuel economy is justified in the current context and the cost of moving from the maximum economic benefit level to the maximum environmental benefit level (i.e. where total benefit equals total cost). Both of these clearly deliver substantial value to consumers in excess of what they are willing to pay.

Exhibit II-9 shows these results graphically. The top figure presents the values in dollars and miles per gallon as stated in the NHTSA/EPA materials. The bottom figure converts the increase in fuel economy to a standard unit, dollars per a 1-mile increase in mpg. The cost that the standard would impose on consumers is far below the level the empirical evidence shows they are willing to pay.

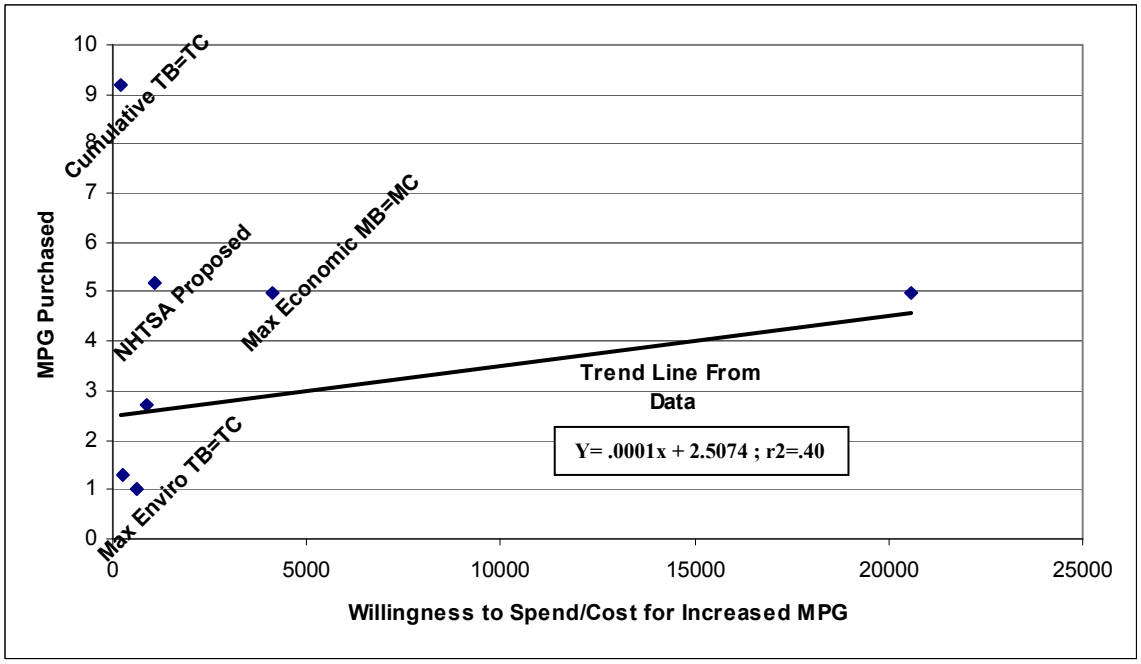
Although this evidence indicates that the consumer welfare gains are likely to vastly exceed the costs, even in a consumer choice framework, we are greatly concerned about the approach that NHTSA/EPA are taking. EPA and NHTSA came out on the right side of this debate for the wrong reason and that mistake must be corrected because it leaves the possibility that the agencies could change their mind easily. The agencies do a cursory review of the theoretical literature and then decide that the models that might lead to a more precise estimation of consumer welfare gains are too imprecise to rely on. So, in the rule, they rely on the objective, engineering estimates of costs and benefits, rather than try to guess what value consumers subjectively place on fuel economy that would lead them to under-invest so dramatically in fuel economy. The rejection of the theory on these empirical grounds is correct, but far too weak. There is a better reason than a bad empirical fit with real world data to reject the consumer choice models that estimate the subjective state of consumers – the assumptions underlying the model are incorrect, but it is not only the assumptions about consumers that do not fit reality. Focusing on behavioral characteristics of consumers and their apparent deficiencies as economic utility maximizers ignores many significant problems on the supply-side of the market.

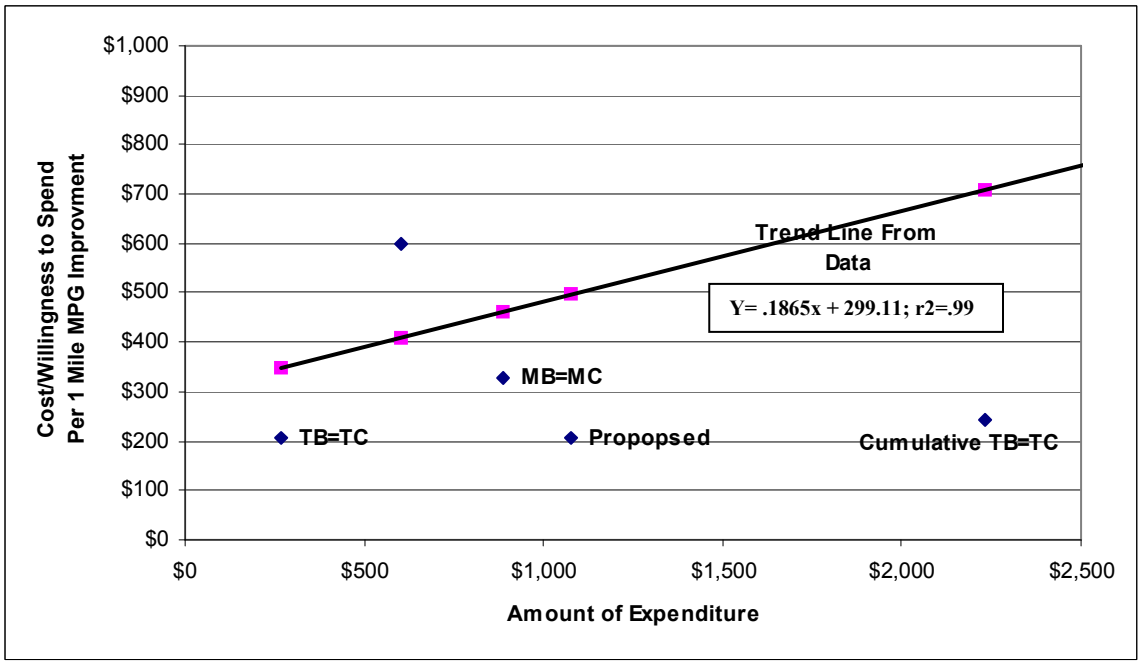
At the most basic level, producers are people, too, and they suffer from the same frailties that consumers do as human beings. They are deficient in their motivation, perception and calculation when it comes to reading the market. Auto manufacturers are also massive bureaucratic organizations, which introduces another layer of barriers to efficiency in the market. There are also transaction cost issues and market structural problems that plague energy markets.[16]

If NHTSA/EPA are going to pursue this line of analysis, they must adopt a much more complete framework. They must recognize that the so-called "consumer choice " models are really "market output'" models in which both the supply-side and the overall market structure are at least as important as the demand-side in determining the level of fuel economy observed.

[16] It is generally agreed that externalities are a separate cause of market failure.

EXHIBIT II-9:
WILLINGNESS TO PAY FOR FUEL ECONOMY COMPARED TO COST OF FUEL ECONOMY





Sources: National Highway Traffic Safety Administration and Environmental Protection Agency Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. ***Notice of Proposed Rulemaking, 2009,*** **p. 49603; Walter McManus,** ***Can Proactive Fuel Economy Strategies Help Automakers Mitigate Fuel Price Risk?,*** **University of Michigan Transportation Research Institute, September 14, 2006, p. 2.**

Underestimation of Benefits

In addition to an inadequate conceptual framework, the cost benefit analysis suffers from important flaws in the calculation of benefits that result in a serious underestimation of the net benefits of CAFE standards.

The Rebound Effect: NHTSA/EPA continue to mishandle and overestimate the effect that increased fuel economy has on the number of miles that people drive. Known as the "rebound effect", NHTSA/EPA assume that people will increase their driving by 10 percent when the cost of driving declines as a result of increased fuel economy. They then subtract the amount of fuel consumed from the out of pocket savings the consumer would enjoy because the vehicle gets more miles per gallon. They also calculate the increases in congestion, noise and accidents that would result from the increased driving. These costs are subtracted from the benefits that consumers and society would enjoy as a result of increased efficiency.

The rebound effect should not enter into the consumer welfare analysis. When consumers have more money in their pockets as a result of improved fuel economy, they are better off by exactly that amount of money. What they do with the money is not the concern of the agencies in the consumer welfare analysis. We assume that consumers will use the money to increase their welfare. The fact they spend some of it on increased driving does not diminish the increase in welfare that they enjoy.

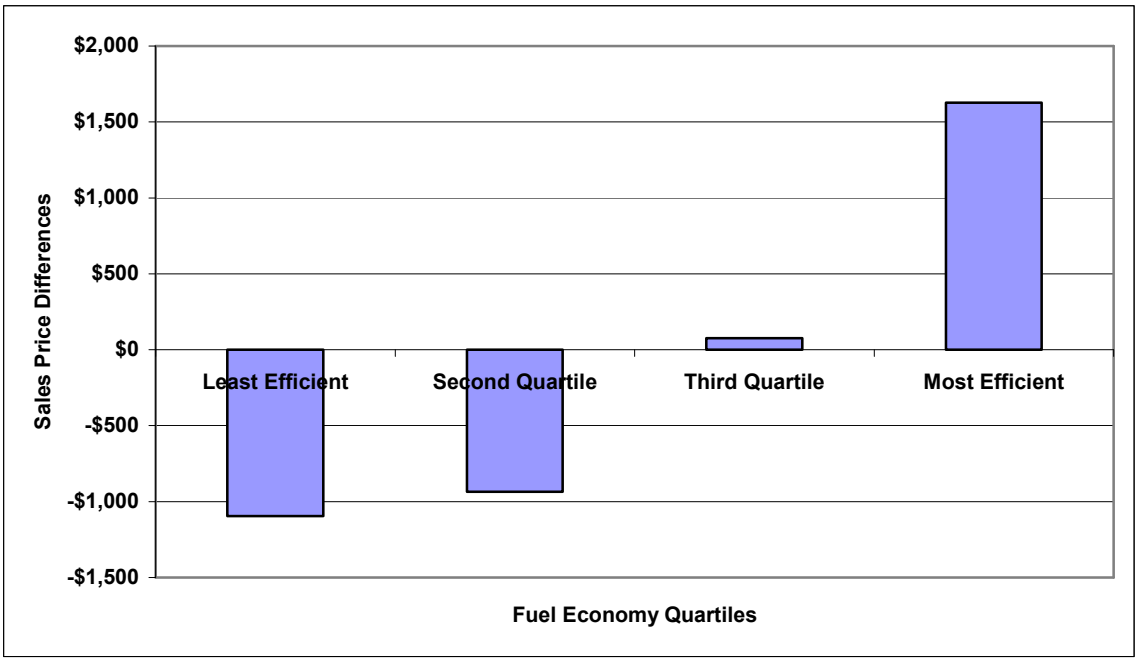
NHTSA has also used a rebound rate that is too high for the societal analysis.

The Resale Value of Fuel Efficient Vehicles: The NHTSA/EPA economic analysis fails to recognize the increased value at resale of fuel-efficient vehicles. It assumes a uniform resale value for vehicles of 30.6 percent of the purchase price after year five. The results of recent studies contradict that assumption. In fact, the empirical evidence suggests that consumers place a much higher value on fuel-efficient vehicles.

One study, based on vehicle sales from 1999 to 2008, used econometric methods to estimate the impact of rising gasoline prices on used vehicle prices (see Exhibit II-10). It found that a one-dollar increase in the price of gasoline would increase the resale value of the vehicles that got the highest mileage (most efficient quartile) by $1,600 per vehicle, while the vehicles that got the worst mileage (lowest quartile) would decrease in value by over $1,000.

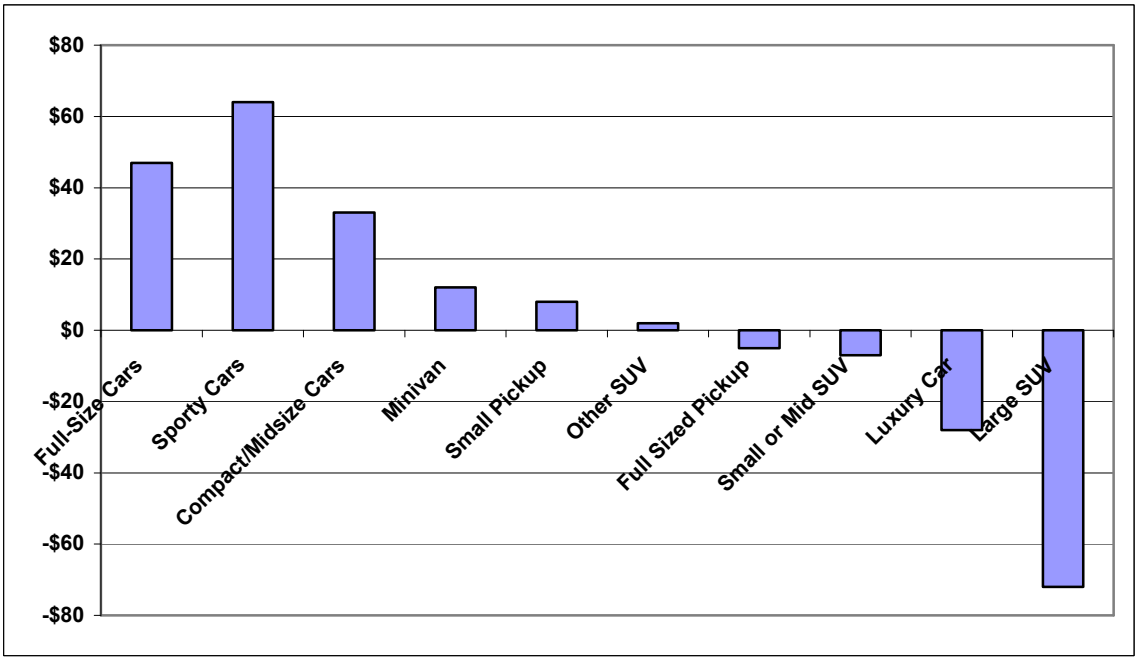
A study by the Congressional Budget Office found that between 2002 and 2006, the prices for large, less fuel efficient types of vehicles declined steadily, while the price of smaller, more fuel efficient vehicles rose (see Exhibit II-11). Combined with data on the types of vehicles that automakers chose to produce, this clear shift in buyer preferences signaled a major failure of automakers to respond to changing demand. NHTSA/EPA replicate this error by failing to take fuel economy levels into account when estimating the resale value of vehicles.

EXHIBIT II-10:
USED CAR PRICE CHANGES RESULTING FROM A $1 INCREASE IN GASOLINE PRICES



Source: Meghan R. Busse, Christopher R. Knittel and Florian Zettelmayer, *the Differential Effect of Usage Cost on New and Used Durable Goods Markets: Evidence form the Automobile Industry,* September 2009, p. 22

EXHIBIT II-11:
AVERAGE MONTHLY CHANGE IN THE PRICE OF USED VEHICLES, 2002-2006



Source: Congressional Budget Office, *Effects of Gasoline Prices on Driving Behavior and Vehicle Markets.* p. 20.

The Military Value of Oil: NHTSA/EPA assign no military or strategic value to reduced oil consumptions. The amendments to EPCA that restarted the standard setting process at NHTSA were entitled the Energy Independence and Security Act. The role of military and strategic concerns loomed large in the Congressional debate. Mr. Markey, the floor manager, singled out several key groups whose support was an "important contribution" to securing passage of EISA, among them "Securing America's Future Energy and the Energy Security Leadership Council, who brought together retired military officials and corporate CEOs to highlight the national and economic security dangers associated without growing dependence on imported oil."[17] There is a substantial policy and academic literature that believes oil has a military value.[18]

The qualitative security and foreign policy aspects are quite important in the contemporary environment. As a recent effort to estimate "US Military Expenditures to Protect the Use of Persian Gulf Oil for Motor Vehicles" put it:

> "Expenditures on the military are only a portion of the entire relevant military or "security" cost of using oil, just as the total social cost of pollution due to cars is equal to the value of the resources devoted to controlling pollution (the control costs) plus the value of the resources damaged by whatever pollution still is emitted (residual damages), the total military or security costs of using oil is equal to the military "control" costs plus the dollar cost of whatever military or security problems remain in spite of or even due to, the military expenditures. These "residual" costs include reduced flexibility in the conduct of US foreign policy, strains on international relations due to the activities of the US military and even due to competition for oil, anti-American sentiment due to the presence of the US military in the Middle East, political destabilization of the Middle East, and the nonfinancial human-suffering cost of war and political instability related to US demand for oil. Although to our knowledge nobody ahs ever quantified these costs, they are important. Indeed, one could argue that a primary motivation of many programs and policies aimed at reducing US dependence on foreign oil is not to reduce military expenditures related to defending the Persian Gulf, but rather to mitigate some of the political and human costs associated with US demand for Persian Gulf oil. If this is right, then the "costs" that we have not estimated may be large relative to the military costs we have estimated.[19]

A zero for the military and strategic value of oil reduction is simply wrong. NHTSA should have quantified what it could in the framework of the model. To the extent that there is a large and significant unquantifiable value, it should have oriented its considerations toward greater energy conservation. Thus, the decision to maximize economic value, with no consideration of the quantifiable military value of oil and at the expense of maximizing

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[17] Markey, Extension of Remarks.

[18] International Center for Technology Assessment, *The Real Price of Gasoline,* 1997, *Gasoline Cost Externalities: Security and Protection Services,* January 25, 2005; Lovins Amory, et al. *Winning the Oil Endgame* (Rocky Mountain Institute: 2004); Mark A. Delucchi and James J. Murphy, "US Military Expenditures to Protect the Use of Persian Gulf Oil for Motor Vehicles," *Energy Policy,* (36) 2008, and the numerous sources cited therein.

[19] Dellucchi and Murphy, p. 2262.

economic conservation, ignores the intent of the Congress in enacting the **Energy Independence and Security Act.** In our 2008 comments, we used a value of $0.30/gallon.

Exhibit II-12 shows that these are big-ticket items in the cost benefit analysis. Compared to the net benefits calculated in the base case of the proposed standard, handling these issues improperly has or can have a substantial effect on the bottom line calculation of the cost benefit analysis in setting the standard. Mishandling any of these issues could result in a sharp reduction in the estimation of the benefits and, as a result, the setting of the standard at a much lower level than is appropriate.

EXHIBIT II-12:
IMPACT OF RECOMMENDATIONS FOR RULEMAKING FRAMEWORK

	Increase in Benefit Estimate as a Percent of Net Benefits Compared to Proposed Standard	
	Consumer Welfare	**Societal Cost-Benefit**
Include consumer gains	**143**	**na**
Proper treatment of the rebound effect*	**16**	**4**
Recognize enhanced resale value of fuel vehicles*	**18**	**18**
Assign military value to reduced oil ($0.30/gal)*	**na**	**6**

Sources and notes: National Highway Traffic Safety Administration and Environmental Protection Agency Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, *Preliminary Regulatory Impact Analysis*, Tables 7, 10, X-10; The estimate of the impact of altering the resale value assumption assumes an average increase of $300 in resale value for vehicles that meet the maximum environmental/economic standard compared to the proposed standard.

The starred items in Exhibit II-12 represent flaws in the analysis as conducted by NHTSA/EPA. In other words, these flaws in the analysis mean that even the large benefits cited in Exhibit II-4 above have been significantly underestimated. A simple example of a decision that needs to be corrected is the handling of the resale value of vehicles. NHTSA uses a uniform resale value for vehicles expressed as a percentage of their purchase price. The empirical evidence shows that more fuel-efficient vehicles hold their value better. They fetch higher prices upon resale. The uniform resale price assumption severely undervalues improved fuel economy by 18 percent.

The single non-starred item is of extreme importance. In the analysis of the proposed rule, NHTSA included consumer gains in the analysis, but contemplated excluding all or part of these gains. NHTSA identifies arguments that would exclude or dramatically diminish the estimate of consumer welfare gains in the cost-benefit analysis. Excluding these gains would lower the estimate of benefits by 143 percent. In other words, the costs of the proposed standard would exceed the benefits. NHTSA made the correct decision to include the consumer welfare gains, but is contemplating alternative approaches. Since the handling of consumer welfare gains can have such a huge impact on the analysis, we devote a great deal of attention to it in Section III.

E. ESTABLISHING A LONG-TERM VISION FOR ENHANCED FUEL ECONOMY

In recognition of the vehicle product cycle, the recent amendments to the statute under which NHTSA regulates fuel economy requires it to promulgate rules at least 18 months in advance of the model year to which the standard applies, but the redesign and refresh cycle of the industry where significant modifications can be made in the fuel economy of vehicles requires more lead time than that. At the same time, NHTSA cannot set standards for more than five years. In contrast to this narrow window through which Congress allows NHTSA to set fuel economy, the Congress is considering very long term time frames for legislating climate change policy – setting 10, 20 and 40 year targets. Because the climate challenge is long term and the product design cycle is lengthy, standard setting must take a long-term view.

Tailpipe Emission Standards Should be the Focal Point of Policy

From a policy perspective, it is critically important that the Clean Air Act's framing of standard setting, which allows EPA to take a long-term view and a technology-forcing role, is being joined to the NHTSA approach. It must shake the standard setting process out of its lethargy. The decision to join NHTSA and EPA creates the opportunity for a major improvement in the regulation of automobiles because the Clean Air Act allows EPA to take a longer-term view with greater flexibility. Moreover, the lengthy discussion of the failure of the market to yield an efficient outcome with respect to energy efficiency presented in Section II has two critical purposes in these comments and the process of standard setting for both fuel economy and tailpipe emissions.

First, the explanation of why the vehicle fleet is less efficient than it should be is critical to understanding why fuel economy standards are the right policy to address the problem and how those standards should be set. The explanation of the "efficiency gap" (the gap between the optimal level of efficiency and the level the marketplace yields) involves a host of market imperfections, barriers and obstacles on both the supply and the demand side. Our analysis shows that setting fuel economy standards is an ideal approach to addressing the market imperfections, barriers, flaws and obstacles that underlie the market failure.

Second, and more importantly, the law and practice of setting fuel economy standards at NHTSA under the Energy Policy Conservation Act have severely restricted the ability of the agency to set fuel economy standards in the public interest (see Exhibit II-13). Standards are the right policy instrument, and EPA is the right agency to take the lead for a variety of reasons

First, NHTSA is required to achieve only a 35-mile per gallon standard by 2020, but beyond that there is no mandate to achieve higher levels of fuel economy. In contrast, as a result of a recent Supreme Court ruling, EPA is obligated under the Clean Air Act (CAA) to regulate tailpipe emissions of pollutants, such as carbon dioxide.

Second, NHTSA is severely constrained in the time frame for which it can set standards. It must give the automakers at least 18 months advance notice of what the standard will be and it cannot set standards more than 5 years in advance. This narrow window for standard setting is too short for effective long term planning. The rulemaking period barely covers a full product

design cycle. NHTSA has repeatedly said that the time frame is too short to ask the industry to do too much. The short time horizon shortchanges the public. EPA is not under this time constraint. Therefore, it can give the industry a long-term trajectory that promotes energy efficiency and environmental clean-up. In other words, NHTSA has neither the legal mandate nor the ability to take a long-term view of fuel economy, but EPA has the ability to do so for tailpipe emissions.

EXHIBIT II-13:
INSTITUTIONAL REASONS TO SHIFT THE FOCUS OF STANDARD SETTING TO EPA

Institutional Context of standard Setting	NHTSA (under the Energy Policy Conservation Act)	EPA (under the Clean Air Act)
Mandate	**Permissive above 35 mpg, maximum feasible subject to constraints**	**Obligatory: to protect the Public health and welfare**
Time Frame	**Limited to a short 18-60 month period**	**Unlimited**
Economic Constraint	**Practicable, restricted by industry capacity**	**Costs considered**
Technological Innovation	**Restrained by industry Plans**	**Technology forcing**
Implementation	**Existing regulatory apparatus No responsibility for measurement**	**Existing regulatory apparatus Responsibility for measurement**

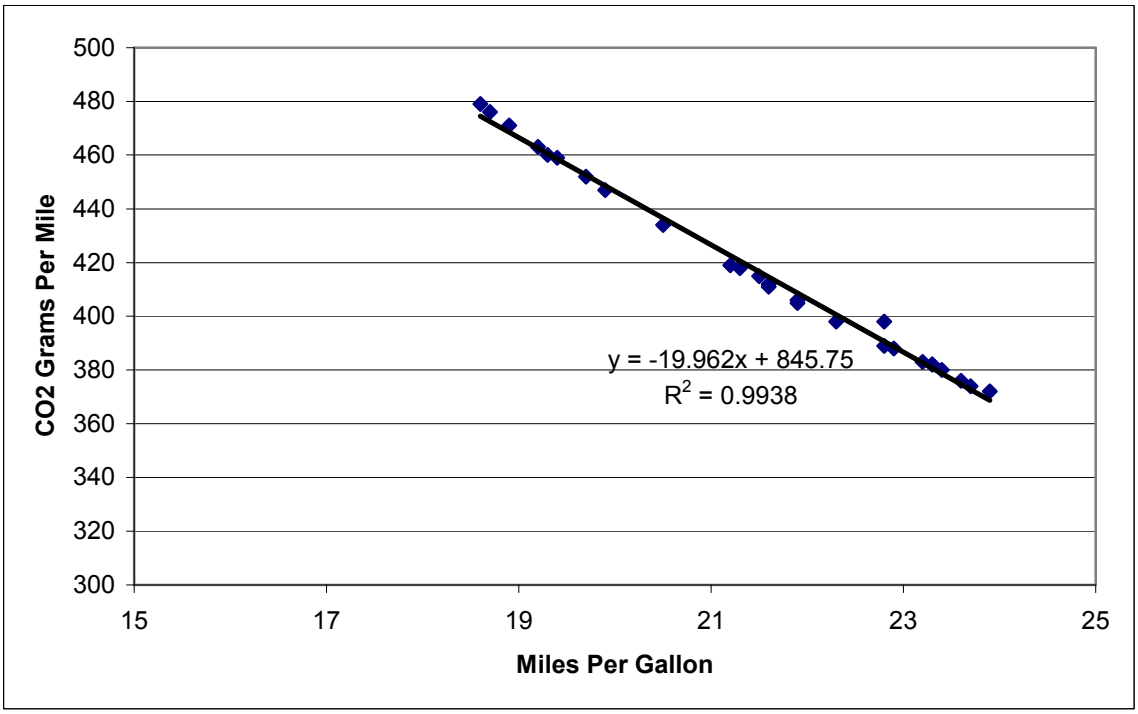
Third, the economic constraint under which NHTSA operates is more restrictive than EPA's. NHTSA is bound to do what is "economically practicable," while EPA must consider cost. NHTSA has interpreted its mandate under the statute to be largely constrained by what the industry's capabilities are. It hesitates to be technology forcing, repeatedly finding that the industry has not planned and therefore cannot make significant changes. What the industry "can" do is largely a function of what it "wants" to do, not what is in the public interest. The result is the behavior and plans of the automakers play a prominent role in determining the outcome. Because the concept of economic practicability has been interpreted to rest substantially on the contemporary capabilities of the industry, it sets the primary constraints on progress. To the extent that automakers are deficient economic actors and market structures are imperfect, this undermines the ability of the agency to write rules that are in the public interest. Poor performance by the industry becomes a self-fulfilling prophecy, and in light of recent developments, a self-inflicted wound, in the setting of lax standards, and thus allows the industry to continue with its poor performance. EPA is not bound by this practice.

Fifth, NHTSA has chosen to assume that vehicle attributes remain constant. In recent years, consumers have proven to be willing to change their preferences, a shift that caught automakers by surprise. EPA has more flexibility to envision and promote changes in vehicle attributes in response to emissions standards.

Finally, because there is a direct physical relationship between the amount of greenhouse gasses a vehicle emits and the amount of gasoline it uses, by fulfilling its obligation to protect the public health and welfare under the Clean Air Act, EPA will also be effectively establishing fuel economy standards. In fact, EPA has had the responsibility for measuring the fuel economy of vehicles since the Energy Policy Conservation Act (EPCA) established the Corporate Average Fuel Economy (CAFE) standards. Ironically, in order to measure fuel economy, EPA actually measures the tailpipe emissions of carbon dioxide and converts that to the number of gallons fuel consumed.

Exhibit II-14 shows data on fuel economy and greenhouse gas emissions for autos sold in the U.S. in 2006-2009. These are adjusted, sales weighted data by manufacturer. There is a near perfect linear relationship between carbon dioxide emissions and fuel economy. Thus, there is no doubt that by regulating tailpipe carbon dioxide emissions, EPA can accomplish the goal of promoting energy conservation through higher fuel economy.

EXHIBIT II-14:
THE RELATIONSHIP BETWEEN FUEL ECONOMY AND CARBON DIOXIDE EMISSIONS



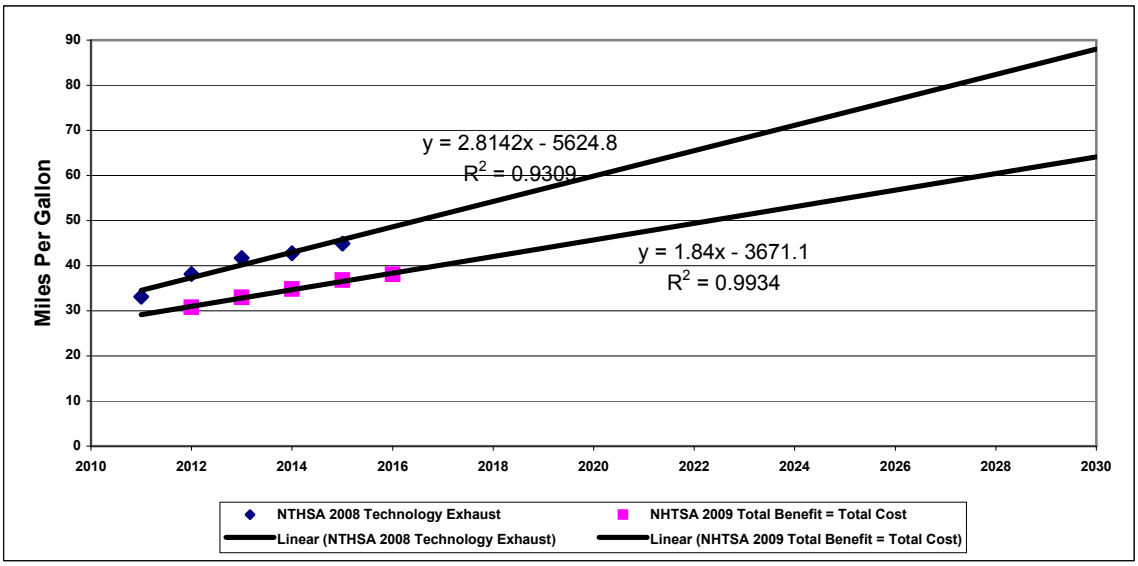
Source: Environmental Protection Agency, *Light Duty Automotive Technology: Carbon Dioxide Emission, and Fuel Economy Trends: 1975 Through 2009* November 2009, p. vii.

A First Step Toward Establishing a Long-Term Vision

While the current state of the auto industry has led the federal agencies to set a low standard, the technical potential exists to achieve much higher levels of fuel economy that

Exhibit II-15 shows. In the 2008 CAFE proceeding, NHTSA examined a potential standard it called Technology Exhaustion, which is the point where the maximum usage of available technologies to reduce energy consumption is reached, disregarding the cost impacts. In short, technologies identified in 2008 could already support the goal of 45 mpg by 2020 and the technological limits are not fixed. The limit should advance over time as the cost of technologies declines, the automakers become more adept at incorporating new technologies and technologies move from the research and development phase into the deployment phase. Projecting a constant rate of growth puts the technology exhaust point at 60 mpg by 2020 and close to 90 by 2030.

EXHIBIT II-15: POTENTIAL FOR LONG TERM IMPROVEMENT IN FUEL ECONOMY STANDARDS

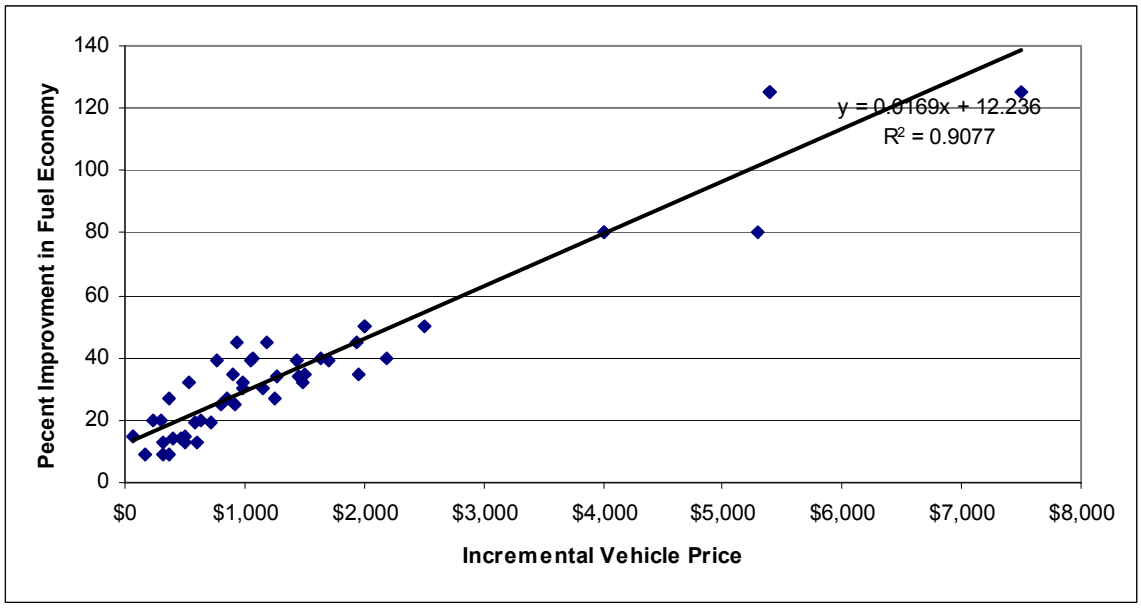


Sources and notes: National Highway Traffic Safety Administration and Environmental Protection, Agency, ***Proposed Rulemaking to Establish Light Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Preliminary Regulatory Impact Analysis*****, Tables 1b; National Highway Traffic Safety Administration,** ***Average Fuel Economy Standards, Passenger Cars and Light Trucks, Preliminary Regulatory Impact Analysis*****, 2008 Table 1b.**

Exhibit II-15 also shows a projection of the total benefit=total cost scenario, which we call the maximum environmental/economic scenario. Projecting a constant rate of increase in the maximum environmental/economic standard level achieved in 2012 –2016 out to 2020 would put the standard at just over 45 miles per gallon in 2020. Projecting longer-term possibilities is uncertain, but the commitment to a continuous improvement could raise average fuel economy for the overall fleet to much higher levels, in the range of 70 to 90 miles per gallon, especially as electric vehicles.

NHTSA/EPA are not the only ones who recognize that the technology is available to carry the fleet to much higher levels of fuel economy. A cost study conducted for CITI examined a small set of possible efficiency packages and found that current technology could dramatically increase fuel economy and carry the fleet past 40 miles per gallon (see Exhibit II-16).

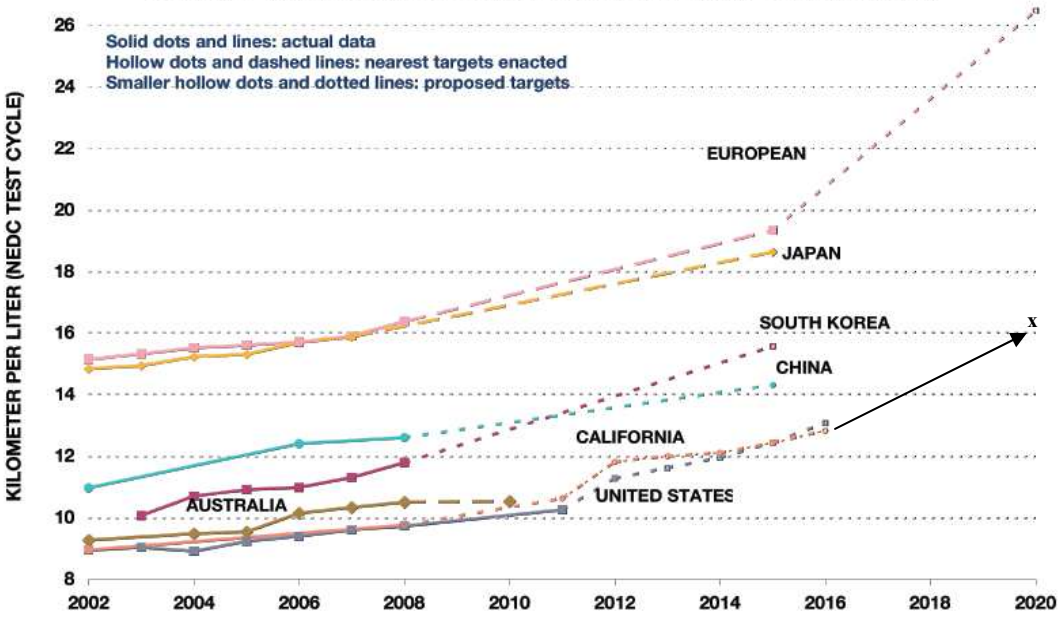
EXHIBIT II-16:
INCREMENTAL COST AND GAINS IN FUEL ECONOMY



Source: Citigroup Global Markets, *CAFÉ and the U.S. Auto Industry Revisited,* October 13, 2009, Appendix C

Finally, while international comparisons raise many issues because of differences in vehicle fleets, a broad gauge of where fuel economy standards can be instructive (see Exhibit II-17). The most recent data from the ICCT shows that the U.S. target for 2016 is among the lowest

EXHIBIT II-17:
INTERNATIONAL COMPARISONS OF FUEL ECONOMY TRAJECTORIES



International Council on Clean Transportation, http://www.theicct.org/documents/ICCT_PVStd_Nov_09.pdf. x= 45 mpg in 2020

standards being implemented by major developed nations and those likely to be important sources of future vehicle growth. A target of 45 miles per gallon by 2020 is not very high by international standards.

F. CONCLUSION

These comments show that shifting the responsibility of standard setting to the EPA creates a much greater the possibility of delivering large benefits to the consumer, the nation and the environment. NHTSA has failed to deliver these benefits because it is unduly constrained by law and practice. This is the third CAFE rulemaking in less than a decade, and the constraints on the approach taken by NHTSA to standard setting that limit its ability to promote the consumer and public interest have been clear in each. In our 2008 comments on the CAFE rulemaking, we criticized NHTSA's approach on many grounds. Unfortunately, given the transitional nature of this proceeding, many of those flaws have been brought forward into this Notice and supporting materials. Indeed, the dire circumstances of the auto industry have made matters worse. The agencies have been forced to set standards far below the level that makes economic and environmental sense and leave very large sums of potential consumer, national security, energy and environmental benefits unrealized because the industry is in such a fragile state.

In our comments on the Draft Environmental Impact statement in the 2008 proceeding, we included a report (reproduced herein as part of Section IV) in which made a prediction based on our reading of the developments in the industry.

> Given the strong consumer interest in higher fuel economy and the dramatic changes in auto industry plans, if NHTSA sets a standard to lead the industry to higher levels of fuel economy as it is required to do under the law, higher levels of fuel economy will be achieved and fewer auto makers will fail the "TB=TC" standard than previously anticipated by NHTSA. Indeed, when NHTSA revisits the fundamental assumptions in its model that slow the inclusion of fuel savings technology in the vehicle fleet, which have been called into question by developments in the market, it will arrive at a much higher level for standards across the board, but particularly for the "technology exhaust" and "TB=TC" scenarios.

While that prediction might have seemed bold at the time, a comparison between the 2008 rulemaking and the current rulemaking shows that we were exactly right. One year later, we believe the maximum economic value scenario has advanced by 3.5 miles per gallon and the maximum environmental/economic value scenario is almost 41 miles per gallon. (as shown in Exhibit II-18).

Thus, EPA and NHTSA have the opportunity in the current rulemaking to establish a platform on which a dynamic, innovative automobile manufacturing sector can be built in America, one which meets the needs for transportation in our continental economy in a manner that saves consumers money, enhances national security through reduced oil imports, and ensures that the transportation sector makes it full contribution to meeting the challenge of global warming. To build that platform, it is critically important to recognize the vital role that fuel economy standards play in correcting market failures and orienting markets toward actions that

increase consumer welfare, while promoting social goals. Establishing a firm theoretical and empirical basis for calculating and including consumer welfare gains in the analytic framework is one of the pillars on which a sound rulemaking process must be based.

EXHIBIT II-18:

OPPORTUNITY FOR STANDARDS TO LEAD THE INDUSTRY TO HIGHER FUEL ECONOMY
(Miles Per Gallon for the 2015 standards assuming 2011 weights for vehicle mix)

	2008	2009
Marginal Benefit=Marginal Cost	**32**	**35.5**
Total Cost=Total Benefit	**38.9**	**40.9**
Technology Exhaust	**44.9**	**na**

III. ENERGY EFFICIENCY MARKET FAILURE

A. INTRODUCTION

As discussed in Section II, the Notice barely scratches the surface of the debate over the "efficiency gap" and the policies to deal with it. The terminology applied to describe the failure of energy markets to achieve the level of energy efficiency one would expect from a theoretically efficient market has proliferated as concern over this problem has grown. The existence of this "efficiency gap" is explained with terms like barriers, obstacles, challenges, imperfections, and failures. These terms are often applied differently by different authors. When all is said and done, however, there is substantial consensus on the challenges energy efficiency faces.

To establish a framework for explaining the existence and magnitude of the market failure, as well as why fuel economy standards are an effective solution to the problem, this section reviews several literatures.

First, we review the discussion of the issue in the Notice of Proposed Rulemaking and its supporting documents. The agencies have invited comment on this issue.

Second, we briefly establish the basis for market failure analysis in the general economic literature. We start from traditional economic discussions and then move to more recent challenges to the traditional model in transaction cost and behavioral economics.

Third, we review the general "efficiency gap" literature. This literature was cited in the Notice and supporting documents.

Fourth, we review the "efficiency gap" literature as it relates directly to fuel economy and the importance of supply-side causes of market failure. This literature was also cited in the Notice and supporting documents.

Exhibit III-1 summarizes the conclusion of the literature review in the remainder of this section. It identifies all the market failures that the NPRM did as well as those it did not mention. We have highlighted the factors we believe affect the auto market that are addressed by standards.

- Neoclassical economics recognizes societal flaws – primarily in the form of externalities and public goods.
- Traditional analysis of industrial organization and market structure, conduct and performance, recognizes that there are structural problems that affect market performance.
- Some of the problems that have long been recognized rise to the level of endemic imperfections – imperfections that are repeatedly found in market structures.
- The analysis of transaction costs has given rise to new institutional economics, which offers another major challenge to the assumption that markets work perfectly.

EXHIBIT III-1: CAUSES OF ENERGY MARKET FAILURE AND THE ROLE OF STANDARDS IN CLOSING THE "EFFICIENCY GAP"
(Highlighted Factors are Addressed by Efficiency Standards)

Neo-classical and Traditional Industrial Organization

SOCIETAL FLAWS

Externalities:
- Environmental
- Energy Security

Public Goods
- Basic research
- **Information**
  - Learning by doing
  - Learning-by-using

Other

INDUSTRY STRUCTURAL PROBLEMS

Imperfect Competition
- Concentration
- Barriers to Entry
- **Scale**
- Vertical Leverage
- Collusion

Marketing
- **Bundling: Multi-attribute**
- Gold Plating
- Inseparability
- Purchase Method
- Advertising

Regulation & Policy
- Price Distortion Avg-cost
- Permitting
- Other Distortions

Cost Structure
- **Product cycle**
- Disaggregated/ fragmented Mkt.

Elasticity
- Own-price
- Cross-price
- Income

Availability
- Lack
- Emergency replacement

Quality
- Improper installation
- Lack of enforcement

Challenges from Keynesian, New Institutional and Behavioral Economics

ENDEMIC IMPERFECTIONS

Ownership
- Agency
- Transfer
  - Limited payback
  - Lack of premium

Capital
- Illiquidity

Asymmetric Information

Perverse Incentives/ Conflict of Interest

Moral Hazard

TRANSACTION COST/ NEW INSTITUTIONAL ECONOMICS

Friction
- Sunk costs
- Lifetime

Risk & Uncertainty
- Technology
- Marketplace
- Policy
- Financial
- Liability

Imperfect Info.
- Availability
- Accuracy
- Search Cost

Organizational Structure

BEHAVIORAL FACTORS

Motivation
- Preference
- Custom
- Values & Commitment
- Social group & status

Perception
- Prospect
  - Framing
    - Loss Avoidance
    - Status Quo
    - Salience
    - Social Influence
- Awareness
  - Attention
  - Low priority

Calculation

Bounded rationality
- Ability to process info
- Limited understanding

Heuristic Decision Making
- Rules of thumb
- Information
- Discounting
- Low Probability Events
- Long-Term
- Small Outcomes

Implementation
- Improper use & maintenance

- In addition to the behavioral causes of market failure that the NPRM identified, there are additional important behavioral problems that cause market failure by looking at the friction in economic transactions and the institutions that develop to deal with it.

Many of the market imperfections identified in the literature afflict the market for fuel economy in light duty vehicles.

The recent financial meltdown has resulted in the thorough repudiation of the efficient market hypothesis.[20]

B. MARKET FAILURE IN THE GENERAL ECONOMIC LITERATURE

The Traditional Approach

Market failure is a sufficiently widespread phenomenon to be recognized as an important analytic issue even for introductory economic texts. In one widely used text, John Taylor states that "in certain circumstances – called market failure – the market economy does not provide good enough answers to the "what, how and for whom" questions, and the government has a role to play in improving on the market"[21] Taylor defines market failure as "any situation in which the market does not lead to an efficient economic outcome in which there is a potential role for government."[22] Taylor identifies the "major sources of market failure as "public goods, externalities, and monopoly power."[23]

An advanced text on antitrust and regulation offers the following observation on the importance of market failure in economic analysis:

> If we existed in a world that functioned in accordance with the perfect competition paradigm, there would be little need for antitrust policies and other regulatory efforts. All markets would consist of a large number of sellers of a product and consumers would be fully informed of the product's implications. Moreover, there would be no externalities present in this idealized economy, as all effects would be internalized by the buyers and sellers of a particular product.
>
> Unfortunately, economic reality seldom adheres closely to the textbook model of perfect competition. Many industries are dominated by a small number of large firms. In some instances, principally the public utilities, there may be a monopoly. Consumers who use hazardous products and workers who accept risky employment may not fully understand the consequences of their actions.

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[20] George Cooper, *The Origin of Financial Crises" Central Banks, Credit bubbles and the Efficient Market Fallacy* (New York: Vintage, 2008); Justin Fox, *The Myth of the Rational Market* New York: Harper, 2009); Richard Posner, *A Failure of Capitalism* Cambridge: Harvard University Press, 2009); Mark Cooer and Barbara Roper, Reform of *Financial Markets:The Collapse of Market Fundamentalism and the First Steps to Revitalize the Economy* (Consumer Federation of America, 2009).

[21] John B. Taylor, *Economics* New York: Houghton Mifflin, 1998), p. 49.

[22] Taylor, Economics, p. 405.

[23] Taylor, *Economics,* p. 404.

> There are also widespread externalities that affect the air we breathe, the water we drink, and the future viability of the planet.[24]

The difference between framing the issue as "economic reality seldom adheres closely to the textbook model of perfect competition" and "in certain circumstances… the market economy does not provide good enough answers" may have a substantial impact on a broad view of policy because the challenge of finding the instances where markets have failed and intervention is justified may be substantial. However, where the evidence of market failure is strong, as in the case of energy efficiency, a debate over the extent of the problem is no longer necessary.

These two citations identify three broad areas of analysis that are common in the literature:

- structural conditions of supply, e.g. lack of competition (small numbers or monopoly);
- consumer behavior, e.g. ill-informed or unaware, and
- societal, e.g. externalities and characteristics of products (public goods) that undermine supply;

Imperfect competition, which is mentioned in the above quotes in the form of the small number of competitors or, in the extreme, the "monopoly" problem, actually receives a good deal of attention in traditional economics, especially in the literature on industrial organization. The dominant paradigm is the structure conduct performance (SCP) approach (see Exhibit III-2).

The analysis commences from the bottom of the figure, with performance and works its way up through the model. The central concern is with market performance. The concept of performance is multifaceted. It includes, among other factors, productive and allocative efficiency, progress, and fairness.[25] The measures of performance to which we traditionally look are pricing and profits. They are the most direct measure of how society's wealth is being allocated and distributed.[26]

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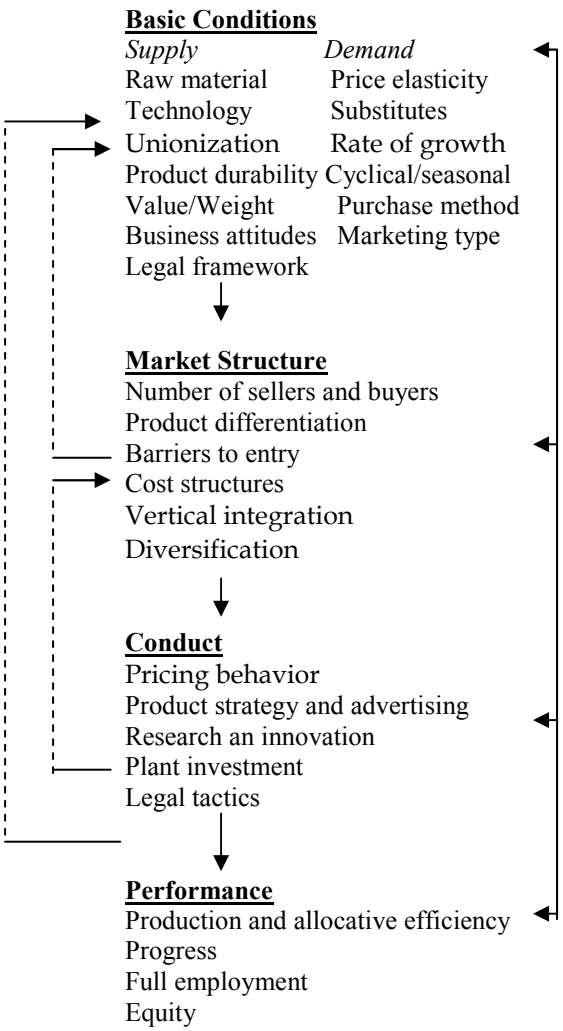
[24] W. Kip Vsicusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust,* Cambridge: MIT Press, 2001), p. 2.

[25] F. M Scherer and David Ross, *Industrial Market Structure and Economic Performance* (Houghton Mifling: Boston, 1990) (hereafter Scherer and Ross), p. 4.

[26] Scherer and Ross 1990, p. 4: We begin with the fundamental proposition that what society wants from producers of goods and services is good performance. Good performance is multidimensional… Decisions as to what, how much and how to produce should be efficient in two respects: Scarce resources should not be wasted, and production decisions should be responsive qualitatively and quantitatively to consumer demands. The operations of producers should be progressive, taking advantage of opportunities opened up by science and technology to increase output per unit of input and to provide consumers with superior new products, in both ways contributing to the long-run growth of real income per person. The operation of producers should facilitate stable full employment of resources. The distribution of income should be equitable. Equity is notoriously difficult to define, but it implies at least that producers do not secure rewards in excess of what is needed to call forth the amount of services supplied.

EXHIBIT III-2: THE STRUCTURE CONDUCT PERFORMANCE PARADIGM

Structure-Conduct-Performance



Sources

The figure is a primarily based on F. M Scherer and David Ross, *Industrial Market Structure and Economic Performance* (Houghton Mifling: Boston, 1990) (hereafter Scherer and Ross), pp. 5, 53-54; with additional factors from W. Kip Vsicusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust,* Cambridge: MIT Press, 2001), p. 5 and William G. Shepherd, *The Economics of Industrial Organization* (Englewood Cliffs, NJ: Prentice Hall, 1985), p. 5

Measures of Workable Competition

STRUCTURAL CRITERIA

The number of traders should be at least as large as scale economies permit.

There should be no artificial inhibitions on mobility and entry.

There should be moderate and price-sensitive quality differentials in products offered.

CONDUCT CRITERIA

Some uncertainty should exist in minds of rivals as to whether price initiatives will be followed.

Firms should strive to attain their goals independently, without collusion.

There should be no unfair, exclusionary, predatory, or coercive tactics.

Inefficient suppliers and customers should not be shielded permanently.

Sales promotions should be informative, or at least not misleading.

There should be no persistent, harmful price discrimination.

PERFORMANCE CRITERIA

Firms' production and distribution operations should be efficient and not wasteful of resources.

Output levels and product quality (that is variety, durability, safety, reliability, and so forth) should be responsive to consumer demands.

Profits should be at levels just sufficient to reward investment, efficiency, and innovation.

Prices should encourage rational choice, guide markets toward equilibrium, and not intensify cyclical instability.

Opportunities for introducing technically superior new products and processes should be exploited.

Promotional expenses should not be excessive.

Success should accrue to sellers who best serve consumer wants.

The performance of industries is determined by a number of factors, most directly, the conduct of market participants.[27] Do they compete? What legal (or illegal) tactics do they employ? How do they advertise and price their products? The fact that conduct is only part of the overall analytic paradigm is important to keep in mind.

Conduct is primarily a product of other factors.[28] Conduct is affected and circumscribed by market structure. Here we look at the number and size of the firms in the industry, their cost characteristics and barriers to entry, as well as the basic conditions of supply and demand.

Basic conditions of supply and demand are also important. Some of the key conditions that are important in the energy sector are elasticities of supply and demand, technology, the growth and cyclical nature of demand, and the type of marketing.

Regardless of how much weight one gives to the causal assumptions of the paradigm, the list of variables is important. These are the factors that taken together determine whether markets work or fail. Also note that the paradigm contemplates the possibility that structure and behaviors affect basic conditions.[29] There are feedback effects in the model. The important role of policy is recognized.

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[27] Scherer and Ross 1990 p. 4: Performance in particular industries or markets is said to depend upon the conduct of sellers and buyers in such matters as pricing policies and practices, overt and taciturn interfirm cooperation, product line and advertising strategies, research and development commitments, investment in production facilities, legal tactics (e. g. enforcing patent rights), and so on.

[28] Scherer and Ross 1990, p. 5: Conduct depends in turn upon the structure of the relevant market, embracing such features as the number and size distribution of buyers and sellers, the degree of physical or subjective differentiation prevailing among competing seller's products, the presence or absence of barriers to entry of new firms, the ratio of fixed to total costs in the short run for a typical firm, the degree to which firms are vertically integrated from raw material production to retail distribution and the amount of diversity or conglomerateness characterizing individual firms' product lines.

Market structure and conduct are also influenced by various basic conditions. For example, on the supply side, basic conditions include the location and ownership of essential raw materials; the characteristics of the available technology (e.g. batch versus continuous process productions or high versus low elasticity of input substitution); the degree of work force unionization; the durability of the product; the time pattern of production (e.g. whether goods are produced to order or delivered from inventory); the value/weight characteristics of the product an so on. A list of significant basic conditions on the demand side must include at least the price elasticity of demand at various prices; the availability of (and cross elasticity of demand for) substitute products; the rate of growth and variability over time of demand; the method employed by buyers in purchasing (e.g. acceptance of list prices as given versus solicitation of sealed bids versus haggling); and the marketing characteristics of the product sold (e.g. specialty versus convenience shopping method).

[29] Scherer and Ross, p. 6.: As the solid arrows of Figure 1.1 suggest, we shall be concerned mainly with causal flows running from market structure and/or basic conditions to conduct and performance. That is, we seek theories that permit us to predict ultimate market performance from market structure, basic conditions, and conduct.

There are also important feedback effects (dashed arrows in Figure 1.1). For instance, vigorous research and development efforts can alter an industry's technology, and hence it cost conditions and/or the degree of physical productions differentiation. Or sellers' pricing policies may either encourage or discourage entry or drive firms out of the marker, thereby transforming the dimension of market structure. In this sense, both basic conditions and market structure variables are *endogenous,* that is determined within the whole system of relationships and not fixed by outside forces.

The theoretical concepts in the framework are challenging empirically. Pure and perfect competition is rare, but the competitive goal is important.[30] Therefore, a great deal of attention has been focused on the relative competitiveness of markets and conditions that make markets more competitive or workably competitive. Summarizing an "explosion of articles on workable competition", Scherer and Ross developed a list of "the criteria of workability suggested especially frequently by diverse writers [that] can be divided into structural, conduct and performance categories.[31] The list presented in Exhibit III-2, is verbatim from the text.[32] These are the characteristics of a workably competitive market. Sometimes the market exhibits these characteristics and is workably competitive, sometimes it does not and can be said to exhibit market failure.

Transaction Costs and the New Institutional Economics

Transaction cost economics is framed as a critique of neoclassical economics.

> The costliness of economic exchange distinguishes the transaction cost approach from the traditional theory economists have inherited from Adam Smith… An exchange process involving transaction costs suggests significant modifications in economic theory and very different implications for economic performance.[33]

Transaction costs analysis launches from the observation that there is friction in human activity that is not accounted for in the neoclassical models of economic behavior. Failing to take transaction costs into account misrepresents the cost of action and therefore the pattern of activity that occurs. Noting the difference from neoclassical assumptions, Douglass North, one of the first to receive a Nobel prize in this school of economics, argued as follows.

> If political and economic markets were efficient (i.e., there were zero transaction costs) then the choices made would always be efficient. That is, actors would always possess true models or if they initially possessed incorrect models the information feedback would correct them. But that version of the rational actor model has imply led us astray. The actors frequently must act on incomplete information and process the information they do receive through mental constructs that can result in persistently inefficient paths….
>
> The theory is based on the fundamental assumption of scarcity and hence competition; its harmonious implications come from its assumptions about a frictionless exchange process in which property rights are perfectly and costlessly specified and information is likewise costless to acquire. Although the scarcity and hence competition assumption has been robust and has provided key underpinnings of neoclassical theory, the other assumptions have not survived nearly so well.

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[30] Scherer and Ross 1990, p. 16-17.
[31] Scherer and Ross 1990, p. 53.
[32] Scherer Ross, pp. 53-54.
[33] Douglass C. North, *Institutions, Institutional Change and Economic Performance* (Cambridge: Cambridge University Press, 1990), p. 27.

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> For the past thirty years, other economists and other social scientists have been attempting to modify and refine the issue to see just what have been missing from the explanation. Put simply, what has been missing is an understanding of the nature of human cooperation and coordination.[34]

Information is the resource at the center of transaction cost and institutional economics because "the costliness of information is the key to the costs of transacting, which consists of the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements.[35]

> Institutions are formed to manage and reduce transaction costs.
>
> Institutions provide the structure for exchange that (together with the technology employed) determines the cost of transacting and the cost of transformation. How well institutions solve the problems of coordination and production is determined by the motivation of the players (their utility function), the complexity of the environment, and the ability of players to decipher and order the environment (measurement and enforcement).[36]

Although their existence of institutions stems from the transaction cost problem that constitutes a deviation from the frictionless efficiency claim, their function is to reduce and control the extent of the deviation. However, there is a gap between the broad institutions of society and the organizations within the institutional environment. The creation of organizations may create inertia, lock in on inefficient solutions, or conflicts of interest that result in wide from the second best solution that the institutions are intended to achieve[37] The deviation of the institutions from their ideal is the result of the difficulty of enforcement, "there are two reasons why enforcement is typically imperfect… the cost of measuring the multiple margins that constitute contract performance [and] the fact that enforcement is undertaken by agents whose own utility functions influence outcomes."[38] Central to the challenge of monitoring, is the agency issue. "The agency issue is ubiquitous in hierarchical organizations. The problem of monitoring and metering the various attributes that constitutes the performance of agents in contrast to the standard neoclassical frictionless model.[39] Thus, agency, asymmetric information and conflicts of interests are the barriers and imperfections in that drive organizations farther from the goal of efficiency.

Behavioral Economics

Over the past couple of decades, behavioral economics has mounted a second major challenge to the dominant economic paradigm.[40] The neoclassical paradigm at the core of

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[34] North, p8…. 11.
[35] North, p. 27.
[36] Norht, p. 34.
[37] North, p. 7.
[38] North, p. 54.
[39] North, p. 32.
[40] Wilkinson, Nick, *An Introduction to Behavioral Economics* (Hampshire, Palgrave, 2008); Camerer, Colin F, George Lowenstein and Matthew Rabin (Eds.), *Advances in Behavioral Economics* (New York: Russell Sage, 2004).

market structural analysis makes assumptions about the nature of human behavior that are necessary for its propositions and conclusions to be valid. Economic actors are presumed to be narrowly focused on their own economic interest and fully capable of pursuing those interests with rational precision. People are assumed to rationally and consistently pursue selfish, utility maximization according to a time consistent discounting model based on Bayesian probabilities for outcomes in which all income and assets are fungible.[41]

Behavioral economics challenges every assumption of this model of economic actors at the level of motivation, perception and calculation. For purposes of policy analysis, we believe the findings of behavioral economics can be usefully divided into three groups – motivation, perception and calculation. Wilkinson's *Introduction to Behavioral Economic*, has two sets of chapters, one foundational, one advanced, that can be organized according to this scheme as follows:

Motivation:	Foundations: Values, Attitudes, Preferences and Choice, Nature and Measurement of Utility, Advanced: Fairness and Social Preferences
Perception	Foundations: Decision-making under Risk and Uncertainty, Utility Theory, Prospect Theory, Reference Points, Loss aversion, Decision Weighting Advanced: Behavioral Game Theory, Bargaining, Signaling, Learning
Calculation	Foundations: Mental Accounting, Framing and Editing, Budgeting and Fungibility, Choice Bracketing, Advanced: The Discounted Utility Model, Alternative Intertemporal Choice Models

People engage in behaviors for many reasons, other than economics, including habit and custom. Values other than economic value are important. Non-economic factors, like habit, altruism and fairness are important motivators of human action. There appear to be specific biases in the way people value outcomes (e.g. avoiding loss is more highly valued making gains).

Whatever their motivation, people do not perceive their movement toward a goal as purely or simplistically efficiency maximizing. They view the world from an initial starting point and select goals and strategies from that perspective and they are influenced by social factors as they move toward the goal. People are reflective and social, sensitive to norms, social influence and learning. They view outcomes from a subjective perspective relative to where they are, where they were and where others are.

Their willingness and ability to engage in calculation is limited. In a complex world, calculation is challenging. They adopt rules of thumb and heuristics that result in bounded rationality. They do not discount well, misjudging small, low probability or distant events. We add to this, the observation that their ability to implement choice once made may deficient as well.

C. THE GENERAL EFFICIENCY GAP LITERATURE

This section reviews several discussion of the efficiency gap that draw on the generic analyses of market failure discussed above. It begins with two observations at a general level offered early in the debate, and then it looks at two more detailed frameworks. These two discussions of market failure in energy efficiency are by two major research organizations

[41] Paraphrasing Wilkinson, Introduction, p. 5.

published over a decade apart (Lawrence Berkeley Laboratory and Resource for the Future). These are institutions that generally have very different views on the need for public policy. The first draws from a series of papers written in the mid 1990s by researchers at the Lawrence Berkeley Laboratory, who are generally supportive of government intervention in the market.[42] The second draws from a series of papers written over a decade later by researchers at Resources for the Future, who are generally skeptical of government intervention.[43] Despite the many years and different perspectives between them, they produce very similar discussions of the problem of market failure. We will briefly summarize the approaches taken in these studies and then present a composite description of the barriers, obstacles and challenges to increasing energy efficiency.

The Link Between the General Literature and the Efficiency Literature

These concepts of market failure form the general literature have direct applicability to the energy efficiency gap. Over a decade ago, Decanio authored a series of articles analyzing market failure in the adoption of energy efficiency technologies with a review of specific causes of market failures that highlights the endemic imperfections identified in the pervious analysis.

He was careful distinguish the source of market failure from behavioral issues that might arise at the individual level and to focus on structural and institutional issues.

> In thinking about why firms may not always behave optimally, it is important to remember that a firm is a collection of individuals; brought together under a complex set of contracts both written and unwritten, but that the firm itself is not an entity acting with a single mind… The behaviour of the firm is the outcome of the interplay of the motivations of the individuals comprising it, rules and conventions governing their interaction and the environment within which the firm operates….
>
> The individuals making up a business firm may all be rational seekers after their own interests, but he outcome of their collective action may be suboptimal. The presence of public goods, externalities, and the clash between individuals' private incentives and the good of the whole all combine to produce outcomes that fall short of what could be obtained if all the resources of the group were deployed by a single guiding intelligence.[44]

His analysis launches from observations about "asymmetric information and divergent incentives" noting that "even without limitations on the ability of individuals to 'comprehend and compute' the complex reality they face, institutions and other restriction on information availability and real differences in the underlying interests of the parties can lead to suboptimal results."[45]

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[42] Golove, William H. and Joseph H. Eto, Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency.

[43] Kenneth Gillinham, Richard G. Newell, and Karen Palmer, *Energy Efficiency Economics and Policy* (Resources for the Future, April 2009).

[44] Stephen J. Decanio, "Barriers within Firms to Energy-Efficient Investments," *Energy Policy,* September 1993, (hereafter, Barriers)pp. 906-907.

[45] Decanio, Barriers, p. 908.

He then explains the complex set of endemic problems that affect market behavior and outcomes.

> Indeed, a major task of organizational design is to induce the managers of a stockholder owned corporate to act in a manner as consistent as possible with the interests of the owners. This manifestation of the principal-agent problem leads to a variety of reason why profitable investments might not be undertaken.
>
> One frequently cited factor causing under investment in energy savings technologies is the alleged shortsightedness of management. This myopia is usually thought of as being manifested in very short payback periods required for energy (and other) investments, or unduly high internal hurdle rates.[46]

While this may sound like recourse to the individual level, Decanio offers structural and institutional reasons why the myopia might exist.

> Yet deeper consideration of the situation facing the owners and management of a large, multidivisional corporation uncovers several factors that might lead to adoption of overly stringent investment criteria, despite the fact that the cost of capital faced by the firms is considerably lower than the hurdle rates that projects are required to meet in order to be accepted.
>
> Managerial compensation is often tied to recent performance, and in many corporations, managers are rotated through different jobs every few years… [T]]his sort of frequent job turnover may lead managers to prefer projects with short payback periods… The shareholders cannot easily observe the true profitability of projects, so they may not be able to prevent dissipation of profits into managerial slack (defined as the excess of resources allocated over the minimum necessary to accomplish the tasks assigned) if a lower hurdle rate close to the cost of capital were applied. Imposition of a too high hurdle rate means that some profitable projects are foregone, but it still constitutes a second-best solution to the owners' monitoring and control problem.
>
> In a principal-agent framework, executives may under invest in relatively risky projects if they perceive those project to have a potentially negative impact on their own welfare… a conflict to interest exists because even if the principal can observe which projects are selected, the principal cannot know *why* they were selected…
>
> A similar rationale for a bias in favor of projects with rapid paybacks arises when moral hazard is present in the agency relationship….Moral hazard is present if the principal (the owner) cannot observe either the manager's effort or the random state of nature, *ex post,* and the manager has disutility for effort. In this case,

[46] Decanio, Barriers, p. 908.

> projects with more rapid paybacks may enable the owner to set contract terms for the manager that control the moral hazard at lower cost.[47]

While Decanio emphasizes the endemic causes of failure in energy markets, almost a quarter of a century ago, Stern used the findings of the behavioral economics to explain why the neoclassical assumptions about consumer price increases were dubious, at best, for analyzing energy efficiency. Neoclassical economists assumed that consumers respond equally to the size of increases and decreases in real prices. Behavioral economics suggests that consumers may respond quite differently.

> Although people are typically assumed to respond to marginal prices, they are more likely to notice average prices, and the limited evidence suggests that what people perceive most clearly is neither of these, but rather the total cost (for example, the monthly electric bill, rather than the marginal price per kilowatt hour). People are usually assumed to respond to real, rather than nominal prices, although the evidence on this point is inconclusive… The assumptions, typical in policy models, that demand is a smooth function of price and that the behavioral response to price change is independent of the speed of change seem to disregard the perceptual processes that determine whether stimuli are recognizably differential. Smoothing curves makes sense for forecasting, but for policy analysis, it is important to know whether a small stimulus or slow change will produce a small response or will be imperceptible. Finally, the almost universal assumption that people respond to price increases and decreases symmetrically seems to contradict research on cognition that shows that people respond more strongly to prospects of loss (such as price increases) than to prospects of gain (such as price decreases).[48]

People may respond to the speed (more than size) of average (more rather than marginal), nominal (rather than real) changes in bills (not prices), and more to increases than decreases (rather than symmetrically).

The LBL Framework

A 2004 report to the California Energy Commission from Lawrence Berkeley Laboratory captures much of the above discussion of market failure in the form of technology penetration frontiers (See Exhibit III-3). The output variable is the reduction of greenhouse gas emissions, which is certainly appropriate for the current proceeding from the EPA point of view and, since there is a direct physical relationship between tailpipe emissions and gasoline consumption, it fits the NHTSA purpose as well. We have preserved the labels from the original in Exhibit III-3, but added in some of the specific factors the analysis cites in its case studies. The graph shows the penetration of energy efficiency technologies along the X-axis and cost of carbon along the Y-axis.

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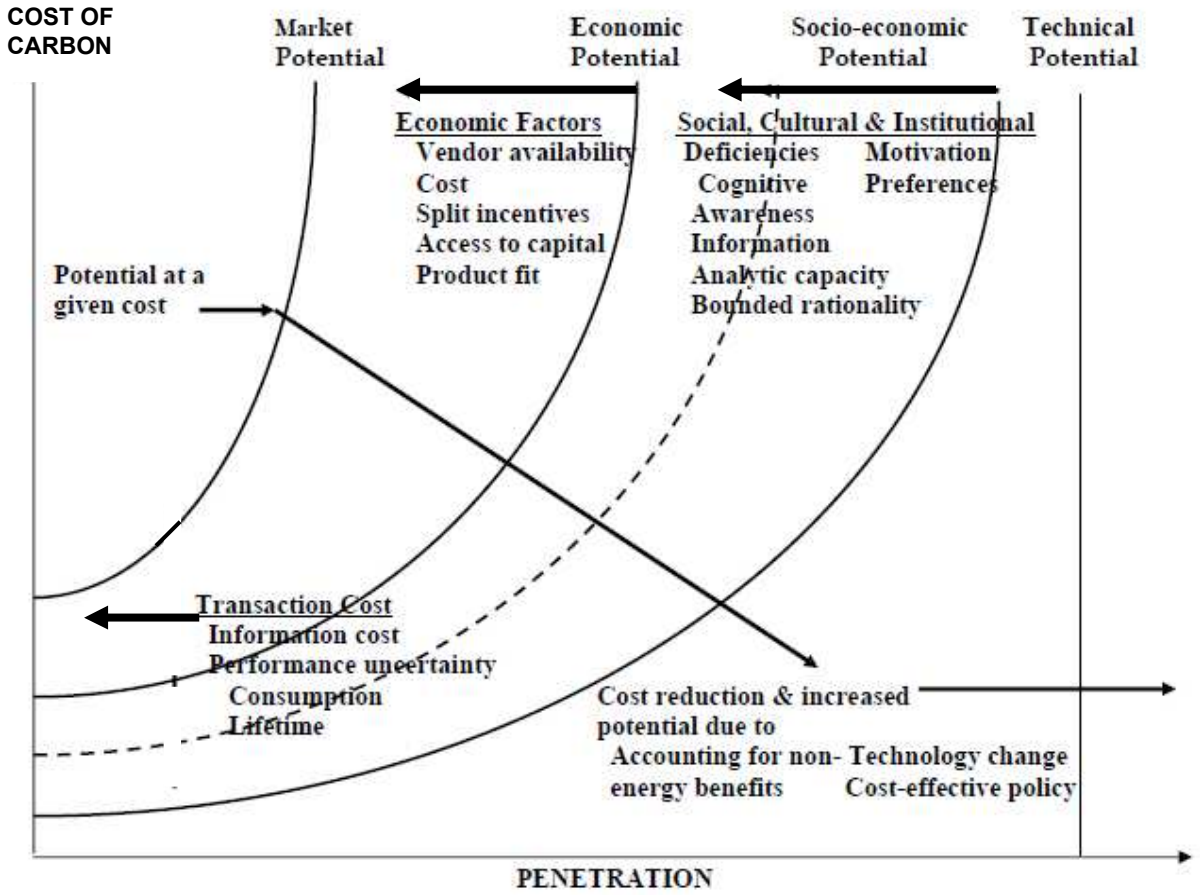
[47] Decanio, pp. 908, 909

[48] Stern Paul C., "Blind Spots in Policy Analysis: What Economics Does Not Say about Energy Use," *Journal of Policy Analysis and Management,"* 5:2 (1986), p. 203.

EXHIBIT III-3: PENETRATION OF MITIGATION TECHNOLOGIES: A CONCEPTUAL FRAMEWORK



Source: Jayant Sathaye and Scott Murtishaw, *Market Failures, Consumer Preferences, and Transaction Costs in Energy Efficiency Purchase Decisions* (California Energy Commission, November 2004), consultant report, p. 11.

At the extreme right is the maximum technical potential reduction in carbon achievable with the penetration of available technology. In the 2008 rulemaking, NHTSA calculated this limit as the "Technology Exhaust" scenario. The level of reduction in carbon that is achieved in the marketplace is lower because several sets of factors keep the technologies from penetrating the market. The exhibit identifies all of the major categories of market imperfections, barriers, obstacles, etc. discussed above – behavioral factors (social, cultural & institutional), economic factors and transaction costs – each of which establishes a different frontier. Technological change and public policy play an important role in determining where the market will settle along a given frontier as well as influencing where the technological limit is. Thus, this presentation arrays the market structure analysis presented in Exhibit III-1 in a technology investment framework.

We add a distinction within the Social/Cultural/Institutional category between what we call deficiencies, i.e. behavioral characteristics and processes that lead consumers to under invest in efficiency even though they are interested in doing so, and motivational factors, i.e. consumer

preferences that lead to under investment in efficiency because they do not value it. This distinction is important in the current context because the agencies have assumed no change in product attributes. The goal is to achieve efficiency without changing the attributes of the vehicles. As the literature review shows, given constant preferences, there are numerous behavioral factors that reduce the amount consumers choose to invest in energy efficiency. Another set of factors moves consumer along the frontiers. A higher price on carbon, or a lower cost to reduce carbon would move investment up the frontier.

A 1996 paper prepared by leading analysts at the Lawrence Berkeley Laboratory,[49] written in the midst of the electricity deregulation movement, was driven by a concern that "ratepayer-funded utility energy-efficiency programs are likely to change in size, scope, and nature as the deregulation process proceeds."[50] The paper "focuses on understanding to what extent some form of future intervention may be warranted and how we might judge the success of particular interventions."[51] These questions remain front and center today.

Deregulation in the electricity sector did not fare very well or spread throughout the utility industry, and in the past few years, reliance on interventions in the market to increase efficiency and renewables has grown, even in the deregulated states.[52] The growth of market interventions is consistent with the conclusions in the LBL paper. "We conclude that there are compelling justifications for future energy-efficiency policies. Nevertheless, in order to succeed, they must be based on a sound understanding of the market problems they seek to correct and a realistic assessment of their likely efficacy".[53]

LBL identified four broad categories of factors that inhibited investments in energy efficiency – barriers, transactions costs, market failures, and behavioral (noneconomic) factors. Exhibit III-3 categorizes these barriers to efficiency and provides the supporting text. It identifies about two-dozen specific factors spread roughly equally across these four categories. A key aspect of the analysis is to identify each of the categories as coming from a different tradition in the economic literature. The barriers category is made up of what we have called market structural factors. The market failure category is made up of externalities and imperfect competition (which we place in the structural category).

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[49] Golove, William H. and Joseph H. Eto, *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency,* Energy and Environment Division, Lawrence Berkeley Laboratory, March 1996.

[50] Golove and to, Market Barriers, p. iv.

[51] Golov and Eto, Market Barriers, p. iv.

[52] There has recently however, been a dramatic re-commitment to publicly-sponsored energy efficiency and a substantial increase in allocated resources. (Sanstad, p. 6-5).

[53] Golove and Eto, Market Barriers,, p. x.

EXHIBIT III-4: LAWRENCE BERKELEY LABORATORY MARKET FAILURE ANALYSIS

Barriers[1]
- Misplaced incentives
  - Agency[4]
- Capital
  - Illiquidity[8]
- Bundling
  - Multi-attribute
    - Gold Plating[11]
    - Inseparability[13]
- Regulation
  - Price Distortion[14]
- Chain of Barriers
  - Disaggregated Mkt.[15]

Transaction Cost[2]
- Sunk costs[3]
- Lifetime[5]
- Risk[6] & Uncertainty[7]
- Asymmetric Info.[9]
- Imperfect Info.[10]
- Availability
  - Cost[12]
  - Accuracy

Behavioral (noneconomic) factors[16]
- Custom[17]
- Values[18] & Commitment[19]
- Social group & status[21]
- Psychological
  - Prospect[24]
- Bounded rationality[26]
  - Ability to process info[27]

Market Failures
- Externalities
- Mis-pricing[20]
- Public Goods[22]
- Basic research[23]
- Information (Learning by Doing)[25]
- Imperfect Competition/Market Power[28]

Sources and Notes:

1) Six market barriers were initially identified: 1) misplaced incentives, 2) lack of access to financing, 3) flaws in market structure, 4) mis-pricing imposed by regulation, 5) decision influenced by custom, and 6) lack of information or misinformation. Subsequently a seventh barrier, referred to as "gold plating," was added to the taxonomy (p.9).

2) Neo-classical economics generally relies on the assumption of frictionless transactions in which no costs are associated with the transaction itself. In other words, the costs of such activities as collecting and analyzing information; negotiating with potential suppliers, partners, and customers; and assuming risk are assumed to be nonexistent or insignificant. This assumption has been increasingly challenged in recent years. The insights developed through these challenges represent an important new way to evaluate aspects of various market failures (especially those associated with imperfect information). Transaction cost economics examines the implications of evidence suggesting that transaction costs are not insignificant but, in fact, constitute a primary explanation for the particular form taken by many economic institutions and contractual relations (p. 22).

3) Transaction cost economics also offers support for claims that the illiquidity of certain investments leads to higher interest rates being required by investors in those investments (p. 23).

4) Misplaced, or split, incentives are transactions or exchanges where the economic benefits of energy conservation do not accrue to the person who is trying to conserve (p. 9).

5) Thus, as the rated lifetime of equipment increases, the uncertainty and the value of future benefits will be discounted significantly. The irreversibility of most energy efficiency investments is said to increase the cost of such investments because secondary markets do not exist or are not well-developed for most types of efficient equipment. This argument contends that illiquidity results in an option value to delaying investment in energy efficiency, which multiplies the necessary return from such investments (p. 16)

6) If a consumer wishes to purchase an energy-efficient piece of equipment, its efficiency should reduce the risk to the lender (by improving the borrower's net cash flow, one component of credit-worthiness5) and should, but does not, reduce the interest rate, according to the proponents of the theory of market barriers. (p.10). Potential investors, it is argued, will increase their discount rates to account for this uncertainty or risk because they are unable to diversify it away. The capital asset pricing model (CAPM) is invoked to make this point (p. 16).

7) Perfect information includes knowledge of the future, including, for example, future energy prices. Because the future is unknowable, uncertainty and risk are imposed on many transactions. The extent to which these unresolvable uncertainties affect the value of energy efficiency is one of the central questions in the market barriers debate. Of course, inability to predict the future is not unique to energy service markets. What is unique is the inability to diversify the risks associated with future uncertainty to the same extent that is available in other markets (p. 20).

8) In practice, we observe that some potential borrowers, for example low-income individuals and small business owners, are frequently unable to borrow at any price as the result of their economic status or "credit-worthiness." This lack of access to capital inhibits investments in

energy efficiency by these classes of consumers (p. 10).

9) Finally, Williamson (1985) argues that the key issue surrounding information is not its public goods character, but rather its asymmetric distribution combined with the tendency of those who have it to use it opportunistically (p. 23).

10) [K]nowledge of current and future prices, technological options and developments, and all other factors that might influence the economics of a particular investment. Economists acknowledge that these conditions are frequently not and in some cases can never be met. A series of information market failures have been identified as inhibiting investments in energy efficiency: (1) the lack of information, (2) the cost of information, (3) the accuracy of information, and (4) the ability to use or act upon information (p. 20).

11) The notion of "gold plating" emerged from research suggesting that energy efficiency is frequently coupled with other costly features and is not available separately (p.11).

12) Even when information is potentially available, it frequently is expensive to acquire, requiring time, money or both (p. 20).

13) Inseparability of features refers specifically to cases where availability is inhibited by technological limitations. There may be direct tradeoffs between energy efficiency and other desirable features of a product. In contrast to gold plating where the consumer must purchase more features than are desired, the inseparability of features demands purchases of lower levels of features than desired. (p.12)

14) The regulation barrier referred to mis-pricing energy forms (such as electricity and natural gas) whose price was set administratively by regulatory bodies (p. 11).

15) On the cost-side of the equation, the critics contend that, among other things, information and search costs have typically been ignored or underestimated in engineering/economic analyses. Time and/or money may be spent: acquiring new information (search costs), installing new equipment, training operators and maintenance technicians, or supporting increased maintenance that may be associated with the energy efficient equipment (p.16). [T]he class, itself, consists of a distribution of consumers: some could economically purchase additional efficiency, while others will find the new level of efficiency is not cost effective (p. 13).

16) Discounted cash-flow, cost-benefit, and social welfare analyses use price as the complete measure of value although in very different ways; behavioral scientists, on the other hand, have argued that a number of "noneconomic" variables contribute significantly to consumer decision making (p. 17).

17) [C]ustom and information have evolved significantly during the market barrier debate (p. 11).

18) In the language of (economic) utility theory, the profitability of energy efficiency investments is but one attribute consumers evaluate in making the investment. The value placed on these other attributes may, in some cases, outweigh the importance of the economic return on investment (p. 19).

19) [P]sychological considerations such as commitment and motivation play a key role in consumer decisions about energy efficiency investments (p. 17).

20) Externalities refer to costs or benefits associated with a particular economic activity or transaction that do not accrue to the participants in the activity (p. 18).

21) Other factors, such as membership in social groups, status considerations, and expressions of personal values play key roles in consumer decision-making (p.17). In order for a market to function effectively, all parties to an exchange or transaction must have equal bargaining power. In the event of unequal bargaining positions, we would expect that self-interest would lead to the exploitation of bargaining advantages (p. 19).

22) Public goods are said to represent a market failure. It has been generally acknowledged by economists and efficiency advocates that public good market failures affect the energy services market. (p. 19) [T]he creation of information is limited because information has public good qualities. That is, there may be limits to the creator's ability to capture the full benefits of the sale or transfer of information, in part because of the low cost of subsequent reproduction and distribution of the information, thus reducing the incentive to create information that might otherwise have significant value (p. 20).

23) Investment in basic research in believed to be subject to this shortcoming; because the information created as a result of such research may not be protected by patent or other property right, the producer of the information may be unable to capture the value of his/her creation (p. 19).

24) Important theoretical refinements to this concept, known as prospect theory, have been developed by Tversky and Kahneman (1981, 1986). This theory contends that individuals do not make decisions by maximizing prospective utility, but rather in terms of difference from an initial reference point. In addition, it is argued that individuals value equal gains and losses from this reference point differently, weighing losses more heavily than gains (p.21).

25) The information created by the adoption of a new technology by a given firm also has the characteristics of a public good. To the extent that this information is known by competitors, the risk associated with the subsequent adoption of this same technology may be reduced, yet the value inherent in this reduced risk cannot be captured by its creator (p. 19).

26) This work is consistent with the notion of bounded rationality in economic theory. In contrast to the standard economic assumption that all decision makers are perfectly informed and have the absolute intention and ability to make decisions that maximize their own welfare, bounded rationality emphasizes limitations to rational decision making that are imposed by constraints on a decision maker's attention, resources, and ability to process information. It assumes that economic actors intend to be rational, but are only able to exercise their rationality to a limited extent (p.21).

27) Finally, individuals and firms are limited in their ability to use — store, retrieve, and analyze — information. Given the quantity and complexity of information pertinent to energy efficiency investment decisions, this condition has received much consideration in the market barriers debate (p. 20).

28) This barrier suggests that certain powerful firms may be able to inhibit the introduction by competitors of energy-efficient, cost-effective products (p. 10).

Source: Golove, William H. and Joseph H. Eto, *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency*

The LBL paper bases a substantial part of its argument on a transaction cost perspective as a critique of neo-classical economics.

> Neo-classical economics generally relies on the assumption of frictionless transactions in which no costs are associated with the transaction itself. In other words, the cost of such activities as collecting and analyzing information; negotiating with potential suppliers, partners and customers; and risk are assumed to be nonexistent or insignificant. This assumption has been increasingly challenged in recent years. The insights developed through these challenges represent an important way to evaluate aspects of various market failures (especially those associated with imperfect information).[54]

Starting from the observation that "transaction costs are not insignificant but, in fact, constitute a primary explanation for the particular form taken by many economic institutions and contractual relations"[55] the LBL paper identifies such costs and information as a critical issue, pointing out that "the key issue surrounding information is not its public goods character, but rather its asymmetric distribution combined with the tendency of those who have it to use it opportunistically."[56] Indeed, information plays a very large role in the analysis, entering in six different ways. In addition to the public goods and asymmetry concerns, the paper identifies four other ways information can create a barrier to efficiency –"(1) the lack of information, (2) the cost of information, (3) the accuracy of information, and (4) the ability to use or act upon information."[57]

The RFF Framework

A recent paper from Resources for the Future, entitled *Energy Efficiency Economics and Policy,* addresses exactly the same issues as the earlier LBL paper – the debate over the "efficiency gap" observed in energy markets.

> Much of the literature on energy efficiency focuses on elucidating the potential rationales for policy intervention and evaluating the effectiveness and cost of such interventions in practice. Within this literature, there is a long-standing debate surrounding the commonly cited "energy efficiency gap..." Within the investment framework… the energy efficiency gap takes the form of under investment in energy efficiency relative to a description of the socially optimal level of energy efficiency. Such under investment is also sometimes described as an observed rate or probability of adoption of energy-efficient technologies that is "too slow."[58]

The RFF paper suggests three broad categories of market failures – the individual, the interaction between economic agents and the fit between economic agents and society. We refer to these three levels as the behavioral, the market structural and the societal levels.

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[54] Golove and Eto, Market Barriers, p. 22.
[55] Golove and Eto, Market Barriers, p. 23.
[56] Golove and Eto, Market Barriers, p. 23.
[57] Golove and Eto, Market Barriers, p. 20.
[58] Kenneth Gillinham, Richard G. Newell, and Karen Palmer, *Energy Efficiency Economics and Policy* (Resources for the Future, April 2009), p. 7.

In the present context, we consider behavioral failures to represent consumer behavior that is inconsistent with utility maximization, or in the current context, energy service cost-minimization. In contrast, market failure analysis is distinct in presupposing individual rationality and focusing on the conditions surrounding interactions among economic agents and society[59] Exhibit III-5 is taken from the RFF paper, but extended in two ways. In the market failure category, it shows the distinction between the structural and societal levels suggested by the above quote. It also includes a few more specific failures that were discussed in the text, but not included in the original table. There are about a dozen specific market failures spread across these categories. The text to define each of the barriers is provided in the table.

EXHIBIT III-5: RESOURCES FOR THE FUTURE: POTENTIAL MARKET FAILURES

Potential Market Failures	Potential Policy Options
Societal Failures	
Energy Market Failures	
Environmental Externalities [1]	Emissions pricing (tax, cap and trade)
Energy Security	Energy Taxation; strategic reserves
Innovation market failures	
Research and development spillovers[2]	R&D tax credit; public funding
Learning-by-doing spillovers[3]	Incentives for early adoption
Learning-by-using[4]	Information program
Structural Failures	
Capital Market Failures	
Liquidity constraints[5]	Finance/Loan Programs
Information problems[6]	
Lack of information[7]	Information programs
Asymmetric info. > Adverse selection[8]	Information programs
Principal-agent problems[9]	Information programs
Average-cost electricity pricing[10]	Real-time pricing; market pricing
Potential Behavioral Failures[11]	
Prospect theory[12]	Education, information, product Stds.
Bounded rationality[13]	Education, information, product Stds.
Heuristic decision making[14]	Education, information, product Stds.
Information[15]	Education, information, product Stds

Sources and Notes

1) **Externalities**: the common theme in energy market failures is that energy prices do not reflect the true marginal social cost of energy consumption, either through environmental externalities, average cost pricing, or national security (p. 9).

2) **R&D spillovers** may lead to underinvestment in energy-efficient technology innovation due to the public good nature of knowledge, whereby individual firms are unable to fully capture the benefits from their innovation efforts, which instead accrue partly to other firms and consumers (p. 11).

3) **Learning-by-doing** (LBD) refers to the empirical observation that as cumulative production of new technologies increases, the cost of production tends to decline as the firm learns from experience how to reduce its costs (Arrow 1962). LBD may be associated with a market failure if the learning creates knowledge that spills over to other firms in the industry, lowering the costs for others without compensation.

4) Positive externalities associated with learning-by-using can exist where the adopter of a new energy-efficient product creates knowledge about the product through its use, and others freely benefit from the information generated about the existence, characteristics, and performance of the product (p. 12).

5) **Capital:** Some purchasers of equipment may choose the less energy-efficient product due to lack of access to credit, resulting in underinvestment in energy efficiency and reflected in an implicit discount rate that is above typical market levels (p. 13).

6) **Information:** Specific information problems cited include consumers' lack of information about the availability of and savings from energy-efficient products, asymmetric information, principal-agent or split-incentive problems, and externalities associated with learning-by-using (p. 11).

[59] Gillingham, Newell and Palmer, p. 8.

7) Lack of information and asymmetric information are often given as reasons why consumers systematically underinvest in energy efficiency. The idea is that consumers often lack sufficient information about the difference in future operating costs between more-efficient and less-efficient goods necessary to make proper investment decisions (p. 11).

8) Asymmetric information, where one party involved in a transaction has more information than another, may lead to adverse selection (p. 11).

9) Agency: The principal-agent or split-incentive problem describes a situation where one party (the agent), such as a builder or landlord, decides the level of energy efficiency in a building, while a second party (the principal), such as the purchaser or tenant, pays the energy bills. When the principal has incomplete information about the energy efficiency of the building, the first party may not be able to recoup the costs of energy efficiency investments in the purchase price or rent charged for the building. The agent will then underinvest in energy efficiency relative to the social optimum, creating a market failure (p. 12).

10) Prices faced by consumers in electricity markets also may not reflect marginal social costs due to the common use of average-cost pricing under utility regulation. Average-cost pricing could lead to under- or overuse of electricity relative to the economic optimum (p. 10).

11) Systematic biases in consumer decision making that lead to underinvestment in energy efficiency relative to the cost-minimizing level are also often included among market barriers. (p. 8); The behavioral economics literature has drawn attention to several systematic biases in consumer decision making that may be relevant to decisions regarding investment in energy efficiency. Similar insights can be gained from the literature on energy decision-making in psychology and sociology. The evidence that consumer decisions are not always perfectly rational is quite strong, beginning with Tversky and Kahneman's research indicating that both sophisticated and naïve respondents will consistently violate axioms of rational choice in certain situations (p. 15).

12) The welfare change from gains and losses is evaluated with respect to a reference point, usually the status quo. In addition, consumers are risk averse with respect to gains and risk seeking with respect to losses, so that the welfare change is much greater from a loss than from an expected gain of the same magnitude (Kahneman and Tversky 1979). This can lead to loss aversion, anchoring, status quo bias, and other anomalous behavior (p. 16).

13) Bounded rationality suggests that consumers are rational, but face cognitive constraints in processing information that lead to deviation from rationality in certain circumstances (p. 16); Assessing the future savings requires forming expectations of future energy prices, changes in other operating costs related to the energy use (e.g., pollution charges), intensity of use of the product, and equipment lifetime. Comparing these expected future cash flows to the initial cost requires discounting the future cash flows to present values (p. 3).

14) Heuristic decision-making is related closely to bounded rationality and encompasses a variety of decision strategies that differ in some critical way from conventional utility maximization in order to reduce the cognitive burden of decision-making. Tversky (1972) develops the theory of elimination-by-aspects," wherein consumers use a sequential decision making process where they first narrow their full choice set to a smaller set by eliminating products that do not have some desired feature or aspect (e.g., cost above a certain level), and then they optimize among the smaller choice set, possibly after eliminating further products. (p. 16) For example, for decisions regarding energy-efficient investments consumers tend to use a simple payback measure where the total investment cost is divided by the future savings calculated by using the energy price today, rather than the price at the time of the savings— effectively ignoring future increases in real fuel prices (p. 17). The salience effect may influence energy efficiency decisions, potentially contributing to an overemphasis on the initial cost of an energy-efficient purchase, leading to an underinvestment in energy efficiency. This may be related to evidence suggesting that decision makers are more sensitive to up-front investment costs than energy operating costs, although this evidence may also be the result of inappropriate measures of expectations of future energy use and prices (p. 17).

15) Alternatively, information problems may occur when there are behavioral failures, so that consumers are not appropriately taking future reductions in energy costs into account in making present investments in energy efficiency (p. 12).

Source: Kenneth Gillinham, Richard G. Newell, and Karen Palmer, *Energy Efficiency Economics and Policy* (Resources for the Future, April 2009) (Entitled "Commonly Cited Market and Behavioral Failures Relevant to Energy Efficiency Along with Potential Policy Responses").

The societal level market failures are closest to what the traditional sources of the economic literature refer to as market failure. These are primarily externalities and public goods. These were also considered market failures in the LBL framework. The LBL barriers and transaction costs fit in the category of interactions between economic agents, as would imperfect competition.

One obvious and important point is that, once again, information problems occur in all three categories of the RFF analysis, with several manifestations in each. Information can be a problem at the societal level since it can be considered a public good that is not produced because the authors of the information cannot capture the social value of information. It is a structural problem because, where it is lacking, even capable, well-motivated individuals cannot make efficient choices and where it is asymmetric, individuals can take advantage of the less informed to produce outcomes that are not efficient. It is a problem at the behavioral level where individuals lack the ability to process and use information.

LBL did not offer specific policy recommendations to address the market imperfections, but RFF did. These are included in Exhibit III-4.

A second paper from RFF emphasizes a broader range of supply-side market imperfections that affects the long-term availability of technology. These affect research, development and demonstration, in addition to deployment. Beyond the general externality issue, there are a number of more discrete problems identified in the energy sector that are akin to classic externalities. Individual firms have little incentive to invest in basic research or to deploy enabling technologies because they have difficulty capturing the gains.[60] There are investments that are necessary to support a variety of complementary investments whose value cannot be captured by individual actions. More broadly, knowledge spillovers flow from technological development in a manner that may have much greater social value than individual firms can capture.[61] Similarly, network effects of complex energy systems may create social values that exceed the private value of individual actions.[62] The challenge of large or complex projects can pose problems.[63] In complex systems, developing and deploying new technologies in response to policy mandates, assessing and assigning liability and providing insurance may be a great challenge.[64]

Individuals or firms can be expected to make private calculations that minimize their direct cost, but they cannot be expected to figure the benefits of avoiding the impact of more expensive alternatives down the road, costs that have broader impacts,[65] particularly when the options impose high costs on a dispersed set of individuals.[66] Cost compression and

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[60] Raymond J. Kopp and William A Pizer, *Assessing U.S. Climate Policy Options* (Washington, D.C.: Resources for the Future, November 2007).pp. 118-120, "R&D tends to be underprovided in a competitive markets because its benefits are often widely distributed and difficult to capture by individual firms…. economics literature on R&D points to the difficulty firms face in capturing all the benefits from their investments in innovation, which tend to spill over to other technology producers and users."

[61] Kopp and Pizer, Assessing, " In addition, by virtue of its critical role in the higher educations system, public R&D funding will continue to be important in training researchers and engineers with the skill necessary to work in either the public or private sector to product GHG-reducing technology innovations (p. 120)… Generic public funding for research tends to receive widespread support based on significant positive spillovers that are often associated with the generation of new knowledge. (p. 136)."

[62] Kopp and Pizer, Assessing, p. 137. Network effects provide a motivation for deployment policies aimed at improving coordination and planning – and where appropriate, developing compatibility standards – in situations that involve interrelated technologies, particularly within large integrated systems (for example, energy productions, transmission, and distribution networks). Setting standards in a network context may reduce excess inertia (for example, the so-called chicken-and-egg problems with alternative fuel vehicles), while simultaneously reducing search and coordination costs, but standard scan also reduce the diversity of technology options offered and may impede innovation over time.

[63] Kopp and Pizer, Assessing, p. 120, "Similarly, rationales for public support of technology demonstration projects tend to point to the large expense; high degree of technical, market and regulatory risk; and inability of private firms to capture the rewards for rewards for designing and constructing first-of-a-kind facilities."

[64] Kopp and Pizer, Assessing, p. 137, "Finally, incomplete insurance markets may provide a rationale for liability protection or other policies for certain technology options (for example, long-term CO2 storage)."

[65] Kopp and Pizer, Assessing, p. xx, Many technologies have competing or multiplicative (rather than additive) impact. The most compelling economics typically reside with the first abatement options in the analytical sequence. Pursuing energy efficiency in electric power, for example, has the potential to reduce the number of new coal-fired power plants needed.

[66] Kopp and Pizer, Assessing, p. 120, "The mismatch between near-term technology investment and long-term needs is likely to be even greater in a situation where the magnitude of desired GHG reductions can be expected

learning/innovation resulting from economies of scale is a benefit that policy may promote where individuals cannot.[67]

Because of the long-lived nature of the assets in this sector, uncertainty plays an important role. Planning for and investing over such a long time period is difficult. There are critical technological development/deployment issues that arise at the societal level. Uncertainty about technologies in a space that emerges out of a policy concern rather than being the outgrowth of a market driven process, may pose a unique challenge[68] because the economic value is contingent upon a continuing commitment to the policy.[69]

D. THE IMPORTANT ROLE OF THE SUPPLY-SIDE IN THE ENERGY MARKET FAILURE

Since the sources of market failure on the consumer side have been acknowledged in the Notice and supporting materials, and worked over thoroughly in the literature, we believe it is important to elaborate on the supply-side causes of market failure. As depicted in Exhibit III-6, which is from our comments in the 2008 proceeding, we view the supply-side problems as antecedent to the demand-side problems. Because the Notice has raised the consumer welfare issue and the prospect of a joint standard setting process opens the possibility of altering the approach to standard setting, in these comments we expand the discussion of market failure, especially on the supply-side.

In 2008, we summarized the important role of supply side and market structural factors as follows; here we expand on that discussion.

> The cars that are sold in the marketplace reflect not only what consumers want to but also, what automakers want to sell. Automakers spend millions on advertising and promotions to move the metal that makes the most profit for them. It is simply wrong to claim that all the advertising and marketing has no effect.
>
> Failing to recognize the imperfections on the supply-side leads NHTSA to an over reliance on automaker product plans. Thus, it is a much better representation of reality to say that the auto market undervalues fuel economy. The problem is not just the consumer. Indeed, the automakers may be a bigger part of the problem. If automakers are required to produce and sell more fuel-efficient vehicles, they will have to change their advertising and marketing focus. With the automaker resistance to more fuel efficient vehicles dampened, the apparent market valuation

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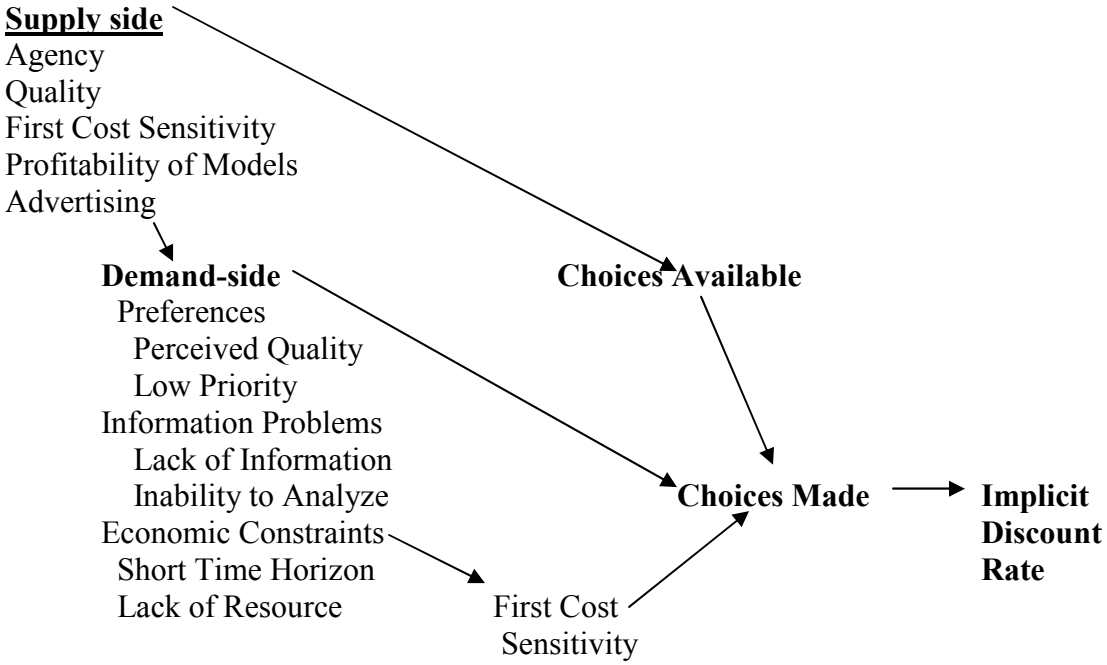
to increase over tie. If more stringent emissions constraint will eventually be needed, society will benefit from near-term R&D to lower the cost of achieving those reductions in the future."

[67] Kopp and Pizer, Assessing, p. 136, "Another potential rationale involves spillover effects that he process of so-called "learning-by-doing" – a term that describes the tendency for production costs to fall as manufacturers gain production experience."

[68] Kopp and Pizer, Assessing, p. 120, "The problem of private-sector under investment in technology innovation may be exacerbated in the climate context where the energy assets involved are often very-long lives and where the incentives for bringing forward new technology rest heavily on domestic and international policies rather than natural market forces."

[69] Kopp and Pizer, p. 120, "Put another way, the development of climate-friendly technologies has little market value absent a sustained, credible government commitment to reducing GHG emissions."

EXHIBIT III-6:
IMPERFECTIONS IN THE AUTO MARKET



Source: 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.

of fuel economy will rise quickly. It is the automakers who have been at least as large a drag on fuel economy as consumers.

Automakers prefer to sell certain models because they are more profitable. They prefer simple technologies that are less demanding to produce and maintain. They have a first cost bias, seeking to keep the sticker price low. They seek to influence the public to purchase the vehicles that best suit their interests. On the supply-side there is an agency problem – a separation between the builder or purchaser of buildings and appliances and the user. Suppliers may not choose to manufacture or stock efficient vehicles if they are less profitable, hoping that advertising and showroom persuasion can point consumers in the direction the manufacturers want them to go.

Consumers are influenced by advertising and may not perceive quality properly. The priorities afforded to any particular attribute are difficult to discern in a multi-attribute product. They lack the information necessary to make informed choices. The life cycle cost calculation is difficult, particularly when projections about future gasoline prices and vehicle use are necessary.

> Even when they do consider efficiency investments, they may not find the more efficient vehicles to be available in the marketplace.
>
> We view the apparent high discount rate attributed to consumers as the result of other factors not the root cause of the demand-side problem. We do not accept the claim that consumers are expressing irrational preferences for high returns on efficiency investments; irrational because they appear to be a return that is so much higher than they can get on other investments they routinely have available. Rather, we view the implicit discount rate as a reflection of the fact that the marketplace has offered an inadequate range of options to consumers who are ill-informed and unprepared to conduct the appropriate analysis and who lack the resources necessary to make the correct actions.[70]

The apparently grossly irrational discount rate reflects market imperfections and failures, not irrational consumers.

> The implicit discount rates calculated from consumer choices reflect not only individual time preferences but a whole collection of variables that may depress the ultimate level of investment. The calculated discount rate is affected by consumers' price expectations and their levels of certainty about these; the extent to which available information is imperfect, mistrusted, or ignored; the purchase of some equipment to quickly replace nonfunctioning equipment rather than to minimize life-cycle cost; the presence in the market of builders, landlords, and other purchasers who will not pay for the energy the equipment uses; the fact that consumers with limited capital do not always purchase what they would if they had more capital; differential marketing efforts for different products, and so forth. Recognizing such possibilities, some analysts say that the data reflect "market discount rates."[71]

The implication is that policies that alter the supply-side conditions in which consumers make decisions will lead to different market outcomes.

In a recent analysis Greene focused attention on the consumer decision-making under uncertainty about investments in fixed assets as the origin of the market failure. He sees this as a problem that lies at the intersection of transaction cost[72] and behavioral economics,[73] but then

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[70] Comment 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, pp. 38-40.

[71] Stern, Blind Spots, p. 209;

[72] David L. Greene, John German and Mark A. Delucchi, "Fuel Economy: The Case for Market Failrue," in Dan Sperling and James S. Cannon (Eds.), *Reducing Climate Impact in the Transportation* Sector (Springer, 2009), p. 183, The classical formulation of the rational economic choice model takes no account of the transaction costs of optimization. These include the time, effort and expense of collecting and processing information. If these costs outweigh the potential benefit of an optimal choice, rational consumers would decline to optimize. Comparing fuel economy numbers is relatively easy but few consumers have the tools to convert those fuel economy numbers into estimates present value fuel savings.

[73] Green, German and Delucchi, Fuel Economy, p. 184, A variety of uncertainties make the investment in increased fuel economy a risky bet for consumers. Despite labeling, consumers are not sure what fuel economy will

pointed out that there are a host of potential supply-side problems that can drive the market from optimum efficiency. As those who control the information, automakers have the ability to exploit consumers opportunistically.[74] As the agents who choose which product attributes to bundle, they influence the range of choices available to consumers.[75] The under investment in efficiency technologies becomes a market problem. "If markets undervalue energy efficient technology, it follows that companies will also undervalue investments in research and development to create new efficient technologies."[76] Other authors add additional endemic problems that arise in energy markets including moral hazard[77] and the failure of secondary markets to develop for energy efficiency.[78]

While this approach alone implicates the supply-side of the market in the overall market failure, one does not have to see the supply-side contribution to market failure as derivative of the demand-side problem. The supply-side is an independent cause of market failure, not simply a reflection of demand-side problems. "Actual Firms are more complicated and perhaps less efficient than simple profit-maximization models suggest, even when managers and employees are fully rational.[79]

The supply-side of the market is imperfect at the individual level, although here the unit of analysis is the firm. The deficiencies of the firm compound deficiencies of the individuals that make them up.

> This market failure has little to do with the working of neoclassical markets because the rational action approach fails to appreciate two critical points. First, innovation, organizations and technological substitution are socially regulated matters, and as such they are shaped by a host of non-economic factors. Second, while current technologies may be less than optimally efficient in energy and

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actually be achieved in real world driving. They cannot accurately predict future fuel prices any more than experts can. They are not even certain exactly how much driving they will do, or how long their car will last. Consumers preference for the status quo, combined with fuzzy preferences for future savings guarantee loss-averse behavior. Consumers may be rational and as well informed as possible, yet the market will still decline investments in energy efficiency that have positive expected net present value because of the combined effect of uncertainty and loss aversion.

[74] Green, German and Delucchi, Fuel Economy, p. 183, Information asymmetry occurs when one party to a market transaction possess knowledge superior to the other. The suppliers of air conditioners, for example, will have better information about their energy efficiency than the buyers. This enables unscrupulous sellers to deceive consumes, resulting in a reluctance of consumers to trust even scrupulous sellers' high efficiency claims. The adoption of fuel economy labeling has undoubtedly diminished the importance of this problem, yet manufacturers still advertise vehicles based on their highway mileage rather than their combined city/highway fuel economy rating. (Greene, p. 183)

[75] Green, German and Delucchi, Fuel Economy, p. 203.

[76] Green, German and Delucchi, Fuel Economy, p. 204.

[77] Richard B.Howarth and Bo Anderson, "Market Barriers to Energy Efficiency," *Energy Economics,* October 1993,p. 268, Finally, the problem of "moral hazard' might arise under either energy service contracts or performance guaranteed. To the extent that the energy intensity of a device depends on user behaviour, institutions that weaken user incentives to minimize direct energy costs might lead to reduced energy efficiency. .

[78] Richard B. Howartha nd Alan H. Sanstad, "Discount Rates and Energy Efficiency, *Contemporary Economic Policy,*13, July 1995, p. 104.

[79] Howarth and Sanstad, Discount Rates, p. 107.

> environmental terms, they enable a highly integrated network of industry actors to produce… in uncertain environments…
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> Economic actions are embedded in social relations; the natural evolution of even the most rational organizations involved the absorption of rational ends into a framework of cultural means. organizations as the tools of managers whose ends are not necessarily congruent with those of owners, employees or the long tern welfare of the enterprise… Organizations that appear rational frequently make serious mistakes, bad investments and poor management decisions… The behavior of firms seems to be shaped by a combination of cultural, institutional, macro-social/economics and technical factors).[80]

It is a mistake to assume that either firms or consumers act in markets solely on the basis of rational self-interest. Economic calculations take place in social and cultural contexts including social obligations, normative expectations, social status attainment, and risk avoidance.

Decanio offers a similar set of observations launching from the observation that performance by firms varies widely.[81] He points to a range of factors that push firms from optimum behavior, emphasizing the institutional challenges of large, bureaucratic organizations.

> Perceptive observers have identified a tendency in free societies toward rigidity and over-bureaucratization brought on by the accumulation of rent-seeking activities, political advantage of special interests, and institutionalization of otherwise transitory market advantages. The same kind of institutional arteriosclerosis can afflict business.
>
> All of these explanations of why firms do not make profitable energy-savings investments can be fit within an expanded economic decision framework that includes transaction and monitoring costs, second-best solutions to information deficiencies and bounded rationality of individual members of organizations… Corporate culture, which fundamentally influences the firm's attitude towards change and adaptation, is too complex to be described in terms of economical simplification.[82]

He offers a litany of factors that drive firms from the optimum, including conflict of interest between the center of periphery of the organization, high hurdle rates, priorities, incentives, risk avoidance, sunk costs, and monitoring costs.

Suppliers who make the major choices are affected by factors much like consumers. They are risk averse and exhibit a first cost bias that reflects constrained resources. Efficient products

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[80]Loren Lutxenhier, "Innovation and Organizational Networks: Barriers to Energy Efficiency in U.S; Housing Industry," *Energy Policy,* 22(10) 1994, pp. 867-868.

[81] Stephen DeCanio, "Why Do Profitable Energy-Savings Invetment Projects Languish?" *Journal of Genreal Management,* 20(1) 1994, p. 63. First, it is necessary to discard the baggage carried by most economists that immersion in a market environment guarantees efficiency behaviour by the market participants…. In actuality, companies rise and fall; variations in performance are huge, both across and within sectors

[82] DeCanio, Languish, p. 67

may not be stocked by dealers because of lack of demand[83] or lack of capital. A bias for short-term profits may inhibit innovation. "Firm size may also significantly influence innovation… uncertainty of markets and the drive for short term gains means that these advantages generally translate into higher profits for lower selling costs, rather than innovations in quality or efficiency.[84]

> The organizations can become obstacles to change.
>
> No only do markets often fail to deliver efficiency, but sometimes they introduce uncertainties that make innovation risky… Activity in the industry is highly cyclical… the structure of the industry represents, in part, an adaptation to market cycling.[85]
>
> Large-scale manufacturing and distribution systems can also act as inertial brakes on change… Ironically, complacency resulting from market dominance may also reduce the perceived benefits of innovation.[86]

At the individual level on the supply-side, there is an agency problem – a separation between the builder and purchaser of buildings and appliances and the user.[87] Suppliers may not install energy efficiency technologies properly, as it requires different skills or considerations.[88]

At a more general level, producers are people, just as consumers and they are influenced and affected by the same behavioral factors as consumers. Their profit motivation may mitigate some aspects of the behavioral economic factors that result in less than optimal behavior, but it does not cure all of the problems, with respect to efficient outcomes. Indeed, as suggested above, their profit motive may exacerbate the problem because of the tendency to opportunistically exploit information asymmetries or to under invest in research to maximize short-term profits. IN short, the supply-side also suffers from problems of motivation, perception, calculation and operation with respect to efficiency.

> Firms are faced with myriad concerns other than economic optimization or technical innovation, including internal competition for resources and control,

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[83] McKinsey and Company, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost? – McKinsey and Company for the Conference Board, 2007*p. 16, "Even when consumers intend to purchase energy efficient devices, they may have a hard time finding the item, due to a retailer's approach to inventory management and stock optimization."

[84] Lutzenhiser, Innovation, p. 871.

[85] Lutzenhiser, Innovation, p. 871.

[86] Lutzenhiser, Innovation, p. 872.

[87] McKinsey, Reducing, p. 41, "The owner, operator, occupant and bill-payer (benefit capturer) associated with a building may be separate entities or may not be involved for the full relevant time period; a result, their interests in supporting energy efficiency and GHG abatement are not aligned."

[88] Grene, Gerrman and Delucchi, Fuel Economy, pp. 95-96"Large annual increases in fuel economy require aggressive changes to every aspect of the vehicle. The industry does not have the resources to handle this level of change all at once. Even if it did, it would be too risky to implement the changes all at once….There are also many examples of poor quality vehicles and inadequate technologies rushed to market. The Chevy Chevette, Ford Pinto and Chrysler K cares all offered good fuel economy and sole well at the time, but developed reputations as relatively unreliable vehicles, damaging the reputations of the companies.."

> goal conflicts, information relations and institutional inertia. Changing organizational environments offer opportunities for innovation, but stabilizing network connections can inhibit technical change and slow its transfer. Large-scale systems exhibit considerable momentum, but evolve at uneven rates under the influence of contending interests and ways of thinking…
>
> Perceived costs and risks include question of reliability of alternatives, maintenance problems, call back complaints and risk of damage to reputation, uncertainties regarding requirements and costs of gearing up; uncertain source of supply and technical support; and exclusive distribution agreements.[89]

Policy Implications

At one level, the policy implications of this broader view of market failure are fundamental. For example, several of the analysts who conclude that there is substantial market failure suggest that this requires policy makers to rethink their view of price as a policy instrument.

> Energy analysts have rarely asked two central behavioral questions about price effects: How does the information embodied in price enter a consumer's awareness? And how does awareness of price affect action? Rather, policy models usually make strong assumptions about price responses that probably distort the cognitive processes that mediate those responses…
>
> People may respond to price changes not only as a function of their magnitudes, but also as a function of whether they notice the stimulus… A policy implication of the attentional view of the price response is that it will sometimes be more effective to invest resources in drawing consumers' attention to an increase than to increase the size of the incentive.[90]

At another level and for the purposes of this proceeding, the policy implication is focused in a different area. Whatever one thinks about the merits of price versus other policy instruments is irrelevant. Congress has made the choice of policy instruments in the statutes that authorize the agencies to set standards. Standard setting may be the best solution to the market failure, or the second best (compared to price), but Congress has chosen it. The agencies could conclude that the policy will be less effective than the engineering analyses project because the policy instrument does not address critical market imperfections, but they must do so within the parameters set by Congress.

In fact, we have seen both conceptual and empirical evidence to suggest that standard setting and approach to policy that is an effective instrument for achieving the goals Congress has set. In the above analysis, the role that standards can play in addressing the behavioral factors underlying market failure, about which there is consensus, seems to be widely accepted.

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[89] Lutzenhiser, Innovation,p. 871-872).
[90] Stern, Blind Spots, p. 203.

Recent analyses seem to put these issues at the core of the problem in the energy market. That is, with the overwhelming evidence of a large and persistent efficiency gap, some have tried to "resolve" the market failure problem by relabeling it. Instead of a market failure, it is seen as a "normal" market that is sluggish in the face of uncertainty surrounding investments that are irreversible and immobile resulting in sunk costs. Faced with the risk of loss in an uncertain environment, consumers and producers wait. It has been pointed out that this does not resolve the policy debate, since policies to reduce risk and uncertainty can speed the market toward "objectively" efficient outcomes, particularly where the individual perception of risk is different from the actual societal level of risk. The entire analysis is reframed as an externality problem, centered not on the true cost to society, but on the true risk to society.

In fact, some analysts envision this broader role for the setting of standards.

> The uncertainty/loss aversion model of consumers' fuel economy decision making implies that consumers will undervalue expected future fuel savings to roughly the same degree as manufacturers' perception that consumers demand short payback periods. This suggests that increasing fuel prices may not be the most effective policy for increasing the application of technologies to increase passenger and light truck fuel economy. This view is supported by the similar levels of technology applied to U.S. and European passenger cars in the 1990s, despite fuel prices roughly three times higher in Europe. It is also circumstantially supported by the adoption by governments around the world of regulatory standard for light-duty vehicle fuel economy and carbon dioxide emissions.[91]

This view moves standards into the transaction costs arena as a solution to the market failure problem. But the ability of standards to address the market failure problems goes beyond their ability to address the barriers to investment in efficiency enhancing technologies grounded in the view that focuses on consumer behavioral and transaction cost economics. Standard can address the behavioral and transaction cost problems that afflict the supply-side of the market, as well as some of the structural problems, as shown in Exhibit III-7.

> A principle finding is that frictionless models of competitive equilibrium are incomplete and potentially misleading guide to energy policy. Good policy arguably involves more than simply "getting prices right." A potential role exists for governments to intercede when the vagaries of market institutions lead to lags in the development and adoption of energy-efficient technologies.[92]

> Subjective uncertainty, however, may stem from the fact that precise estimates of energy prices and equipment performance are costly to obtain from the perspective of individual consumers. If the costs of gathering information were

[91] Green, German and Delucchi, Fuel Economy, p. 203; "Discount rates used by consumers in these purchases can be expected to include potentially substantial permia for risk, liquidity, and uncertainty," .

[92] Howarth and Anderson, Market Barriers, p. 264.

EXHIBIT III-7:
CAUSES OF MARKET FAILURE ADDRESSED BY STANDARDS

ENDEMIC FLAWS
- Agency
- Asymmetric Information
- Moral Hazard

STRUCTURAL PROBLEMS
- Scale
- Bundling
- Cost Structure
- Product Cycle
- Availability

SOCIETAL FAILURES
- Externalities
- Information

TRANSACTION COSTS
- Sunk Costs, Risk
- Risk & Uncertainty
- Imperfect Information

BEHAVIORAL FACTORS
- Motivation
- Calculation/Discounting

pooled across individuals, substantial economies of scale should b achieved which could reduce the uncertainties associated with certain technologies.[93]

The informational requirements that must be met to identify an efficient tax regime, however, are particularly onerous. The government must know not only the level of consumer expectations but also the specific way in which they are formed, and this information must be effectively conveyed to manufacturers through the structure of the tax. In practice, such information may be very difficult to obtain reducing the efficacy of tax instruments.

Such limitations suggest a potential role for the direct regulation of equipment performance. Energy efficiency standards led to demonstrable improvement in the fuel economy of automobiles in the 1970s and early 1980s. State and local governments set requirements concerning the thermal performance of building elements.[94]

In some cases the direct regulation of equipment performance might side-step problems of asymmetric information, transaction costs and bounded rationality,

[93] Howarth and Anderson, Market Barriers, p. 265.
[94] Howarth and Anderson, Market Barriers, p. 264..

obviating the need for individual consumers to make unguided choices between alternative technologies.[95]

This literature review has presented a broad-brush overview of a very large subject. Many of the analyses cited present empirical evidence to support the conceptual conclusions we have woven together into the case for the importance of the supply-side and market structure and causes of market failure. Building the analytic framework has a substantial pay-off. It leads to important conclusions about the path public policy should follow.

- Standards are a good candidate to address the problem.

- Because they do not assess the extent to which the supply-side causes the efficiency gap, the consumer choice models as currently configured are not a measure of the value consumers would or should place on energy efficiency if the market was not so fundamentally flawed. They will mislead policy makers about the value of policies to promote efficiency.

- Understanding the important role that institutions and organizations play in the economy also allows us to conduct an institutional capacity assessment of the two agencies. Motivation (legislative mandate), perspective (time horizon, technology forcing), calculation (economic constraints), and implementation (measurement of fuel economy) all argue for the EPA under the Clean Air Act as the lead agency.

[95] Howarth and Sanstad, Discount Rates, p. 108.

IV. CONSUMER AND PRODUCER BEHAVIOR AS INDICATORS OF SUPPLY-SIDE MARKET FAILURE

At the heart of the market failure debate are three questions

- What do consumers want?
- What do automakers offer them?
- Why does there appear to be a misfit between the two?

This section presents analyses conducted by the Consumer Federation America into these questions. The analyses presented here buttress the basic conclusion that we reached in our analysis of the standards in Section II and the literature in Section III.

- The analysis embedded in the literature on the "efficiency gap" explains why consumers do not demand as much efficiency as they should.
- The econometric evidence cited by the agencies in the Notice and supporting materials support the conclusion that consumers are willing to pay for more efficiency than automakers are providing.
- Our analysis shows consumers want more fuel economy than the automakers have been supplying for a period of time that is long enough for them to have done a better job.

The econometric evidence cited indicates that over the period from 1997 through 2007, there was a clear shift in consumer demand toward more fuel efficient vehicles in both the new and used car markets, as the study contained in Appendix A shows. The shift was not strong enough, however, to eliminate the very large "efficiency gap." Our reading of the theoretical and empirical evidence indicates that a significant part of the problem was caused by the failure of automakers to make more fuel-efficient vehicles available to consumers. The study in Appendix B supports that conclusion with basic market data. Over the period from 1998 to 2007, the period in which gasoline prices more than double on a fairly continuous basis, the absolute number and percent of models with fuel economy above 30 miles per gallon did not rise in proportion to the gasoline price or the shift in consumer demand. When consumers walked into show rooms, they found half as many models that got 30 mpg or more than they found a decade earlier, in spite of the dramatic increase in gasoline prices.

We have recently updated several aspects of the studies in Appendices A and B (See Exhibit IV-1). Our new survey found that 78 percent of Americans strongly support increasing fuel economy standards to 35 mpg by 2016. Despite current gas prices below $3 a gallon, a large majority remains concerned about future gas prices (74%) and dependence on Middle-Eastern oil (70%). As the table below shows, public opinion on this issue has remained extraordinarily consistent over the nearly 5 years of CFA consumer surveys. The persistence of great concern about gas prices and dependence on oil imports shows a strong base of public support for significant improvements in motor vehicle fuel economy.

Exhibit IV-1:
Public Concern about Key Energy Issues (great concern in parentheses)

	Gasoline Prices	Middle Eastern Oil Dependency	Global Warming
November 2009[96]	74 (55%)	70% (49%)	46% (33%)
January 2009	76 (60)	76 (60)	55 (40)
April 2008	85 (73)	76 (60)	52 (37)
July 2007	82 (65)	74 (52)	61 (46)
October 2006	67 (48)	64 (48)	51 (36)
May 2006	81 (67)	73 (54)	54 (38)
August 2005	86 (74)	75 (56)	55 (31)
February 2005	81 (65)	70 (50)	49 (33)

Source: CFA consumer survey (ORC) February 2005 - November 2009

Automakers are still not providing the fuel-efficient cars consumers want. Only 4% of the 1,040 EPA rated 2010 models have an overall fuel economy rating of 30 mpg and above (see Exhibit IV-2). Consumers roaming through new car lots will only find that 44 of the 1040 models offered get over 30 mpg. Given that the preponderance of fuel inefficient vehicles was a major factor in the crash of the U.S. automobile industry, it is remarkable that so few of today's vehicles get over 30 mpg. An important reason for much, much stronger fuel economy requirements in the future is to protect the car companies from themselves. When consumers are drowning in a sea of fuel-inefficient cars, it is hard to see the efficient ones and difficult to get vehicles that combine the attributes they want with the fuel economy they desire. The statement that "fuel-efficient cars are currently offered for sale," is misrepresents the reality, when one looks at the distribution of choices consumers were offered, that it should be treated as effectively false.

EXHIBIT IV-2: 2006-2010 COMBINED FUEL ECONOMY RATINGS COMPARISON USING CURRENT EPA TESTING AND CFA'S MILEAGE RATING SYSTEM

Mileage Rating Scale		2006		2007		2008		2009		2010	
Rating	Miles per Gallon	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Excellent	Over 40 MPG	4	0.4%	2	0.2%	2	0.2%	2	0.2%	4	0.4%
Good	30-39 MPG	7	0.7%	7	0.6%	11	0.9%	15	1.3%	40	3.8%
30 MPG and Above		11	1.0%	9	0.8%	13	1.1%	17	1.4%	44	4.2%
Fair	20-29 MPG	385	35.8%	431	36.4%	437	36.5%	440	37.2%	552	53.1%
Poor	Under 20 MPG	680	63.2%	744	62.8%	748	62.4%	725	61.3%	444	42.7%
Under 30 MPG		1065	99.0%	1175	99.2%	1185	98.9%	1165	98.6%	996	95.8%
Totals		1076	100.0%	1184	100.0%	1198	100.0%	1182	100.0%	1040	100.0%

Totals for each year include all vehicles with EPA fuel economy estimates from 2006 to 2010. Combined fuel economy estimates were calculated using the EPA estimate of 55% city and 45% highway driving. 2006-2007 MPG ratings were converted to the 2008 EPA rating, which factors in faster speeds and acceleration, air conditioner use, and colder outside temperatures, using the calculator provided by EPA.

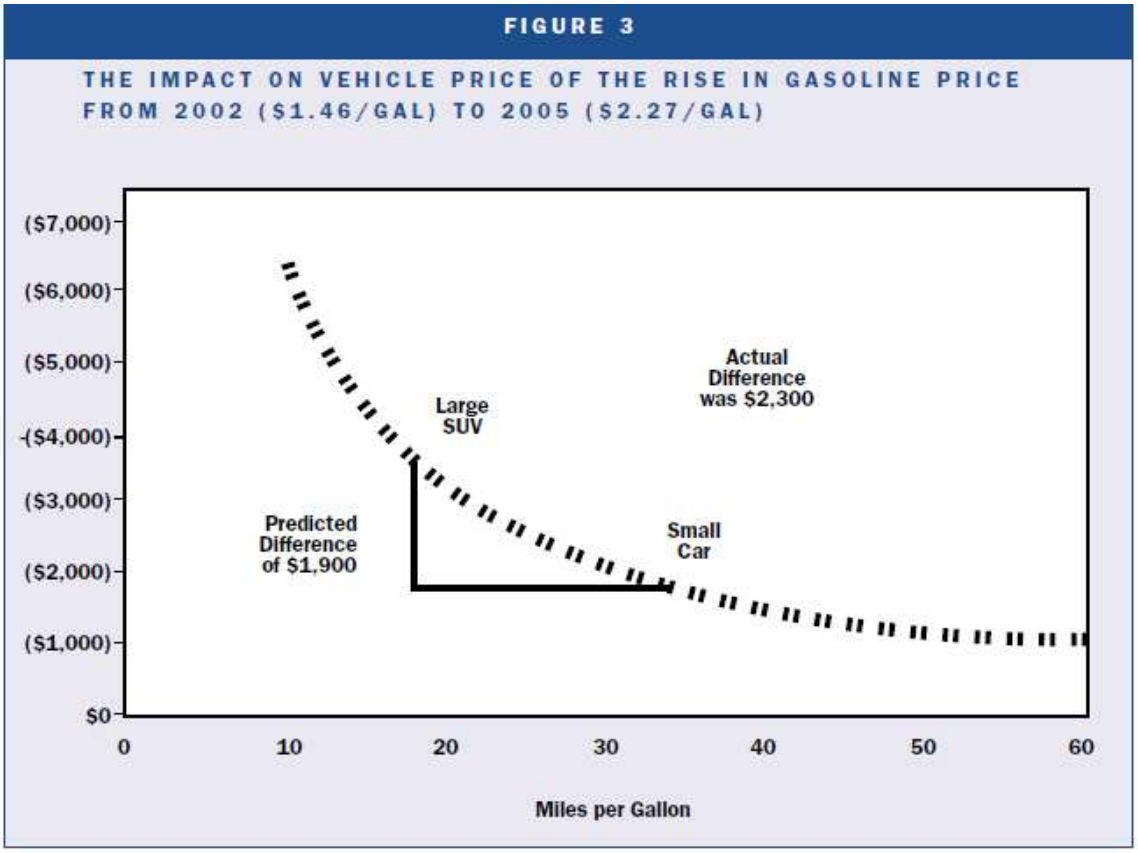
Consumer Federation of America's Mileage Rating Scale (MRS): CFA developed the MRS as an easy way for consumers to identify better performing vehicles and to monitor industry improvements. As indicated in the chart, there are 4 possible mileage ratings covering various MPG ranges.

Early in this decade, the automakers had been pressed by policy makers to provide more fuel-efficient vehicles, and they promised to do so, but they failed to follow through. Failing to recognize and anticipate consumer demand, they continued to expand the stock of fuel inefficient vehicles and tried to cover their mistake by dramatically lowering the price to prop up demand. As losses mounted and when demand finally collapsed, they were left in the dire straits we now find them.

This history is particularly significant for the rulemaking process. While NHTSA/EPA must grant the industry some relief in the near term, if the wound was self-inflicted, then the agencies can have confidence that by raising the standard in the years ahead, they will be doing the industry a service, not imposing harm upon it.

In the previous discussion, we have seen circumstantial and some econometric evidence that links gasoline prices to auto prices. Walter McManus draws the link between the movement of prices and the failure of the automakers to react. His econometric model that analyzes the relationship between gasoline costs and car prices predicts a $1900 relative price decline between a large SUV and a small car, compared to the actual price decline of $2,300, based on data from 2002 to 2005 (see Exhibit IV-3). Gasoline prices had steadily risen over the period, by a total of more than fifty percent, yet looking at the U.S. automakers' statements and product announcements, he finds that they simply did not believe the increase in fuel prices mattered.

EXHIBIT IV-3: GASOLINE PRICES AND VEHICLE PRICES



Source: Walter McManus, The Link between Gasoline Prices and Vehicle Sales: Economic Theory Trumps Conventional Detroit Wisdom, PPRA Paper No. 3463, November 7, 2007. p. 59

> We presented evidence that a significant portion of changes in vehicle prices can be explained by changes in fuel prices. …In disaggregate data on 445 individual vehicles for 2002 to 2005, we showed that the negative impact of rising fuel prices on vehicle prices is greater for less fuel efficient vehicles than for more fuel efficient vehicles.
>
> Detroit maintained well into 2005 that rising fuel prices were not having an impact on sales of less fuel-efficient, more profitable SUVs. It is difficult to explain this lapse in sound economic analysis. Perhaps public statements concerning sales forecasting and sales reporting have become more public relations than economics, and the denial of a link between fuel prices and sales was helpful in justifying decisions that had already been made. Perhaps the practice of defining "sales" as the crude count of units sold, which may be appropriate for production planning but not marketing, meant that economists spent too much time explaining differences in unit sales and thus missed the impact of the actual changes in prices. Perhaps the weight of Detroit's challenge to slow the ongoing loss of market share to Japan and Europe (and the fact that whenever Detroit's incentives slowed, so did Detroit's sales) made digging into the details a low priority.
>
> Whatever the reasons, Detroit did not accept or publicly admit the link between fuel prices and vehicle demand until it was impossible to ignore. The industry would have benefited from a greater adherence to the principles of economics.[97]

Of course, the automakers were dead wrong. Gasoline prices continued to mount, consumers continued to shift their purchasing patterns, and the U.S. automakers continued to fail to adjust, causing the bankruptcy of two of the big three.[98]

The two bodies of research in this section, document the details of the failure by looking at the misfit between consumer attitudes and purchasing patterns on the one hand and the product lines the automakers were offering, on the other.

From the point of view of analysis of market performance, the implications are that automakers contributed substantially to this failure of the market to deliver energy efficiency in the vehicle fleet. The public policy implications of this market failure are also profound. Throughout this period, NHTSA was actively engaged in rulemakings on light duty vehicles –

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[97] Walter McManus, The Link between Gasoline Prices and Vehicle Sales: Economic Theory Trumps Conventional Detroit Wisdom, PPRA Paper No. 3463, November 7, 2007. p. 59

[98] It was not only U.S. automakers that failed to see the important shift. An executive from Honda dismissed the shift in 2007 (see John German, "Lead Time, Customers, and Technology, Technology Opportunities and limits on the Rate of Deployment," in Dan Sperling and James S. Cannon (Eds.), *Reducing Climate Impact in the Transportation* Sector (Springer, 2009),p. 90) Certainly, the recent increase in fuel prices will cause some change in customer behavior, but it is unlikely to cause major changes in customer demand. Also, there is no evidence that most customers would be willing to spend money just for the good of society. The view of most consumers is that it is the government's job to ensure that the needs of society are met, and even most environmentalists do not appear to be willing to pay extra themselves. Customers will generally accept cost increases if the government requires all other purchasers to also contribute to societal solutions

first trucks, then cars and trucks. The approach to setting fuel economy standards was deficient, allowing the product plans of the automakers to constrain the increases in fuel economy that NHTSA would order.

In Section II, we demonstrated the institutional causes of this regulatory failure. Our analysis of NHTSA's approach to writing fuel economy standards filed in the 2008 proceeding finds so many flaws and biases against increasing fuel economy standards that one suspects these institutional weaknesses were reinforced by the process of "regulatory capture," a well-documented process in the economic literature, in which the agency regulating an industry becomes highly sympathetic to its interests, which undermines its ability to regulate in a manner that promotes and protects the public interest.[99] Appendix C is an excerpt from the technical Appendix to our 2008 comments that identifies the critical problems in NHTSA's approach to standard setting. Of the major flaws identified in the overall approach to the analysis (see Table Appendix C, A-2), only the fuel price assumption has been corrected, and that is only because the speculative bubble in oil prices has burst.

By joining NHTSA and EPA in this proceeding, some of those flaws have been corrected. Above all, the agencies have moved away from proprietary data to rely on more publicly available sources. Yet, the analysis is still plagued by many of the same flaws. Indeed, the circumstances of the industry have caused the level of the standards set to deviate even farther from the economically efficient and environmentally effective outcome.

The combination of our analysis of the supply-side market failure with the endemic and pervasive flaws in NHTSA's approach to standard setting lead us to conclude that the public interest would be better served if the focal point of standard setting is shifted to EPA.

[99]Stigler, George. 1971. "The Theory of Economic Regulation," *Bell Journal of. Economics and. Management Sciencei*. 2:3-21; Michael E. Levine and Jennifer L. Florrence, "Regulatory Capture, Public Interest and the Public Agenda, *Journal of Law, Economics and Organization,* , 6,1990.

APPENDIX A:
FUEL ECONOMY AND AUTO SALES:
AUTOMAKERS AND THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION IGNORE MARKET SIGNALS

AUGUST 2008

EXECUTIVE SUMMARY

This analysis explores important and fundamental flaws in the underlying economic assumptions made by the National Highway Traffic Safety Administration (NHTSA) in proposing its 2011-2015 fuel economy standards for autos and light trucks that render the draft environmental impact statement (DEIS) insufficient. NHTSA's proposed fleet wide standards that reach a mere 31.7 miles per gallon in 2015 and are grossly inadequate, robbing consumers and the nation of multiple billions of gallons of vital gasoline savings over the next decade. As a result, the DEIS measures the wrong alternatives and reaches the wrong conclusions about environmental impacts.

NHTSA's approach to setting fuel economy standards is

- to start with automaker product plans,
- assert that consumers undervalue fuel economy by demanding unrealistic economic returns from fuel saving technologies and
- assume that automakers are severely constrained in their ability to apply new fuel saving technology.

Neither the product plans nor the assumptions about consumer and automaker behavior relied on in NHTSA's analysis bear any relationship to auto market reality.

- Consumers are looking for higher mileage today than NHTSA has mandated for seven years from now.
- The product plans on which NHTSA based its rule seven years in the future have already been torn up by the automakers, who have belatedly recognized the shift in consumer behavior toward greater fuel economy.
- The mix of cars and trucks that NHTSA projects bears no relationship to the vehicles that consumers are buying.

Relying on auto industry judgment in product plans, which are out of touch with the market reality, NHTSA has proposed fuel economy standards that are far too low. Not only did NHTSA assume that consumers are unwilling to buy fuel economy beyond a very narrow economic assumption, but it also assumed that higher fuel economy has no value in the marketplace (particularly in resale value). Our market behavior analysis and public opinion polling shows that consumers want more fuel-efficient cars than the automakers are offering

them. The crucial role of a higher fuel economy standard is to push the automakers to deliver what the public wants, but NHTSA has failed to do so.

CFA made many of these points in its July comments filed in the rulemaking, but recent events have made the flaws in NHTSA's analysis and framework so much more obvious that we feel obliged to restate our objections to the proposed rule and incorporate new evidence into the record. Our earlier recommendations are all the more compelling in light of the mounting evidence that NHTSA has failed to propose a reasonable standard. NHTSA must:

- Raise the standards for 2011 and 2012; and
- Withdraw the proposed standards for 2013 through 2015, so it can fix its analytical framework and economic assumptions before promulgating fuel standards for those distant years.

The anecdotal evidence of the dramatic changes in the auto market is everywhere. In the past month, the Big Three have announced (or leaked) plans to abandon or slash their leasing businesses because the value of their gas-guzzlers at the end of the lease term is so low that the economics of leasing no longer makes sense. Clearly, fuel economy is a key determinant of the resale value, but NHTSA's analysis assumes that fuel economy has no impact on resale value of vehicles whatsoever.

While data on auto sales for the first half of 2008 make it clear that consumers are highly sensitive to fuel economy in their purchase decisions, our analysis shows that this shift in consumer behavior has been evident for three years. In addition, our analysis reveals that it is not just a shift between trucks (SUVs) and cars, but that it is has also been evident within the car and truck categories.

The automakers were slow to recognize this market change. They chose to continue to produce gas-guzzlers, trying to bribe consumers to purchase them with discounts, rebates and low interest financing. It was a fool's game, and the jig is up. In the past month, the big 3 U.S. automakers have declared their intention to dramatically alter its vehicle mix in the next few years, yet NHTSA assumes that automakers cannot make such changes rapidly. Assuming that vehicle manufacturers are unable to make such changes causes NHTSA to severely underestimate the fuel savings technologies that could be included in new vehicles. Pushing automakers to close the gap is precisely the role of fuel economy standards. The technologies exist to achieve almost twice the fuel savings that NHTSA's proposed rule achieve, but NHTSA has incorrectly assumed that consumers lack the desire and automakers lack the ability to get these technologies into the fleet.

Dramatic changes in the marketplace reflect a greater willingness of consumers to buy more fuel-efficient vehicles (new and used). However, at the core of NHTSA's analysis are assumptions that restrict the inclusion fuel saving technologies in new vehicles. NHTSA's base case fuel economy levels and vehicle mix simply do not reflect the reality of the auto market. Our survey evidence analyzed below demonstrates the motivation and willingness of consumers to purchase more fuel-efficient vehicles and reveals a shocking mismatch between what consumers want and what automakers have been offering.

The remainder of this report examines the increasing responsiveness of the auto market to fuel economy, which was not fully reflected in NHTSA's modeling. NHTSA has based its proposed rule on automaker product plans that are completely outdated. It did not have to set standards beyond 2012 in the current rulemaking and the choice to do so, despite clear evidence that the product plans do not reflect reality, violates the letter and spirit of the Energy Policy Conservation Act (EPCA) as recently amended by the Energy Independence and Security Act of 2007. Instead of proposing rules that achieve the maximum feasible increases in fuel economy, as obligated under the EPCA, NHTSA has proposed rules that are much closer to the minimum allowable.

In our initial comments we demonstrated that if NHTSA repaired the analytic framework and corrected its economic assumptions, it could easily go to a much higher standard that would push the fleet average for 2015 from 31.6 mpg to 34.5 mpg. Given the dynamic developments in the marketplace, NHTSA should certainly consider even higher levels for 2013 to 2015. The highest level of fuel economy that NHTSA considered, called the "technology exhaustion" standard, was based on erroneous assumptions about the inability of automakers to improve fuel economy. The technology exhaustion alternative, which would move the fleet to 41.4 mpg by 2015, is certainly technologically feasible and, under realistic assumptions about the value of oil and externalities, would not only save 50 billion gallons more gasoline, but also produce $30 billion more in net total benefits. With so much potential gain for consumers and the nation, NHTSA must adopt a more realistic model of consumer and automaker behavior, adjust the economic assumption and consider much higher levels of fuel economy.

This report is divided into three sections:

- Consumer Attitudes
- Fuel Economy and Year-Over-Year Changes in Auto Sales
- Changes in Consumer Behavior in Gasoline and Auto Markets

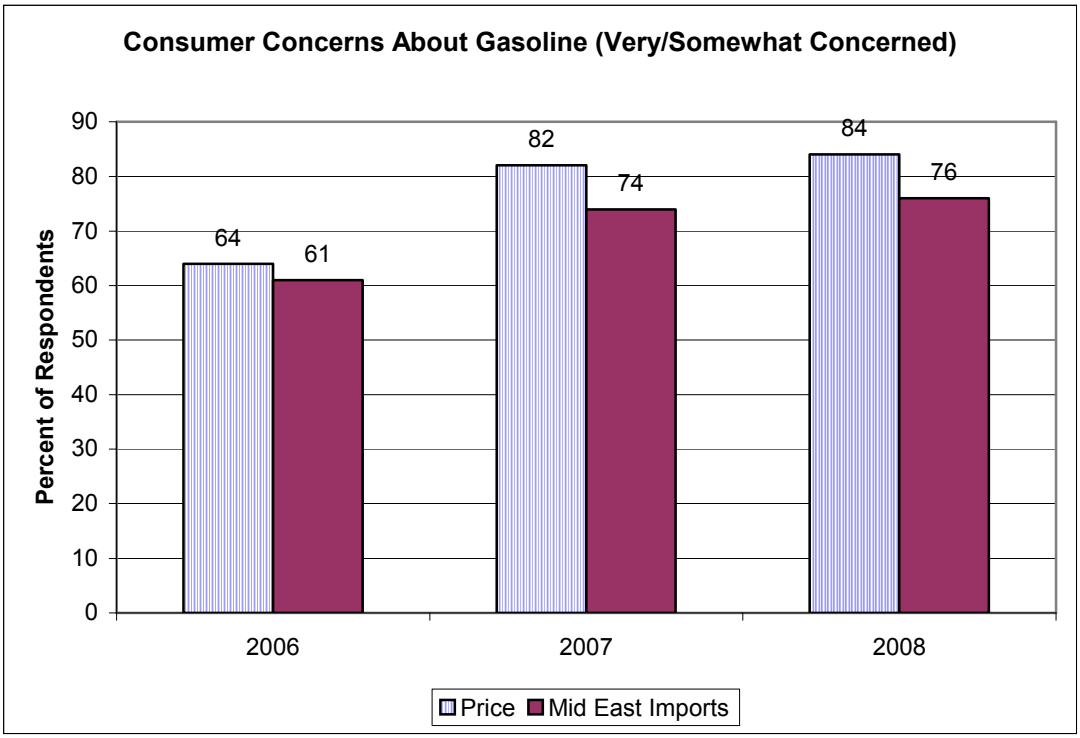
The next section presents a discussion of recent survey evidence on the shift in consumer and market behavior, which must inform NHTSA's analysis. We then analyze year-over-year changes in sales and fuel economy to ascertain when the shift in consumer behavior occurred. Finally, we review long run trends and present an econometric analysis of fuel economy over the past half-decade.

CONSUMER ATTITUDES

Our survey evidence demonstrates the motivation and willingness of consumers to purchase more fuel-efficient vehicles (see Exhibit 1).

- Eighty-four percent of respondents say they are concerned about rising gasoline prices (70 percent very concerned).[100]
- Seventy- six percent of respondents says they are concerned about Mid Eastern oil imports (57 percent very concerned).
- Both of these figures have been rising steadily since we began asking the question about two years ago.

Exhibit 1:



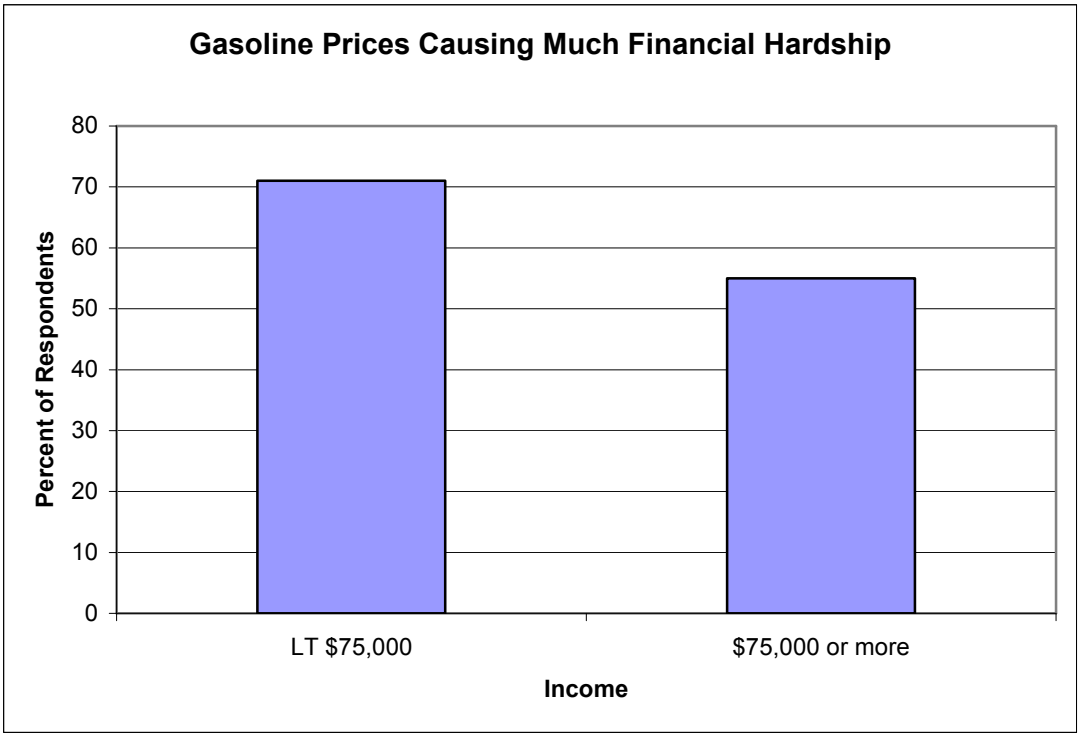
Source: National opinion polls conducted for the Consumer Federation of America by the Opinion Research Corporation. 2008, July 17-20; 2007, see Consumer Federation of America, *No Time to Waste*, available at http://www.consumerfed.org/pdfs/No_Time_To_Waste.pdf 2006 see Consumer Federation of America, *Consumers Still Greatly Concerned About Better Gas Mileage and Oil Imports Despite Falling Gas Prices, available at http://www.consumerfed.org/pdfs/Gas_Mileage_Consumer_Attitudes_Manu_Performance_Press_Release111306.pdf*

[100] "Thinking about the next five years, how concerned personally are you about gasoline prices, U.S. dependency on Mid Eastern oil, and global warming?"

There are no significant differences in these concerns across various demographic categories (age, income, education, gender) with one exception. Households with incomes of $35,000 per year or more are more likely to be concerned about Mid East imports (81 percent) than those with incomes below $35,000 (69 percent).

The concern about gasoline prices reflects the impact that rising gasoline prices are having on the respondents. Eighty-four percent of respondents say that rising gasoline prices have placed a financial burden on their household budgets (63 percent a severe burden). Not surprisingly (see Exhibit 2), households with incomes of $75,000 or more are less likely to say they have suffered much financial hardship (55 percent) than households with incomes below $75,000 (71 percent.) Also, rural households (those living outside of metropolitan areas) are more likely to say they have suffered much financial hardship as a result of gasoline costs (35 percent) compared to those living in urban areas (26 percent).

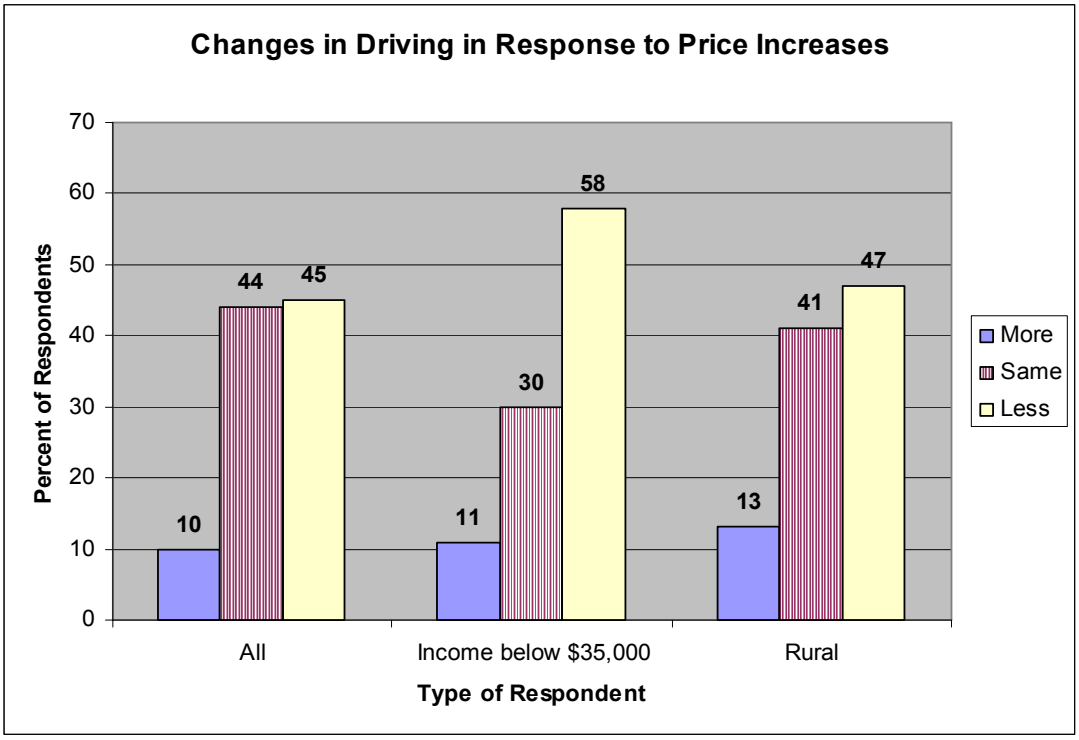
Exhibit 2:



Source: National opinion poll conducted for the Consumer Federation of America by the Opinion Research Corporation. 2008, July 17-20

Our April 2008 survey also helped reveal how Americans are responding to this hardship.[101] When asked (whether they were driving more or less than a year ago, 45 percent of respondents said less, and only 10 percent said more (see Exhibit 3). Lower income households were more likely to say that they were driving less (58 percent compared to 45 percent for all respondents).

Exhibit 3



Source: See Mark Cooper, *Ending America's Oil Addiction* (Washington, D.C.: Consumer Federation of America, April 2008). http://www.consumerfed.org/pdfs/First_Quarterly_Gas_Report_2008.pdf

The most striking result of the most recent survey can be found in responses to questions about the fuel economy of the vehicles consumers currently drive compared to the fuel economy they would like to get in their next vehicles.

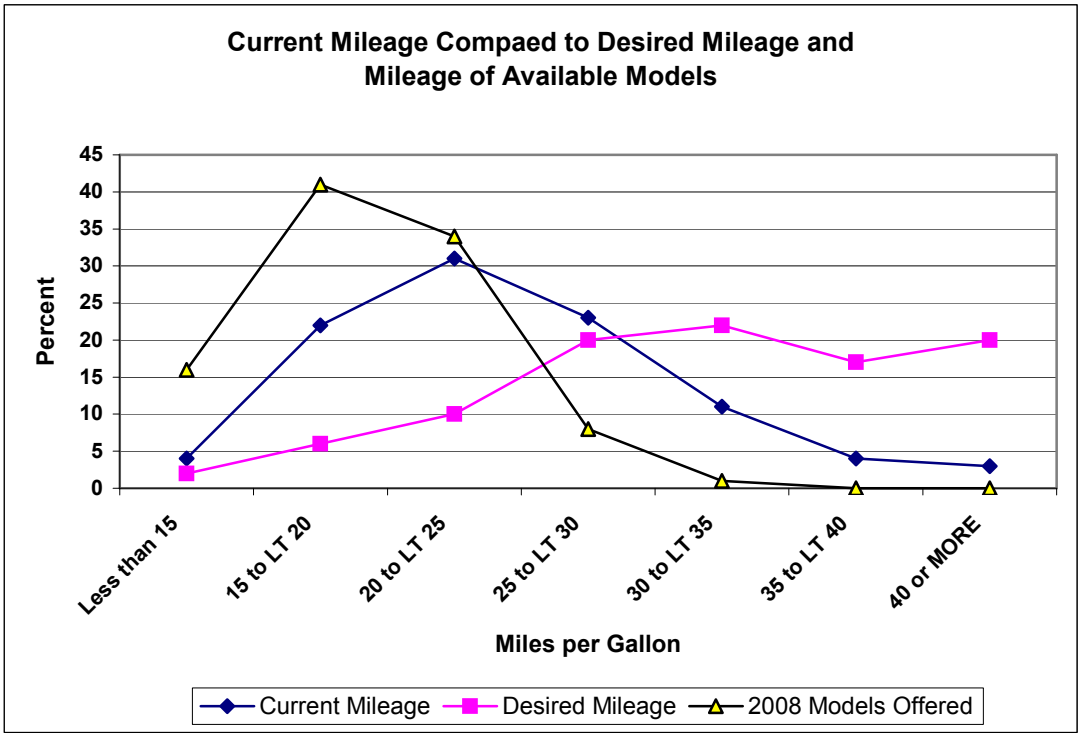
- Among those who drive and intend to purchase a new vehicle, the current average fuel economy is reported at about 24.1 miles per gallon.
- These respondents say they want to get 32.7 miles per gallon in the vehicle they purchase.

There is also a clear mismatch between the desires of consumers and the models that the automakers offered in 2008 (see Exhibit 4).

[101] See Mark Cooper, Ending America's Oil Addiction (Washington, D.C.: Consumer Federation of America, April 2008). http://www.consumerfed.org/pdfs/First_Quarterly_Gas_Report_2008.pdf

- Whereas 59 percent of the respondents say they want to get more than 35 miles per gallon in the next vehicle they purchase, only 1 percent of the 2008 models offered by automakers achieve that mileage.
- The average goal for consumers in the market today is 32.7 miles per gallon, well above the standard of 31.6 miles per gallon that NHTSA has set for 2015.

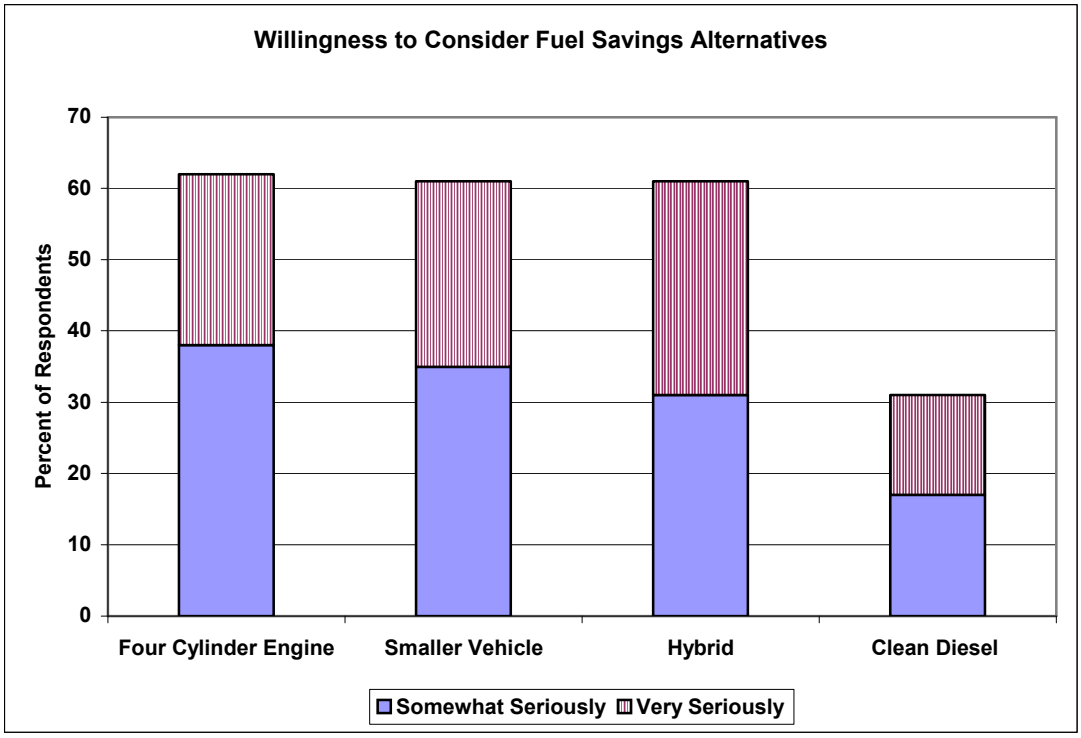
Exhibit 4:



Source: National opinion poll conducted for the Consumer Federation of America by the Opinion Research Corporation. 2008, July 17-20; CFA database on miles per gallon.

Consumers back up their desire to achieve higher fuel economy in their next vehicles with a willingness to consider alternatives that would lower fuel economy (see Exhibit 5.) When asked about four major ways to improve fuel economy, about 60 percent of respondents said they would very or somewhat seriously consider four cylinder engines, hybrids and small vehicles. Clean diesel engines would be considered by about one-third of respondents. There were few differences across demographic categories, with two exceptions. Respondents with incomes above $50,000 were more willing to consider a hybrid (68 percent) than those with incomes below $50,000 (57 percent). Younger (age 18-24) and older respondents (age 65 or more) were less likely (50 percent) to say they would consider a hybrid than respondents with ages between 25 and 65 (70 percent).

Exhibit 5:



Source: National opinion poll conducted for the Consumer Federation of America by the Opinion Research Corporation. 2008, July 17-20;

These attitudes are impacting behavior in the marketplace. Consumers do not just say they are feeling the pinch of rising gasoline prices, or claim to alter their behaviors in reaction to higher gasoline prices, or just express a desire to have more fuel efficient vehicles, the evidence on auto sales suggests that they are taking action. Consumers are switching to smaller vehicles[102] with smaller engines.[103] Large vehicles are piling up on lots and losing value both as new and used vehicles.[104] Automakers are dramatically retooling their production plans in response to consumer behavior.[105]

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[102] David Shephardsom, "U.S. Auto Fleet Hits MPG Record," *Detroit News,* August 13, 2008, " By year's end, when actual car sales are tabulated, the fuel efficiency numbers are expected to be even higher because consumers are responding to high oil and gas prices by buying smaller vehicles, Beth Lowery, General Motor's vice president for the environment said."

[103] Ron Lieber and Tara Siegel Bernard, "Ditch the Gas Guzzler? Well, Maybe Not Just Yet," *New York Times,* August 2, 2008, p. B-4, "Sales of vehicles with four-cylinder engines represented 47.2 percent of all new vehicle sales during June, up from 38.4 percent of all new sales compared to the year-earlier period. "They would be even higher if they were available," said Charlie Vogelheim, vice president of automotive development at J.D. Power and Associates.

[104] Nick Bunkley, "An SUV Traffic Jam," *New York Times,* August 13, 2008, p. C-1.

[105] See University of Michigan Transportation Research Institute, Automotive Analysis Division, "Auto Consumers Restructuring the Auto Industry's Restructuring," *Auto New Service,* Issue 53, for compilation of the announcements and related press.

FUEL ECONOMY AND YEAR-OVER-YEAR CHANGES IN AUTO SALES

While the headlines describing the current woes of the automakers point to a sudden shift in consumer purchasing patterns, a shift from light trucks and large SUVs to more fuel-efficient cars, a close look at the data indicates that:

- There was nothing sudden about the shift.
- It involves much more than a shift from trucks and SUVs to cars (higher fuel economy within vehicle types sells more vehicles).
- Simply put, it did not take $4 gas to cause the change in consumer behavior, it started at least three years ago when gas was $2.50 per gallon and has been growing progressively.

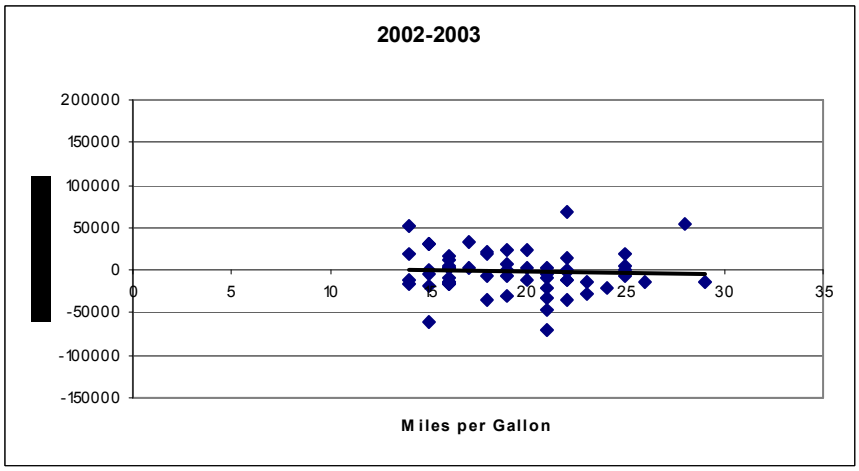
The automakers not only missed the shift in consumer behavior, they actually tried to resist it by continuing to pump out gas-guzzlers and trying to bribe consumers to buy them with rebates and low interest.[106] To examine this issue we compiled a database of the top fifty models in each year and charted their sales (reported by Automotive News) and EPA mileage ratings across time. There is an average of 61 models in each year-to-year comparison (because different models will be included in the top fifty in one year, but not the next). A total of 83 models occurred in the top fifty over this period for which we had sales and mileage data. These models represent an average of approximately two-thirds of all units sold over the period.

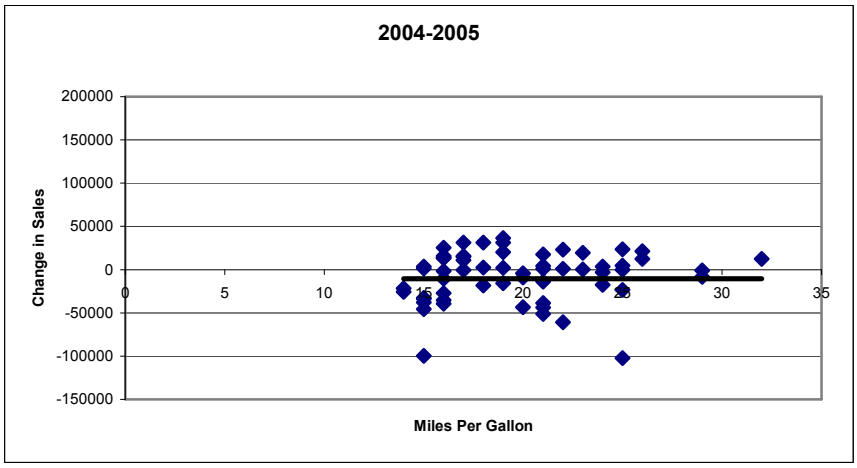
Exhibit 6 shows the sales for the top sixty models, plotting EPA mileage ratings (all based on the new method) against the change in sales. From 2003-2005, there was no relationship between fuel economy and sales; the regression line was flat. Starting with the 2005-2006 comparison, there is a relationship; vehicles that got higher mileage fared better in the marketplace. The relationship persisted in 2006-2007 and through the first half of 2008. While the direction of the relationship remained about the same (i.e. the slope of the line did not change much) the relationship became much stronger (the scatter of the observations around the line became smaller in magnitude). In the first half of 2008, the level of fuel economy of the model accounts for over 40 percent of the variance in the change in sales.

The graphs in Exhibit 5 exclude the Prius, which is the only hybrid to be ranked in the top fifty over this period and has been so popular that there have been delivery delays. (It is an outlier and its "poor" performance in recent years is not the result of a lack of demand but, rather, the result of a lack of supply. This is a circumstance that is radically different than that faced by vehicles with conventional engines).

[106] While the discounting practices are obvious, blasted incessantly across TV screens and in newspaper advertising, rigorous analysis is rare. One early analysis (Walter McManus, "The Link Between Gasoline Prices and Vehicle Sales," *Business Economics,* January 2007) shows that the shift in pricing occurred in early 2005.

Exhibit 6: Fuel Economy Affects Changes in Sales





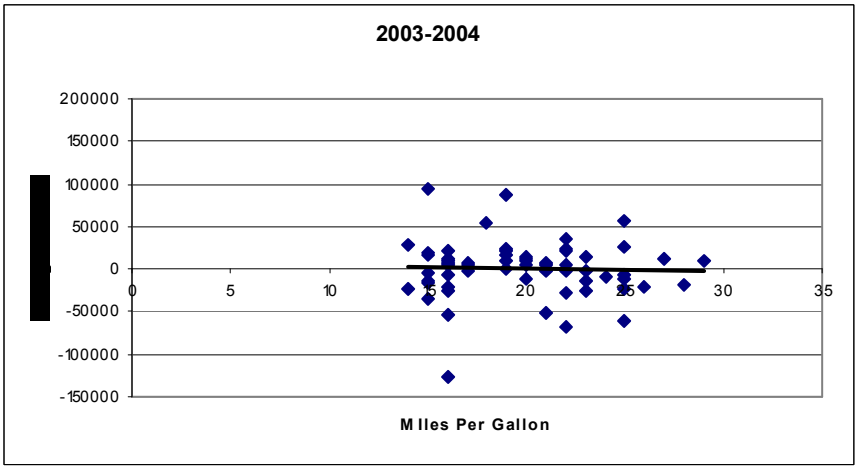
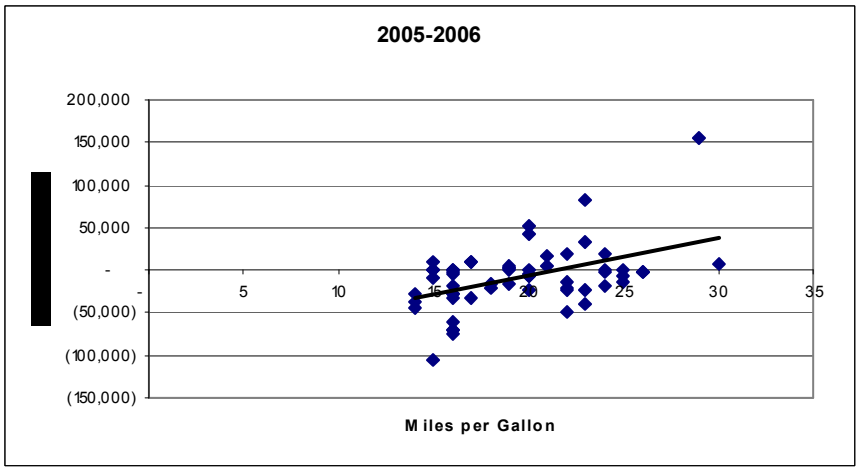
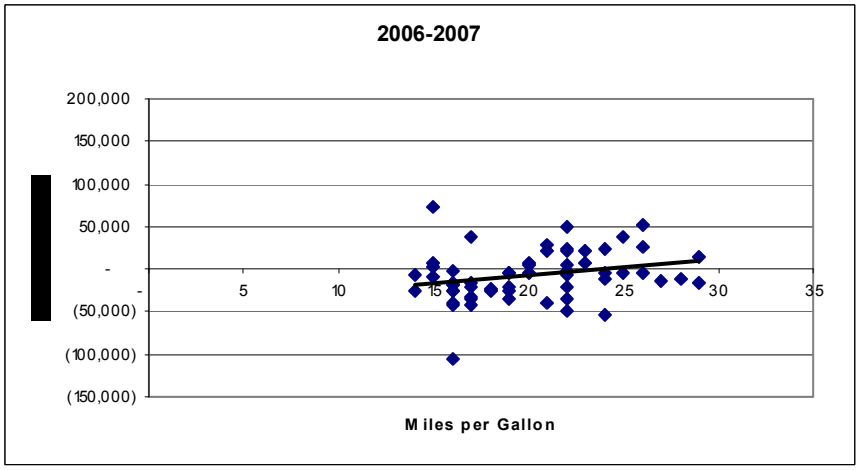
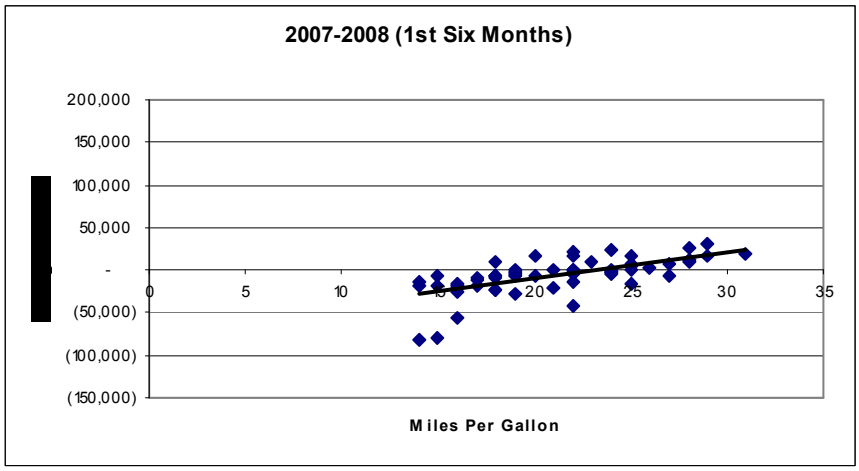


Exhibit 5 (cont'd):



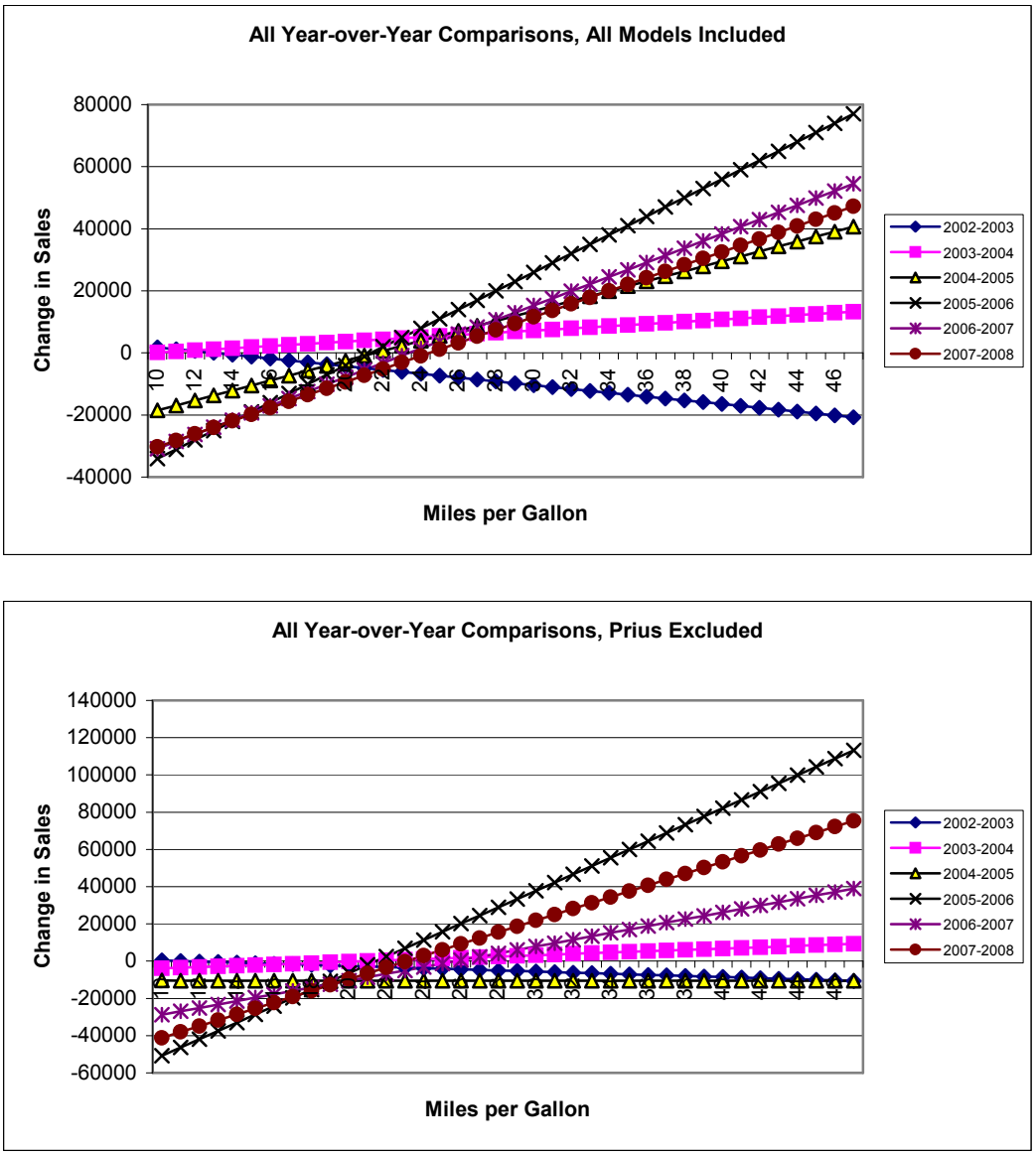




Source: CFA Data Base

Exhibit 7 shows the individual regression lines (without the data points) for all vehicles and vehicles with conventional engines. The graphs show that the shift in the market took place well before the first half of 2008. Including the Prius does not change that conclusion; it merely pushes the data of the market structural change back one year.

Exhibit 7



Source: CFA Data Base

The above analysis concludes that fuel economy played a key part in determining sales in recent years. We explored alternative explanations that might account for the shift in buying patterns. One obvious possibility is a shift in preference away from truck and SUVs. Exhibit 8 shows that the structural shift is not the result of a shift from trucks to cars. We examined this in

two ways. In one set of regressions, we introduced trucks as a covariate, to control for the effect of being a truck model as opposed to a car model. Even controlling for the type of vehicle (car v. truck) fuel economy is an important determinant of the change in sales. A second approach is to examine the relationship between fuel economy and sales separately for cars and trucks. Our conclusion that the structural shift occurred well before the first half of 2008 is confirmed and strengthened. The structural shift occurred in 2006 for cars and somewhat earlier (2005) for trucks.

Exhibit 8: Regression Results: Fuel Economy as a Predictor of Sales

Year	All Light Duty Vehicles			All Light Duty Vehicles (Truck Covariate)			Cars Only			Truck Only		
	B	Sig.	R2	B	Sig.	R2	B	Sig.	R2	B	Sig	R2
2002-2003	-297	*	0	1697		3	4511	*	7	-179		0
2003-2004	-354		0	68		0	-624		0	2842		0
2004-2005	-4		0	1036		0	-940		0	4535	**	9
2005-2006	4429	***	21	5463	**	20	3020	*	0	3738		5
2006-2007	1833		2	4487	**	6	4191		6	4878	*	9
2007-2008	3150	***	42	3124	***	41	2752	***	31	3778	**	17

*** p< .10, ** p < .0,*** p < .01**

We also examined the issue of whether the change in mileage for a specific model, year over year, affected change in sales. While all of the coefficients were positive, indicating better mileage was associated with better sales performance, none was statistically significant and all were small. This should not be surprising because the improvement in fuel economy within models was quite small, only 1 mile per gallon, on average, over the five year period from 2002-2005. It is the much larger differences in mileage between models that are having the effect.

CHANGES IN CONSUMER BEHAVIOR IN GASOLINE AND AUTO MARKETS

Thus far we have seen that public opinion and new car sales indicate a clear shift in consumer attitudes toward fuel economy. A recent Congressional Budget Office Study[107] (CBO) explores similar issues and reinforces our findings. What are the effects of high prices on consumption patterns? After four years of rising prices (2002-06), CBO found that when gasoline prices rise significantly, people will:

- Use less gasoline;
- Drive less if they can;
- Drive more slowly;
- Use mass transit where it is available; and
- Buy more fuel-efficient cars, if they can find them.

The formal expression of this relationship in economic analysis is the price elasticity of demand. How much does a particular behavior change in response to a price change? The price elasticity of demand is usually calculated in percentages. A one-percentage point increase in prices that results in a one-percentage decline in the behavior is said to be an elasticity of -1 (-.01/+.01 = -1). CBO studied a variety of behaviors and calculated the elasticity of demand – the percentage change in a particular behavior in response to a change in gasoline prices. As Exhibit 9 shows, there is a small, negative price elasticity. The short- run elasticities are considerably less than -.1. A one percent increase in price leads to a reduction in consumption or changes in behavior that reduce consumption of less than one-tenth of one percent. In the long run, the elasticities are somewhat higher -.2 to -.4, but still quite low compared to other commodities. Moreover, the elasticity of demand has declined over time and is likely to continue to do so.

For a variety of reasons, consumers are currently only about one-fifth as responsive to short-run changes in gasoline prices as they were several decades ago. That decline in sensitivity has been attributed to growth in real income, which has rendered gasoline a smaller share of consumers' purchases from disposable income. Price sensitivity has also declined because a gallon of gasoline takes a car farther than it did in the past, in part because of fuel economy standards. The development of distant suburbs also has contributed by making consumers more reliant on the automobile. The longer commutes are balanced by lower housing costs.[108]

[107] Congressional Budget Office, *Effects of Gasoline Prices on Driving Behavior and Vehicle Markets*, January 2008.
[108] CBO, Effects of Gasoline Prices, pp. x-xi.

Exhibit 9: Price Elasticities of Demand for Various Gasoline Consumption-Related Behaviors Compared to Selected Other Products

Product	Study Trait	Period of Impact Short-terms	Long-term
Gasoline Related[a]			
Consumption	CFA (1997-2005 Expenditures)		-.28
	Recent	-.06	-.40
	1994-2006	-.02 to -.04	
	Higher prices	-.066 to -.074	
	1974-1989	-.05 to -.08	
	Older		-.38 to -.43
Travel Speed	CBO	-.06	
	Recent	-.05	
	Older		-.35
Miles Traveled	CBO	-.035	
	Recent	-.02 to -.03	-.11 to -.15
	Older	-.1 to -.16	-.26 to -.31
New Vehicle Fuel Economy (improvement)	CBO truck-car Switch to cars	.28	
	CFA Implicit mpg	.1	
	CFA	.1	
Other Commodities[b]			
Eggs			- .1
Gasoline			- .2
Shoes			- .9
Foreign Travel			-1.2
Alcoholic Beverages			-1.5
Jewelry			-2.6

a) Congressional Budget Office, Effects of Gasoline Prices on Driving Behavior and Vehicle Markets (Washington, D.C.: January 2008).

b) Jon B. Taylor, *Economics* (Boston: Houghton Mifflin, 1998), *p*. 99.

To track the trends in vehicle fuel economy, the CBO relied on Environmental Protection Agency (EPA) mileage estimates and auto sales from *Automotive News.* CFA compiled a database on fuel economy and sales using NHTSA data.[109] Our analysis includes more recent data than was used by the CBO, allowing us to extend some analyses to 2007 with preliminary sales data. We find similar patterns of shifts to more fuel-efficient vehicles in consumer

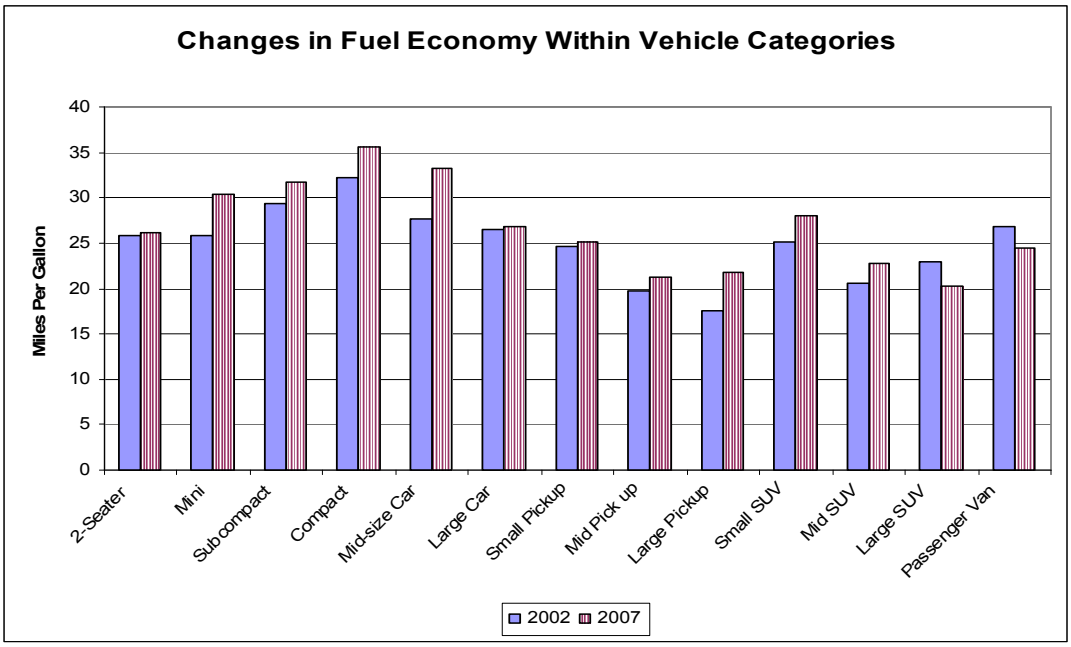
[109] Jack Gillis and Mark Cooper, *Still Stuck in Neutral: America's Continued Failure to Improve Motor Vehicle Fuel Efficiency: 1996:2005,* July, 2007, available at http://www.consumerfed.org/pdfs/Still_Stuck.pdf; Jack Gillis, Stuck *in Neutral: America's Failure to Improve Motor Vehicle Fuel Efficiency: 1996-2005,* November 2006; available at http://www.consumerfed.org/pdfs/Stuck_in_Neutral.pdf.

purchasing behavior, and with these data, we can explore some important aspects of the automotive market in greater detail.

As gasoline prices rise, people switch from less fuel-efficient trucks to cars. As the CBO noted, "Price spikes in the spring of 2005, in October 2005 (after Hurricane Katrina), and in the spring of 2006 all coincided with sharp increases in the new-car market share. Market shares for leading categories of light trucks – especially SUVs – went the opposite way, dipping as gasoline prices rose."[110] In our data, with annual sales, the shift is 2.3 percent. Applying the shift coefficient calculated by CBO to the average difference between cars and trucks in our data, we find that the switch results in an improvement of fuel economy of about .1 percent for every 1 percent increase in gasoline prices. We arrive at a similar estimate by calculating the change in the fleet average fuel economy compared to the average real price of gasoline.

One of the key findings of the CBO study is that fuel economy improved both because consumers shifted their purchases away from less fuel-efficient types of vehicles (trucks and large SUVs) and because "the average fuel economy of cars and light trucks alike have been increasing since 2002."[111] Our data shows (see Exhibit 10)

Exhibit 10:



Source: Mark Cooper, *Ending America's Oil Addiction* (Washington, D.C.: Consumer Federation of America, April 2008).
http://www.consumerfed.org/pdfs/First_Quarterly_Gas_Report_2008.pdf

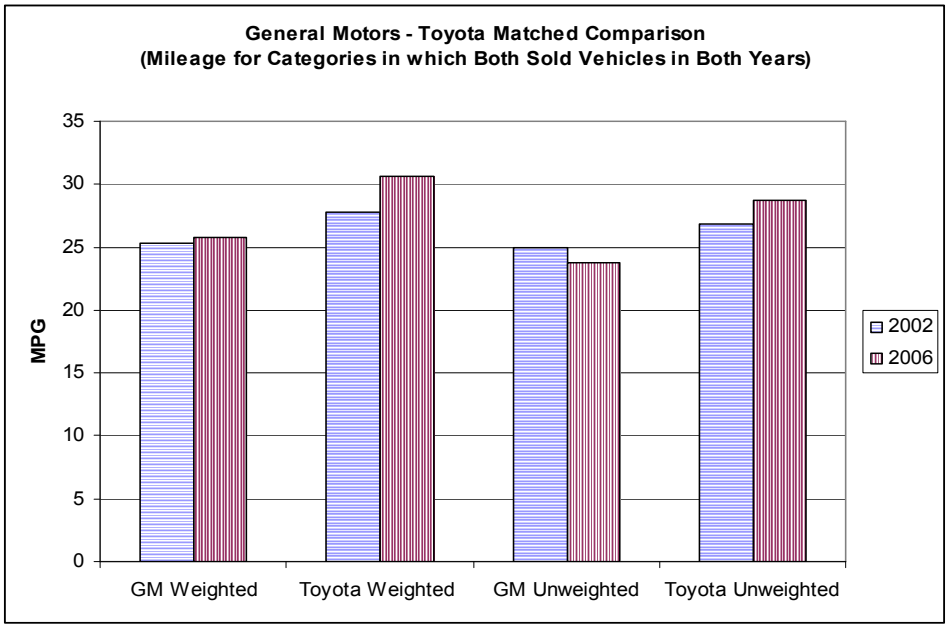
that the overall improvement in fuel economy was just under one mile per gallon (for 2002-2006) and 2 miles per gallon for 2002-2007; much less than consumers now say they want (8 mpg). And, the improvement in the fuel economy within the individual categories of cars and

[110] CBO, Effects of Gasoline Prices, p. 16.
[111] CBO, Effects of Gasoline Prices, p. 20.

light trucks is uneven. The largest improvements came in minis, compacts, and mid-sized cars. Passenger vans and large SUVs did not improve much (which is why sales plummeted). While many consumers shifted to smaller more fuel-efficient vehicles, those who required larger vehicles could not find the fuel- efficiency they needed and wanted.

Fuel economy improvement was also very uneven across auto manufacturers. One of the more dramatic aspects of the past half-decade has been the competition between General Motors (GM) and Toyota for the top spot as the leader in sales in the American auto market. The following figure shows the average fuel economy for GM and Toyota based only on categories of cars in which both had sales in 2002 and 2007 (see Exhibit 11). This graph matches the two automakers by categories of product sold for which they compete head-to-head. It shows both the sales-weighted average fuel economy (mpg) and the unweighted average of the individual models they marketed. For Toyota, both the weighted and unweighted fuel economy averages improved. Toyota's mileage improved both because consumers shifted their purchases to more fuel-efficient categories of vehicles and Toyota offered, on average, significantly more fuel-efficient models. GM's average fuel economy improved because consumers shifted their sales between categories, but GM did not offer, on average, a significantly more fuel-efficient slate of models.

Exhibit 11:



Source: Mark Cooper, *Ending America's Oil Addiction* (Washington, D.C.: Consumer Federation of America, April 2008). http://www.consumerfed.org/pdfs/First_Quarterly_Gas_Report_2008.pdf

We were able to test the proposition that fuel economy became more important to consumers over the period since 2002 with an econometric model of fuel economy (see Exhibit 12). After controlling for the key vehicle characteristics that affect fuel economy (vehicle weight, engine traits like horsepower, displacement, number of cylinders, transmission type, drive ratio, dynamometer setting, wheel base, interior volume), each year after 2002, there was a statistically significant, though small, improvement in the fuel economy of cars. For cars, the

effect became steadily larger over time. A car sold in 2006 got 2.377 more miles per gallon than one built in 2002, controlling for all the other factors included; for trucks, the increase was .879 miles per gallon.

Exhibit 12: Linear Regressions to Examine Factors Affecting Fuel Economy
(Unit of Analysis is the Sales Weighted Model)
(Regression Coefficients, All Statistically Significant at the .001 level)

Variable	Cars		Trucks	
	Fuel Economy	Product Sales	Fuel Economy	Product Sales
2003	.0662	15456	.982	10120
2004	1.084	-148	.482	-5090
2005	1.758	16763	.869	-16488
2006	2.377	3936	.879	-24092
Fuel Economy	na	945	na	.823
R^2	.56	.32	.24	.12

Control variables: engine (horsepower, displacement, cylinders), body weight, wheel base, interior volume); transmission type, drive ratio, dynamometer setting;
all coefficients are significant at the .05 level or higher

Truck sales were down 24,092 in 2006, compared to 2002; controlling for all the other factors, car sales were up 3,936. For trucks, the effect was large in 2003, declined in 2004 and rebounded in 2005 and 2006. We also find that fuel economy was positively related to product sales. We find the negative effect on truck/SUV sales in 2004, 2005, and 2006, with the effect growing larger over time. This is consistent with the CBO findings. In addition to the shift from trucks to cars and after controlling for all the other factors, a one mile per gallon increase in fuel economy resulted in an additional sale of just under 1,000 more cars and trucks for each model.

APPENDIX B:
STILL STUCK IN NEUTRAL:
AMERICA'S CONTINUED FAILURE TO IMPROVE
MOTOR VEHICLE FUEL ECONOMY

July 2007

INTRODUCTION

The most intense energy policy debate in Washington D.C. in three decades is being shaped by high gasoline prices, oil imports, and the dwindling market share of the U.S. "Big 3" automakers. The link between fuel economy and auto industry performance – between rising gasoline prices and auto production decisions – is receiving close scrutiny because Congress is close to enacting the first major increase in CAFE standards in thirty years.

In 2000, the U.S. experienced significant increases in the cost of gasoline. Shortly thereafter, carmakers promised voluntary fuel economy improvements while strongly opposing increased CAFE regulations. This report looks at how the car companies responded to the gas price increases by examining the model by model fuel economy offered by manufacturers between 1998 and 2007 and the fuel economy performance of the top 50 selling vehicles in the U.S. in 2005 and 2007. These dates were well after the onset of the gasoline price spiral and well after improvements in fuel economy promised by the automakers would be evident in their product line.

FUEL ECONOMY TEN YEARS LATER: More Models, Poorer Choices

During the past ten years, as gas prices have gone up, the number of models (trims) with 30 MPG or higher have gone down (61 – 46). The exhibit below compares the price of gasoline and the number of high efficiency (30 or more MPG) models offered by the auto makers. In 2001, as gasoline prices maintained their 33 percent increase over the 1990s, the car makers promised more fuel efficient vehicles.[112] Prices remained well above 1990s levels for three years and then began another march upward. In spite of their promises, the number of high efficiency models offered by the auto makers to the public actually declined.

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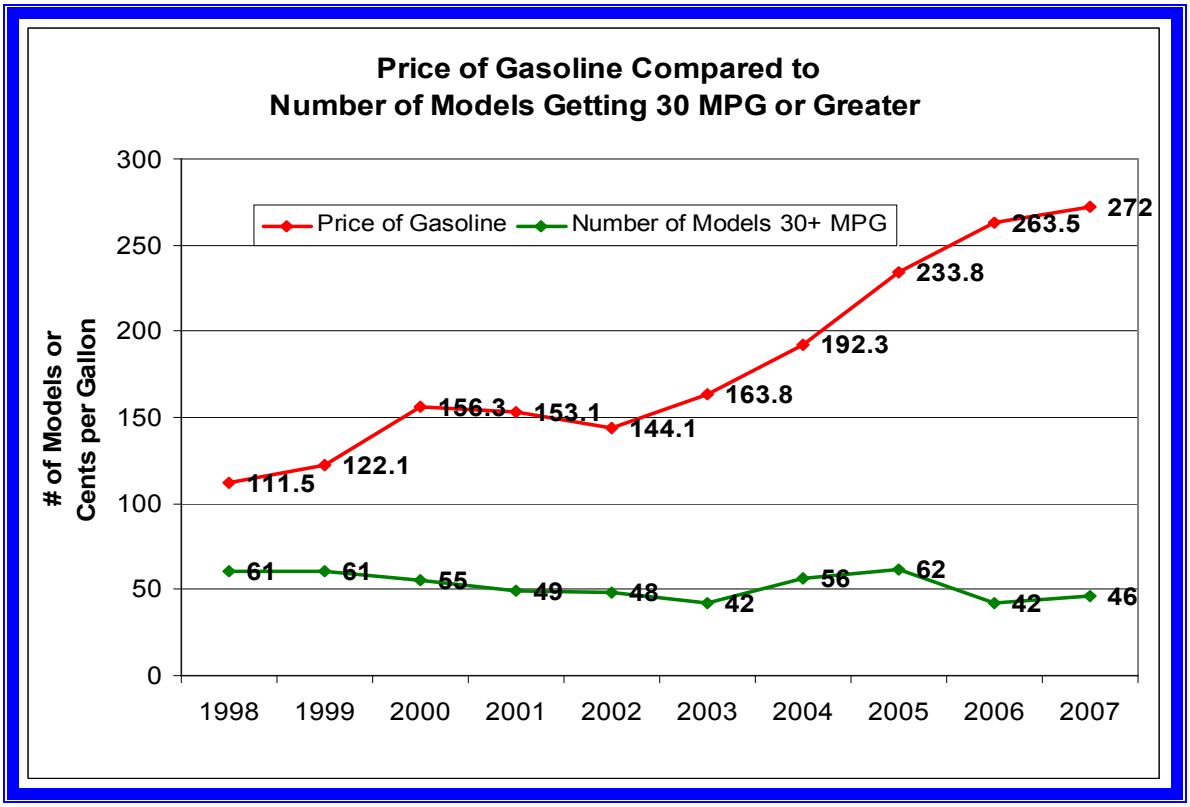
[112] Jeffry Ball, "GM to Produce Hybrid Trucks, Burses in Scramble to Build "Green' Vehicles, *Wall Street Journal,* August 3, 2000: *U.S. auto makers, who used to argue in lockstep that they didn't have the technology to affordably improve the fuel economy of their cars and trucks, now are stomping all over each other in a scramble to build the latest and greatest green vehicles. Another sign of the race came Wednesday, when General Motors Corp. Vice Chairman Harry Pearce confirmed that the No. 1 auto maker will begin producing "hybrid" versions of its full-size pickup trucks and buses…. Mr. Pearce was trying to best Ford Motor Co., which last week announced it will improve the fuel economy of its sport-utility-vehicle lineup by 25% during the next five years.* The Ford comment was made in a National Press Club speech by Ford President and CEO, Jacques Nasser, as reported on by the Associated Press, July 28, 2000. The Alliance of Auto Manufacturers, claimed to be "taking a proactive leadership role in researching and developing advanced fuel economy technologies for passenger cars and light trucks" two years later in comments to the National Academy of Sciences (see Request for Comments: *National Academy of Science Study on Future Economy Improvements Model Years 2005-2010*, Docket No. 2002-11419, May 8, 2002. (see generally Richard Byrne, *Life in the Slow Lane: Tracking Decades of Automaker Roadblocks to Fuel Economy* (Union of Concerned Scientists, July 2003).

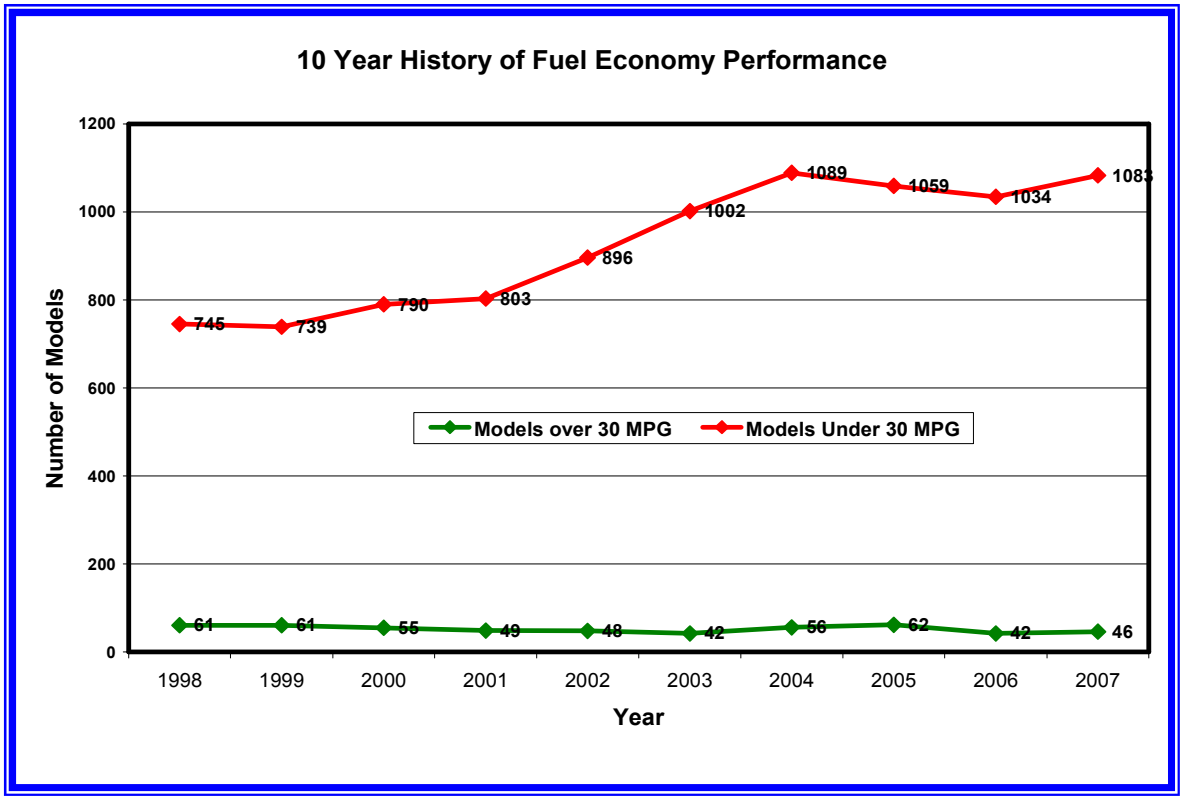
1. As the Price of Gas Goes Up, the Number of Good Performers Goes Down



Source: Gas Prices—Energy Information Institute; Models—U.S. EPA; available at http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_m.htm

Not only did the car makers fail to increase the number of efficient models offered, but the number of inefficient models jumped sharply (see Exhibit 2). While the number of different models increased dramatically during the past 10 years (806-1129), as mentioned above, the number of vehicle models getting over 30 MPG actually declined from 61 in 1998 to only 46 in 2007. In 1998, one out of 13 models on the market got 30 mpg or more. By 2007, that ratio had declined to one in 24. Efficient models have been swamped by inefficient models. During this time period, the domestic manufacturers used extraordinary (and profit eating) incentives to induce consumers to keep buying large fuel-inefficient vehicles rather than improve the fuel efficiency of their product offerings.

2. Poor Performers Increase—Good Performers Decline

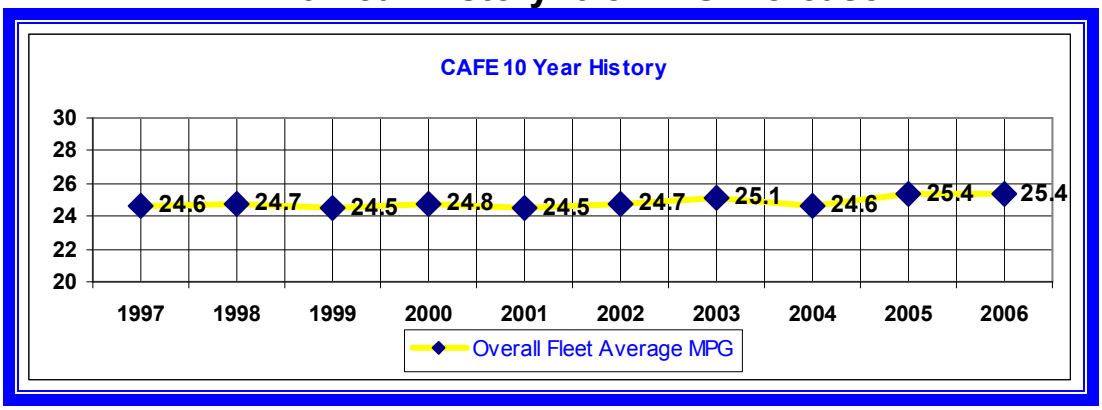


3. Models Getting 30 MPG: Going Backwards for 10 Years

Year	Models Over 30 MPG	%	Models Under 30 MPG	%	Total Models
1998	61	8%	745	92%	806
1999	61	8%	739	92%	800
2000	55	7%	790	93%	845
2001	49	6%	803	94%	852
2002	48	5%	896	95%	944
2003	42	4%	1002	96%	1044
2004	56	5%	1089	95%	1145
2005	62	6%	1059	94%	1121
2006	42	4%	1034	96%	1076
2007	46	4%	1083	96%	1129

As the exhibit below shows, the prevalence of poor performing models has resulted in a combined average fuel economy in the new vehicle fleet that has been essentially flat for over a decade.

4. CAFE 10 Year History: 0.8 MPG Increase



COMPARING RESULTS: U.S. vs. Asian Manufacturers

For a closer look at manufacturer response to gas price increases, well after they became established, we examined the changes in fuel economy performance of the top selling 2005 and 2007 vehicles. As noted in Exhibit 1, gas prices spiked in 2000 and began a steady march upward in 2003. Looking at the popular 2005 and 2007 models provides the opportunity to examine car company reaction after they had plenty of time to improve efficiency.

First, we compared the top selling Asian models with those from the U.S. manufacturers. Asian car companies improved the fuel economy of a much higher percentage of their popular models than did the U.S. manufacturers. In fact, the fuel economy of the majority (52%) of the most popular U.S. manufacturer models in 2005 actually declined two years later. In contrast, over two-thirds (68%) of the most popular Asian models the top improved during the same time.

5. Overall: The U.S. vs. Asian Carmakers 2005-2007

	Improved	Declined or Stayed the Same
Asian[113]	13 (68%)	6 (32%)
U.S.[114]	15 (48%)	16 (52%)

As the Exhibit 6 below shows, two manufacturers, GM and Ford, had more of their popular vehicles decrease than increase. Ford was able to offset the number of models that decreased in MPG with substantial increases of those fewer models whose MPG went up. GM

[113] Toyota, Honda, Nissan, Hyundai
[114] GM, Ford, Chrysler

was not able to offset increases with decreases. (Ford had four models that together improved by 4.6 MPGs, and five that together subtracted only 1.3 MPGs, while GM had six models that together improved 4.3 MPGs but seven that together subtracted 4.7 MPGs.)

The other top selling manufacturers went up with Toyota, Hyundai and Nissan increasing dramatically. Honda increased the number of models with better fuel efficiency but its net mileage decreased.

6. Changes in Manufacturers' Top Selling Models[115] 2005-2007

Sales Rank in 2007	Manufacturer	MPG Change from 2005 to 2007	Number of Models	Percent of Most Popular Models	MPGs added or subtracted
1	GM	↑ Increased	6	46%	4.3
		↓ Decreased/Same	7	54%	-4.7
		Balance	**-1**		**-0.4**
2	Ford	↑ Increased	4	44%	4.6
		↓ Decreased/Same	5	56%	-1.3
		Balance	**-1**		**3.3**
3	Toyota	↑ Increased	6	67%	8.2
		↓ Decreased/Same	3	33%	-1.1
		Balance	**3**		**7.1**
4	Chrysler	↑ Increased	6	56%	2.3
		↓ Decreased/Same	4	44%	-0.6
		Balance	**1**		**1.7**
5	Honda	↑ Increased	3	60%	0.5
		↓ Decreased/Same	2	40%	-2.4
		Balance	**1**		**-1.9**
6	Nissan	↑ Increased	2	67%	5.0
		↓ Decreased/Same	1	33%	-0.6
		Balance	**1**		**4.4**
7	Hyundai	↑ Increased	2	100%	5.7
		↓ Decreased/Same	0	0%	0.0
		Balance	**2**		**5.7**

NOTE: for more details on the changes of the top 50 vehicles in 2005 and 2007, see Exhibit 8 following.

[115] BMW and VW are not included as they only had one model each in the most popular models. BMW's 3 series improved and VW's Jetta declined.

CONSUMER DEMAND: When It Comes To Sales, Fuel Economy Matters

In mid-2001, when it became clear that the gasoline price spike of 2000 would continue, the leading U.S. auto manufacturers declared their intention to increase the fuel economy of light trucks and SUVs. While they had enjoyed a decade of increasing sales of these vehicles, they were vulnerable to rising gasoline prices. Unfortunately, the manufacturers did not keep their promise and, as gasoline prices continued to rise, consumers shied away from these gas guzzlers. In 2006, sales declined dramatically. Overall from 2004 to 2006, sales of SUVs and light trucks declined (9,175,183 to 8,430,043) by 8%. From 1997 to 2007, sales of mid-size SUVs, once one of the most profitable vehicle segments, went down by 43%, from 9.1% in May 1997 to 5.2% in May 2007.[116]

Clearly, auto makers need time to incorporate significant changes in fuel efficiency. However, if they had followed through on their promises of 2001, we would certainly expect to see improvements in fuel economy of new cars by 2005 or 2007. Furthermore, in the short run, auto manufactures can adjust their production runs and marketing to sell more efficient cars.

In order to determine the impact of fuel economy on sales ranking, we compared the change in sales ranking of the top fifty models from 2005 to 2007 with their fuel economy rating. Using regression analysis we determined, as shown in Exhibit 7 below, that there is a significant, positive relationship between fuel economy and change in rank between 2005 and 2007.

We also observed two other factors that are related to changes in popularity of models – size class and manufacturer. Small SUVs increased dramatically in popularity, while small and large pickups, vans, large cars and large SUVs declined. The "Big 3" manufacturers suffered a significant decrease in popularity, while Asian manufacturers enjoyed an increase in the popularity of their models.

These three factors (sales ranking, size class, and manufacturer) are interrelated. The "Big 3" product lines emphasize pickups and larger vehicles that get less miles per gallon.[117] When these three factors are combined in a multiple regression, they account for about one-third of the variance in change in rank.[118]

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[116] Power Information Network, J.D. Power & Associates, June 25, 2007.

[117] Simple correlations among theses three factors show

	SSUV	BIG 3	MPG '07	Change in Rank
SSUV	-	-.122	.053	.379**
Big 3			-.475**	-453**
Mpg '07				.340*

** p <..01 *p<.05

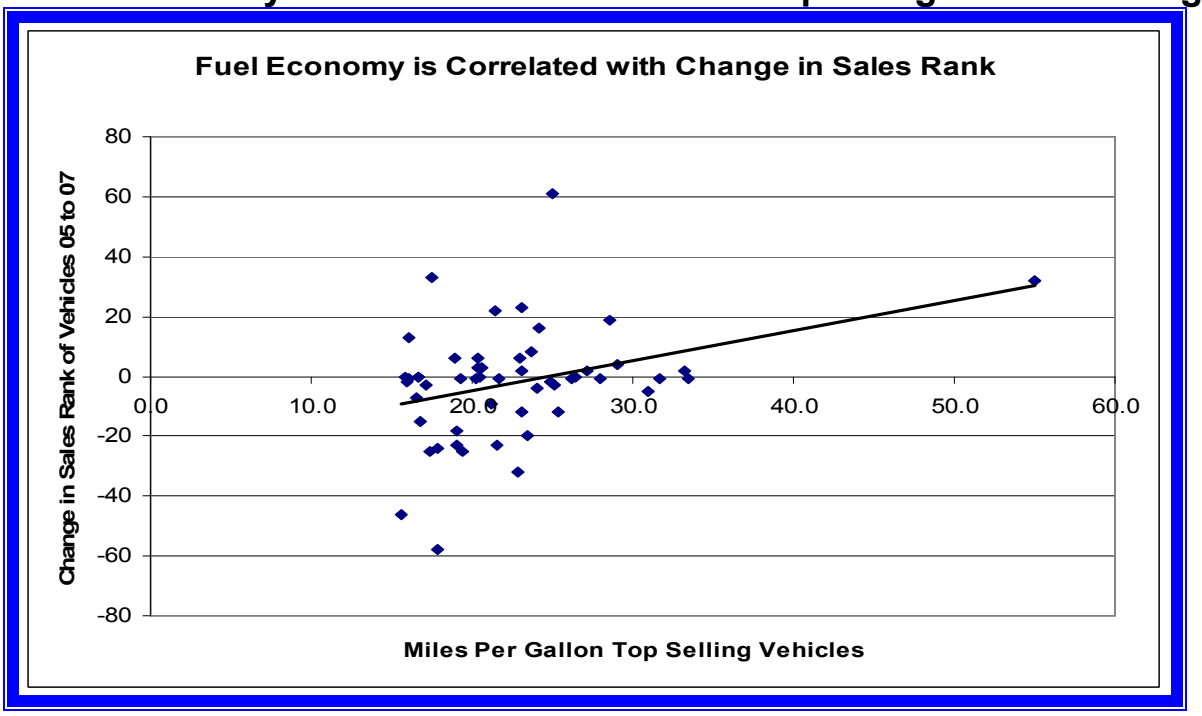
[118] A multiple regression shows each has an effect on rank as expected.

Rank Change = -7.674 +.495 (MPG) + 27.894 (SSUV) – 13.397 (Big 3)
(.406) (10.004) (5.383)

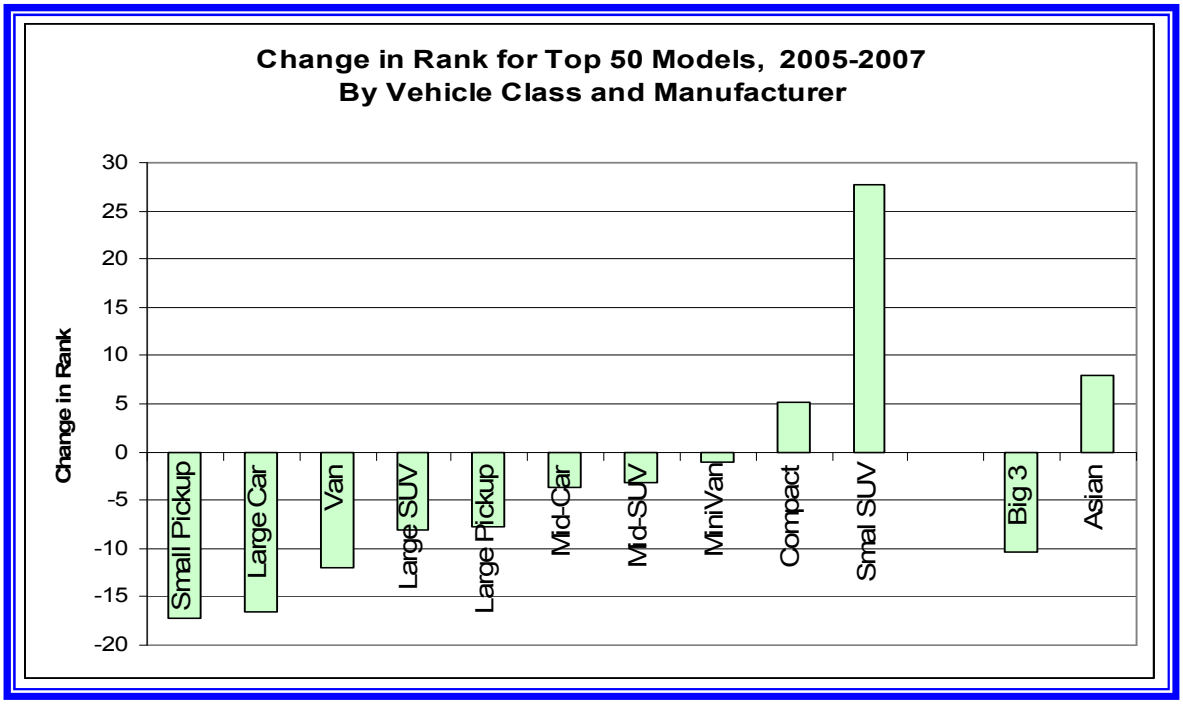
R = .577

Adjusted R^2 = .333

7. Fuel Economy Matters when It Comes to Improving Sales Ranking



8. Consumer Demand Shifts



CONCLUSION

The pattern of behavior of the auto makers in the past decade, particularly since the onset of the gasoline price spiral beginning in 2000, has special importance because Congress is in the midst of a major energy policy debate. The U.S. auto makers, in particular, claim that an increase in fuel economy standards will hurt the industry. While the U.S. car companies blame high labor and legacy costs for their current problems, our review of the relationship between fuel economy performance and sales ranking provides powerful evidence that the Big 3's failure to follow through on their promises to increase fuel economy is a major cause of its current problems. Interestingly, the cash incentives being offered mainly by the "Big 3" to sell fuel inefficient vehicles are often larger than the claimed labor cost disadvantage.[119] In addition, the incentives being offered are larger than the investments necessary to produce much more fuel efficient vehicles.[120]

Had the "Big 3" followed through on their stated intention to improve the fuel economy of their fastest selling vehicles, likely those vehicles would have continued to be consumer favorites and their financial sheets would have been much healthier. It appears that the domestic car companies viewed previous CAFE requirements as a "ceiling" rather than a minimum level of performance.

Today, by passing a strong CAFE requirement, without loopholes, Congress will be providing a blueprint to help the "Big 3" become competitive again by building the vehicles that the American consumer really wants.

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[119] This is most evident in the dramatic difference in large cash discounts being offered on many of the larger less fuel efficient models sold by the Big 3 – ranging as high as $3,000 to $5,000. In contrast, the Asian manufacturers offer no cash discounts, although they have begun to offer finance incentives on some of the less fuel efficient models. (see http://www.edmunds.com/incentives/RebateController?step=1&setzip=20815&tid=edmunds.n.incentivesindex.incentives.1.1.*)

[120] Consumer Federation of America, A Consumer Pocketbook And National Cost-Benefit Analysis Of "10 In 10": Increasing Cafe Standards 10 Miles Per Gallon Over Ten Years Will Save Consumers Money And Help Cure The National Oil Addiction (Consumer Federation of America, June 2007), available at: http://www.consumerfed.org/pdfs/CFA_Cost-Benefit_Analysis_of_10_in_10,_June_07.pdf, citing cost estimates from National Academy of Sciences, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards* (January 2002).

APPENDIX: DETAILS ON CHANGES IN THE MOST POPULAR MODELS FROM 2005 AND 2007 AND THE CFA MILEAGE RATING SYSTEM

Following is a detailed look at the performance of the top 50 selling vehicles in 2005 and 2007 as well as an explanation of the Consumer Federation of America's Mileage Rating System (MRS) which is designed to quickly point out the fuel misers from the guzzlers.

10. Changes in the EPA MPG for Most Popular Models 2005-2007[121]

(Colors indicate CFA's Mileage Rating Scale. See key below.)

Make	Model	2005 MPG (Sales Rank 2005)	2007 MPG (Sales Rank 2007*)	FE Change U = up D = Down or No Change	Rank Change + = up - = Down 0 = No Change
Ford	F150	16.0 (1)	15.8**(1)	D	0
Chevrolet	Silverado**	16.9 (2)	16.7 (2)	D	0
Toyota	Camry	26.8 (3)	26.4 (3)	D	0
Dodge	Ram pickup**	15.5 (4)	16.1 (5)	U	-
Honda	Accord	26.1 (5)	26.2 (6)	U	-
Toyota	Corolla/Mat.	32.8 (6)	33.2 (4)	U	+
Honda	Civic	34.2 (7)	33.5 (8)	D	-
Nissan	Altima	25.6 (8)	28.0 (9)	U	-
Chevrolet	Impala	24.5 (9)	23.1 (7)	D	+
Chevrolet	TrailBlazer	16.7 (10)	17.8 (34)	U	-
Ford	Explorer	16.0** (11)	16.8 (26)	U	-
GMC	Sierra**	16.8 (12)	16.7 (12)	D	0
Dodge	Cara./Grand	20.5** (13)	20.6 (10)	U	+
Jeep	Gr. Cherokee	17.4 (14)	17.4** (39)	D	-
Chevrolet	Cobalt	27.0 (15)	27.1 (13)	U	+
Chevrolet	Malibu	25.9 (16)	25.4 (28)	D	-
Ford	Taurus**	22.3 (17)	—		
Ford	Focus	27.9 (18)	29.1 (14)	U	+
Chrysler	T&C	20.4 (19)	20.5 (19)	U	0
Honda	Odyssey	21.9 (20)	20.2 (21)	D	-

[121] NOTE: Automotive News data was used to determine the top selling models in 2005 and 2007. CAFE sales data was used to determine a sales-weighted EPA MPG for each model. CAFE 2006 sales data was used to project sales for 2007 models. When a top selling 2005 vehicle subsequently dropped from the top fifty in 2007, we continued to track its fuel economy rating. Also, when a car was added to the top fifty in 2007, we went back and developed a fuel economy rating for the corresponding 2005 model. This resulted in the list containing more than 50 vehicles. Chevrolet Trailblazer includes EXT model, Chevrolet Impala does not include Monte Carlo model.

Make	Model	2005 MPG (Sales Rank 2005)	2007 MPG (Sales Rank 2007*)	FE Change U = up D = Down or No Change	Rank Change + = up - = Down 0 = No Change
Toyota	Tacoma	19.9 (21)	20.4 (15)	U	+
Jeep	Liberty	19.2 (22)	19.0 (45)	D	-
Ford	Escape	21.1 (23)	23.0 (17)	U	+
Toyota	Sienna	20.8 (24)	21.7 (25)	U	-
Ford	Mustang	20.7 (25)	20.4 (22)	D	+
Chevrolet	Tahoe**	16.4 (26)	17.1 (29)	U	-
Honda	CR-V	24.1 (27)	24.2 (11)	U	+
Ford	E-series van	16.4 (28)	—*** (23)		+
Chrysler	300	21.5 (29)	21.2 (38)	D	-
Honda	Pilot	19.0 (30)	19.3 (31)	U	-
Toyota	Highlander	21.5 (31)	24.1 (35)	U	-
Chrysler	PT Cruiser	23.2 (32)	23.1 (44)	D	-
Chevrolet	Equinox	21.0 (33)	21.6 (56)	U	-
Hyundai	Sonata	22.8 (34)	24.9 (36)	U	-
Chevrolet	Colorado	20.0 (35)	19.4 (60)	D	-
Chevrolet	Exp./G van	17.1 (36)	16.6** (43)	D	-
Toyota	Tundra	16.8 (37)	16.1 (24)	D	+
Pontiac	G6	25.1 (38)	23.7 (30)	D	+
Pontiac	Grand Prix	22.9 (39)	23.5 (59)	U	-
Ford	Ranger	19.6 (40)	19.1 (58)	D	-
Nissan	Sentra	29.1 (41)	31.7 (42)	U	-
Hyundai	Elantra	27.4 (42)	31.0 (47)	U	-
Dodge	Durango	15.4 (43)	15.6* (89)	U	-
Ford	Expedition	16.0 (44)	16.0 (46)	D	-
Dodge	Neon	28.1 (45)	—		
Lexus	RX	21.4 (46)	25.1 (49)	U	-
Ford	Five Hundred	23.1 (47)	22.8 (79)	D	-
Toyota	Prius	55.0 (48)	55.0 (16)	D	+
GMC	Envoy	16.6 (49)	17.8 (107)	U	-
BMW	3 series	21.6 (50)	23.1 (27)	U	+
VW	Jetta	26.9 (51)	25.4 (48)	D	+
Mazda	Mazda3	27.9 (56)	28.6 (37)	U	+
Jeep	Wrangler	16.2 (65)	17.5 (32)	U	+
Nissan	Murano	22.0 (72)	21.4 (50)	D	+
Toyota	RAV4	24.9 (79)	25.0 (18)	U	+
Dodge	Charger	—	21.0 (33)		
Dodge	Caliber	—	28.0~ (40)		
Ford	Fusion	—	24.3 (20)		

Make	Model	2005 MPG (Sales Rank 2005)	2007 MPG (Sales Rank 2007*)	FE Change U = up D = Down or No Change	Rank Change + = up - = Down 0 = No Change
Ford	Edge	—	20.5~ (41)		

*Based on Jan-May sales (Auto News)
**In the case of dual fuel vehicles we assumed that 10% of the users would be using ethanol E85 and the remainder gasoline.
***Not reported by EPA
~Estimate not based on sales

Key for CFA: Mileage Rating Scale	Excellent Over 40 MPG	Good 30-39 MPG	Fair 20-29 MPG	Poor Under 20 MPG

CFA'S MILEAGE RATING SCALE (MRS): A New Way to Categorize Performance

CFA has developed a Mileage Rating Scale (MRS) to help consumers quickly identify which new or used vehicles are Excellent, Good, Fair or Poor, in terms of gas mileage.

11. Consumer Federation of America's Mileage Rating Scale

Mileage	Mileage Rating Scale
Over 40 MPG	Excellent
30-39 MPG	Good
20-29 MPG	Fair
Under 20 MPG	Poor

By helping consumers to easily identify which new or used vehicles are Excellent, Good, Fair or Poor, in terms of gas mileage, the Mileage Rating Scale enables them to make more informed vehicle purchases. As we saw with safety ratings, when consumers are able to easily compare performance, they quickly vote with their dollars.

CFA's Mileage Rating Scale (MRS) also provides a method of tracking the overall change in fuel economy performance over time. The following exhibit shows the decline in the percent of "Good" and "Excellent" vehicles during the past 10 years and an increase in the percent of "Poor" vehicles. The percentage rated "Fair" remains about the same. This gradual decline in vehicle fuel economy, along with the increased vehicle population, is a major factor in America's increasing dependence on foreign oil.

We've included a look at 2001, because that was the second year gas prices increased considerably and car makers indicated they'd respond voluntarily with better performers without regulations. While they increased the numbers of models they offered, overall, they chose to decrease the number of good performers

12. Charting the Changes in Fuel Economy: More Models, Poorer Performance

Year	1998	2001	2007
Excellent	7 (1%)	5 (1%)	2 (<1%)
Good	54 (7%)	44 (5%)	44 (4%)
Fair	462 (57%)	491 (58%)	621 (55%)
Poor	283 (35%)	312 (37%)	462 (41%)
Total	806	852	1129

F:\WordDocs\CFA\Motor Vehicle Fuel Efficiency Project\Studies\STILL Stuck in Neutral--America's Continued Failure to Improve MVFE 2005-2007.doc

APPENDIX C:

EXCERPT FROM

Re: Comments 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

COMMENTS AND TECHNICAL APPENDICES OF THE CONSUMER FEDERATION OF AMERICA

CONCEPTUAL AND DEFINITIONAL FLAWS IN NHTSA'S ANALYTIC FRAMEWORK

OVERVIEW OF WHAT NHTSA DID AND WHY IT IS FLAWED

NHTSA is required by Congress to set the fuel economy standard at the "maximum feasible" level. As NHTSA points out at the beginning of the Notice of Proposed Rulemaking (NPRM):

> *…the Energy Independence and Security Act of 2007 (EISA), which Congress passed in December 2007(EISA) mandates the setting of separate* ***maximum feasible standards*** *for passenger cars and for light trucks at sufficient levels to ensure that the average fuel economy of the combined fleet of all passenger cars and light trucks sold by all manufacturers in the U.S. in model year (MY) 2020 equals* ***or exceeds*** *35 miles per gallon…. In developing the proposed standards, agency considered the four statutory factors* ***underlying maximum feasibility*** *(technological feasibility, economic practicability, the effect of other standards of the Government on fuel economy, and the need of the nation to conserve energy) as well as other relevant considerations such as safety.*[122]

NHTSA properly places a spotlight on the balancing required:

> *We solicit comment on all aspects of this proposal, including the methodology, economic assumptions, analysis and tentative conclusions. In particular, we solicit comments on whether the proposed levels of CAFE satisfy EPCA, e.g. reflect an appropriate balancing of the explicit statutory factors and other relevant factors.*[123]

NHTSA is required to give the automakers at least 18 months notice of what the fuel economy standard will be for a model year. However, it is forbidden to set standards more than five years in advance. The statute also set some minimum standards that must be met – a

[122] NPRM, pp. 7-8, emphasis added.
[123] NPRM, p. 16.

combined fuel economy standard of 35 miles per gallon for cars and trucks in 2020. NHTSA is also required to set standards that ensure that steady progress is made at least toward the minimum goal. While the new minimum level receives a great deal of attention, the maximum feasible level deserves as much, if not more attention.[124]

This technical appendix shows that NHTSA's tentative conclusions – its proposed standards – do not reflect an appropriate balancing of the three critical factors that the law requires it to consider in setting the standard. It has failed to properly balance technological feasibility, economic practicability and the need of the nation to conserve energy, unnecessarily and illegally sacrificing conservation to the other statutory factors.

- In its analysis, NHTSA identified two energy conservation alternatives that bracket the range of economically reasonable standards. One alternative would maximize fuel savings at no net cost to society by including fuel saving technologies until the total cost equals the total benefit. The other would maximize the economic return on investments in fuel economy by including fuel savings technology only up to the point where marginal benefits equal marginal costs. A reasonable rule would have balanced the economic and conservation concerns and set the standard between the two extremes. NHTSA simply chose to set the standard at the lower level of conservation with no consideration of the enormous energy conservation cost of that decision.
- NHTSA chose to define "feasibility" and "practicability" in a manner that lets the least fuel-efficient auto makers drive down the standard. NHTSA's approach protects the least capable automakers rather than requiring them to rise up to the level that the industry as a whole could achieve. Ironically, by setting a lower standard, in the face of dramatically rising consumer expectations, the Administration is creating an environment of failure for those companies who are driving down the standard.
- In defining economic practicability on the demand-side, NHTSA fails utterly to understand consumer behavior in regard to fuel economy, vastly underestimating the value consumers place on and realize from fuel savings.

There are numerous other flaws in NHTSA's analysis that will be discussed in these technical appendices, all of which bias the analysis against fuel conservation, but these fundamental errors in the analytic framework – failing to balance technological feasibility, economic practicability and the need for conservations combined with the severe undervaluation

[124] The plain language of the statue makes it clear that maximum feasible is the goal, rather than the minimum standard legislated by Congress, and Congressman Market, floor manager of the bill emphasized this in his extension of remarks upon passage of the bill, pointing out that "if the maximum feasible level for model year 2020 is higher than 35 miles per gallon due to technological progress and/or other factors, Congress intends to require DOT to set standards at the maximum feasible level. "Extension of Remarks of Congressman Edward J. Market (D-MA) on the Senate Amendments to H.R. 6," Submitted for the Record December 18, 2008.

of conservation – have led NHTSA to set standards that not only rob the nation of vitally needed, technologically feasible and economically practicable fuel savings, but also violate the Energy Independence and Security Act of 2007 and the Administrative Procedures Act….

THE APPROACH TO EVALUATING STANDARDS

NHTSA has developed a highly complex model to examine the interaction of the statutory factors in setting the standard (See Exhibit A-1). NHTSA requires fuel savings technologies to pass a series of screens in order to be included as the basis for the standard. Exhibit A-1 offers a summary picture of the model that identifies the key features of the model that greatly affect the level at which the standard is set. NHTSA defines the key elements of the analytic framework – technological feasibility and economic practicability as follows:

> "Technological feasibility" means whether a particular method of improving fuel economy can be available for commercial applications in the model year for which a standard is being established.[125]
>
> "Economic Practicability" means whether a standard is "within the financial capability of the industry, but not so stringent as to" lead to "adverse economic consequences, such as a significant loss of jobs or the unrealistic elimination of consumer choice." In an attempt to ensure the economic practicability of attribute based standards, the agency considers a variety of factors, including the annual rate at which manufacturers can increase the percentage of its fleet that has a particular type of fuel savings technology and cost to consumers. Since consumer acceptability is an element of economic practicability, the agency has limited its consideration of fuel saving technologies to be added to vehicles to those that provide benefits that match their costs. Disproportionately expensively [sic] technologies are not likely to be accepted by consumers.[126]

First, automakers must be able to put the technology into vehicles. NHTSA's analysis gives great weight to the automaker product plans and the technology adoption capabilities of the automakers. The product plans play a very large role in setting the standard, since they define what is technically feasible. NHTSA then assumes a limitation of the ability to implement new technologies. NHTSA sets phase-in caps for technologies ranging from 2 to 33 years, depending on the extent of redesign effort, capital investment and changes to manufacturing lines. Most caps are in the 2-6 year range.

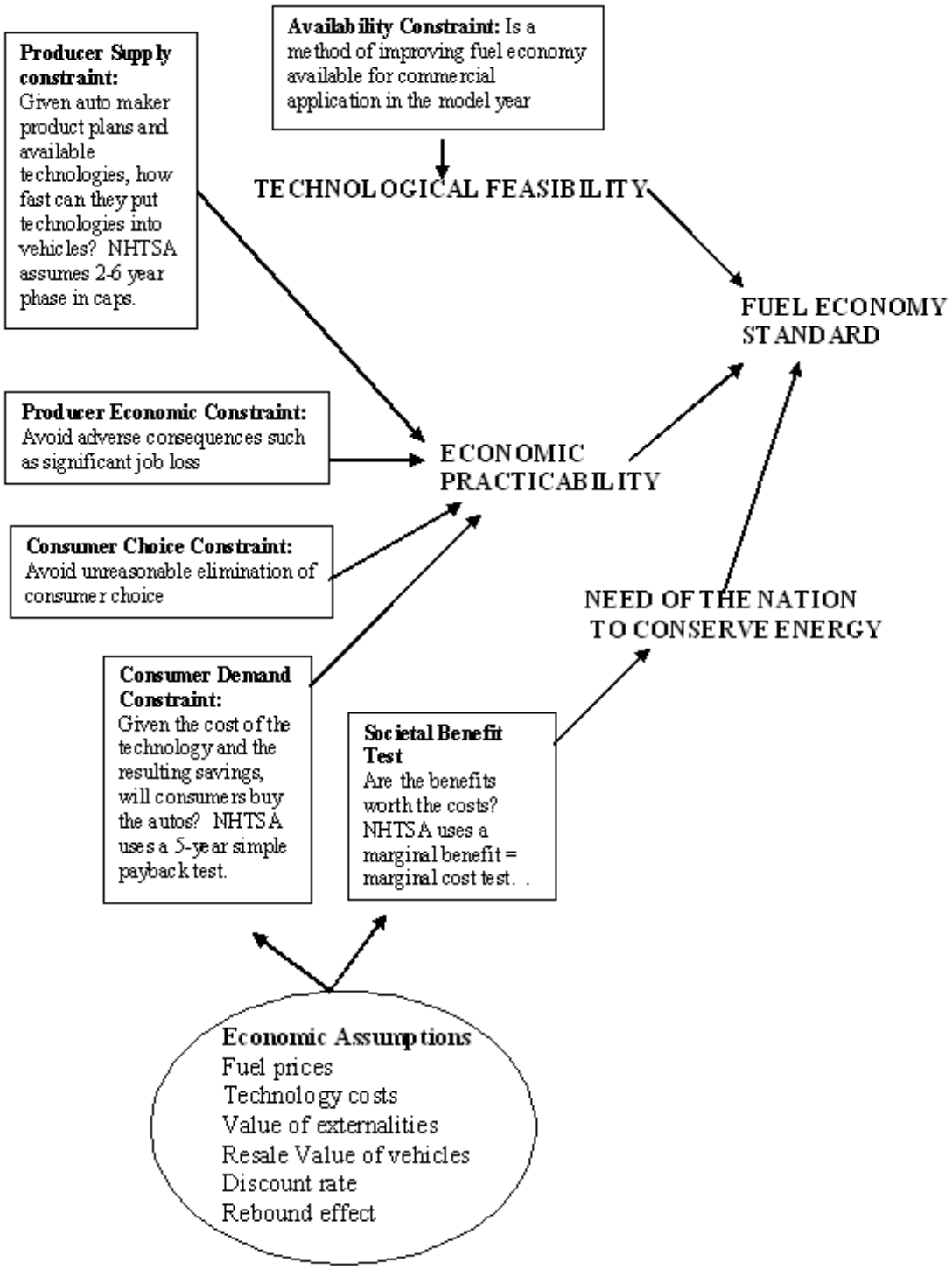
Second, consumers must be willing to pay for those technologies. If consumers won't buy the cars, then automakers will be unable to sell them and their fleet average mpg will not

[125] NPRM, p. 44.
[126] NPRM, p. 44.

improve. The will simply have to pay fines, but no fuel will be saved. NHTSA assumes consumers will not buy technologies that do not meet a simple five year payback test.[127]

[127] NPRM, p. 191.

Exhibit A-1:
Schematic of NHTSA's Approach to Evaluating Fuel Economy Standards



Third, the technologies must yield a benefit to society. The consumer economic and societal perspectives on technologies to raise fuel economy are not identical. Society may count external costs (economic and environmental costs) that may not enter into the private calculation of the consumer. Individuals may demand a higher or lower return on investment than society (or the government). For the societal benefits test, NHTSA assumes that fuel economy spending must yield a 7% return on investment and that society prefers to stop investing in fuel economy when the marginal cost exceeds the marginal benefit. This produces the maximum economic benefit from the standard, not the maximum fuel savings that is technologically feasible and economically practicable.

Fourth, key economic assumptions dictate the outcome of the cost-benefit analysis. Key parameters are the fuel cost, technology cost, value of externalities, discount rates, etc.

While some of the criteria that are used to screen out "methods of improving fuel economy" are precisely defined in the NPRM – e.g. phase-in caps, social welfare principle and a five year payback period – others are not. Phrases such as "Avoid adverse impact" and "avoid unreasonable elimination of consumer choice" are not precisely defined. They are judgmental black boxes. Moreover, the phrasing of these factors seems biased and is indicative of a bias against conservation and higher fuel economy that seems to pervade NHTSA's analysis. For example:

- NHTSA never considers that setting a higher standard might increase consumer choice by pushing automakers to produce a wider range of fuel-efficient cars for consumers to choose from.
- Nor does NHTSA consider in its analysis that higher standards could spur more rapid innovation and adoption of fuel savings technologies.
- It does not consider that pushing the industry to produce more fuel efficient cars might improve employment opportunities by better aligning supply and demand. The utter failure of the industry to foresee recent shifts in consumer demand and the resulting losses of jobs does not enter into NHTSA's thinking.
- NHTSA provides no precise measures by which one could evaluate the impact of the "jobs" and "choice" constraints on the outcome of its analysis. To the extent that they have influenced its decision to set the standard at a specific level, they seem out of touch with the current auto market reality.

There are key flaws in every one of the major elements of NHTSA's analysis. All of the flaws undervalue fuel economy and lead NHTSA to set the standards too low. Some of the flaws are so large and so at odds with the intent of Congress and the current energy reality that they constitute a violation of the law and administrative procedures. Other flaws are smaller and more a "difference of opinion," but they reinforce the bias against conservation. Some of the flaws are easily quantifiable because NHTSA was required to prepare sensitivity analyses that show how the standard would be raised under alternative sets of economic assumptions and

parameters. Other flaws are deeply embedded in the black box that lies at the core of the analysis and therefore are difficult to quantify, but important nonetheless.

AN UNBALANCED APPROACH LEADS NHTSA TO PROPOSE AN UNREASONABLY LOW STANDARD

NHTSA conducts a very large number of analyses of individual technologies under a range of economic assumptions, but it presents no results for public review about the constraints which led to the inclusion or exclusion of any individual technology. Rather, it presents a series of evaluations of broad levels of fuel economy standards and summary measures of how those standards fare in relation to each of the key criteria. Since data to evaluate the standard is publicly available only at this very aggregate level of detail, we must conduct the analysis at this aggregate level…

In short, NHTSA's choice of the "optimized" standard is unreasonable for the following reasons:

- Conceptually, or definitionally, NHTSA's "optimized" alternative fails to properly balance the economic considerations and the need to conserve energy mandated by Congress.
- Conceptually, or definitionally, the "optimized" alternative fails to properly balance the supply-side practicability consideration and the need to conserve energy mandated by Congress.
- Conceptual and empirical flaws in NHTSA's analysis undermine its application of the consumer demand-side constraint.

It is critically important to recognize all three flaws because the policy filters or screens are cumulative. Correcting one of the errors alone will not automatically lead to the proper standard, because policy alternatives may be screened out by one of the other flaws.

Each of the key factors NHTSA has used to set the fuel economy standard suffers from two types of flaws (see Exhibit A-2). They are incorrectly conceptualized/defined, and they are incorrectly specified empirically. CFA's comments and the technical appendices focus on supply-side and demand-side economic practicability issues. Technical Appendix A focuses on the conceptual/definitional issues. Technical Appendix B discusses the empirical economic flaws in the analysis.

AUTO MARKET FAILURE AND THE FAILURE OF NHTSA'S MARKET MODEL

NHTSA's view of the market failure in the auto market is very narrow, generally admitting only a problem of externalities that are not internalized. This results in the failure of NHTSA to adopt reasonable standards that reflect the will of the Congress and the dire situation in which the U.S. finds itself.

> Consumers generally have no direct incentive to value benefits that are not included in the price of fuel – for example, benefits such as energy security and limiting global climate change. These are the market failures which EPCA requires NHTSA to address.[128]

Given the rather dramatic market failures in the auto market in recent years, market failures that have little to do with the cited externalities, we suspect that there are other sources of market failure, like information problems, agency problems, perverse incentives, etc. Moreover, the problem is not limited to the demand-side of the market. There are imperfections in the supply-side.

Exhibit A-2:
Flaws in NHTSA's Analysis of Fuel Economy Standards

Adoption Constraint	Conceptual/Definitional Flaw	Empirical Specification Flaw
Supply-Side	Failure to adopt a clear standard. Suggestion that laggards set a low bar.	Plans are not fully reported or evaluated. NHTSA lets product plans drive the supply-side, but the plans it has are incomplete and the track record of the industry's ability to predict where the market is going has been abysmal in recent years.
Demand-Side	Five year payback is not supported by any evidence and contradicted by current market behavior. Rebound effect is inappropriately applied to consumer welfare calculation.	Fuel prices are too low. Rebound effect is too large. Resale price fails to reflect the economic value of fuel economy.
Societal Welfare	Failure to balance economic need and need to conserve energy.	Fuel prices are too low. Oil has no military or strategic value. Rebound effect is too large. Discount rate is it too high.

[128] NPRM, p. 310.

Although NHTSA has built its entire analysis around the narrow view of market failure, it was confronted with conclusions in its own analysis that contradict that assumption. NHTSA discovers that there are fuel savings technologies that pay for themselves, but have not been moved into the vehicle fleet. Since this cannot be explained by the externalities market failure, there must be other market failures operating.

> *If some fraction of fuel economy improvements (as perceived and valued by vehicle purchasers) is large enough to exceed the increased vehicle cost (and result in an increase in vehicle sales), then what would be the nature of the market failure such that those levels of fuel economy would not exist but for a CAFE mandate? To better understand this issue, NHTSA seeks comment on the following question: What evidence or data exists that indicate the extent to which consumers undervalue fuel economy improvement? Under what circumstances is it reasonable to expect that a mandated increase in fuel economy would lead to an increase in sales?*

NHTSA's pro-industry view of the world blames the market failure on the consumer, when, in fact, the problem is the automakers. This is one of several reasons that NHTSA's reliance on auto industry plans and data and the extreme efforts to which it goes to "protect" the automakers from discomfort are misplaced.

The cars that are sold in the marketplace reflect not only what consumers want to but also, what automakers want to sell. Automakers spend millions on advertising and promotions to move the metal that makes the most profit for them. It is simply wrong to claim that all the advertising and marketing has no effect …

Failing to recognize the imperfections on the supply-side leads NHTSA to an over reliance on automaker product plans. Thus, it is a much better representation of reality to say that the auto market undervalues fuel economy. The problem is not just the consumer. Indeed, the automakers may be a bigger part of the problem. If automakers are required to produce and sell more fuel efficient vehicles, they will have to change their advertising and marketing focus. With the automaker resistance to more fuel efficient vehicles dampened, the apparent market valuation of fuel economy will rise quickly. It is the automakers who have been at least as large a drag on fuel economy as consumers…

There are two implications for NHTSA's analysis. First, CAFE standards correct market failures and therefore can result in economically beneficial outcomes (increases in sales). Second, CAFE standards address important supply-side market imperfections. They counter the tendency to want to produce low cost, energy inefficient vehicles that generate higher rates of profit. CAFE standards also give automakers an incentive to advertise and market more fuel-efficient vehicles. NHTSA's framework needs to fully reflect this alternative, more realistic view of the auto market.

Unfortunately, NHTSA has structured it analysis to put the automaker resistance to fuel economy increases in the driver's seat in several ways.

The product plans of the auto manufacturers play an important part in the overall outcome because they set the baseline from which NHTSA determines what the auto manufacturers can accomplish over a seven year period. Yet, those product plans reflect more about where they would like to drive the market with their advertising and marketing campaign than what they and the market are capable of. Over the past several years the plans of many of the automakers have been rather bad predictors of the market outcomes, at least judging by the numbers of unsold units piling up in the showrooms and lots and the large discounts the automakers have been forced to offer to move the metal. NHTSA presents no analysis of the fit between product plans and market behavior.

Automaker strategic reaction to the prospect of fines also plays an important role in the analytic framework. NHTSA allows the historical desire of automakers to avoid paying fines to pull down the level of the standard, by assuming that setting standards at a level that might cause automakers to pay fines does no good. NHTSA spares the rod and spoils the child. Fines are not only punitive; they are motivational. If NHTSA continually sets standards that are easy to meet to avoid the threat of paying fines, the automakers are never challenged to achieve much higher levels of fuel economy.[129]

NHTSA claims that the proposed standard "pushed many of the manufacturers in their applications of technology. NHTSA is proposing standards that it estimates will entail risk that some manufacturers will exhaust available technologies in some model years. However, the agency has tentatively concluded that the additional risk is outweighed by the significant increase in estimated net benefits to society."[130]

We do not see it that way. In fact, there is very little push here. On average, only one car manufacturer and one truck manufacturer are projected to run out of technology under the proposed rule,[131] but these are technologies that the majority of manufacturers actually can implement. NHTSA's proposed rule is a lot closer to the "least capable manufacturer" standard than an "industry average" capability standard.

Similarly, NHTSA claims that "the agency evaluated the costs and benefits described above and ensured the standards were achievable without the industry's being economically harmed through significant sales losses.'[132] NHTSA has gotten it backwards. It is more likely that the absence of significantly increasing fuel economy standards in the past half decade has led to significant sales loses, than *vice versa*.[133] NHTSA's timidity in proposing higher standards

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[129] NPRM, p. III-13, "In the more stringent alternatives, the Volpe model predicts that increasing numbers of manufacturers will run out of technology to apply and, theoretically, resort to penalty payments. Setting standards this high is not technologically feasible, nor does it serve the need of the nation to conserve fuel. Paying a CAFE penalty does not result in any fuel savings." Note that this quote classifies the phase problem as one of technological feasibility, when in the earlier reference called it a matter of economic practicability. Our earlier discussion makes the point that both practicability and feasibility are consistent with a standard that splits the auto manufacturers in half.

[130] NPRM, p. 315.

[131] PRIA, p. VII-56.

[132] NPRM, p. 316.

[133] PRIA, p. VII-54, shows that the industry lost six percent of its sales and 16 percent of its employment between 2000 and 2005. The "50/50" scenario results in a job loss that is a small fraction of the losses between 2000 and 2005 (28,092 v. 215,600).

to protect the industry is misplaced. The industry needs tougher standards to be protected from its own, self-destructive tendency to under produce fuel economy.

CONCLUSION

It appears that the binding constraints in the proposed rule are the phase-in cap and the social welfare analysis. While the compliance analysis (percent of automakers who fail) and the consumer payback analyses appear to be secondary (because they are not triggered at the level of the standard chosen), their conceptual and empirical flaws need to be corrected by NHTSA. Having written the proposed rule in a manner in which the three constraints could be binding, it is possible that these constraints could be invoked by NHTSA, or other parties, to argue that the standard should not be raised, even though one of the primary constraints is no longer operative. For example, if an increase in fuel prices results in a social welfare analysis that calls for a higher standard, NHTSA and/or other commenters might argue that the consumer benefit test or an automaker compliance criterion militates against setting a higher standard. In short, all of the potential constraints should be fully specified, properly defined and correctly measured independent of the level of the standard.