INSTITUTE FOR ENERGY RESEARCH

COMMENT ON EPA'S PROPOSED RULEMAKING TO ESTABLISH LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSIONS STANDARDS EPA–HQ–OAR–2010–0799

Institute for Energy Research[*]

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INTRODUCTION

On December 1, 2011, the Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) proposed light-duty vehicle greenhouse gas emission standards and corporate average fuel economy standards for light-duty vehicles for model year 2017–2025.[1]

This comment explains that EPA, and by extension NHTSA, fail to justify increasing the greenhouse gas emissions standards for light-duty vehicles. EPA's rule does not affect the pace of climate change in any meaningful way. Therefore, this rule is fatally flawed or the endangerment finding is fatally flawed. After all, EPA is regulating greenhouse gases in order to reduce climate change.

EPA's cost-benefit analysis for this rule is also fatally flawed. EPA's cost-benefit analysis shows positive net benefits only because EPA omits the cost to consumers of limiting consumer choice. Instead, EPA credits forced fuel savings as a benefit. Because the rule increases the upfront cost of buying a car, the rule forces 7 million drivers out of the car market.[2] This means that 7 million people will not be able to enjoy the fuel savings

[*] The Institute for Energy Research (IER) is a not-for-profit organization that conducts intensive research and analysis on the functions, operations, and government regulation of global energy markets. IER maintains that freely-functioning energy markets provide the most efficient and effective solutions to today's global energy and environmental challenges and, as such, are critical to the well-being of individuals and society.

[1] Environmental Protection Agency & National Highway Traffic Safety Administration, *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, 76 Fed. Reg. 74,854 (Dec. 1, 2011).

[2] Forrest McConnell, Director of the National Automobile Dealers Association, *Testimony before the National Highway Traffic Safety Administration and the U.S. Environmental Protection Agency*, Jan. 24, 2012.

calculated by EPA because they will not be able to afford a car in the first place.

Furthermore, EPA's cost-benefit analysis utilizes the "social cost of carbon." The estimates developed through EPA's social cost of carbon analysis are arbitrary and capricious as the social cost of carbon is an unsupportable metric for use in federal rulemaking. Even on its own terms, the social cost of carbon estimate is inapplicable for EPA's analysis, because of what is called "leakage" in the climate change literature. Specifically, EPA ignores the possibility that its rule will *increase* greenhouse gas emissions outside of the United States, through mechanisms such as a lower world price of oil due to restricted American demand.

Lastly, EPA is legally required to consider less restrictive alternatives to achieve their goals of greenhouse gas emission reductions from motor vehicles. EPA does not conduct this analysis in this proposed rule.

For these reasons, EPA should not regulate greenhouse gases from vehicles using the Clean Air Act.

A. ACCORDING TO EPA, THIS PROPOSED RULE WILL ONLY REDUCE GLOBAL TEMPERATURE 0.0076–0.0184 °C BY 2100—TOO LITTLE TO AFFECT CLIMATE IN A MEANINGFUL WAY OR BE DETECTABLE AGAINST BACKGROUND NATURAL VARIABILITY

This proposed rule to regulate greenhouse gas emissions from light-duty vehicles (as well as EPA's endangerment finding for greenhouse gases under section 202 of the Clean Air Act), and *Massachusetts v. EPA* are all predicated on the assumption that regulating greenhouse gas emissions from light-duty vehicles will reduce the impacts of climate change in a meaningful way.[3] According to this proposed rule, however, the climatic benefits from reducing greenhouse gas emissions from light-duty vehicles are very, very small.[4] Because the climatic benefits are so small, this rule will not affect climate change in a meaningful way.

[3] *See* Massachusetts v. EPA, 549 U.S. 497, 525 (2007). The Court stated that "judged by any standard, *U.S. motor-vehicle emissions make a meaningful contribution* to greenhouse gas concentrations and hence . . . to global warming." [emphasis added]

[4] *Id.* at 75,097.

1. Climate Concerns in *Massachusetts v. EPA*—regulating vehicle emissions should result in a "meaningful contribution" to "global warming"

In *Massachusetts v. EPA*[5] the Supreme Court argued that greenhouse gas emissions were causing a number of harms including, "the global retreat of mountain glaciers, reduction in snow-cover extent, the earlier spring melting of ice on rivers and lakes, [and] the accelerated rate of rise of sea levels during the 20th century relative to the past few thousand years . . . ."[6]

The Court continued to explain global warming harms:

> If sea levels continue to rise as predicted, one Massachusetts official believes that a significant fraction of coastal property will be 'either permanently lost through inundation or temporarily lost through periodic storm surge and flooding events.' Remediation costs alone, petitioners allege, could run well into the hundreds of millions of dollars.[7] [internal citations omitted]

The failure to regulate greenhouse gas emissions, according to the Court, "contributes" to Massachusetts' injuries[8] and therefore, EPA could take steps to remedy the injuries caused by climate change. The Court further argued that "reducing domestic automobile emissions is hardly a tentative step"[9] and EPA could regulate greenhouse gas emissions from motor vehicles because, "[j]udged by any standard, ***U.S. motor-vehicle emissions make a meaningful contribution to greenhouse gas concentrations and hence . . . to global warming***."[10] [emphasis added]

2. Climate Concerns in EPA's Proposed Endangerment Finding

On December 15, 2009, EPA found that greenhouse gases in the atmosphere "endanger public health and public welfare."[11] In the endangerment finding, EPA argued that increased levels of greenhouse gases were leading to increased temperatures,[12] decreased Arctic sea ice

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[5] 549 U.S. 497 (2007).
[6] *Id.* at 521.
[7] *Id.* at 523.
[8] *Id.*
[9] *Id.* at 524.
[10] *Id.* at 525.
[11] 74 Fed. Reg. 66,496 (Dec. 15, 2009).
[12] *Id.* at 66,518.

extent,[13] increased precipitation,[14] an increase in sea level rise, increased forest fires, reduced snowpack, increased droughts, [15] and "endangers the water resources important for public welfare"[16] among other concerns.

3. Climate Concerns in EPA's Proposed Rule to Regulate GHGs from Light-Duty Vehicles 2017–2025

As EPA explains in the current proposed rule, "light-duty vehicles, heavy-duty trucks, buses, and motorcycles—accounted for 23 percent of all U.S. GHG in 2007."[17] Because greenhouse gas emissions from light-duty vehicles represent a large portion of U.S. greenhouse gas emissions, EPA argues light-duty vehicles contribute to the effects of climate change:

> the health effects of climate change linked to observed and projected elevated concentrations of GHGs include the increased likelihood of more frequent and intense heat waves, increases in ozone concentrations over broad areas of the country, an increase of the severity of extreme weather events such as hurricanes and floods, and increasing severity of coastal storms due to rising sea levels. These effects can all increase mortality and morbidity, especially in vulnerable populations such as children, the elderly, and the poor.[18]

The proposed rule also states there is a "critical need to address global climate change."[19]

4. Despite these concerns, the proposed rule does not affect climate in a meaningful way, but instead results in, at most, 0.02°C less warming by the year 2100

According to statements from the Supreme Court and EPA on the need to address climate change, this rule would not affect global warming or climate change in any meaningful way. This is because, according to EPA's modeling, the proposed rule would result in an incredibly small reduction in the increase in global temperature. According to EPA:

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[13] *Id.*
[14] *Id.*
[15] *Id.* at 66,532.
[16] *Id.* at 66,533.
[17] 76 Fed. Reg. at 74,861.
[18] *Id.* at 75,162–63.
[19] *Id.* at 74,854.

> The results of the analysis demonstrate that relative to the reference case, projected atmospheric CO2 concentrations are estimated by 2100 to be reduced by 3.29 to 3.68 part per million by volume (ppmv), global mean temperature is estimated to be reduced by 0.0076 to 0.0184 °C, and sea-level rise is projected to be reduced by approximately 0.074–0.166 cm, based on a range of climate sensitivities. The analysis also demonstrates that ocean pH will increase by 0.0018 pH units by 2100 relative to the reference case.[20]

A reduction of global temperature by 0.0076–0.018°C 90 years in the future is too small an amount to affect heat waves, air quality, precipitation, intense storms, harm agriculture, wildlife, or ecosystems in any way. A decrease in sea level rise of 0.0074–0.166 cm, 90 years in the future will not reduce the loss of costal property that the Supreme Court was concerned about in *Massachusetts v. EPA*.[21]

Because EPA's regulation of greenhouse gases from light-duty vehicles does not impact global warming in a meaningful way, EPA's regulation is not rational. Either global warming and climate change is a problem that can and should be addressed in a meaningful way through the regulation of greenhouse gas emissions from vehicles or EPA should not be regulating greenhouse gases from vehicles. Instead, EPA claims global warming is a problem but takes no meaningful steps to do anything about it. This is not rational.

EPA's regulations themselves are very significant. The regulations would double fuel economy standards from 2010 to 2025. But even this will not result in a meaningful reduction in the increase in temperature. Therefore, it does not appear that U.S. greenhouse gas emissions from light-duty vehicles endanger public health and welfare.

In the proposed rule, EPA obfuscates the fact that the rule does not make any meaningful contribution to global warming by stating that the climate impacts are merely "small." EPA states:

> Although the projected reductions and improvements are small in comparison to the total projected climate change, they are quantifiable, directionally consistent, and will

[20] *Id.* at 75,097.
[21] 549 U.S. 497, 522 (2007).

> contribute to reducing the risks associated with climate change.[22]

EPA's explanation is not sufficient. Just because EPA can quantify something using a computer model or a hand-held calculator, does not mean that it is either detectable or meaningful.

For instance, Hansen et al. 2006[23] reported that that the precision of their estimate of the annual global temperature anomaly is only known (with 95% confidence) within a range of +/-0.05°C. Thus the error in our measurement of the global temperature is more than twice as great as the *highest* level of temperature savings calculated by the EPA (which is 0.0184°C).

The error is compounded when calculating a trend over the long-term (like out to the year 2100—or a timescale of about a century). For instance, using a least-squares statistical fit to the temperature annual global temperature anomalies in Hansen's dataset from 1900–2011 shows that the temperatures have risen at a rate of 0.681 +/- 0.074°C per century. So for a century-long trend, the error is more than 4 times as large as the EPA's highest amount of temperature savings.

While EPA's temperature savings is quantifiable, it is not detectable. Since it is not detectable, it means that we cannot assess any sort of scientific meaningfulness from such a change.

This lack of scientific meaningfulness in EPA's regulation is a problem. EPA is supposed to protect the public health and welfare. EPA's regulations should be meaningful, not merely "quantifiable," and "directionally consistent." EPA's statement about quantifiability and directionality would be equally true if greenhouse gas emissions standards were increased by 1 gram per mile (ie. 249 grams per mile instead of 250). But instead of tightening the standard to 249 grams per mile, EPA sets the standard at 163 grams per mile in 2025. EPA gives no rational basis for choosing 163 grams per mile instead of 249 grams per mile.

For all practical purposes, in the context of human welfare, setting the GHG emission standard at 249 grams per mile would result in the same climate impact as setting the standard at 163 grams per mile. The theoretical

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[22] 76 Fed. Reg. at 75,097.

[23] James Hansen et. al., *Global Temperature Change*, 103 PNAS, Sept. 26, 2006, http://www.pnas.org/content/103/39/14288.full.pdf.

temperature impact of a 1 gram per mile standard would be even less than 0.0076–0.018°C, but because 0.0076–0.018°C is so small, the difference would be indistinguishable in the real world.

It should be noted that the EPA Administrator is required to explain the reasonableness of her regulatory response. For example, *Motor Vehicle Mfrs.' Ass'n v. State Farm Mut. Auto. Ins. Co*., requires the agency to "examine the relevant data and articulate … a 'rational connection between the facts found and the choice made.'"[24] The EPA has not done that in this case—there is no rational connection between EPA finding that greenhouse gases endanger public health and welfare and a rule which does not result in a meaningful impact on the imperiled public health and welfare.

5. The climate impact of the proposed rule, though small, may nevertheless be overstated

It is quite possible that EPA's estimate of the reduction in temperature and sea level rise is an overestimate. EPA used a climate sensitivity of 1.5 to 6°C. More recent science argues that the climate sensitivity is likely to be below or in the low range of this estimate.[25] For example, one recent paper found it likely that that climate sensitivity is between 1.7°C and 2.6°C.[26] Another recent paper found a "Transient Climate Response of 1.3–1.8°C".[27]

Previously, EPA has avoided considering climate sensitivities lower than the AR4 range arguing that the IPCC was correct. In 2010, EPA stated:

> "the IPCC indicates the levels of understanding and confidence in quantitative estimates of equilibrium climate sensitivity have increased substantially and there is increased confidence of key processes that are important to climate sensitivity due to improved comparisons of models to one

[24] 463 U.S. 29, 43 (1983). *See also Public Citizen v. Young*, 831 F.2d 1108, 1112 (D.C. Cir. 1987) ("[i]mposition of pointless burdens on regulated entities is obviously to be avoided if possible"); *Indus. Union Dep't v. API*, 448 U.S. 607, 645 (1980) (plurality) (rejecting statutory construction that "would give OSHA power to impose enormous costs that might produce little, if any, discernible benefit").

[25] *See e.g.* Andreas Schmittner et. al., *Climate Sensitivity Estimated from Temperature Reconstructions of the Last Glacial Maximum*, SCIENCE DOI: 10.1126/science.1203513.

[26] *Id.*

[27] Gillett, N.P., et al., 2012. *Improved constraints on 21st-century warming derived using 160 years of temperature observations*, GEOPHYSICAL RESEARCH LETTERS, 39, L01704, doi:10.1029/2011GL050226.

> another and to observations. Thus EPA concludes that the use of the climate sensitivity range for the climate analysis for this rule is appropriate and supported by the scientific literature from the major assessment reports."[28]

In this proposed rule, it is good to see EPA consider a climate sensitivity lower than the IPCC's standard climate sensitivity of 2 to 4.5°C. EPA's past response is now inadequate because of more recent science. Furthermore, the more recent science argues for climate sensitivity nearer the low end of the range and discounts the top end of the range EPA used.

The climate sensitivity is important because it forms the basis for EPA's justification for regulating greenhouse gases from light-duty vehicles. If the lower bound for climate sensitivity is correct, the impact of this proposed rule would only be about 0.008°C by 2100—an incredibly small amount to say the least.

6. Because these regulations would not affect climate in a meaningful way, this calls into question EPA's Endangerment Finding

This proposed rule is a follow-up to EPA's proposal that greenhouse gases from motor vehicles "endanger public health or welfare" under section 202 of the Clean Air Act. The 2017-2025 light-duty vehicle standard demonstrates that the Endangerment Finding is on shaky ground. If greenhouse gas emissions from motor vehicles "endanger public health or welfare," it stands to reason that this proposed rule should lead to meaningful climatic benefits. However, because this proposed rule would only lead to a reduction in global temperature by 0.0076–0.0184°C by 2100 that is both climatically meaningless and undetectable against background natural variability, this rule does not create a meaningful impact.

7. Conclusion to Section A

Because this rule fails to affect climate in a meaningful way, and because reducing climate harms is the point of EPA's regulatory authority under *Massachusetts v. EPA* and the proposed endangerment finding, EPA should not regulate greenhouse gases from light-duty vehicles.

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[28] EPA, *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards EPA Response to Comments Document for Joint Rulemaking*, 5-388 – 5-398, Apr. 2010, http://www.epa.gov/otaq/climate/regulations/420r10012a.pdf .

B. EPA's Cost-Benefit Analysis Is Flawed and Does not justify Promulgating this Rule

Depending on the discount rate used, and the value attributed to the social benefits from reduced greenhouse gas emissions, EPA estimates that through the year 2050, the proposed rule will have net benefits (i.e. benefits exceeding costs) ranging from $460 billion to $1.7 trillion (in 2009 dollars).[29]

However, EPA's cost-benefit analysis rests upon several dubious assumptions, at times straining to account for various possible benefits from the new rule while ignoring quite plausible drawbacks. Even a cursory inspection of EPA's own breakdown of the numbers should give EPA pause before implementing the rule. Because of the sensitivity of the results to the controversial assumptions, it is not merely that EPA may be overstating the net benefits of the rule. Rather, the new rule may impose large net *costs*.

As EPA's own discussion indicates, its modeling assumes that the current market for fuel economy is incredibly inefficient, with consumers and businesses making massive, systematic errors in their behavior over the course of decades. If, in reality, households and businesses are *not* as shortsighted as the EPA analysis assumes—perhaps because the EPA modeling leaves out one or more important factors that matter to vehicle buyers in the real world—then the EPA's cost-benefit analysis collapses.

In addition to basing its case on an assumption that households and businesses irrationally fail to reap advantageous fuel economy savings, EPA's estimates also incorrectly deploy the concept of "Social Cost of Carbon" (SCC) from the climate change literature. Although the SCC is a useful theoretical concept in discussions of worldwide carbon taxes or other frameworks, there are several problems with EPA's invocation of the concept in the context of US-based fuel economy mandates.

1. EPA Assumes That in Absence of Fuel Economy Regulations, Vehicle Buyers Would Ignore Hundreds of Billions of Dollars in Potential Gains

In standard economic models, it is assumed that households rationally

[29] 76 Fed. Reg. at 75,113.

act in their interest, and spend their incomes in ways that maximize utility. It is not that economists literally believe each consumer is a robot capable of performing complex calculus problems with each item in the grocery store, but instead economists believe that rationality is a safe benchmark assumption. This is because the forces of competition, learning from the examples of others, and the ubiquity of product ratings and other information will tend to limit systematic errors on the part of consumers, especially for expensive, recurring purchases and in markets that have many customers.

To be sure, standard economic theory allows a role for government intervention in the case of "negative externalities," which can include greenhouse gas emissions. In this case, although motorists (for example) would presumably make vehicle purchases that tended to equate marginal *private* benefits with marginal *private* costs, nonetheless their behavior would be suboptimal since each vehicle buyer would ignore the *social* costs of his or her behavior. In this setting, the typical economic textbook might recommend a carbon tax or a cap-and-trade framework to force consumers to "internalize the externality" and to once again have their private incentives aligned with social welfare.

To be clear, the above analysis is typical in standard economic theory, but this is *not* how EPA approaches the cost-benefit assessment of the proposed rule. Instead, EPA assumes that the new rule will *benefit* vehicle buyers *even considering only their narrow self-interest*, and then *on top* of these net private benefits, EPA adds the social benefits of reduced greenhouse gas emissions. In other words, EPA attempts to justify the new rule not simply on the grounds that individual consumers are ignorant of how their behavior will affect global temperatures in the year 2100, but EPA *also* assumes that consumers are ignorant of how their behavior will affect their gasoline purchases *next* year.

EPA recognizes the problem:

> For this proposed rule, EPA projects significant private gains to consumers in three major areas: (1) Reductions in spending on fuel, (2) for gasoline-fueled vehicles, for time saved due to less refueling, and (3) additional driving that results from the rebound effect. In combination, these private benefits, mostly from fuel savings, appear to outweigh the costs of the standards, even without accounting for externalities.

> **Admittedly, these findings pose an economic conundrum**….If our analysis projects net private benefits that consumers have not realized…then, [assuming efficient markets], there must be additional costs of these private net benefits that are not accounted for [in the EPA analysis]….**The estimate of large private net benefits from this rule, then, suggests either that the assumptions [of efficient markets and rational consumers] do not hold, or that EPA's analysis has missed some factor(s) tied to improved fuel economy that reduce(s) consumer welfare**.[30] [Bold added.]

To see just how important EPA's assumption of consumer error is to its overall cost-benefit results, consider the following table:

EPA Estimates of Costs and Benefits of Proposed Rules for Varying Discount Rates and Social Cost of Carbon (Millions, 2009$)

	2017	2020	2030	2040	2050	NPV, 3%	NPV, 7%
Technology Costs	$2,300	$8,470	$35,700	$39,800	$44,600	$551,000	$243,000
Fuel Savings	$570	$7,060	$85,800	$144,000	$187,000	$1,510,000	$579,000
Implicit Assumed Consumer Error	*N/A*	*N/A*	*$50,100*	*$104,200*	*$142,400*	*$959,000*	*$336,000*
Other Benefits (Low SCC Case)	$101	$1,240	$15,600	$29,000	$40,700	$275,000	$124,000
Other Benefits (High SCC Case)	$250	$3,100	$40,500	$75,100	$102,000	$764,000	$614,000
Net Benefits (Low SCC Case)	($1,630)	($166)	$65,600	$133,000	$183,000	$1,230,000	$460,000
Net Benefits (High SCC Case)	($1,480)	$1,690	$90,500	$179,000	$244,000	$1,720,000	$950,000

Source: Adapted from Table III-81, 76 Fed. Reg. at 75,144.

The above table shows the breakdown of the aggregate net benefits figures quoted earlier. For example, if we assume a discount rate of 7% and take the lowest estimate of the SCC that EPA uses, then the cost of the proposed rule (through 2050) has an estimated present value of $243 billion, in the form of higher vehicle costs passed on to the purchaser.

[30] 76 Fed. Reg. at 75,113.

However, this gross cost is offset by (a) fuel savings of $579 billion and (b) other benefits (including avoided climate-change damages) of $124 billion. On net, therefore, the high discount rate and low SCC yield benefits of ($579 billion + $124 billion) - $243 billion = $460 billion. Similar calculations show that if we assume a low discount rate of 3%, and a high SCC, then the net benefits rise to $1.72 trillion.

IER has added the row entitled "Implicit Assumed Consumer Error." These values are the difference between the fuel savings and the assumed technology cost (i.e. higher vehicle price, holding all else constant except for fuel efficiency) for each time period. For example, in the year 2040 EPA assumes consumers will suffer $39.8 billion in the form of higher vehicle prices. However, consumers will benefit from saving $144 billion in fuel expenditures. This means that *looking solely at private costs and benefits*, in the year 2040 the rule will ostensibly provide net benefits to consumers of $104.2 billion.

This is quite a large error to attribute to consumers, and to repeat, this is an *annual figure* (for the year 2040), and it is reckoned in inflation-adjusted 2009 dollars. The reader should recall EPA's own admission: *Either* consumers are going to systemically ignore hundreds of billions of dollars in free money, *or* the EPA's modeling omits important real-world considerations. In the next subsection this comment will explore what these considerations might be.

Before doing so, it should be reiterated just how significant this assumption of consumer irrationality is to EPA's overall cost-benefit assessment. For the high discount rate, low SCC scenario, the implicit consumer error through 2050 is $336 billion, compared to total net benefits of $460 billion. Thus *73 percent* of the total net benefits allegedly accruing from the proposed rules (in this particular scenario) are due to the assumed consumer error. In the scenario assuming a low discount rate and high SCC, the implicit consumer error accounts for 56 percent of the total estimated net benefits.

In other words, if it turns out that EPA is indeed omitting important factor(s) from its modeling—such that consumers wouldn't systematically miss out on hundreds of billions of dollars over the course of decades if the government doesn't force them to reap this free money—then EPA's claimed net benefits from the proposed rules would fall by roughly one-half to three-fourths, depending on the other parameter values.

2. The Alleged "Energy Paradox"

As explained in the previous subsection, EPA's analysis rests on the assumption that consumers are irrationally unwilling to pay a higher price for "the same" vehicle that is equal in all respects to another, cheaper vehicle, except for superior fuel economy. This behavior is assumed true even when the present value of lifetime savings on fuel expenditures would more than compensate for the higher initial purchase price, leading to the term "energy paradox" in the literature. The EPA discussion relates some of the theories in the literature to explain this "conundrum," such as consumers incorrectly calculating the fuel savings from differences in mpg ratings, consumers using rules of thumb when making purchases rather than optimizing calculations, etc.

The problem with these ad hoc explanations is that they ignore the tremendous profit opportunities such massive consumer irrationality would leave open to enterprising firms. For example, even if one were to believe that individual motorists could make gross computational errors of this magnitude, surely *entire taxicab fleets* wouldn't be plagued by these simple mistakes. (And yet, in 2011 New York City Mayor Bloomberg sought the power to regulate fuel economy standards for NYC cabs.[31]) Another obvious industry—and one that is more open to competition than taxi fleets—to benefit from this alleged inefficiency is the rental car market. It might take some ingenuity to implement, but if the EPA's analysis is correct, then a rental car company could presumably profit by buying only vehicles with very high fuel-efficiency, and coming up with various methods for capturing the savings this would allow for its customers. (For example, it would be fairly easy to estimate the dollar savings in fuel for a given trip that would last only a few days—as opposed to estimating the lifetime fuel savings when buying a new car.) The fact that rental car agencies currently *don't* consist entirely of the highest fuel-efficient models is yet more evidence that EPA's modeling leaves out important factors.

Consider the following table produced from data from U.S. Department of Energy and EPA.[32] In every case, the 2010 version of each car is larger,

[31] *See* New York City Press Release, *Mayor Bloomberg and Taxi Commissioner Yassky Join Senator Gillibrand and Congressman Nadler to Introduce Green Taxis Act*, http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2011a%2Fpr100-11.html&cc=unused1978&rc=1194&ndi=1, Mar. 28, 2011.

[32] United States Department of Energy and Environmental Protection Agency, www.fueleconomy.com . The cars included in this graph are the base model—the sedan

has a larger engine, has more passenger volume, and more luggage volume. The fuel economy is similar with the 2010 version generally getting slightly worse city fuel economy and slightly better highway fuel economy.

Year, Make, Model	City MPG	Highway MPG	Car Type	Engine Size	Passenger Volume	Luggage Volume
1985 Honda Accord	23	30	Subcompact	1.8 liter	85	12
2010 Honda Accord	22	31	Large Cars	2.4 liter	106	14
1985 Honda Civic Coupe HF	40	48	Two Seater	1.5 liter	NA	NA
1985 Honda Civic	26	31	Subcompact	1.5 liter	84	12
2010 Honda Civic	26	34	Subcompact	1.8 liter	91	12
1985 Toyota Camry	25	31	Compact	2.0 liter	93	14
2010 Toyota Camry	22	33	Midsize	2.5 liter	101	15

Data Source: www.fueleconomy.gov

Consumers demand a certain fuel economy, but consumers also want to maximize other attributes such as performance and size (then again, maybe the fuel economy of these cars is actually higher than consumers' actual preferences because of CAFE standards). If consumers really demanded very fuel efficient cars, Honda would still make a car today that gets better gas mileage than the 1985 Honda Civic Coupe HF. The Civic Coupe HF got nearly 50 mpg on the highway a quarter century ago. Today, the Honda's most fuel efficient car is a hybrid sedan Civic that gets 44 mpg in the city and 44 mpg on the highway. The better explanation for this outcome is that consumers have preferences for a variety of attributes that the EPA analysis omits, *not* that consumer irrationality increased over the last 25 years.

One of the most obvious effects of higher fuel efficiency is a lighter vehicle, which (other things equal) means a vehicle that provides less safety for its occupants in the event of a crash. Anecdotally, it is typical to hear a father explain his vehicle purchase for a daughter going off to college in terms of its safety, rather than couching the decision in terms of how much money she will save in fuel expenditures.

Scholarly studies have attempted to quantify the extra motorist deaths attributable to the CAFE standards first put into place in the 1970s. Depending on the particular assumptions and the time frame chosen, the

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version with the smallest available gasoline engine and manual transmission.

estimates range from 41,600 to 124,800 deaths.[33] A 2002 National Academy of Sciences study found that the downsizing effect of CAFE led to 1,300 to 2,600 deaths in a single year and ten times that many serious injuries.[34] Also, weight in vehicles still matters and one way to get better fuel efficiency is through weight reductions. A study from the Insurance Institute for Highway Safety recently found that "strong relationship between vehicle weight and occupant safety."[35] In fact, they found that "Hybrids on average are approximately 10 percent heavier than their conventional counterparts and have lower injury rates in a crash. . . the odds of sustaining an injury in a hybrid were about 25 percent lower than in a lighter non-hybrid vehicle."[36]

It is important to note that even if the EPA's analysis is correct to assume that vehicle consumers do not correctly calculate the lifetime savings from higher fuel efficiency, then by the same token we must allow for the possibility that vehicle consumers may not correctly estimate the higher probability of injury or death from driving a car that is lighter or has less space between the steering wheel and driver's seat, etc. In order to achieve its findings of a pure boon to consumers, the EPA analysis assumes that the higher mileage standards are achieved through holding all else constant, and increasing the final price of vehicles. But in reality, in the new equilibrium the "irrational" and "myopic" consumers may buy vehicles that achieve the new efficiency mandates through a combination of less safety and only slightly higher prices. To the extent that *this* calculation is "irrational" and "myopic," the regulations may reduce one type of inefficiency (i.e. excessive fuel consumption) while increasing another one (i.e. excessive crash deaths). EPA certainly has offered no argument showing that fuel consumption is a more serious social problem than traffic fatalities.[37]

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[33] *See* J.R. Dunn, *Death by CAFE Standards*, AMERICAN THINKER, Apr. 13, 2010, http://www.americanthinker.com/2010/04/death_by_cafe_standards.html .

[34] Board on Energy and Environmental Systems, EFFECTIVENESS AND IMPACT OF CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS (2002), http://www.nap.edu/openbook.php?record_id=10172&page=R1.

[35] Insurance Institute for Highway Safety, *Injury Odds and Vehicle Weight Comparison of Hybrids and Conventional Counterparts*, Sept. 2011, http://www.iihs.org/research/topics/pdf/hldi_28.10.pdf.

[36] *Id.*

[37] To be clear, the text refers to traffic fatalities that result from consumers incorrectly estimating the tradeoff between vehicle price and safety. The EPA analysis does incorporate costs from traffic accidents, but these appear to include only the accidents due to extra driving, *not* to consumer "irrationality" regarding vehicle safety.

Besides the possibility of other factors entering into the consideration, another explanation for the ostensible "irrationality" of consumers is that they treat the uncertainty of the future differently from how the EPA's modeling approach requires. When evaluating the present monetary value of improvements in fuel efficiency, two of the most important considerations are future interest rates and the price of gasoline. These are highly volatile, and consumers quite rationally may not place much weight on expected savings from fuel economy occurring several years in the future.

In other words, consumers may rationally have much higher discount rates than EPA assumes they should have. Consider this research presented by economist Ronald J. Sutherland in the context of a previous NHTSA rulemaking:[38]

> Corporations frequently require high hurdle rates in excess of 12 percent to undertake capital investments. Dixit and Pindyck present a compelling analysis of observed high discount rates for irreversible investments.[39] The technical literature indicates that irreversible investments may require hurdle rates two to four times the average discount rate in order to trigger an investment.[40] However, fuel economy standards have the unattractive investment properties of being irreversible, whereas common stocks are highly liquid. Metcalf and Rosenthal[41] and Hassett and Metcalf[42] explain how this irreversibility property warrants discount rates of at least two or three times higher than may be expected. Allowing for the irreversibility property of such investments,

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[38] Ronald J. Sutherland, *Public Interest Comment on Light Truck Average Fuel Economy Standard Model Years 2008–11*, Mercatus Center, http://www.mercatus.org/sites/default/files/publication/Fuel_Economy_Standards_for_Light_Trucksv2.pdf .

[39] Avinash Dixit and Robert S. Pindyck, INVESTMENTS UNDER UNCERTAINTY (1994) Princeton University Press.

[40] Avinash Dixit, *Investments and Hysteresis*, THE JOURNAL OF ECONOMIC PERSPECTIVES, 1992, 6(1), Winter, pp. 107–132; Saman Majd and Robert S. Pindyck, *Time to Build, Option Value, and Investment Decisions*," JOURNAL OF FINANCIAL ECONOMICS, 1987, 18, pp. 7–27. Robert McDonald and Daniel Siegel, "The Value of Waiting to Invest," *Quarterly Journal of Economics*, 1986, 101, pp. 707–728.

[41] Gilbert Metcalf and Donald Rosenthal, *The 'New' View of Investment Decisions and Public Policy Analysis: An Application of Green Lights and Cold Refrigerators*, JOURNAL OF POLICY ANALYSIS AND MANAGEMENT, 1995, 14 (4), pp. 517–531.

[42] Kevin A. Hassett & Gilbert Metcalf, *Energy Conservation Investment: Do Consumers Discount the Future Correctly?*, ENERGY POLICY, Vol. 21, June 1993, p. 710–716.

> a required rate of return of at least 20% appears reasonable for high-income households.
>
> Energy saving investments are typically irreversible investments and therefore require an even higher premium. The proposed fuel economy standards for light trucks are irreversible investments. The investment in fuel economy is a sunk cost at time of purchase. The investment cannot be reversed, should the consumer decide that the investment is unwarranted. Hassett and Metcalf apply the irreversible investment model to investments in energy conservation and conclude that an appropriate hurdle rate would be about four times greater than the standard discount rate. Metcalf and Rosenthal reach a similar conclusion in applying the model to commercial lighting and to energy efficient refrigerators. If the government imposed discount rate of 7 percent is considered standard, an appropriate discount rate for the fuel economy benefits would be at least 14 percent, but probably closer to 21 percent or event 28 percent.
>
> The application of higher hurdle rates indicates that the benefits from fuel economy standards should be revised downward. The NHSTA study calculates consumer benefits as the present value of future energy saving using a 7 percent discount rate. However, the evidence on discount rates, as well as revealed consumer preferences, indicates that an appropriate discount rate is at least 2 or 3 times higher that [sic] the government imposed rate.[43]

Consumers may not act as EPA assumes they should act, but that is no proof that consumers act against their rational economic self-interest. Consumers may be maximizing other dimensions that EPA is not considering.

Responding to this argument in the past, EPA has argued that we are suggesting that "there must be a loss associated with improving fuel economy, because many consumers do not purchase highly fuel-efficient vehicles already on the market." Furthermore, EPA states:

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[43] Ronald J. Sutherland, *Public Interest Comment on Light Truck Average Fuel Economy Standard Model Years 2008–11*, Mercatus Center, http://www.mercatus.org/sites/default/files/publication/Fuel_Economy_Standards_for_Light_Trucksv2.pdf.

> OMB Circular A-4 notes that "Economists ordinarily consider market prices as the most accurate measure of the marginal value of goods and services to society." The fuel savings that consumers will receive are directly measurable using market prices for fuel, while the values that consumers reveal through their purchase decisions are indirect measures and may therefore be less reliable.
>
> EPA, along with most commenters on the rule, finds that there are cost-effective fuel savings that the market has not at this time provided to consumers and includes those benefits in our analysis.[44]

In other words, EPA is ignoring (or at least heavily discounting) people's actual purchase decisions and only considering what EPA can measure—fuel consumption. This same logic is contained in this proposed rule. Just because people may value safety, power, four wheel drive, comfort, convenience, size, more than fuel economy does not mean EPA can discount those choices. It is not necessarily irrational to value other characteristics more than fuel savings as EPA assumes.

The EPA's logic can be turned on its head, to show the problem with its approach. Currently, it is unprofitable for manufacturers to produce vehicles with the specific combination of attributes that would satisfy the proposed mileage standard. That means the amount consumers would be willing to pay for *these* compliant vehicles is less than the market value of the resources that would be required to produce them; that's what it means to say their production is currently unprofitable. Thus EPA's own criterion shows that its rule would force vehicle manufacturers to devote scarce resources into channels that are less valuable than other potential outlets.

3. Models which purport to show consumers do not act in their rational economic self-interest are crude at best

To reiterate, the EPA cost-benefit analysis relies on a particular theory of consumer behavior—namely that it is prone to extreme error in the

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[44] *See* EPA, *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards EPA Response to Comments Document for Joint Rulemaking*, 5-388 – 5-398, Apr. 2010, http://www.epa.gov/otaq/climate/regulations/420r10012a.pdf .

context of vehicle fuel economy. In the literature modeling consumer behavior, the estimated valuations of fuel economy vary by an order of magnitude, suggesting that the econometricians do not understand this issue very well.[45] In practice, there are no "controlled experiments" where consumers are offered the choice between two *otherwise identical* vehicles, where one is more expensive yet has better fuel economy. On the contrary, in the real world there are tradeoffs between vehicles that simultaneously differ on vehicle size, acceleration, price, safety, and finally fuel economy. More recent modeling has done a better job capturing these nuances,[46] but economists have still not reached a consensus on exactly what motivates consumers when making vehicle purchases.

To give a concrete example of the problem, the EPA's discussion of the "energy paradox" acknowledges that consumers in practice do not always have a full spectrum of vehicle attributes varying in each dimension, and then says in a footnote: "For instance, in [model year] 2010, the range of fuel economy (combined city and highway) available among all listed 6-cylinder minivans was 18 to 20 miles per gallon. With a manual transmission, 4-cylinder minivan, it is possible to get 24 mpg."[47]

The EPA discussion is here trying to explain why the energy paradox persists; in EPA's view, the market for some inexplicable reason isn't offering minivans getting 24 mpg, and so consumers have no choice but to buy the less fuel efficient models, even though the savings in price is swamped by the long-run fuel expenditures that these cheaper minivans will require.

But the EPA discussion fails to ask: *Why* did the market for minivans concentrate on automatic transmission, 6-cyclinder models that only got 18 to 20 mpg? After all, car companies in the past offered manual transmissions in their station wagons and vans. So why are car companies not offering manual transmissions in their minivans now? Could it be that many of the households in the market for a new minivan weren't interested in an option that would require using the clutch while taking the kids to soccer games and other activities throughout the week in stop-and-go

[45] *See* EPA & NHTSA, *Proposed Rulemaking To Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy* Standards, 74 Fed. Reg. 49,454 at 49603 (2009).

[46] *See e.g.*, Jacob Gramlich, *Gas Prices and Endogenous Product Selection in the U.S. Automobile Industry*, http://www.econ.yale.edu/seminars/apmicro/am08/gramlich-081216.pdf (2008).

[47] Footnote 507 in 76 Fed. Reg. at 75,114.

driving? In the EPA's crude modeling, if these households had instead been forced to buy a more expensive, 4-cylinder minivan with a stick shift, EPA's rule would be doing them a favor in the long run.

4. A one-size-fits-all regulatory policy is not the answer for people with heterogeneous tastes and preferences

As another specific example of the true subtleties involved—which are ignored by simplistic models—we must remember that a typical suburban family might purchase a "gas guzzling" SUV in order to make large grocery runs, pick up furniture, pull a boat, etc., while it *also* purchases a fuel efficient car for other travel. Depending on future movements in gasoline prices, the family can then adjust its driving accordingly, using the SUV more when gasoline is cheap, while relying more heavily on the hybrid when gasoline prices are relatively high. The typical model looking for "the" consumer valuation of fuel economy currently does not capture the flexibility and needs of actual motorists. By imposing a one-size-fits-all decision that raises fuel economy (while hurting other attributes) across the board, the government would be taking away options from families and making them worse off.

Another problem with the entire approach is to assume that consumers have identical tastes regarding fuel economy. In reality, some consumers may be very concerned, while others may not be. Thus even if the proposed rule made the "representative consumer" better off, in practice it would still harm those consumers who (for whatever reason) do not place a high subjective value on fuel economy.

As a final example showing the problem in the EPA's assumption of a typical vehicle buyer, consider that the proposed rule increases the upfront cost of buying a car, and thereby forces an estimated 7 million drivers out of the car market.[48] This means that 7 million people will not be able to enjoy the fuel savings calculated by EPA because they will not be able to afford a car in the first place. Thus the alleged fuel economy benefits to vehicle buyers who are still *able* to afford their purchase must be weighed against the psychic losses to those who now must postpone or abandon their purchases altogether. Aggregating subjective preferences together to achieve a single number of "net benefits" is a very controversial area of

[48] Forrest McConnell, Director of the National Automobile Dealers Association, *Testimony before the National Highway Traffic Safety Administration and the U.S. Environmental Protection Agency*, Jan. 24, 2012.

economic theory, though EPA hardly discusses the issue.

5. The "Social Cost of Carbon" is used improperly in the EPA's assessment

Besides the problems with overriding consumers' voluntary choices, part of EPA's analysis is methodologically flawed because EPA uses the "social cost of carbon" in its cost-benefit analysis. As a concept, the social cost of carbon has the appearance of specificity without necessarily reflecting reality in a meaningful way.

EPA and NHTSA explain the social cost of carbon thusly:

> EPA has assigned a dollar value to reductions in CO2 emissions using global estimates of the social cost of carbon (SCC). The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change.[49]

EPA argues that by reducing greenhouse gas emissions, this rule would produce benefits, as measured by the social cost of carbon, of a discounted present value of $32.8 billion (using a 5% discount rate) to $522 billion (using a 3% discount rate) and 95th percentile social cost of carbon assumption.[50] But these amounts are almost certainly overestimates. As EPA admits, this rule will only reduce global temperature by 0.0076–0.0184 °C by 2100. Even in the scenario with the most warming, a 0.02°C reduction in temperature is not enough to have any impact on the damages EPA claims will occur with higher temperatures—i.e. "changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change."[51] Without having an impact on these damages, there are no real benefits.

In the economics of climate change literature, the social cost of carbon (SCC) is calculated by reducing the absolute amount of greenhouse gas emissions by one (carbon-dioxide-equivalent) ton and estimating the

[49] 76 Fed. Reg. at 75,126.
[50] 76 Fed. Reg. at 75,129.
[51] *See* 76 Fed. Reg. at 75,126.

corresponding reduction in the present-discounted value of total long-run climate damages.

EPA's cost-benefit methodology assumes that a proposal that reduces greenhouse gas emissions by a certain quantity *R* will therefore yield social benefits (from reduced climate damages) of *R x SCC*. However, this overstates the benefits, because of a phenomenon called "leakage." The calculation of benefits using SCC assumes that if the United States foregoes greenhouse gas emissions as a result of this rule, then those emissions will not happen. This fails to include the impact of these rules outside the United States. Specifically, it is not the case that global emissions from all other sources will be unaffected by the proposed rules. For example, the new rules (and accompanying higher prices for new vehicles) will lead motorists to drive their older, less fuel efficient cars for longer than they otherwise would have, and in the extreme more people will emigrate to jurisdictions that have looser standards and buy more vehicles from exempt manufacturers than would otherwise have occurred. Another major consideration is that reduced U.S. demand for oil will depress world oil prices and lead to greater fuel use by motorists around the world. In the aggregate and over several decades, the actual reduction in global emissions will be lower—and possibly significantly lower—than a naïve estimate would indicate.

Another problem is that the EPA's analysis doesn't ask whether the proposed rules would reduce greenhouse gas emissions in the most efficient manner. In the economics of climate change literature, it theoretically improves social welfare if governments around the world jointly implement a uniform carbon tax equal to the estimated Social Cost of Carbon. The higher price on carbon emissions leads to reductions by precisely those emitters that are most able to afford it. As a result, this "market-based" (though the term is somewhat of a misnomer since it results from government tax policy) approach to fighting climate change would achieve the correct reduction in total emissions in the least-cost manner.

In this theoretically optimal scenario, it is very improbable that the worldwide response to the new carbon tax regime would consist of U.S. manufacturers sharply increasing the fuel efficiency of light duty cars and trucks. There are other, cheaper ways of reducing carbon emissions by a desired quantity. By eschewing "market-based" approaches and directly ordering the particular *form* of emission reductions—namely by increasing the fuel efficiency of new vehicles in certain classes by specific amounts by specific deadlines—the proposed rules are economically inefficient, relative

to other possible policies.

CONCLUSION

EPA fails to provide any justification to regulate greenhouse gas emissions from light-duty vehicles. In fact, EPA's proposed rule clearly demonstrates that greenhouse gas emissions from light-duty vehicles do not "endanger public health or welfare" as required by section 202 of the Clean Air Act. Furthermore, EPA's cost-benefit analysis for this rule is fatally flawed. EPA's cost-benefit analysis shows positive net benefits only because EPA omits the cost to consumers of limiting consumer choice. EPA's cost-benefit analysis utilizes the "social cost of carbon," which estimates in this proposed rule demonstrate to be an arbitrary and unsupportable metric for use in federal rulemaking. For these reasons, EPA should not regulate greenhouse gases using the Clean Air Act.