No. 12-21
July 2012

WORKING PAPER

OVERRIDING CONSUMER PREFERENCES WITH ENERGY REGULATIONS

By Ted Gayer and W. Kip Viscusi

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George Mason University

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Ted Gayer
tgayer@brookings.edu
Ted Gayer is the co-director of the Economic Studies program and the Joseph A. Pechman Senior Fellow at the Brookings Institution. He conducts research on a variety of economic issues, focusing particularly on public finance, environmental and energy economics, housing, and regulatory policy. He received his Ph.D. from Duke University.

W. Kip Viscusi
kip.viscusi@vanderbilt.edu
W. Kip Viscusi is Vanderbilt's first University Distinguished Professor, with primary appointments in the Department of Economics and the Owen Graduate School of Management as well as in the Law School. He is the award-winning author of more than 20 books and 300 articles, most of which deal with different aspects of health and safety risks. He received his Ph.D. from Harvard University.

Keywords: Energy regulations; Cost-benefit analysis; Behavioral economics; Consumer choice; Climate policy; Energy efficiency standards

JEL: Q4, Q48, Q5, Q54

Abstract

This paper examines the economic justification for recent U.S. energy regulations proposed or enacted by the U.S. Department of Energy, the U.S. Department of Transportation, and the U.S. Environmental Protection Agency. The case studies include mileage requirements for motor vehicles and energy-efficiency standards for clothes dryers, room air conditioners, and light bulbs. The main findings are that the standards have a negligible effect on greenhouse gases and the preponderance of the estimated benefits stems from private benefits to consumers, based on the regulators' presumption of consumer irrationality.

[*] The authors would like to thank Caroline Cecot, Kasey Higgins, Jinghui Lim, and Sam Miller for assistance in developing the case studies for this paper.

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Introduction

The efficiency rationale for any government regulation rests on the existence of some type of market failure. The ways markets may fail are quite diverse, ranging from characteristics of the market structure to various kinds of externalities; that is, adverse effects on parties other than the buyer and seller of a product. In the absence of some type of market failure there is no legitimate basis for regulation from the standpoint of enhancing economic efficiency.

This article examines a major class of recent government initiatives by the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Transportation (DOT) pertaining to energy efficiency (as distinct from economic efficiency). The regulations of interest all pertain to consumer products that are durable goods. There may be some kind of market failure with respect to the energy usage of these products, as energy use leads to environmental consequences. However, the existence of an imperfection alone cannot justify all regulations that take the form of government intrusion into the marketplace to override consumer choices. We examine the justification for these energy regulations and show that demonstrable market failures are largely incidental to an assessment of the merits of these regulations. Rather, the preponderance of the assessed benefits is derived from an assumption of irrational consumer choice. The impetus for the new wave of energy-efficiency regulations has little to do with externalities. Instead, the regulations are based on an assumption that government choices better reflect the preferences of consumers and firms than the choices consumers and firms would make themselves. In the absence of these claimed private benefits of the regulation, the costs to society dwarf the estimated benefits.

We begin with a discussion of how one might assess the desirability of energy-efficiency standards. What criteria should be applied to such policies? We advocate the mainstream-economics approach of evaluating the merits of regulations based on their benefits and costs and whether, on balance, the regulations promote social welfare.[1] But framing the issue in these terms is only the starting point; it leaves open the determination of what constitutes a cost or a benefit. As our discussion in this paper indicates, government agencies do not properly assess the benefits from energy-efficiency standards. They assume consumers and, in some cases, firms are incapable of making rational decisions and that regulatory policy should be governed by the myopic objective of energy efficiency to the exclusion of other product attributes. Energy-efficiency standards provide a valuable case study of how agencies can be blinded by parochial interests to assume not only that their mandate trumps all other concerns but also that economic actors outside of the agency are completely incapable of making sound decisions. The assumption that the world outside the agency is irrational is a direct consequence of the agencies' view that energy efficiency is always the paramount product attribute and that choices made on any other basis must be fundamentally flawed.

The most prominent economic justification for environmental policies is to remedy a market failure due to externalities, which do represent actual potential benefits of energy-efficiency standards. The classic example of an externality is the release of air pollution as a byproduct of production of a marketable good. The air pollution harms human health, but abatement raises the firm's production cost. If the government clearly establishes a property right for the clean air, then depending on who owns the property right, either polluters would need to purchase the use of the air or the victims of pollution would need to pay polluters to reduce

[1] This approach is consistent with the approach federal regulatory agencies have been required to follow since President Bill Clinton signed Executive Order no. 12866, *Federal Register* 58, no. 190 (October 4, 1993): 51,735–44.

pollution. Either way, as Ronald Coase demonstrated, the social costs of air pollution are internalized into the market decision, resulting in an economically efficient outcome.[2] However, high transaction costs frequently prevent the affected parties from reaching an efficient solution, especially in the case of air pollution in which large populations are exposed to pollution. As a result, abatement is not undertaken since the production decision is made without considering the external harm to human health. In these cases, more direct government intervention (whether through market-based instruments such as a pollution tax or through command-and-control regulations) can achieve the level of air-pollution reduction that increases net benefits to society.

Environmental policies can be most successful at maximizing net benefits—or at least improving net benefits relative to the nonintervention case—if they are designed after careful consideration of unbiased estimates of the costs and benefits of environmental quality. Benefit-cost analysis (BCA) provides the methodology for such an assessment and is the key component of effective regulatory policy. BCA has played a central role in the evaluation of government regulations for several decades. The BCA approach measures changes in human welfare either as the amount individuals are willing to pay for a gain (or to avoid a loss) or the amount they are willing to accept as compensation for a loss (or to go without a gain). The criterion for choosing among the regulatory options is to determine which option maximizes the difference between these benefits and costs. This is known as the Kaldor-Hicks criterion, which focuses on whether the gainers can potentially compensate the losers.

The conceptual argument for using BCA within the regulatory process is based on long-established economic theories and has been a requirement for all major government regulations for over three decades. Nevertheless, the analyses for recent energy regulations make an increasingly important methodological challenge to BCA concerning the treatment of private

[2] Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1960): 1–44.

benefits to individuals from government regulations. In order to make inferences in an infinitely complex world, neoclassical economics relies on the simplifying assumption that the choices revealed through market transactions express the preferences of rational consumers and producers. Therefore, the traditional approach to BCA assumes that informed citizens are rational, implying that while they do not consider the costs their actions impose on others, they are best able to choose the option that achieves the highest net benefits to themselves subject to their budget constraints. Assuming no market barriers interfere with this optimal behavior, traditional BCA methodology does not find private benefits from regulations that restrict the set of market goods available to consumers.

A fundamental tenet of BCA is that the value of benefits is society's willingness to pay for the benefits based on individual preferences. Any BCA that purports to show that private benefits of interfering with these choices exceed the costs violates this premise. Overriding market decisions to advance the preferences of government agencies will always make consumers and firms worse off unless one demonstrates that there are fundamental flaws which, if recognized, would lead people to make decisions in line with the regulations.

The growing field of behavioral economics sometimes calls into question the assumption of consumer rationality. For example, some studies find that people base decisions on psychological heuristics, which are essentially shortcuts used to process information-rich or uncertain options.[3] These shortcuts can lead to irrational results, such as a tendency to confirm previously held beliefs even if they are inaccurate. Other studies find that, contrary to a rational self-interested model of consumer behavior, people tend to pursue goals such as fairness,

[3] Gerd Gigerenzer, Peter M. Todd, and the ABC Group, *Simple Heuristics That Make Us Smart* (Oxford: Oxford University Press, 1999); and Daniel Kahneman, "Maps of Bounded Rationality: Psychology for Behavioral Economics," *American Economic Review* 93, no. 5 (December 2003): 1449–75.

altruism, and revenge.[4] Such phenomena suggest that people's preferences are more complicated than portrayed in elementary economics textbooks. Other studies find that people at times lack self control and engage in such things as procrastination or making rash decisions.

Although most of the evidence for these behavioral anomalies has been based on small-scale experiments on students rather than actual market behavior, it is well accepted that there are some systematic behavioral anomalies that do not accord with fully rational behavior. However, the existence of such phenomena does not imply that they are ubiquitous and consequential in all economic situations. Just as one would want to assess whether a pollution externality is trivial or important, it is also essential to document both the existence and magnitude of behavioral anomalies if they are to be used as a justification for government intervention.

The existence of behavioral anomalies does not imply that economic outcomes are completely random or that the usual economic tools lack insight. One should be wary about overstating the conflict between the traditional neoclassical approach to economics and the behavioral-economics approach. Demand curves slope downward, and basic economic predictions have enormous empirical support. There is little impetus or rationale for taking away consumers' ability to make their own decisions in a wide range of contexts.

Indeed, even adherents to the behavioral-economics approach use much of the standard economic framework. From a methodological standpoint, all economists rely on logical analyses and empirical tools to make inferences about the economy and economic policies. Likewise, all acknowledge the impossibility of modeling the many facets of human behavior and the necessity of relying on simplifying assumptions. Behavioral economics, for the most part, is concerned with finding the systematic deviations from conventional views of rational behavior and

[4] Matthew Rabin, "Psychology and Economics," *Journal of Economic Literature* 36 (March 1998): 11–46.

integrating them into economic models. Nonetheless, the evidence of systematically irrational behavior can create a conflict between two core BCA principles. If consumers are believed to be acting irrationally (that is, against their self interest), then a BCA must choose between incorporating the benefits of a policy that addresses the harm done by an individual and respecting consumer sovereignty and thus ignoring such benefits, leading to a violation of the Kaldor-Hicks criterion that underlies BCA. A BCA that mistakenly fails to account for a systematic deviation from rationality by consumers will result in a policy prescription that is suboptimal, as it will not address the benefits to consumers of correcting the harm they cause themselves in making market decisions.

The social-welfare implications are also clear if a BCA mistakenly assumes consumers are systematically deviating from making rational decisions that maximize their personal utility subject to their budget constraints. The resulting policy prescription will sacrifice welfare gains, as it will harm consumers by restricting their choices and ignoring their revealed preferences for certain goods. This social-welfare loss suggests that regulators should proceed with extreme caution before justifying costly rules based on the assumption of consumer irrationality. Abandoning the principle of consumer sovereignty shifts regulatory policy from an emphasis on mitigating harm individuals impose on others toward a paternalistic emphasis on mitigating harm individuals impose on themselves.

The principle of consumer sovereignty that underpins traditional BCA and the core of most economic theory is rooted in the neoclassical assumption of rationality. Economists all understand that individual rationality is a simplifying assumption, not an absolute truth asserting consumer infallibility. The basis of the assumption—supported by much empirical evidence—is that in most contexts consumers are better equipped than analysts or policymakers to make

market decisions that affect themselves. Consumers typically are better able to make decisions about which products they value and which goods they should purchase given the substantial heterogeneity in preferences, financial resources, and personal situations.

The principal impetus for respecting consumer decisions can be traced to the fundamental role of heterogeneity in undermining the desirability of mandating uniformity. Differences in preferences and income generate different consumer demand for products. Even for products all consumers might find attractive, there will be differences in preferences; some consumers are willing to pay more for the product than others, giving rise to the usual downward-sloping demand for the product. There will also be more extreme situations in which some consumers may not want a product at any price even though others may value it, as in the case of vegetarians who do not wish to consume meat. In recognition of these differences, the market often generates highly differentiated products, such as very basic automobiles, which serve as a functional form of transportation, to luxury cars. Homogenizing these choices through command-and-control regulations has the effect of imposing costs on those at the low-quality end of the spectrum and depriving those at the high end of product attributes that they value. As a consequence, BCA assessments of consumer product regulations should recognize the important role of heterogeneity throughout the market rather than assuming everyone can be characterized by some average composite consumer.

If BCA abandoned the presumption of consumer sovereignty and replaced it with another assumption about the systematic behavior of consumers, it would lead to the normative implication that the analyst or policymaker decides what is best for each consumer. Given the informational and analytical challenges of finding behavioral failings among heterogeneous individuals, this is a tall order for any analyst or policymaker, especially given that they are also

prone to information and behavioral failings. A principal theme of Viscusi's book, *Rational Risk Policy*, is that government regulators often institutionalize individual irrationality because policymakers are human and because the pressures exerted by their constituencies push policies in directions away from rational norms.[5]

Exaggerated responses to highly publicized risks are as much a problem for government policy as for citizens at large. Similarly, the U.S. Government Accountability Office (GAO) has documented examples of flawed government decision making with respect to energy policies involving a program run by EPA and DOE to promote energy-efficient appliances.[6] The GAO found the program vulnerable to fraud, including the granting of energy-efficient status to many bogus products. As Glaeser notes, "If humans make mistakes in market transactions, then they will make at least as many in electing representatives, and those representatives will likely make mistakes when policymaking."[7]

A shift away from the principle of consumer sovereignty will also lead to regulations focused more on correcting self harm than on internalizing environmental harm. For example, it would place greater weight on regulations that ban energy-inefficient products than on regulations that raise the price of pollution. Policies designed to focus on addressing the purported irrationality of the consumer rather than on the traditional goal of internalizing external costs of pollution will sacrifice some pollution reduction for more protection of the consumer from self harm.[8] Therefore, the burden of proof for any BCA conducted as part of a review of regulatory proposals should be placed heavily on justifying any presumption of a

[5] W. Kip Viscusi, *Rational Risk Policy* (Oxford: Oxford University Press, 1998).
[6] U.S. Government Accountability Office, *Energy Star Program: Covert Testing Shows the Energy Star Program Certification Process Is Vulnerable to Fraud and Abuse* (Washington, DC: U.S. Government Printing Office, 2010).
[7] Edward L. Glaeser, "Paternalism and Psychology," *Regulation* 29 (2006): 32–38.
[8] Ted Gayer, "A Better Approach to Environmental Regulation: Getting the Costs and Benefits Right" (Hamilton Project Discussion Paper 2011-06, May 2011).

deviation from consumer sovereignty. The agency preparing the BCA needs to demonstrate a systematic deviation from consumer rationality rather than just presuming that the regulator is better equipped to make decisions that protect individuals from themselves.

The Energy-Efficiency Gap

The clearest regulatory example questioning consumer rationality is with respect to energy-efficient consumer goods, for which consumers frequently face a tradeoff of a higher up-front capital cost versus lower future operating costs over the life of the product. A rational consumer will consider things such as the expected future cost of energy, the expected lifetime of the product, the frequency of use of the product, and the discount rate to convert future savings to present value compared to the up-front capital cost. Under traditional BCA methodology, a consumer who, all other things equal, opts for the less energy efficient product is revealing a rational preference to sacrifice future savings for a low up-front cost. However, if there are systematic behavioral impediments to rational behavior, as has been demonstrated in other contexts in recent research, then this consumer preference could be a misguided decision leading to a suboptimal purchase.

A long-standing empirical finding, known as the energy-efficiency gap, shows that consumer choices for energy-efficiency purchases imply a discount rate much higher than market discount rates, suggesting that consumers underweight the future cost savings stemming from an energy-efficient product compared to the weight they put on the future in other market settings. In an early example, Hausman found implicit discount rates of about 20 percent for a sample of consumers in choosing air conditioners.[9] This discount rate is high, but it is unclear whether it is an empirical anomaly. Interest rates that prevailed in the 1970s were considerably higher than

[9] Jerry A. Hausman, "Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables," *Bell Journal of Economics* 10 (1979): 33–54.

they are today, and consumers routinely pay higher interest rates on credit-card debt. More importantly, consumers more than three decades after the data used in that study are operating in a quite different informational environment. Today, energy labeling policies and private ratings agencies such as Consumers Union provide better information on the energy costs of major appliances.

Empirical evidence suggests that consumers' valuation of the long-term differences in fuel efficiency for different models of cars may be quite reasonable. In an econometric study of prices of used cars, Dreyfus and Viscusi estimated the rate of interest implicit in a consumer's valuation of the discounted value of vehicle operating costs.[10] They offered the following observation on the 11–17 percent interest rate range that they estimated: "This range includes the prevailing rate of interest for car loans in 1988 and is consequently consistent with market rates."[11] Unlike some engineering studies that purport to show that consumers neglect energy efficiency, this study considered a wide range of car attributes other than energy efficiency that are valued by consumers.

The findings of an energy-efficiency gap could suggest irrational consumer behavior. Indeed, the behavioral-economics literature provides evidence—especially in experimental rather than market settings[12]—that people frequently deviate from rationality in making economic decisions. But the evidence is limited and mixed on the narrower question of whether there are

[10] Mark Dreyfus and W. Kip Viscusi, "Rates of Time Preference and Consumer Valuations of Automobile Safety and Fuel Efficiency," *Journal of Law and Economics* 38 (April 1995): 79-105.
[11] Ibid., 79.
[12] A finding that people deviate from rational behavior in a laboratory or field experiment does not necessarily imply that it will occur in a market setting. Indeed, Becker portrays skepticism about behavioral economics for this reason, noting that "there is a heck of a difference between demonstrating something in a laboratory, in experiments, even highly sophisticated experiments, and showing that they are important in the marketplace" and that "some defects in behavior claimed by behaviorists tend . . . to be eliminated in an exchange economy." See Gary Becker, "Interview," *The Region*, Federal Reserve Bank of Minneapolis (2002).

deviations from rationality that systematically lead to suboptimal energy-efficiency choices.[13] Some studies find evidence that people base decisions of which appliances to purchase on current energy prices rather than expected future prices, leading to a tendency to forgo purchasing energy-efficient products.[14] Being able to successfully predict future energy price trends is a daunting task that imposes challenges even for experts in the field. Other studies find that the psychological "salience" of the more expensive, efficient appliance leads to an underinvestment in energy efficiency.[15] Even if such behavioral biases are leading to inefficient energy decisions by consumers, providing accurate information to consumers would be preferable to regulatory mandates. Indeed, Executive Order 12866 (signed by President Clinton and re-affirmed by President Obama in his Executive Order 13563[16]) requires each agency to "identify and assess available alternatives to direct regulation, . . . such as . . . providing information upon which choices can be made by the public."[17] Informational efforts can and do provide energy-cost information over the lifetime of the appliance. Policies that subsidize or mandate energy-efficient products should only be attempted if and when information provision is demonstrated to be ineffective as a means of addressing the behavioral biases and if more improved informational interventions would not be more effective.

There are a number of alternative reasons that can explain the energy-efficiency gap. Many of these explanations are consistent with individual rationality and do not create any

[13] For overviews of the literature, see, for example, Jason F. Shogren and Laura O. Taylor, "On Behavioral-Environmental Economics," *Review of Environmental Economics and Policy* 2, no. 1 (2008): 26–44; and Kenneth Gillingham, Richard G. Newell, and Karen Palmer, "Energy Efficiency Economics and Policy" (discussion paper 09-13, Resources for the Future, Washington, DC, 2009).
[14] Willett Kempton and Laura Montgomery, "Fold Quantification of Energy," *Energy* 7 (1982): 817–27.
[15] Charlie Wilson and Hadi Dowlatabadi, "Models of Decision Making and Residential Energy Use," *Annual Review of Environment and Resources* 32 (2007): 169-203.
[16] Executive Order no. 13563, *Federal Register* 76, no. 14 (January 21, 2011): 3,821–23
[17] Executive Order no.12866, §1(b)(3), 51,735–36, reprinted as amended in 5 U.S.C. § 601 (2006), "Each agency shall identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public."

conflicts with traditional BCA practices. The observed consumer choice may simply reflect actual consumer preferences.[18] For example, Hassett and Metcalf argue that high discount rates are rational in the presence of high sunk costs and uncertainty over future conservation savings.[19] If you are planning to move or have a current liquidity problem, buying the more energy efficient but more expensive appliance may not make sense from an economic standpoint. Many of the studies purporting to show that consumers forgo profitable energy decisions are based on engineering studies that calculate the net present value of a set of possible energy-efficiency consumption choices, which requires assumptions for such things as capital costs, current and future energy prices, duration and frequency of appliance use, and discount rates.[20] These studies omit other relevant costs or benefits of the product to consumers that can drive the purchase decision. For example, Anderson and Newell find that manufacturing plants reject about half of the energy-efficiency projects recommended by engineering analyses because of unaccounted physical costs, risks, opportunity costs, lack of staff for analysis or implementation, risk of inconvenience to personnel, or suspected risk of problems with equipment.[21] By ignoring these relevant characteristics of the product, and the specifics of the customer's economic circumstances, the engineering studies can arrive at incorrect findings of personal savings from the products that have higher up-front costs but yield lower operating costs. Since the engineering studies focus only on capital costs and operating costs, they do not allow for any heterogeneity of preferences and use of products across consumers.

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[18] Jerry A. Hausman and Paul L. Joskow, "Evaluating the Costs and Benefits of Appliance Efficiency Standards," *American Economic Review* 72 (1982): 220–25.
[19] Kevin A. Hassett and Gilbert E. Metcalf, "Energy Conservation Investment: Do Consumers Discount the Future Correctly?" *Energy Policy* 21 (1993): 710–16.
[20] McKinsey & Co, "Electric Power and Natural Gas: Unlocking Energy Efficiency in the U.S. Economy," July 2009, http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.
[21] Soren T. Anderson and Richard G. Newell, "Information Programs for Technology Adoption: The Case of Energy-Efficiency Audits," *Resource and Energy Economics* 26, no. 1 (2004): 27–50.

Another possible explanation for the findings of apparently high consumer discount rates in engineering studies is that consumers do not expect to receive as high a return in energy savings as the analyst assumes. This might be the case if, for example, engineering estimates of potential energy savings misrepresent energy savings because they are based on highly controlled studies that do not directly apply to actual realized savings in a representative house. There is some evidence that engineering estimates of energy saved are indeed faulty.[22] Metcalf and Hassett find that the realized return to attic insulation falls short of the returns promised by engineers and product manufacturers. Accounting for this eliminates the paradox of the energy-efficiency gap in this situation.[23]

Another approach to measuring the energy-efficiency gap is to use empirical studies of energy-use data to estimate the average returns for the set of consumers that adopt an energy-efficient technology, for example, by comparing natural-gas billing data in the first year after weatherization work is done to the previous year. In addition to the problem associated with the short time horizon of such studies, these studies also suffer from the common pitfalls associated with omitted variable bias in which other key factors affecting the decision are ignored. As Allcott and Greenstone explain, such studies can omit many relevant costs and benefits.[24] For example, weatherization of a home can be a time-consuming and unpleasant task for the homeowner. Weatherization can also yield benefits not measured by billing data, such as greater home comfort. Failing to account for these factors that contribute to the consumption decision can lead to spurious findings of a purported energy-efficiency gap.

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[22] Steven Nadel and Kenneth Keating, "Engineering Estimates vs. Impact Evaluation Results: How Do They Compare and Why?" (Research Report U915, American Council for an Energy-Efficient Economy, Washington, DC, January 1, 1991), http://www.aceee.org/research-report/u915.
[23] Gilbert Metcalf and Kevin A. Hassett, "Measuring the Energy Savings from Home Improvement Investments: Evidence from Monthly Billing Data," *Review of Economics and Statistics* 81, no. 3 (1999): 516–28.
[24] Hunt Allcott and Michael Greenstone, "Is There an Energy Efficiency Gap?" (working paper 12-03, Massachusetts Institute of Technology, Cambridge, MA, January 17, 2012).

Finally, the findings of an energy-efficiency gap could be due to market failures entirely consistent with a presumption of consumer rationality. For example, if renters have incomplete information about the energy efficiency of their apartment building, then a landlord might under invest in energy efficiency because he is unable to recoup the costs in the rental rates.[25] There may be other market failures that can contribute to suboptimal consumer choices, such as a lack of information about future costs of more- versus less-efficient products, or inefficiencies stemming from average-cost pricing for electricity due to natural monopoly. Such market failures present economic justifications for possible government regulation, but they do not violate the presumption of consumer sovereignty and will frequently lead to different policy choices than those based on a presumption of consumer irrationality.

Taken as a whole, the engineering and empirical literature on the energy-efficiency gap does not provide strong, credible evidence of persistent consumer irrationality, and the literature on behavioral economics with respect to energy efficiency is still limited and unable to consistently demonstrate the magnitude of the contribution of behavioral deviations from rationality. BCAs should therefore operate under a presumption that consumers and producers accrue net gains from any private market transaction in which they voluntary engage. This presumption of the validity of revealed preference is explicitly recommended in the Office of Management and Budget's (OMB) guidelines for conducting regulatory analyses, known as Circular A-4. In considering the example in which emission standards lead to fuel savings, the OMB states, "These fuel savings will normally accrue to the engine purchasers, who also bear the costs of the technologies. There is no apparent market failure with regard to the market value

[25] Levinson and Niemann find that tenants whose electric bills are included in their rent consume much more electricity than those who pay their own bills. See Arik Levinson and Scott Niemann, "Energy Use by Apartment Tenants When Landlords Pay for Utilities," *Resource and Energy Economics* 26, no. 1 (2004): 51–75.

of fuel saved because one would expect that consumers would be willing to pay for increased fuel economy that exceeded the cost of providing it."[26]

Despite the weak evidence to support deviating from the presumption of consumer sovereignty and despite OMB guidelines to the contrary, the regulatory agencies frequently rely on engineering studies that presume consumers can accrue benefits by regulatory standards that restrict consumption choices. This reliance on engineering studies that presume consumer irrationality rather than model error is not new. Two examples of rules that relied on such engineering studies are an appliance efficiency standard proposed by DOE in 2000 and a light truck fuel economy standard proposed by National Highway Traffic Safety Administration (NHTSA).[27] What follows are case studies of recent analyses used to support energy- efficiency regulations promulgated by DOE, EPA, and DOT.

CAFE Standards for Passenger Cars and Light Trucks

The NHTSA within the DOT regulates corporate average fuel economy (CAFE) standards pursuant to the Energy Policy and Conservation Act of 1975 (EPCA), as revised by the Energy Independence and Security Act of 2007 (EISA).[28] The 2007 Supreme Court decision in *Massachusetts v. EPA* found that the EPA had authority to regulate greenhouse gases under the Clean Air Act, which meant the EPA could regulate vehicle fuel-economy standards as a means

[26] OMB, "Circular A-4: Regulatory Analysis," September 17, 2003, E3, http://www.whitehouse.gov/omb/circulars_a004_a-4.
[27] See Susan E. Dudley and Brian F. Mannix, *Public Interest Comment on the Office of Management and Budget's Draft Guidelines for the Conduct of Regulatory Analysis and the Format of Accounting Statements*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, 2003), http://mercatus.org/sites/default/files/publication/RIA_Guidelines.pdf; and Ronald J. Sutherland, *Public Interest Comment on Light Truck Average Fuel Economy Standards Model Years 2005–07*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, 2003), http://mercatus.org/sites/default/files/publication/Light_Truck_Average_Fuel_Economy_Standards.pdf.
[28] *EPCA*, Public Law 94-163, *U.S. Statutes at Large* 89-871 (1975), codified at *U.S. Code* 49 § 32902, as amended by *EISA*, Public Law 110-140, *U.S. Statutes at Large* 121-1492 (2007): 1577. The EISA amended EPCA to require, among other things, the creation of CAFE standards for medium- and heavy-duty vehicles for the first time.

of reducing greenhouse gases.[29] Thus, the CAFE rulemaking is done jointly by EPA and NHTSA (on behalf of DOT), subject to DOE review.[30]

On December 1, 2011, NHTSA and EPA jointly proposed similar new fuel-economy standards for passenger cars and light trucks for model years 2017 through 2025.[31] NHTSA proposed standards that would require an average industry fleet-wide standard of 40.9 miles per gallon (mpg) by 2021 and 49.6 mpg by 2025.[32] EPA's requirements are framed not in terms of fuel economy but as greenhouse gas emissions standards.[33] This may be effective political salesmanship, but we believe it is a bit of a misnomer given the very minor role greenhouse-gas benefits play in justifying the economic desirability of the regulation.[34] Unlike the NHTSA approach, EPA's greenhouse-gas emission standards impose requirements pertaining to carbon dioxide emissions rather than fuel mileage. The EPA standard of 163 grams of carbon dioxide per mile translates into a 54.5 mpg standard if manufacturers rely solely on fuel efficiency to reduce the emissions.[35] However, there are other mechanisms by which greenhouse-gas emissions can be reduced, such as improved air-conditioning systems,[36] so fuel-economy standards for the two agencies' proposed regulations are not necessarily incompatible.

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[29] *Massachusetts v. EPA*, 549 U.S. 497, 533 (2007) (holding that if the agency finds that greenhouse-gas emissions threaten public health or welfare, then the Clean Air Act "requires the agency to regulate emissions of the deleterious pollutant from new motor vehicles"). See also *Clean Air Act*, Public Law 88-206, *U.S. Statutes at Large* 77-392 (1963), § 202(a)(1), codified at *U.S. Code* 42(2006), § 7521(a)(1) (allowing the EPA to regulate air pollutants from motor vehicles if such pollutants "may reasonably be anticipated to endanger public health or welfare").

[30] NHTSA consults with DOE on CAFE standards pursuant to EPCA, as revised by EISA. See *U.S. Code* 49, §§ 32902(b)(1), 32902(i), 32902(j).

[31] "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards," *Federal Register* 76 (December 1, 2011): 74,854 [hereinafter "Joint Proposed Rule"].

[32] Ibid., 74,859. See also NHTSA, "Preliminary Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2017–MY 2025 Passenger Cars and Light Trucks 2–3" (November 2011) [hereinafter "NHTSA, PRIA"].

[33] Joint Proposed Rule, 74,854. See also EPA, "Draft Regulatory Impact Analysis, Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards v" (November 2011) [hereinafter "EPA, DRIA"].

[34] See table 2 and discussion supra notes 21–24.

[35] Joint Proposed Rule, 74,859.

[36] Ibid., 74,869.

The use of engineering models to compute the net present value (that is, the value today of a stream of future benefits, less costs) of a more versus less fuel-efficient product includes a number of input values that demonstrate the computational complexity that exists for the regulator's analysis. For the analysis of CAFE standards for passenger cars and light trucks (for 2017 and later model years), the EPA and NHTSA needed to derive input values for such things as vehicle miles driven per year, the responsiveness of annual vehicle miles driven to changes in fuel cost, the magnitude of the rebound effect (which is the increase in driving that would occur with more fuel-efficient vehicles), projections of future fuel costs, the number of years the vehicle would be in service, the relationship between the measured fuel efficiency and the actual on-road efficiency, and the discount rate.[37] The analysis presumes the regulator is better than the consumer at computing the various inputs to the net present value computation and the consideration of different vehicle classes controls for other features of the vehicles that might appeal to the consumer. This assumption effectively rules out consideration of motor-vehicle attributes other than fuel efficiency that will be affected by the regulation.

The dimensions of consequence in the EPA and NHTSA analyses essentially convert all motor vehicles into three-attribute products. Cars serve as a means of transportation whose only other dimensions of interest are mpg and cost. One does not have to be a reader of automobile reviews in Edmunds.com, *Car and Driver*, or *Road and Track* to realize that fuel efficiency is but one of many factors people use to assess the quality of an automobile. Acceleration, handling, braking ability, legroom, riding comfort, safety, reliability, styling, and trunk storage are among the many other dimensions of concern to automobile purchasers. Indeed, most

[37] See EPA, DRIA, 7-2 (summarizing benefit values in Table 7.1-6.4-1). See generally EPA and NHTSA, "Joint Technical Support Document, Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards 4-2 to 4-69" (November 2011) [hereinafter "Joint TSD"].

automobile reviews note the tested vehicle price and the mpg but then focus on other vehicle characteristics of consequence to consumers but not as readily apparent.

Econometric studies of the determinants of automobile prices likewise recognize the importance of product attributes in addition to fuel efficiency. For example, the variables included in the used-car price regression equation in Dreyfus and Viscusi included the following: passenger mortality rate for that model, fuel-expenditure operating cost, vehicle acceleration (that is, horsepower-to-weight ratio), cargo capacity, maintenance rating, luxury or sport vehicle, automatic or manual transmission, two-seat model, convertible, wagon, diesel, vehicle size category, and vehicle manufacturer.[38] Several dimensions other than fuel-expenditure operating cost will be affected by design changes in response to CAFE standards.

The analyses by EPA and NHTSA ignore the loss in consumer welfare that would result if achieving higher fuel-economy standards means manufacturers have to sacrifice any of these other vehicle characteristics. The EPA and NHTSA analyses abstract from all these concerns and focus on several cost-related aspects. In addition to the calculation of lifetime fuel savings to the consumer, the regulators also compute the private consumer surplus from additional driving (that is, the private benefit to consumers net of driving costs that occurs because the amount of driving increases as fuel efficiency increases) and the private benefit of reduced fueling time (because consumers would have to refuel less often).[39] The sum of these private net benefits to the consumer represents the bulk of the benefits of the fuel-efficiency mandate for both the NHTSA and EPA analyses. As shown in table 1, NHTSA estimates a total cost of $177 billion and a total benefit of $521 billion.[40] Of the $521 billion in the NHTSA estimate of total benefits (assuming

[38] Dreyfus and Viscusi (1995)
[39] Joint TSD, 4-27 and 4-54.
[40] See also NHTSA, PRIA, 45–46 (table 13). Costs include technology, congestion, accident, and noise costs; benefits are everything else.

a discount rate of 3 percent and constant 2009 dollars) resulting from the proposed CAFE standards for passenger cars and light trucks, fully $440 billion (or 85 percent) stem from private savings to consumers.[41] This $440 billion consists of $416 billion in lifetime fuel savings, $9 billion in consumer surplus from additional driving, and $15 billion in refueling time value.[42]

The EPA analysis for a slightly different standard is similar. As shown in table 2, EPA estimates $192 billion in total costs and $613 billion in total benefits.[43] Most of these benefits (87 percent) are private benefits to consumers: $444 billion in lifetime fuel savings, $71 billion in consumer surplus from additional driving, and $20 billion in refueling time value.[44]

The environmental benefits play a largely incidental role in both analyses. In the NHTSA analysis, the estimated benefits from reducing the greenhouse-gas carbon dioxide accounts for only $46 billion, or 9 percent of total benefits.[45] The greenhouse-gas carbon dioxide benefits in the EPA analysis are also $46 billion, or 8 percent of the benefits EPA estimates.[46]

Even these comparatively modest benefits overstate the benefits to the U.S. citizenry, since they also include the climate-change related benefits to other countries of reduced emissions within the United States.[47] To the best of our knowledge, this is the first situation in which benefits to countries other than the United States have been included in a regulatory impact analysis.

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[41] Ibid.
[42] Ibid.
[43] Joint Proposed Rule, 75,145–47 (table III-82). See also EPA, DRIA, vi (table 1).
[44] Joint Proposed Rule, 75,145–47.
[45] NHTSA, PRIA, 45–46.
[46] Joint Proposed Rule, 75,145–47.
[47] Ibid., 75,127 ("Applying the *global* SCC estimates . . . to the estimated reductions in CO_2 emissions under the proposed standards, we estimate the dollar value of the GHG [greenhouse-gas] related benefits for each analysis year" [emphasis added]). The EPA used social cost of carbon (SCC) estimates developed through an interagency process. EPA, DRIA, 7-3. See also Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866," February 2010, 1, http://www.epa.gov/otaq/climate/regulations/scc-tsd.pdf [hereinafter SCC TSD]. The domestic benefits of reduced emissions are a subset of the larger global benefits. See SCC TSD, 3 (describing a 2011 CAFE rule in which NHTSA used both global and domestic SCC estimates—where the global SCC [$33 per ton of carbon dioxide] was more than 16 times the magnitude of the domestic SCC [$2 per ton of carbon dioxide]).

If one counted only the domestic benefits, the social cost of carbon dioxide benefits would be just 7 to 23 percent of the estimated carbon dioxide benefits.[48] Counting only domestic benefits would reduce the CAFE rule's greenhouse benefits from $46.4 billion to a range of $3.2 billion to $10.7 billion. The domestic benefits of reducing greenhouse gas emissions therefore only account for 0.6 to 2.1 percent of total estimated benefits. The estimated costs of the regulation are 18 to 60 times greater than the domestic greenhouse-gas benefits. If the purpose of the standards is to reduce greenhouse-gas emissions, these regulations are very inefficient.

In our view, this procedure of including benefits to other countries overstates the estimated benefits and lacks economic justification. The benefit of any U.S. government policy is the willingness of the U.S. citizens to pay for that policy. In general, the purpose of regulations is not to impose costs on U.S. citizens to provide benefits to other countries. Unless we value a dollar of benefits to other countries as equal to a dollar of benefits to U.S. residents, the climate-change benefit calculations overstate the actual estimated benefit amount. While there may in fact be some altruistic concern for the well being of other nations, such concerns are unlikely to place these values on the same footing as benefits internal to the United States. Moreover, if all policies were judged based on benefits to the world, the entire U.S. policy landscape would be transformed into an aid mission to less-developed countries.

Indeed, in the CAFE notice of proposed rulemaking, the EPA went one step further than considering the climate-change related benefits from emission reductions in the United States; it also included the economic losses that would result from lower global oil prices to "other countries that produce and sell oil or petroleum products to the U.S."[49] Adopting the world as the reference point for assessing U.S. policies establishes an untenable precedent for other policy

[48] SCC TSD, 11. "On the basis of this evidence, the interagency workgroup determined that a range of values from 7 to 23 percent should be used to adjust the global SCC to calculate domestic effects."
[49] Joint Proposed Rule, 74,932.

contexts and is inconsistent with the underlying tenets of whose welfare effects are being assessed in a BCA.

The role of CAFE standards in reducing other pollutants is not a driver in terms of generating substantial policy benefits. The benefits from reducing other pollutants account for $13 billion in the NHTSA analysis and $8 billion in the EPA analysis.[50] The reduction in petroleum-market externalities associated with energy security accounts for another $22 billion in the NHTSA analysis and $24 billion in the EPA analysis.[51] With estimated costs of the regulation of $177 billion by NHTSA and $192 billion by EPA,[52] this regulation clearly fails a BCA without the presumption of consumer irrationality and the resulting substantial private benefits associated with mandating more-fuel-efficient vehicles.

NHTSA does attempt to address "the question of why current vehicle purchasing patterns do not result in average fuel economy levels approaching those that this rule would require . . . [and] why manufacturers do not elect to provide higher fuel economy even in the absence of increases in CAFE standards."[53] The main explanations NHTSA offers, without any empirical support, are that consumers might have inadequate information about the value of higher fuel economy, they may not give enough attention to long-term horizons, they may be driven by loss aversion in which they place more weight on short-term losses versus long-term gains, and there may be a lack of salience of fuel savings.[54] NHTSA also postulates that the irrationality might lie with the manufacturers, who may be forgoing profitable activities because of mistaken assumptions about the premiums prospective buyers would pay for increased fuel economy.[55]

[50] See tables 1 and 2. See also NHTSA, PRIA, 45–46; and Joint Proposed Rule, 75,145–47.
[51] Ibid. (all sources).
[52] Ibid.
[53] NHTSA, PRIA, 699.
[54] Ibid. 699–711.
[55] Ibid., 703.

NHTSA does acknowledge that perhaps "the agency's underlying assumptions about some of the factors that affect the value of fuel savings differ from those made by potential buyers, because NHTSA has used different estimates for some components of the benefits from saving fuel from those of buyers, or simply because the agency has failed to account for some potential costs of achieving higher fuel economy."[56] Similarly, NHTSA acknowledges the existence of heterogeneous preferences across a range of characteristics by mentioning the possibility "that achieving the fuel economy improvements required by stricter fuel economy standards might lead manufacturers to forego [*sic*] planned future improvements in performance, carrying capacity, safety, or other features of their vehicle models that represent important sources of utility to vehicle owners."[57] This would suggest that "compromises in these or other highly-valued attributes would be viewed by potential buyers as an additional cost of improving fuel economy that the agency has failed to acknowledge or include in its estimates of the costs of complying with stricter CAFE standards."[58] Ultimately, NHTSA reports that it "has been unable to reach a conclusive answer to the question of why the apparently large differences between its estimates of benefits from requiring higher fuel economy and the costs of supplying it do not result in higher average fuel economy for new cars and light trucks."[59] Despite NHTSA's admission that it is uncertain whether the lack of market demand for higher fuel economy is due to consumer irrationality or consumer preferences, it proceeds to promulgate a regulation that assumes the former.

[56] Ibid.
[57] Ibid., 708.
[58] Ibid.
[59] Ibid., 711.

EPA also acknowledges that "it is a conundrum from an economic perspective that these large fuel savings have not been provided by automakers and purchased by consumers."[60] Rather than explore possible determinants of consumer choice other than fuel economy, EPA then proceeds to conjecture possible justifications. The first justification offered amounts to an assertion of consumer irrationality, in that "consumers put little weight on benefits from fuel economy in the future and show high discount rates."[61] Another justification hints at a systematic behavioral bias without offering specifics: "Fuel savings in the future are uncertain, while at the time of purchase the increased costs of fuel-saving technologies are certain and immediate."[62] Another justification seems grounded in neither neoclassical economics nor behavioral economics: "Consumers may not be able to find the vehicles they want with improved fuel economy."[63] The other justifications largely amount to problems of inadequate information, such as the reasoning that fuel-economy benefits are not salient enough to consumers, that consumers have difficulty calculating expected fuel savings, or that consumers might associate higher fuel economy with inexpensive, less well-designed vehicles.[64] Among the list of justifications for the "paradox" are acknowledgements that it could be a consequence of EPA's miscalculation or omitted variables, in that "factors such as transaction costs and differences in quality may not be adequately measured" and "there is likely to be variation among consumers in the benefits they get from improved fuel economy."[65] The behavioral justifications offered by NHTSA and EPA offer very little evidence that consumers are causing self harm in their vehicle-purchasing decisions and would thus accrue private benefits by having their options restricted.

[60] EPA, DRIA, 5-12.
[61] Ibid., 8-10.
[62] Ibid.
[63] Ibid.
[64] Ibid.
[65] Ibid.

The review also raises the question of why a rigid mandate is warranted rather than an informational regulation that would provide consumers with the guidance to make sounder choices. Indeed, in 2011 EPA did just that by issuing its Motor Vehicle Fuel Economy Label Final Rule.[66] The mandated label for all new cars is quite extensive, including an overall mpg rating, a city mpg rating, a highway mpg rating, gallons/100 miles, driving range on a tank of gas, fuel costs in five years versus the average new vehicle, annual fuel costs, fuel economy and greenhouse-gas rating, and smog rating.[67] These components of the label address the purported behavioral failures in that they (i) indicate the longer-term fuel costs, thus diminishing the effect of high discount rates, (ii) make the benefits of fuel economy salient and a less "shrouded" attribute, (iii) provide easy calculations of fuel economy, (iv) enable consumers to know the actual fuel-economy benefits rather than relying on rough rules of thumb, (v) make it clear that fuel economy is a valued vehicle attribute not a proxy for a less-expensive vehicle, (vi) make it easier for consumers to identify which vehicles provide fuel economy, (vii) provide diverse measures of fuel economy that consumers can relate to their driving style, and (viii) make the fuel costs more apparent as an upfront cost similar to that of the sticker price. Indeed, the EPA label rule is directed at remedying all but a couple of the types of consumer choice failures that EPA claims account for the private benefits of fuel-economy standards.

What is striking about the EPA analysis of the CAFE standard is that the EPA regulatory impact analysis does not even mention the existence of the agency's own new label rule. This oversight goes to the heart of the CAFE standard analysis, as most of the benefits needed to

[66] "Revisions and Additions to Motor Vehicle Fuel Economy Label Final Rule," *Federal Register* 76 (July 6, 2011): 39,478 [hereinafter EPA Label Rule].
[67] Ibid, 39,480.

justify the regulation relate to consumer choice failures targeted by the new labeling rule.[68] If the label rule does not have zero economic benefits, then the EPA analysis of the fuel-economy standard necessarily overstates the benefits associated with the proposed CAFE standards. If the label rule is completely worthless and generates no benefits for consumer choice, then EPA was remiss in issuing the regulation and the OMB, the watchdog over all major new federal regulations, was remiss in permitting the agency to move forward with a rule other EPA assessments implicitly treat as worthless.

We take an intermediate view with respect to the labeling regulation. Informational strategies have a productive role to play and should be the primary policy instrument used if the alleged market failure stems from a lack of information. Before EPA should consider other, more intrusive forms of intervention, it should demonstrate that private decisions are flawed and that informational remedies will not suffice. In general, agencies should examine less-restrictive regulatory alternatives before adopting highly intrusive technology-forcing standards. The proposed EPA fuel-economy label rule is not ideal, as Cohen and Viscusi discuss, but it is far superior to restricting the choices available to consumers.[69] That a particular labeling approach may fall short should serve as an impetus for developing more effective informational policies rather than abandoning all labeling regulations because the particular policies implemented were not designed as well as they could have been. Informational regulations remain highly attractive, as they use a form of intervention that does not attempt to homogenize consumer choice or override the preferences of those who value a more diverse set of automobile attributes than mpg and cost.

[68] The labeling policy even seeks to call consumers' attention to greenhouse-gas emissions and environmental externalities generally. However, it is unlikely voluntary restraints will be sufficient to generate efficient control of the external damages from energy use.

[69] Mark Cohen and W. Kip Viscusi, "The Role of Information Disclosure in Climate Mitigation Policy" (paper presented at Stanford-RFF Climate Policy Conference, Washington, DC, October 2011).

Even if EPA and NHTSA could demonstrate some form of consumer choice failure, these choices would need to be completely flawed to warrant counting the entirety of the private savings as net economic benefits. In the absence of the regulation, EPA and NHTSA are assuming there could be no rational basis for choosing a vehicle that does not meet the proposed standards even though the majority of the vehicles people currently drive do not meet the fuel-efficiency target. Choosing a car other than a Toyota Prius, a Nissan Leaf, or a Chevrolet Volt is not an inexplicable quirk of individual behavior but generally stems from valuation of car attributes these models do not offer. Indeed, applying the behavioral economists' critique of conspicuous consumption and status goods to cars may suggest that the purchase of highly fuel-efficient cars may be driven by forces behavioral economists view as irrational. The issue of rationality based on behavioral economists' scorecards may cut in the opposite direction to the extent that people purchase visibly fuel-efficient vehicles such as the Prius not for their own benefit but as a badge of political correctness to signal their environmental credentials to their neighbors. Such conspicuous consumption poses no problems if private choices are respected, irrespective of the source of the preferences.

CAFE Standards for Heavy-Duty Vehicles

On September 15, 2011, NHTSA and EPA jointly proposed fuel-economy standards for on-road heavy-duty vehicles, categorized as combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. The agencies relied on the same analytical framework they used for the CAFE standards for passenger cars and light trucks, meaning computing private fuel savings through an engineering analysis of the net present value of higher fuel economy and

reduced fueling time, as well as computing effects on emissions of carbon dioxide and other pollutants, congestion, traffic fatalities, noise, and energy security.

As with the CAFE standards for passenger cars and light trucks, the bulk of the benefits of the heavy-duty vehicles standards are private benefits to the purchasers rather than benefits from reducing externalities. As shown in table 3, using a 3 percent discount rate and 2009 dollars, the agencies estimate a total cost of $9.6 billion and a total benefit of $58.9 billion for model-year trucks 2014 through 2018.[70] Of the $58.9 billion in estimated total benefits, fully $50.5 billion (86 percent) stem from private savings to consumers. This $50.5 billion consists of $50.1 billion in fuel savings and $400 million in the value of reduced fueling time.

The estimated benefits from reducing greenhouse-gas carbon dioxide account only for $5.7 billion, or less than 10 percent of total benefits. This number overstates the benefits to U.S. citizens, as it includes the climate-change related benefits to other countries of reduced emissions within the United States. In the final rule, EPA and NHTSA acknowledge that "the reductions in external costs are less than the costs of new fuel saving technologies needed to meet the standards."[71] Rather than see this as violating the market-failure rationale for the regulation, the agencies justify their rule by stating that the private "savings in fuel costs are *by themselves* sufficient to pay for the technologies" and thus the "*entire* value of the reductions in external costs represents additional net benefits of the program, beyond those resulting from the fact that the value of fuel savings exceeds the costs of technologies necessary to achieve them."[72]

The agencies' attempts to explain the seeming irrationality of buyers of heavy-duty trucks is more strained than in the case of passenger cars, because in this case the vast majority of the

[70] "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles," *Federal Register* 76 (September 15, 2011): 57,106, 57,347 (to be codified at 49 C.F.R. pt. 523). These numbers are found in table VIII-33 of the final rule.
[71] Ibid., 37,315.
[72] Ibid. 57,316 (emphasis in the original).

vehicles are purchased and operated by businesses, which the agencies acknowledge have "narrow profit margins, and for which fuel costs represent a substantial operating expense."[73] The agencies are arguing that these firms, operating in a highly competitive environment, are forgoing substantial cost-minimizing purchases and thus incurring losses to owners and shareholders.

The agencies' first hypothesis for why the trucking industry fails to adopt cost savings technologies is that "there is inadequate or unreliable information available about the effectiveness of many fuel-saving technologies for new vehicles."[74] The agencies reason that the lack of information might be because "information on technologies is costly" and "information has aspects of a public good." There is no evidence given to support these claims with respect to heavy trucks. Fuel-efficiency information can be conveyed at low cost, and with billions of dollars at stake there are ample private-market incentives to provide such information. And if the problem is purely informational, labeling policies will suffice. The agencies' second hypothesis is that the resale market "may not adequately reward the addition of fuel-saving technology to vehicles."[75] Again, given the low cost of conveying information and the substantial amount of savings at stake, this hypothesis lacks credibility. Moreover, the assertion about markets is contradicted by empirical evidence. Since energy-efficient used cars command a price premium from consumer purchasers, as Dreyfus and Viscusi show, what reason is there to believe that profit-maximizing firms will not do likewise?[76]

The agencies' third hypothesis is that there are split incentives between owners and operators of heavy-duty trucks. Since the operators, not the owners, must purchase the fuel,

[73] Ibid.
[74] Ibid., 57,317.
[75] Ibid.
[76] Dreyfus and Viscusi (1995)

"capital investments by truck owners may be channeled into equipment that improves" other features of the trucks rather than into fuel-saving technology.[77] The agencies acknowledge that "if operators can choose freely among the trucks they drive, competition among truck owners to employ operators would encourage owners to invest in fuel-saving technology."[78] They offer no evidence of a lack of competition in the industry that would support the split-incentives hypothesis.

The agencies also offer the hypothesis that "transaction costs of changing to new technologies . . . may slow or prevent their adoption."[79] As noted earlier, given high sunk costs and uncertainty over future savings, a high discount rate is entirely rational. A regulatory mandate that prevents firms from transitioning to a new technology at their desired rate would thus harm, not help, expected firm profits. The agencies acknowledge the possibility that uncertainty about future cost savings may be the reason firms are not purchasing the more fuel-efficient vehicles. Yet they later justify the mandate in part due to this rational response to uncertainty. They acknowledge that "the engineering estimates of fuel savings and costs . . . might overstate their benefits or understate their costs in real-world applications."[80] The agencies present little or no evidence to support their hypotheses of why firms are foregoing cost-reducing truck technologies, yet the agencies are undeterred in promulgating an expensive rule that relies on these hypotheses to justify approximately 85 percent of the rule's estimated benefits.

[77] "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles."
[78] Ibid., 57,317.
[79] Ibid.,57,318.
[80] Ibid., 57316.

Clothes Dryers and Room Air Conditioners

The EPCA[81] prescribes energy-conservation standards for various consumer products, including residential clothes dryers and room air conditioners.[82] EPCA requires that DOE determine whether amended standards are technologically feasible and economically justified and would save a significant amount of energy.[83] At the end of 2011, DOE adopted new energy-efficiency standards for clothes dryers and room air conditioners.[84]

DOE relied on a net present value analysis to demonstrate the economic justification for the new standards.[85] This analysis computed the total consumer expense over the life of the appliance, including the purchase expense and operation costs (including energy expenditures), with the future operating costs discounted to the time of purchase and then summed over the lifetime of the product.[86] Similar to the analysis of the CAFE standards, the computational complexity of this assessment required DOE to assign values for each of six product classes on such things as the purchase price (stemming from manufacturer cost, manufacturer markup, and retailer markup), installation cost, repair and maintenance cost, annual energy consumption per unit, projected energy prices, the lifetime of the appliance, and the discount rate.[87]

Of the four product classes of clothes dryers that saw a tightening of the standard, assuming a 3 percent discount rate, DOE estimated $2.779 billion in consumer savings stemming from the vented electrical standard dryer regulation, $5 million in consumer savings stemming from the vented electric compact 120-volt dryer regulation, $14 million in consumer savings

[81] *Energy Policy and Conservation Act of 1975*.
[82] *U.S. Code* 42 § 6295(c) and (g) (West, Westlaw through Public Law 112-71 [excluding Public Law 112-55 and 112-56] approved December 19, 2011).
[83] Ibid., § 6295(o).
[84] "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,454.
[85] Ibid., 22,457.
[86] Ibid., 22,511.
[87] Ibid.

stemming from the vented electric compact 240-volt dryer regulation, and $215 million in consumer savings stemming from the vented gas dryer regulation.[88]

Of the four product classes of clothes dryers that saw a tightening of the standard, assuming a 7 percent discount rate, DOE estimated $1.017 billion in consumer savings stemming from the vented electrical standard dryer regulation, $2 million in consumer savings stemming from the vented electric compact 120-volt dryer regulation, $6 million in consumer savings stemming from the vented electric compact 240-volt dryer regulation, and $51 million in consumer savings stemming from the vented gas dryer regulation.[89]

As shown in table 4, the estimated increase in consumer savings stemming from a regulatory increase in the energy-efficiency standards for clothes dryers is $3.01 billion (3 percent discount rate) or $1.08 billion (7 percent discount rate). These values make up a significant share of the total estimated benefits of the regulations. For the external benefits, DOE estimates benefits of $93 million to $1.49 billion from reducing carbon dioxide emissions as a result of the regulation. As in the case of the analysis of fuel-economy standards for motor vehicles, this benefit estimate for greenhouse-gas emissions includes all global benefits from reducing domestic emissions. DOE estimates the benefits as between $4.77 million and $49 million (3 percent discount rate) and between $2.06 million and $21.2 million (7 percent discount rate) from reducing other pollutants. The clothes dryer regulations would not pass a BCA if it focused on external environmental benefits, given DOE's estimate of compliance costs of $64.5–$80.6 million.

An earlier proposed regulation of clothes washers was purported to have great energy savings for consumers, but a Rasmussen Research poll found tremendous consumer opposition

[88] Ibid., 22,541, tableV-26.
[89] Ibid., 22,542, tableV-26.

to the standard.[90] By a margin of 6 to 1 the public opposed regulations that would effectively eliminate top-loading washing machines. Even after being informed of the lower operating costs and greater energy efficiency of the new models, consumers opposed the regulation by a margin of 2.6 to 1. Much of the opposition arose because most consumers wash fewer loads per week than the DOE analysis assumed; for this group the present value of the cost savings is far less than the estimated savings. Engineering studies divorced from consumer usage and preferences can produce policies that produce far fewer benefits than predicted.

DOE's net present value analysis of the energy-efficiency standards of room air conditioners computed the total consumer expense over the life of the appliance, including the purchase expense and operation costs (including energy expenditures), with the future operating costs discounted to the time of purchase and summed over the lifetime of the product. DOE assigned input values for each of the six product classes on such things as the purchase price (stemming from manufacturer cost, manufacturer markup, and retailer markup), installation cost, repair and maintenance cost, annual energy consumption per unit, projected energy prices, the lifetime of the appliance, and the discount rate.[91]

Of the six product classes of room air conditioners that saw a tightening of the standard, assuming a 3 percent discount rate, DOE estimated $245 million in consumer savings stemming from the regulation of air conditioners with less than 6,000 Btu/h with Louvers, $1.162 billion in consumer savings stemming from the regulation of air conditioners with 8,000–13,999 Btu/h with Louvers, $3 million *loss* in consumer savings stemming from the regulation of air conditioners with 20,000–24,999 Btu/h with Louvers, $2 million *loss* in consumer savings

[90] Susan Dudley, *Addendum to Public Interest Comment on the Dept. of Energy's Proposed Clothes Washer Efficiency Standards, Docket No. EE-RM-94-403*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, December 4, 2000), http://mercatus.org/publication/doe-clothes-washer-addendum-poll-results.
[91] "Energy Conservation Program," 22,511–12.

stemming from the regulation of air conditioners with greater than 25,000 Btu/h with Louvers, $49 million in consumer savings stemming from the regulation of air conditioners with 8,000-10,999 Btu/h without Louvers, and $24 million in consumer savings stemming from the regulation of air conditioners with greater than 11,000 Btu/h without Louvers.[92]

Of the six product classes of room air conditioners that saw a tightening of the standard, assuming a 7 percent discount rate, DOE estimated $20 million *loss* in consumer savings stemming from the regulation of air conditioners with less than 6,000 Btu/h with Louvers, $558 million in consumer savings stemming from the regulation of air conditioners with 8,000–13,999 Btu/h with Louvers, $3 million *loss* in consumer savings stemming from the regulation of air conditioners with 20,000–24,999 Btu/h with Louvers, $2 million *loss* in consumer savings stemming from the regulation of air conditioners with greater than 25,000 Btu/h with Louvers, $25 million in consumer savings stemming from the regulation of air conditioners with 8,000–10,999 Btu/h without Louvers, and $12 million in consumer savings stemming from the regulation of air conditioners with greater than 11,000 Btu/h without Louvers.[93]

As shown in table 5, the estimated increase to consumer savings stemming from a regulatory increase in the energy-efficiency standards for room air conditioners is $1.47 billion (3 percent discount rate) or $570 million (7 percent discount rate). These values make up a significant share of the total estimated benefits of the regulations. For the external benefits, DOE estimates benefits of $77 million to $1.164 billion from reducing carbon dioxide emissions as a result of the regulations. This estimate includes all global benefits from reducing domestic emissions. DOE estimates between $4.16 million and $42.7 million (3 percent discount rate) and between $2.2 million and $22.6 million (7 percent discount rate) from reducing other pollutants.

[92] Ibid., 22,542 (tableV-28).
[93] Ibid., 22,542 (tableV-29).

The room air-conditioner regulations would not pass a BCA if it focused strictly on external environmental benefits, given DOE's estimate of industry costs of $111.3–$177.6 million.

Acting under authority from EPCA, DOE has promulgated energy-efficiency regulations for other appliances as well. For example, DOE issued standards for residential refrigerators in 2011, and for industrial products, such as high-intensity light fixtures (known as metal halide lamp fixtures) and walk-in coolers and freezers in 2012. As in the case of the fuel-economy standards, for each of these appliance standards, the preponderance of the estimated benefits consists of private benefits to the purchasers of the products. These are only benefits if consumers are not currently making the utility-maximizing choice, or in the case of the metal halide lamp fixtures and walk-in coolers and freezers, if profit-maximizing firms operating in a competitive environment are all failing to minimize their business costs. Put somewhat differently, there must be some form of individual irrationality or behavioral shortcoming of individual choices to give rise to these benefits. DOE provides little, if any, analysis and documentation of this assumed irrationality in its rules. In the clothes dryers and room air conditioners rule, it consists of a single paragraph devoid of any empirical evidence and specific citations to the literature:

> DOE also notes that the economics literature provides a wide-ranging discussion of how consumers trade off upfront costs and energy savings in the absence of government intervention. Much of this literature attempts to explain why consumers appear to undervalue energy efficiency improvements. This undervaluation suggests that regulation that promotes energy efficiency can produce significant net private gains (as well as producing social gains by, for example, reducing pollution). There is evidence that consumers undervalue future energy savings as a result of (1) a lack of information; (2) a lack of sufficient salience of the long-term or aggregate benefits; (3) a lack of sufficient savings to warrant delaying or altering purchases (for example, an inefficient ventilation fan in a new building or the delayed replacement of a water pump); (4) excessive focus on the short term, in the form of inconsistent weighting of future energy cost savings relative to available returns on other investments; (5) computational

> or other difficulties associated with the evaluation of relevant tradeoffs; and (6) a divergence in incentives (that is, renter versus owner; builder vs. purchaser). Other literature indicates that with less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher than expected rate between current consumption and uncertain future energy cost savings.[94]

General Service Incandescent Lamps

EISA established specific energy-efficiency standards for general service incandescent lamps (GSILs),[95] which are standard incandescent or halogen-type light bulbs.[96] The standards were set to be phased in over a two-year period from 2012 to 2014.[97] The light bulb regulation has served as the focal point for much recent controversy over the role of government policies in dictating consumer choices.

Executive Order 12866 requires agencies to assess both the costs and the benefits of intended regulations, even cases (such as the GSIL standards) in which the regulatory standard is specifically prescribed by statute and leaves the agency with no discretion.[98] DOE did not conduct a dedicated BCA for the GSIL standard; instead it included it within a technical-support document that assessed the overall national impacts of EISA.[99]

DOE presents relatively little documentation on how it calculated the costs and benefits of the standard. The DOE analysis calculated cumulative national energy savings as the sum of annual national energy savings, which in turn was estimated as the difference in annual national

[94] Ibid., 22,550.
[95] Public Law 110-140, § 321(a)(3)(A)(ii)(I)(cc), 121 Stat. 1492, 1577 (2007).
[96] Ibid., § 321(a)(1)(A).
[97] Ibid., § 321(a)(3)(A)(ii)(I)(cc).
[98] Executive Order no. 12866, § 1(b)(6).
[99] DOE, "Technical Support Document: Impacts on the Nation of the Energy Independence and Security Act of 2007," 2009.

energy consumption between the base case and the case with the new GSIL standards.[100] DOE estimates 14.14 quads in cumulative national energy savings.

The net present value to consumers is computed as the present value of operating-cost savings minus the present value of increased total installed costs.[101] (Present values were computed for both 3 percent and 7 percent discount rates.) DOE computed the operating-cost savings for a given year by multiplying the surviving stock of GSILs of a given vintage in that year by the per-unit operating-cost savings for that vintage (obtained by multiplying the vintage's expected energy savings by forecasted energy prices), then summing over vintages. [102] DOE computed increased total installed costs for a given year by researching product catalogs, online distributors, and manufacturing interviews to estimate "the increase in unit prices for products that comply with EISA 2007."[103] It then multiplied the surviving stock of GSILs of a given vintage in that year by this annual per-unit total-installed cost increase, then summed over vintages.[104] No consideration was made for consumer preferences for different types of light bulbs or for such things as the rebound effect. Thus, the quality of light, whether the bulb is dimmable, and other aspects of light bulbs are irrelevant to the DOE assessment.

DOE's net present value estimate is for $27.5 billion (7 percent discount rate) or $64.2 billion (3 percent discount rate) in cumulative savings to consumers from 2008 through 2038 stemming from the efficiency standards for light bulbs.[105] These estimates of private benefits far outweigh DOE's estimate of between zero and $16.34 billion in benefits from reducing carbon

[100] Ibid., 17.
[101] Ibid., 26.
[102] Ibid., 26–28.
[103] Ibid., 27–28.
[104] Ibid., 26.
[105] Ibid., 31.

dioxide emissions.[106] Once again, private benefits to consumers drive the economic justification for the analysis.

Conclusion

The economic puzzle raised by all these energy regulations is why consumers are this remiss. How can it be that consumers are leaving billions of potential economic gains on the table by not buying the most energy-efficient cars, clothes dryers, air conditioners, and light bulbs? Moreover, how can it also be the case that firms seeking to earn profits are likewise ignoring highly attractive opportunities to save money? If the savings are this great, why is it that a very basic labeling approach cannot remedy this seemingly stunning example of completely irrational behavior? It should be quite simple to rectify decisions that are this flawed.

It should be a red flag that something is amiss with an analysis that assumes such perplexing consumer and firm behavior that runs counter to the most rudimentary economic theory and our general sense that we do not live in a world in which people never make sound choices. It might be that there is something that is incorrect or perhaps even irrational in the assumptions being made in the regulatory impact analyses. Indeed, upon closer inspection it is apparent that there is no empirical evidence provided for the types of consumer failures alleged. Even if some consumers do sometimes fall short on certain dimensions of choice, the magnitude and prevalence of such a shortfall is important and is never addressed in the regulatory assessments. Nor is there adequate consideration of the actual and potential role of informational remedies that have already been adopted.

Perhaps the main failure of rationality is that of the regulators themselves. Agency officials who have been given a specific substantive mission have a tendency to focus on these concerns to the exclusion of all others. Thus, fuel efficiency and energy efficiency matter, but

[106] Ibid., 35.

nothing else does. If other attributes matter, it is assumed they either are irrelevant or will be included at no additional cost in the post-regulation products. In effect, government officials act as if they are guided by a single mission myopia that leads to the exclusion of all concerns other than their agency's mandate.

Institutional biases of this type are common and are fundamental characteristics of organizational behavior. Indeed, the existence of parochial visions by agencies is a major reason the Executive Office of the President has institutionalized a formal regulatory oversight process beginning with the Ford administration and including a BCA test since the Reagan administration. One question raised by these analyses is whether the legislation mandating these standards permits OMB to provide credible evidence of the market failures pivotal to justifying the regulations. Even if the regulations must by law be issued, there could be changes to the analysis to show the true economic burdens of the regulations. Indeed, OMB guidelines require that the agencies estimate the costs of not pursuing the optimal regulatory response due to legal constraints.[107] Moreover, OMB should also require agencies to prepare analyses in which the domestic greenhouse-gas benefits are included as benefits instead of the greenhouse-gas benefits to the world. And regulatory analyses for energy-efficiency regulations should have much firmer economic grounding than the current engineering approach.

Adopting a more accurate economic analysis does not imply that government agencies do not have any policy tools that can be used to foster greater energy efficiency. Informational policies and more limited forms of policy intervention may be warranted on a benefit-cost basis. Recent regulatory analyses demonstrate that the current energy-efficiency initiatives do very little to address climate change. Rather than squander societal resources on more ineffective

[107] See OMB, "Circular A-4.", which states: "If legal constraints prevent the selection of a regulatory action that best satisfies the philosophy and principles of Executive Order 12866, you should identify these constraints and estimate their opportunity cost."

policy efforts, a more productive approach would be to search for policy options that offer greater potential for making a serious dent in greenhouse-gas emissions.

Table 1. NHTSA's Estimated Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	132.137
Congestion costs	30.040
Accident costs	14.250
Noise costs	0.568
Total Costs	**176.995**
Benefits	
Lifetime fuel savings	416.456
Consumer surplus from additional driving	9.105
Refueling time value	15.292
Petroleum market externalities	21.547
Fatality costs	0.010
CO_2	45.614
CO	0.000
VOC	0.601
NOx	0.594
Particulate matter	6.705
Sox	5.401
Total Benefits	**521.325**
Net Total Benefits	**344.330**

Source: NHTSA, "Preliminary Regulatory Impact Analysis: Corporate Average Fuel Economy for MY 2017–MY 2025," November 2011, table 13.
Note: Estimates are for combined passenger cars and light trucks, 3 percent discount rate, billions of 2009$.

Table 2. EPA's Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	140.0
Accidents, congestion, and noise costs*	52.0
Total Costs	**192.0**
Benefits	
Lifetime fuel savings	444.0
Consumer surplus from additional driving	70.9
Refueling time value	19.5
Energy security benefits	24.2
CO_2	46.4
Non-CO_2 greenhouse-gas impacts	n/a
$PM_{2.5}$-related impacts	8.0
Total Benefits	**613.0**
Net Total Benefits	**421.0**

Source: EPA and NHTSA, "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards," Federal Register 76 (December 1, 2011): 74854, table III-82; and EPA, "Draft Regulatory Impact Analyses: Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," November 2011, table 1.
Note: An * indicates that these were included as disbenefits in EPA's tables. Estimates are for combined passenger cars and light trucks, 3 percent discount rate, billions of 2009$.

Table 3. NHTSA's Estimated Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	8.100
Accident, Congestion, Noise costs	1.500
Total Costs	**9.600**
Benefits	
Lifetime fuel savings	50.100
Refueling time value	0.400
Energy security impacts	2.700
CO_2	5.700
Total Benefits	**58.900**
Net Total Benefits	**49.300**

Source: EPA and NHTSA, Final Rule (2011), table VIII-33.
Note: Estimates are for combined heavy-duty vehicles, 3 percent discount rate, billions of 2009$.

Table 4. National Impacts of Clothes Dryer Rule (2009$ billion)

	3% Discount	7% Discount
NPV of consumer benefit	$3.01	$1.08
Value of CO_2 reduction	$0.093to $1.49	
Value of NO_x reduction	$0.005 to $0.049	$0.002 to $0.021
Change in Industry NPV	–$0.081 to –$0.065	

Source: "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,550–51 (tables V-47 and V-51).

Table 5. National Impacts of Clothes Dryer Rule (2009$ billion)

	3% discount	7% discount
NPV of consumer benefit	$1.47	$0.57
Value of CO_2 reduction	$0.077 to $1.16	
Value of NO_x reduction	$0.004 to $0.043	$0.002 to $0.023
Change in Industry NPV	-$0.18 to -$0.11	

Source: "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,553–54 (tables V-51 and V-52).