ORAL ARGUMENT NOT YET SCHEDULED

No. 20-1145

Consolidated with Nos. 20-1167, 20-1168, 20-1169, 20-1173, 20-1174, 20-1176, 20-1177, and 20-1230

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

COMPETITIVE ENTERPRISE INSTITUTE, et al.,
Petitioners,

v.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, et al.,
Respondents,

ALLIANCE FOR AUTOMOTIVE INNOVATION, et al.,
Intervenors for Respondents.

On Petitions for Review of Final Agency Action by the National Highway Traffic Safety Administration and the U.S. Environmental Protection Agency

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BRIEF OF AMICI CURIAE ECONOMISTS IN SUPPORT OF COORDINATING PETITIONERS

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CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

All parties, intervenors, and amici appearing in this case are listed in the brief of State and Local Government Petitioners and the brief of Public Interest Organization Petitioners.

References to the rulings under review and related cases appear in the State and Local Government Petitioners' brief and the Public Interest Organization Petitioners' brief.

STATEMENT REGARDING SEPARATE BRIEFING, CONSENT TO FILE, AUTHORSHIP, AND MONETARY CONTRIBUTIONS

All parties have consented to the filing of this brief. Amici filed their notice of intent to participate in this case as amici curiae on January 21, 2021. A single joint brief is not practicable in this case because other amicus briefs do not address the unique and distinguished economic expertise of amici Benjamin Leard, Joshua Linn, Kenneth A. Small, and James Stock ("Economists").

No party's counsel authored this brief in whole or in part, and no party or party's counsel contributed money intended to fund the preparation or submission of this brief. No person—other than the amici or their counsel—contributed money intended to fund the preparation or submission of this brief. *See* Fed. R. App. P. 29(a)(4)(E).

STATUTES AND REGULATIONS

The pertinent statutes and regulations are set forth in the briefs of State and Local Government Petitioners and Public Interest Organization Petitioners.

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INTERESTS OF AMICI CURIAE

Amici curiae are leading experts in environmental, energy, and transportation economics. They teach and publish widely within their fields, and have served as advisors within the federal government. Amici have written extensively about how standards that affect fuel economy influence consumer behavior via the rebound effect and/or the sales elasticity for light duty vehicles, and have a professional interest in ensuring that policy is based on reasonable economic analysis. A summary of amici's specific qualifications and affiliations is included as Appendix A.

Amici file this brief as individuals. This brief reflects their independent judgment and does not represent the views of any institutions with which they are affiliated.[1]

[1] Amici Kenneth Small and Joshua Linn took the lead on the topic of rebound, and amici James Stock and Benjamin Leard took the lead on the topic of price elasticity.

INTRODUCTION AND SUMMARY OF ARGUMENT

When the Environmental Protection Agency ("EPA") and the National Highway Traffic Safety Administration ("NHTSA") (collectively, "the agencies") promulgated The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks ("SAFE Rule"), rolling back the emissions and corporate average fuel economy standards they had set in 2012, they justified the rollback based on a cost-benefit analysis they had conducted. 85 Fed. Reg. 24,174 (Apr. 30, 2020). This analysis, however, depends on erroneous economic assumptions which have dramatic implications, resulting in a rule that is in reality far more costly than the agencies acknowledge. In our judgment, the agencies' analysis has critical failings and violates reasonable professional standards.

The SAFE Rule's rollback of standards that affect fuel economy relied on quantifying several economic parameters, including (i) the rebound effect (the increase in driving that results when higher fuel economy lowers driving costs per mile), and (ii) the elasticity of vehicle sales to vehicle prices ("price elasticity," or the connection between price of vehicles and the number of vehicles sold). In the SAFE Rule, the agencies doubled their estimate of the rebound effect compared to their prior estimates and chose a price elasticity far exceeding what the available literature supports. While it is common for economists to debate methodologies and

estimates of values like rebound and price elasticity, the agencies' choices here are unreasonable and unsupported. These inappropriate estimates allow the agencies to claim an unrealistic increase in driving under the prior more stringent standards (vastly reducing those standards' benefits), and artificially high vehicle sales under the SAFE Rule (making the rollback appear more beneficial than it actually is).

Courts must set aside agency actions that are "arbitrary, capricious, [or] an abuse of discretion." 5 U.S.C. § 706(2)(A); 42 U.S.C. § 7607(d)(9)(A) (corresponding Clean Air Act provision). Agency determinations are arbitrary when they do not "examine the relevant data and articulate a satisfactory explanation…including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (internal quotation omitted); *Fed. Commc'ns Comm'n v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009) (applying this standard when an agency changes a prior position).

Our review of the literature shows that the agencies' methodologies for choosing assumed values of the rebound effect and price elasticity—which have dramatic implications for the aggregate costs and benefits of the SAFE Rule—are unreasonable and unsupported by the evidence, and the agencies' actions therefore were arbitrary and capricious.

ARGUMENT

I. THE AGENCIES' REBOUND ESTIMATE IS ARBITRARY AND CAPRICIOUS AND HAS DRAMATIC IMPLICATIONS FOR THE COMPUTED COSTS OF THE SAFE RULE.

When a vehicle is more fuel efficient, the cost per mile of driving is lower. This makes driving cheaper, which may encourage additional driving. This extra driving is called the rebound effect. The numerical value of the rebound effect is stated as the percentage increase in driving resulting from a 1% increase in fuel efficiency. For example, if fuel efficiency is increased by 10%, a rebound effect of 20% means that the miles traveled will increase by 2% (20% of 10%).

When setting the prior standards in 2012, the agencies estimated a rebound effect of 10%, amply supported by the relevant scholarly research. *See* 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62,624, at 62,924 (Oct. 15, 2012). With the SAFE Rule, they arbitrarily *doubled* that estimate to 20%, *see* 85 Fed. Reg. at 24,676, without providing adequate justification. Doubling the estimated rebound value has dramatic implications for the computed costs and benefits of the revised regulation because it implies that any improvement in fuel efficiency results in a relatively large increase in miles driven. This, in turn, results in less fuel savings and more accidents and air pollution than would otherwise occur. A higher rebound value means lower benefits from tightening standards, and therefore lower costs (i.e.,

forgone benefits) from weakening standards. An artificially large 20% rebound effect masks the actual impact of the rollback.

If the agencies had not inflated the rebound rate to 20%, and had instead used their prior 10% rate, the net benefits of the SAFE Rule estimated by the agencies would have declined virtually to zero if a 7% discount rate is used (from $16.1 billion to $0.3 billion). EPA & NHTSA, Final Regulatory Impact Analysis for the SAFE Vehicles Rule, EPA-HQ-OAR-2018-0283-7671, 1805 tbl.VII-483 (Mar. 2020; updated July 1, 2020). Using a 3% discount rate, net benefits are negative ("disbenefits") even with the agencies' 20% rebound value. Using a more accurate 10% rebound, these net *disbenefits* more than double (from -$13.1 billion to -$36.4 billion). *Id.* at 1803 tbl.VII-482. That is, using a proper rebound value would result in the SAFE Rule having negligible positive net benefits or even more negative net benefits, depending on the discount rate.[2]

In altering the rebound effect to make the SAFE Rule seem more beneficial, the agencies took an unclear and inconsistent approach to prioritizing studies, substituted vague descriptions of the overall result of those studies for the studies' expert judgment, and misrepresented the evidence that the rebound effect declines

[2] These are the results using NHTSA's standards that affect fuel economy. Using a 10% rebound for EPA's greenhouse gas standards turns the net benefits negative at a 7% discount rate and makes them even more negative at a 3% discount rate. *Id.* at 1807 tbl.VII-484 & 1809 tbl.VII-485.

with time and income. The agencies' approach produces an assumed value for the rebound effect for the relevant time period that is outside reasonable professional judgment.

A. The Agencies Provided Ample Support for a 10% Rebound Effect in the Prior Standards.

In their analyses for the prior standards, EPA and NHTSA considered 27 studies, completed between 1983 and 2011, which reported rebound estimates ranging from 6% to 75%. EPA & NHTSA, Joint Technical Support Document, Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, EPA-HQ-OAR-2018-0283-0654, at 4-22 to 4-26 (Aug. 2012); NHTSA, Final Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2017-MY 2025 Passenger Cars and Light Trucks, NHTSA-2010-0131-0417, at 848 (Aug. 2012). Although the mean of those estimates is about 22%, the agencies understood that simply averaging the studies that used data from prior time periods was not the right approach. Instead, their cost-benefit analysis requires an estimate that applies to the future, when the regulated vehicles will be driven. They noted that several studies, all using panels of state-level data that cover multiple decades, concluded that the estimated magnitude of the rebound effect has significantly diminished over time because of rising income. *Id.* at 851-52 (citing Kenneth A. Small & Kurt Van Dender, *Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect*, 28 The Energy J. 25 (2007)

(estimating an average rebound effect of 22% across the years 1966-2001, but 11% for the years 1997-2001); Kent M. Hymel, Kenneth A. Small & Kurt Van Dender, *Induced Demand and Rebound Effects in Road Transport*, 44 Transp. Rsch. Part B 1220 (2010) (reporting an average rebound of 24% from 1966 through 2004, but 13% in 2004); David Greene, *Rebound 2007: Analysis of National Light-Duty Vehicle Travel Statistics* (Mar. 2010) (internal EPA research) (using data from 1966 through 2007, projecting a rebound effect of 10% in 2010 and 8% in 2030)); *see also* David L. Greene, *Rebound 2007: Analysis of U.S. Light-Duty Vehicle Travel Statistics*, 41 Energy Pol'y 14 (2012) (same). These results are consistent with economic theory about the decreasing marginal utility of wealth, meaning here that when incomes rise over time, consumers are less sensitive to changes in the cost per mile of driving. These studies all imply that the rebound effect will continue to decline as incomes increase, to values well below 10% over the years that cars subject to the regulations will be driven. Therefore, the agencies conservatively found that a 10% rebound effect, at maximum, was most accurate for forecasting the effects of the regulations.

In 2016, the agencies reaffirmed the 10% rebound value, using similar reasoning. EPA & NHTSA, Draft Technical Assessment Report, Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, EPA-HQ-

OAR-2015-0827-0926, at 10-15 to 10-20 (July 2016) (reviewing recent literature and concluding 10% rebound is appropriate because multiple studies demonstrate that the rebound effect shrinks as incomes rise).

B. The Agencies Failed to Adequately Justify Their Departure From Their Original Rationale for a 10% Rebound Estimate.

The agencies changed course for the SAFE Rule, significantly altering their approach and assumptions about the rebound effect's magnitude. They stated that they "feel 20 percent is a reasonable—and probably even conservative—estimate" based on the evidence. 85 Fed. Reg. at 24,677. They provided no reasoned justification for why they "feel" this way, and in our judgment their analysis violates reasonable professional standards.

1. The Agencies Took an Unclear and Inconsistent Approach to Prioritizing Studies.

Numerous public comments on the proposed SAFE Rule suggested criteria for weighting literature based on the quality of the underlying analysis. *See* Final Regulatory Impact Analysis (2020), *supra*, at 964-65 (listing eight such criteria). In the final SAFE Rule, the agencies acknowledged that the criteria used to determine the relevance of particular studies make a large difference in the rebound estimate. They stated, for example, that if the set of studies considered were restricted to those that use recent U.S. data, and if higher weight were assigned to studies that meet certain quality criteria suggested in the comments they received (and with which we

agree),[3] the resulting set of studies would make a "reasonable case…to support values of the rebound effect falling in the 5-15 percent range" and in fact "more likely to lie toward the lower end of that range." 85 Fed. Reg. at 24,676. Despite this, the agencies inexplicably concluded that "older research suggests a rebound of 20 to 25 percent. The new research…supports a similar—or even larger—range." *Id.*

The agencies provided only a cursory explanation for their decision to double the 10% rebound estimate that they called "reasonable," saying they preferred to rely on the "totality of empirical evidence, rather than restricting the available evidence." *Id.* at 24,674. They declined to exclude or give less weight to estimates using data from Europe, even though Europe's greater population density and more extensive public transit services, along with generally much higher fuel prices, would be expected to lead to a rebound effect far different from in the United States. In fact, two of the agencies' most preferred eight studies[4] are drawn from this European data, despite the agencies' own acknowledgement of the "very different vehicle use and driving patterns between Europe and the U.S." *Id.* at 25,241. *See also* EPA, Science Advisory Board Consideration of the Scientific and Technical Basis of the Proposed Rule, EPA-HQ-OAR-2018-0283-7659, at 27 (Feb. 27, 2020) (stating that papers

[3] These criteria include using multiple odometer readings (rather than a survey respondent's estimate) to measure vehicle miles traveled, accounting for endogeneity of fuel economy, and distinguishing between studies that measure driving changes based on fuel economy versus fuel price. 85 Fed. Reg. at 24,676.
[4] *See id.* at 24,676 n.1770.

using "U.S. data should be weighted more heavily than…those from outside the U.S.") ("Science Advisory Board Report").

Rather than grappling with how to filter or weight the studies, or thoroughly responding to the comments on the proposed SAFE Rule, the agencies' methodology is vague and conclusory. It is impossible to tell whether or not they accounted for the quality, recency, methodology, and sample characteristics of the studies, among other factors. They noted that they have some preferred studies, but failed to explain whether or how they weighted these studies, or exactly why they chose these to the exclusion of others. *See* 85 Fed. Reg. at 24,676 n.1770.

In our judgment, this approach cannot be defended. It is well established that when agencies consider a range of studies to inform a policy decision, they should focus on studies that are similar to the relevant policy context. *See, e.g.*, U.S. Office of Management and Budget, Circular A-4 (Sept. 17, 2003) at 25, https://www.transportation.gov/sites/dot.gov/files/docs/OMB%20Circular%20No.%20A-4_0.pdf. It is better to rely on a clearly defined smaller set of reliable studies than a larger set that includes unreliable ones, and agencies should provide clear parameters for weighting available studies. Because the agencies did not do this, they failed to provide a sound justification for departing from what they referred to as the "reasonable case" for assuming a rebound effect between 5% and 15%.

2. The Agencies Substituted Vague Descriptions of the Overall Results of Studies for the Studies' Expert Judgments.

In their previous reviews of the rebound literature, the agencies reported medians and means of the estimates in the literature. *See, e.g.*, Joint Technical Support Document (2012), *supra*, at 4-22 to 4-23 tbl.4-9. In the SAFE Rule, however, they reported only upper and lower limits of ranges of estimates in each study. *See* Final Regulatory Impact Analysis (2020), *supra*, at 967 tbl.VI-210. This creates a false impression that the range of plausible estimates is wider than it really is.

Considering the author's expert judgment regarding the best estimate is important. Many studies report wide ranges of estimates in order to demonstrate how results depend on varying assumptions, but often the studies' authors have clearly stated assessments regarding which set of assumptions is most justified. It would be inaccurate to read these studies as reflecting a "range" of outcomes by incorporating into the "range" estimates that the authors themselves believe are unreliable. For example, the study by Gillingham et al. (2015) is cited in the 2020 Final Regulatory Impact Analysis as producing a range of estimates of 8% to 22%, but the study itself states that the authors consider their best estimate to be 10%. *Id.*; Kenneth Gillingham et al., *Heterogeneity in the Response to Gasoline Prices: Evidence from Pennsylvania and Implications for the Rebound Effect*, 52 Energy Econ. S41, S47 (2015). A number of rebound experts submitted comments on the proposed SAFE

Rule notifying the agencies that they had mischaracterized their studies. *See, e.g.*, Kenneth A. Small, Comment Letter on Proposed SAFE Rule, NHTSA-2018-0067-7789, at 1 (Sept. 14, 2018) ("A better characterization of the most recent study would be that it finds a long-run rebound effect of…4.0 percent or 4.2 percent under two more realistic models that are supported by the data," not the 18% the agencies continued to cite in the final SAFE Rule); Antonio M. Bento, Comment Letter on Proposed SAFE Rule, NHTSA-2018-0067-11598, at 1 (Oct. 22, 2018) (stating that his study "should not be used to infer the magnitude of the rebound effect" and expressing surprise that the agencies cited it for this reason).

Similarly, the agencies discussed prominently (and seemed to rely on) a meta-analysis of the rebound literature (identifying and considering 74 rebound studies). Alexandros Dimitropoulos et al., *The Rebound Effect in Road Transport: A Meta-Analysis of Empirical Studies*, 75 Energy Econ. 163-79 (2018). They claimed that the study reports a rebound range of 15% to 49% for populations with income, population density, and fuel prices that are "currently representative of the U.S." 85 Fed. Reg. at 24,676. This is highly misleading. In fact, the paper reports 27 values of the rebound effect, depending on Gross Domestic Product (GDP) per capita, gasoline price per liter, and population density. Of these 27 values, the one corresponding most closely to current U.S. conditions is the one for per-capita GDP of $60,000, per-liter gasoline price of $0.50, and population density of 20 people per

square kilometer. That value of the rebound effect is 15%—the lowest value in their cited range. *Id.* at 172 tbl.V. This value is still far higher than the value implied by the Dimitropoulos et al. study that is applicable to the SAFE Rule, however, because it is for 2017. The study authors explain that the meta-regression that produces these values implies that the rebound effect declines by 0.4 percentage points for each $1,000 in increased GDP, and in addition by 0.7 percentage points for each year, together implying very large decreases in the rebound effect for the time over which the SAFE Rule would affect driving. *Id.* at 171.

The agencies also used imprecise and subjective statements to describe the overall implications of the literature. For example, they stated without supporting economic analysis that "[t]he totality of evidence…suggests that a plausible range for the rebound effect is 10-50 percent. The central tendency of this range appears to be at or slightly above its midpoint, which is 30 percent." 85 Fed. Reg. at 24,676. The agencies did not explain what criteria they used to reach these vague conclusions about "the totality of evidence," the "plausible range," or the "central tendency."

3. The Agencies Misrepresented the Evidence that the Rebound Effect Declines with Time and/or Income.

For the prior standards, the agencies considered multiple papers finding that the rebound effect substantially declines with income (meaning that as incomes rise over time, any fuel efficiency improvement will have less of an effect on the total vehicle miles traveled). Final Regulatory Impact Analysis (2012), *supra*, at 851-52

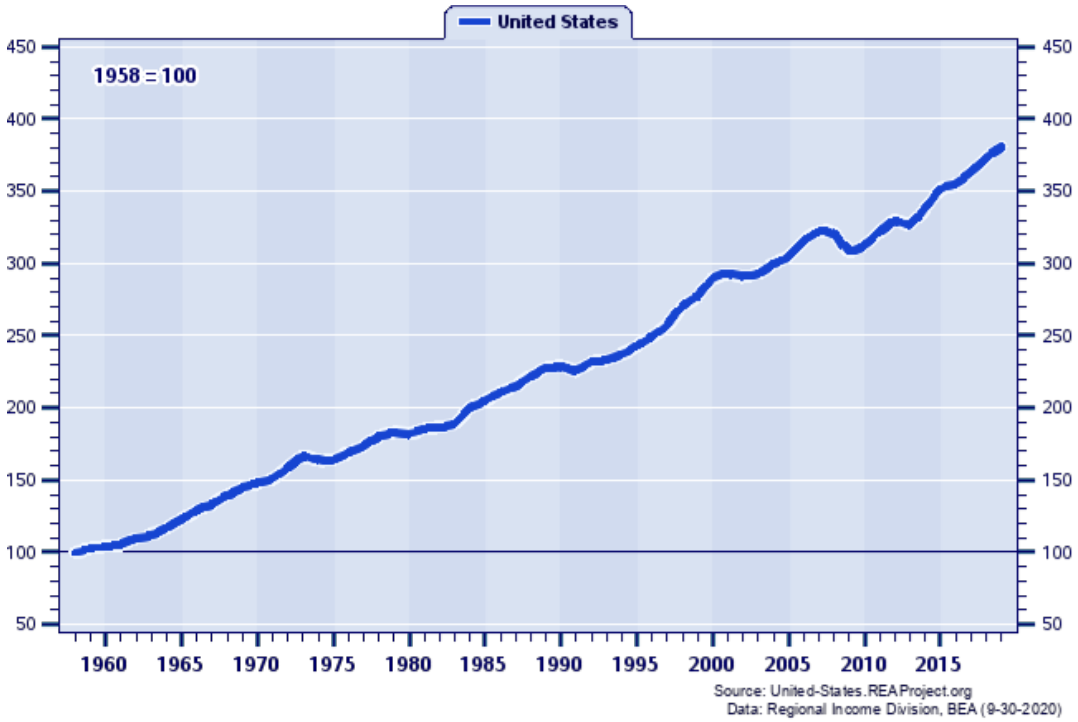
(considering Small & Van Dender (2007); Hymel, Small & Van Dender (2010); and Greene (2010)). *See also* Greene (2012), *supra* (testing and confirming that rising income causes a decline in rebound of similar magnitude to earlier studies) (cited in Final Regulatory Impact Analysis (2020), *supra*, at 967 tbl.VI-210). Despite including two of these papers in the list of studies that "best meet" their criteria, 85 Fed. Reg. at 24,676 n.1770, the agencies appear to have disregarded their conclusions regarding the income effect, referring to "forecasts of limited future growth in most measures of U.S. household income" and stating that "projected growth in the income measure" used in the study by Small and Van Dender (2007) "did not occur during the decade following the 2007 study's publication." *Id.* at 24,671 & 24,675. These statements are incorrect.

First, while the 2009 recession did temporarily reduce real personal income per capita, income soon began growing again. Since 2009, income has in fact grown at 2% per year.[5] The following figure[6] depicts this income growth:

[5] This is the annual growth rate 2009-2019, and is only modestly less than the 2.4% per year rate that occurred over the period studied by Small and Van Dender (annual growth rate 1966-2001) (calculated from data from The Economic Report of the President, at 370 tbl.B-5, 386 tbl.B-17 & 387 tbl.B-18 (Feb. 2020), https://www.govinfo.gov/content/pkg/ERP-2020/pdf/ERP-2020.pdf, and The Economic Report of the President, at 338 tbl.B-7, 361 tbl.B-27, and 371 tbl.B-34 (Feb. 2010), https://www.govinfo.gov/content/pkg/ERP-2010/pdf/ERP-2010.pdf).

[6] This figure is from the website of the U.S. Regional Economic Analysis Project, https://united-states.reaproject.org/analysis/comparative-trends-analysis/per_capita_personal_income/tools/0/0/#:~:text=When%20measured%20in

Real Per Capita Personal Income Indices (1958=100): 1958-2019



Moreover, income is nearly 28% higher in 2019 than it was in 2001 (the last year of data in the Small and Van Dender study), which makes a substantial difference to the estimate of the rebound effect—specifically, lowering it by 6.8 percentage points (from 11% in 2001 to 4.2% in 2019). *See* Small and Van Dender (2007), *supra*, at 39 tbl.2 (column 1) (calculated by amici).

The agencies also incorrectly suggested that future income growth will be too small to matter. The standards set in the SAFE Rule will affect the efficiency of the fleet of vehicles for the next 30 years or more, i.e., until vehicles affected by the regulation are retired. As the agencies point out, private forecasts of real income

%20current%20dollars,1959%20to%20$51,517%20in%202019 (last visited Jan. 16, 2021), and is based on data from the U.S. Bureau of Economic Analysis.

growth over the next 30 years are on the order of 1.6% per year, *see* 85 Fed. Reg. at 24,675 n.1763, which is even larger than the historical growth rate of 1.4% experienced between 2001 and 2019.[7] Such forecasts are far from "forecasts of limited future growth" as the agencies state; rather, they imply that at the time when most vehicles subject to these regulations are retired, incomes will be 61% higher than today, which are already considerably higher than in the time periods of the data used by rebound studies under discussion. This type of income growth would be expected to cause a large reduction in the magnitude of the rebound effect.

The agencies also hypothesized that the rebound effect might increase with household vehicle ownership (i.e., the number of vehicles per household), which is positively correlated with income. No study is cited in support of this statement, nor do the agencies provide evidence that vehicle ownership will increase during the relevant period. The U.S. Energy Information Administration's Annual Energy Outlook 2020 actually projects a 3% *decline* in the total stock of light-duty vehicles per capita between 2019 and 2050.[8]

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[7] The 1.4% growth rate was calculated using data from The Economic Report of the President (2020), *supra*, at 370 tbl.B-5, 386 tbl.B-17 & 387 tbl.B-18.

[8] The light-duty on-road vehicle stock is projected to increase from 257 to 292 million vehicles and the population to increase from 331 to 389 million people, resulting in a vehicle stock per capita decline from 257/331=0.78 to 292/389=0.75. U.S. Energy Information Administration, *Annual Energy Outlook 2020*, tbls.20 & 39 (Jan. 29, 2020), https://www.eia.gov/outlooks/aeo/data/browser/#/?id=18-AEO2020&cases=ref2020&sourcekey=0 & https://www.eia.

Finally, the agencies incorrectly argued that the effect of income on rebound is not uniformly supported by other studies, citing one particular study. 85 Fed. Reg. at 24,676 (discussing B. DeBorger et al., *Measuring the Rebound Effect with Micro Data: A First Difference Approach*, 79 J. of Env'tl. Econ. & Mgmt., 1-17 (2016)). The DeBorger study on which the agencies based this argument, however, has numerous shortcomings for this purpose: it uses European data, it reports a very large degree of uncertainty for these particular results (standard of error more than half the estimated size of the rebound effect itself), and it is based on income variations across households rather than over time. Regardless, the study's "best estimate of the rebound effect is some 7.5-10%," even without an income effect. DeBorger, *supra*, at 3.

By dismissing the effect of income on the rebound effect, the agencies discard key reasoning given in the regulatory documents for the prior standards, reasoning that has only been strengthened by newer evidence. Their stated reasons for doing so are incorrect, causing them to state a rebound value far outside the scope of reasonable consideration.

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gov/outlooks/aeo/data/browser/#/?id=49-AEO2020&cases=ref2020&sourcekey=0.

II. THE AGENCIES' ASSESSMENT OF PRICE ELASTICITY IS ARBITRARY AND CAPRICIOUS AND DISREGARDS BILLIONS OF DOLLARS IN SOCIAL COSTS.

In the context of the SAFE Rule, price elasticity is a measure of the change in new vehicle sales in response to a change in new vehicle prices. This is significant to setting standards that affect fuel economy because such standards may increase the cost of manufacturing vehicles, which in turn may decrease the number of vehicles sold. That in turn affects the benefits of stricter fuel efficiency standards. Because new vehicles are more fuel-efficient and safer than old vehicles, a decrease in new vehicles sold reduces the standards' greenhouse gas benefits and increases their costs as measured by traffic fatalities. Thus, using an artificially large elasticity overstates the reduction in traffic fatalities and understates the increase in emissions due to the rollback.

The price elasticity is the percentage change in sales resulting from a 1% increase in the price of a given product. A price elasticity of -0.4, for example, means that sales decline by 0.4% when prices increase by 1%. The price elasticity varies from product to product. In the United States, where automobiles are generally considered essential goods, automobile demand is relatively inelastic (meaning that changes in price do not result in large changes in demand for automobiles). Peter Howard & Max Sarinsky, *Turbocharged: How One Revision in the SAFE Rule Economic Analysis Obscures Billions of Dollars in Social Harms*, N.Y.U. Inst. for

Pol'y Integrity 3 (Nov. 2020), https://policyintegrity.org/files/publications/Turbocharged_How_One_Revision_in_the_SAFE_Rule_Economic_Analysis_Obscures.pdf.

In the regulatory proposal for the SAFE Rule, the agencies projected a price elasticity for new vehicles in the range of -0.2 to -0.3. 83 Fed. Reg. 42,986, 43,075 (Aug. 24, 2018). In their final rule, however, the agencies amended the price elasticity estimate with minimal discussion, raising it more than three-fold to -1.0—a number far outside the range of reasonable judgment.

Because this elasticity estimate causes the agencies' models to predict a larger increase in new vehicle sales due to the rollback, it affects the level of cost or benefit that is expected. Applying even a moderately smaller price elasticity of either -0.4 or -0.6—two values that in our judgment are still too high—to the agencies' model reveals that inflating the price elasticity to -1.0 "obscures at least $4-$8 billion in net costs." *See* Howard, *supra*, at 11. Even with a -1.0 price elasticity, the SAFE Rule produces net costs or only minimal net benefits. *Id.* An accurate price elasticity value would make the SAFE Rule even more costly.

A. The Agencies Have Failed to Justify the Use of a -1.0 Price Elasticity.

Determining the SAFE Rule's impact on vehicle fleet turnover and new vehicle sales is a complex task that must be undertaken carefully. *See, e.g.*, Preliminary Regulatory Impact Analysis for the SAFE Vehicles Rule, EPA-HQ-

OAR-2018-0283-3041, at 951 (Oct. 2018) ("the magnitude—and possibly even the direction—of [fuel economy improvements'] effect on sales of new vehicles is difficult to anticipate"). Despite this, the agencies justified their price elasticity estimate with only two sentences and a few outdated citations. This is wholly insufficient for multiple reasons.

1. The Studies on Which the Agencies Relied Consider Price Elasticity in the Short Run, But This Is Not the Proper Timeframe to Assess the SAFE Rule's Long-Term Impacts.

Many products, including automobiles, have different price elasticities depending on the timeframe considered, making it common practice to consider short-run and long-run elasticity values. Short-run elasticities generally measure sales effects that take place within one year of a price change; long-run elasticities measure effects beginning approximately five to ten years into the future. In the analysis for the SAFE Rule, the agencies projected sales out through 2050, making a long-run analysis relevant to the majority of the time period. *See* 85 Fed. Reg. at 24,618 tbls.VI-154 & VI-155.

NHTSA and EPA have long understood short-run elasticity estimates to be inappropriate for analyzing the long-term impacts of a rule. In setting the prior standards, for example, they explained that the price elasticity for motor vehicles is "smaller in the long run" because "though people may be able to change the timing of their purchase when price changes in the short term, they must eventually make

the investment" in a new car. 77 Fed. Reg. at 63,102 n.1300. Short-run elasticity is applicable only at the start of a program and "over time, a long-run elasticity may better reflect behavior." *Id.* In the same discussion, the agencies explicitly recognized that -1.0 is "generally considered to be a short-run elasticity." *Id.* Later, EPA again explained that "short run elasticity estimate[s]…may not be appropriate for standards that apply several years into the future." EPA Miderm Evaluation Proposed Determination, EPA-HQ-OAR-2018-0283-7640, at A-40 (Nov. 2016). *See also* Science Advisory Board Report, *supra*, at 22 (While "a consumer can easily hold on to their existing vehicle a bit longer[,]…an old vehicle will not be functional forever, and thus the long-run price elasticity for new vehicles is likely to be smaller [in magnitude] than the short-run elasticity"); NHTSA, CAFE Model Peer Review, NHTSA-2018-0067-0055, at B-35 (rev. July 2019) (advising the agencies that the long-run price elasticity provides the "proper focus" for analyzing the SAFE Rule's impacts).

In promulgating the SAFE Rule, the agencies cited three papers—McCarthy (1996), Bordley (1994), and Kleit (1990)—as support for their -1.0 price elasticity estimate. *See* 85 Fed. Reg. at 24,617 n.1641. Only one of these studies, McCarthy (1996), actually estimates an elasticity—providing a short-run estimate of -0.87. P.S. McCarthy, *Market Price and Income Elasticities of New Vehicle Demands*, 78 Rev. of Econ. & Statistics 543 (1996). Bordley (1994) simply assumes, without providing

justification, a short-run elasticity of -1.0. R. Bordley, *An Overlapping Choice Set Model of Automotive Price Elasticities*, 28B Transp. Rsch. B401 (1994). Kleit (1990) assumes a long-run elasticity of -1.0, justifying that assumption by referring to Irvine (1983), which in turn does not estimate the market elasticity but instead provides a partial literature review of papers published between 1967 and 1978, which predominantly report short-run elasticity estimates. A.N. Kleit, *The Effect of Annual Changes in Automobile Fuel Economy Standards*, 2 J. of Regul. Econ. 151 (1990); F.O. Irvine, *Demand Equations for Individual New Car Models Estimated Using Transaction Prices with Implications for Regulatory Issues*, 49 S. Econ. J. 764-82 (1983). Despite the recognized importance of long-run estimates, the agencies never directly acknowledged that they were using a short-run estimate.

2. The Studies on Which the Agencies Relied Do Not Support a -1.0 Elasticity in the Long or Short Run.

Even the limited number of studies that the agencies selected fail to support a -1.0 price elasticity, in either the long or short run. A paper by the Center for Automotive Research ("CAR Report") is the only study the agencies cited that actually estimates the long-run elasticity using data, finding it to be -0.61. Sean P. McAlinden et al., *The Potential Effects of the 2017-2025 EPA/NHTSA GHG/Fuel Economy Mandates of the US Economy*, Center for Automotive Research, 27 (Sept. 2016), https://www.cargroup.org/wp-content/uploads/2017/02/The-Potential-Effects-of-the-2017_2025-EPANHTSA-GHGFuel-Economy-Mandates-on-the-

US-Economy.pdf (cited in 85 Fed. Reg. at 24,617 n.1642). In their justification for the SAFE Rule, however, the agencies referred not to the actual new estimate from the CAR Report. Instead, they cited the mean value of -0.72 from the CAR Report's literature review, which the CAR Report notes is strongly influenced by an "extreme outlier" study published in 1957 (which uses pre-World War II data), that the study authors believe should be "excluded from consideration." *Id*. at 28. When the CAR Report excludes that study, it finds the mean long-run estimate in its literature review to be -0.61. *Id.*[9] As discussed above, just changing the long-run elasticity from the assumed -1.0 to -0.6 increases the net costs of the SAFE Rule by about $4 billion. Howard, *supra*, at 11.

None of the other studies the agencies cited consider long-run estimates at all, and several of the studies actually find that price elasticity is likely to be less

[9] This value based on this literature is still too large. All but one of the long-run elasticities reported in the CAR Report were published in 1970 or earlier, nearly 50 years ago, and the CAR Report misreports the sole recent paper with long-run elasticity values, C. Fischer et al., *Should Automobile Fuel Economy Standards be Tightened?*, 28 The Energy J. 1-29 (2007) (finding values based on model simulations, not estimated from data), by separately reporting elasticities for cars and light trucks. This ignores substitution between the two, making the -0.82 long-run elasticity value that the CAR Report takes from the Fischer et al. study inaccurate. The Fischer et al. paper also reports a long-run elasticity for the *combined* market for new motor vehicles, finding it to be -0.36. Because the standards that affect fuel economy apply to all new light-duty vehicles, the correct elasticity is the combined market affected by a price increase, not one supposing that only cars are affected or, alternatively, only light trucks. Using the correct value from Fischer et al. would make the CAR Report's estimated long-run price elasticity even smaller.

than -1.0 in magnitude, *even in the short run*. McCarthy (1996) estimates short-run elasticity of -0.87 and the CAR Report estimates short-run elasticity of -0.79. Thus, at best, the agencies' selected literature supports a short-run elasticity estimate within the range of -0.8 to -1.0, making -1.0 a high-end estimate of short-run elasticity rather than a central estimate.

3. The Agencies' Own Experts Have Advised that Their Chosen Elasticity Value Is Improper.

In addition to their own cited research not supporting their chosen elasticity value, the agencies failed to respond to reasonable advice demonstrating that using a -1.0 price elasticity is unsupported. EPA's Science Advisory Board advised that use of -1.0 price elasticity to model long-term sales impacts is unjustified and not based on the academic literature. Science Advisory Board Report, *supra*, at 23 (advising agencies to conduct a "sensitivity analysis with alternative price elasticities—both larger and smaller than -0.2 to -0.3"). Likewise, the agencies' peer reviewer advised the agencies that the relevant literature, "with a proper focus on long-term price elasticity of demand, provides support for a price elasticity of demand that is well below -1.0 (in absolute value)," and that "the -1.0 elasticity figure does not have a solid grounding in economic evidence." CAFE Model Peer Review, *supra*, at B-33 & B-35.

B. The Agencies' -1.0 Price Elasticity Estimate Is Inconsistent with the Recent Literature.

There are fewer distinct empirical estimates of the long-run elasticity in the literature than it initially appears. Many papers select elasticities estimated by others or simply assume an elasticity to complete a model designed to ask different questions. In particular, there is a substantial literature studying choice by current buyers among different car models, but those models are not well-suited for estimating the long-run market-level elasticities relevant here, which is not which cars consumers will buy, but when and whether they buy new cars at all. In assessing market elasticities, using studies that are merely based on assumptions, or that are not based on the authors' own empirical estimates, can result in double counting and is indefensible. Similarly, it is not defensible to use models aimed at a different purpose, such as studying consumer choice among new vehicles (e.g., a new Toyota Camry vs. a Honda Accord) rather than the decision whether to purchase any new vehicle.

Focusing on the relevant literature, we know of only four distinct estimates of the long-run elasticity based on original data analysis since 2000: (i) the CAR Report; (ii) the SAFE Rule Notice of Proposed Rulemaking, 83 Fed. Reg. 42,986; (iii) Benjamin Leard, *Estimating Consumer Substitution Between New and Used Passenger Vehicles*, Resources for the Future Working Paper 19-02 (rev. Apr. 2020), https://media.rff.org/documents/WP_19-01_Rev_9-19.pdf; and (iv) James H. Stock

et al., Comment on Proposed SAFE Rule, EPA-HQ-OAR-2018-0283-6220 (Oct. 26, 2018). The first three studies report long-run elasticity estimates of -0.61, -0.2 to -0.3, and -0.40, respectively. CAR Report, *supra*, at 28; 83 Fed. Reg. at 43,075; Leard, *supra*, at 4. The Stock et al. comment on the proposed SAFE Rule does not report elasticities, but elasticities in the range of -0.03 to -0.09 can be calculated from their results. The Stock et al. comment also includes an important correction of a spreadsheet error in the Notice of Proposed Rulemaking,[10] resulting in a revised elasticity estimate for that model of -0.07 rather than the Notice of Proposed Rulemaking's calculation of -0.2 to -0.3. *See* Stock Comment, *supra*, at 6-8.

Thus, among the research published since 2000, the long-run price elasticity estimates range from -0.07 (the revised value from the Notice of Proposed Rulemaking, with the correction that we note above) or less (Stock et al.) to -0.61 (CAR Report). Our review of the literature provides no evidence whatsoever for a conclusion of a consensus value of -1.0, the level chosen by the agencies. Instead, based on the more recent studies, the long-run elasticity is substantially lower. In our professional judgment, the agencies acted arbitrarily in selecting an elasticity

[10] The forecast in the Notice of Proposed Rulemaking was overstated by approximately a factor of four—the model was estimated using quarterly data, but the quarterly projections were aggregated incorrectly to annual data.

figure that is far outside of any reasonable range that could be supported by the relevant literature.

CONCLUSION

For the foregoing reasons, the Court should vacate the SAFE Rule.

Respectfully submitted,

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APPENDIX A - LIST OF AMICI CURIAE

Benjamin Leard is an assistant professor in the Department of Agricultural and Resource Economics and a Baker Center Fellow at the University of Tennessee. He is also a university fellow at Resources for the Future. His relevant research focuses on the demand for passenger vehicles and the effects of environmental regulations in the transportation sector. He has published research articles in leading environmental economics and science journals.

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Kenneth A. Small is Professor Emeritus of Economics at the University of California at Irvine, specializing in urban, transportation, and environmental economics. His relevant research includes urban highway congestion, measurement of value of time and reliability, and effects of fuel efficiency standards. Professor

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James Stock is the Harold Hitchings Burbank Professor of Political Economy in the Department of Economics at Harvard University. His research is in econometric methods, macroeconomics, and environmental economics with a focus on fuels and climate change. He served as Chair of the Harvard Economics Department from 2007-2009 and as Co-Editor of *Econometrica* from 2009-2012. In 2013-2014 he was a member of President Obama's Council of Economic Advisers, where his portfolio included macroeconomics and energy and environmental policy. He is the co-author, with Mark Watson, of a leading undergraduate econometrics textbook.

CERTIFICATE OF COMPLIANCE WITH WORD LIMITATION

Pursuant to Federal Rules of Appellate Procedure 29(a)(4)(G) and 32(g)(1), counsel hereby certifies that the foregoing Brief of Economists as Amici Curiae in Support of Coordinating Petitioners contains 6,489 words, as counted by counsel's word-processing system, and this complies with the applicable word limit established by the Court.

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CERTIFICATE OF FILING AND SERVICE

I hereby certify that on this 21st day of January, 2021, a true and correct copy of the foregoing Brief of Amici Curiae Economists in Support of Coordinating Petitioners was filed with the Clerk of the United States Court of Appeals for the D.C. Circuit via the Court's CM/ECF system. Counsel for all parties are registered CM/ECF users and will be served by the CM/ECF system.

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