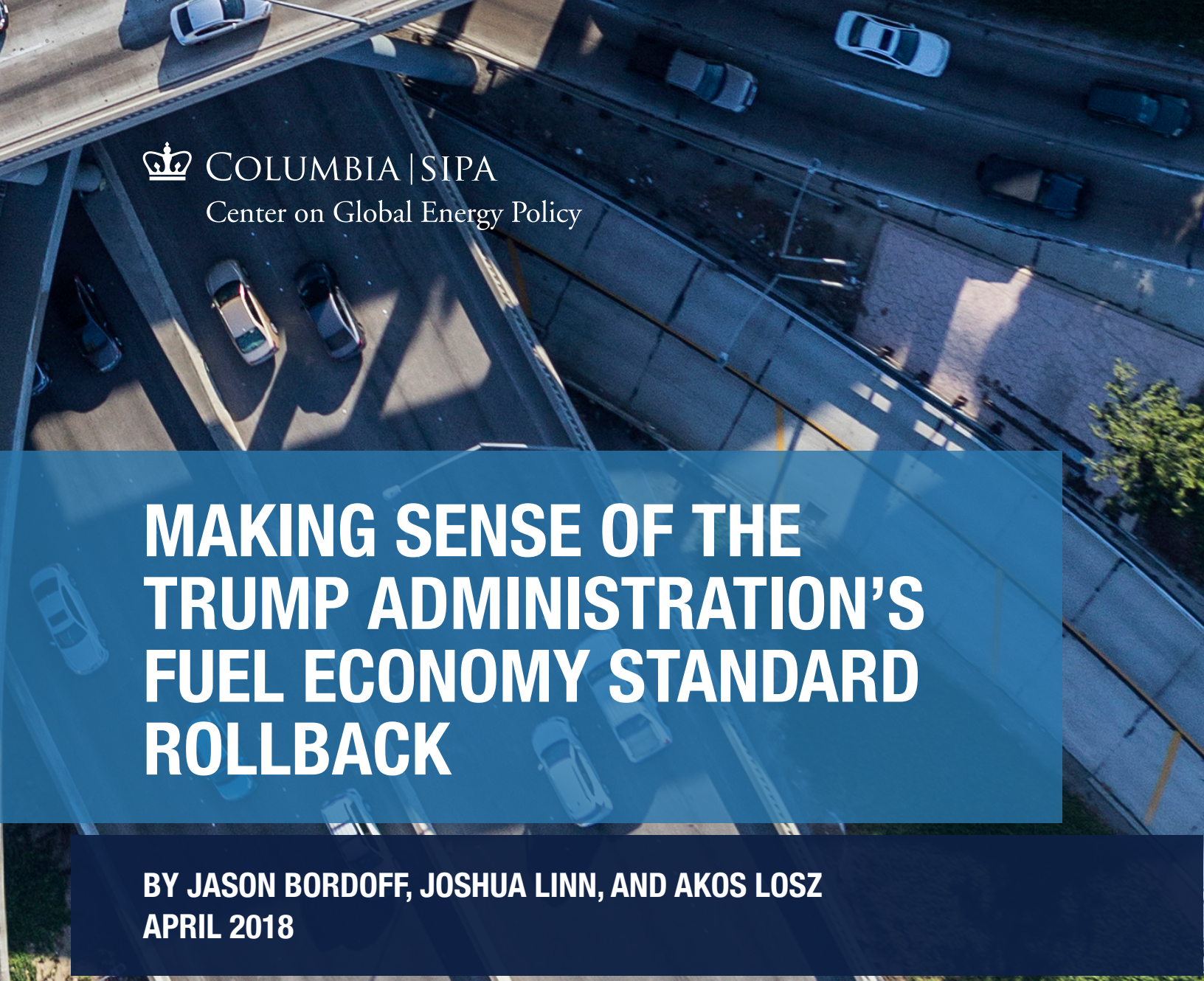

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BY JASON BORDOFF, JOSHUA LINN, AND AKOS LOSZ
APRIL 2018

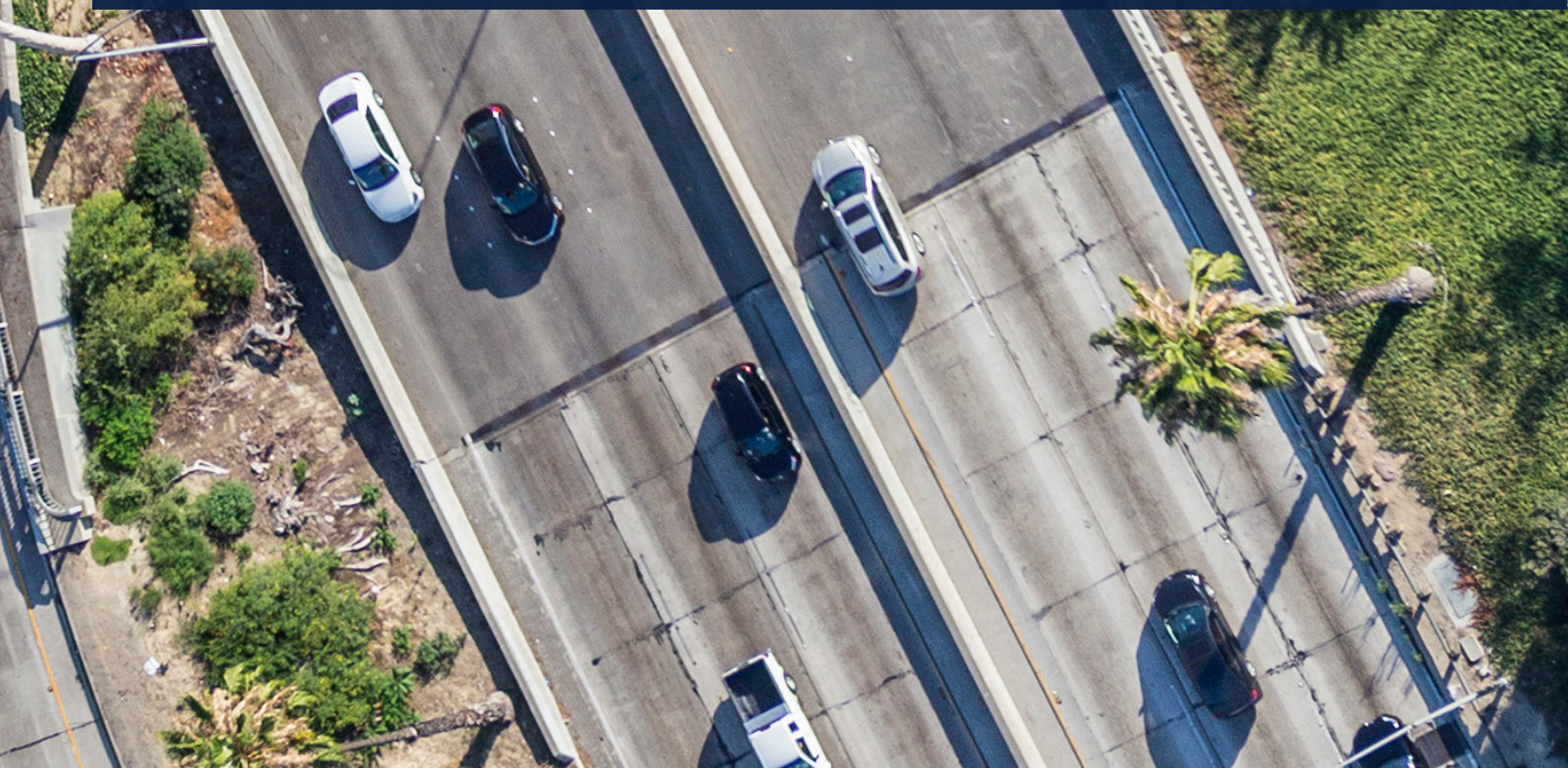

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

On April 2, 2018, the US Environmental Protection Agency (EPA) announced that planned fuel economy increases for model year 2022–2025 cars and light trucks are too stringent and should be revised.[1] The EPA thus initiated a process to set new standards for 2022–2025, in partnership with the National Highway Transportation Safety Administration (NHTSA).

Although the agencies may eventually ease fuel economy standards less than a full rollback of the standards to 2021 levels would imply, for illustrative purposes we assess the implications of a full rollback for gasoline consumption, oil imports, and carbon emissions. Given that the agencies' 2016 analysis suggests that a full rollback would harm society on balance, we discuss which changes to the 2016 analysis might lead the agencies to conclude that a rollback benefits society.

To facilitate discussion of these important public policy issues, this paper makes two points about the EPA's announcement:

Due to the gradual turnover of the on-road vehicle fleet, eliminating the tighter fuel economy standards for 2022–2025 would have small effects on gasoline consumption, greenhouse gas emissions, and oil imports during those years and even out to 2030. However, the ultimate impact of the weaker standards could be greater, especially if they hurt the progress of new technologies and the political momentum for tighter standards in the United States and in other countries over the longer term.

Changes in the social cost of carbon, fuel prices, miles traveled, and market shares of light trucks since the 2016 analysis are unlikely to cause the benefits of rolling back the standards to exceed the costs. If the agencies conclude that the benefits of rolling back the standards exceed the costs, the reasoning will likely be based on other factors, such as consumer willingness to pay for fuel-saving technologies or the cost and effectiveness of those technologies.

INTRODUCTION

On April 2, 2018, the EPA announced that planned fuel economy increases for cars and light trucks in model years 2022–2025 are too stringent and should be revised.[2] The EPA thus initiated a process to set new standards for 2022–2025, in partnership with the NHTSA.

The standards were a central part of the Obama administration's efforts to reduce US greenhouse gas emissions. The move to weaken the standards has been sharply criticized by many environmental groups, policymakers, and others. Supporters of the current standards argue that the standards would substantially reduce emissions at a modest cost. But the standards have been highly controversial, and the move has also received a great deal of praise from other groups. Supporters of weakening the standards—including those in the Trump administration—argue that the current standards would be excessively costly to consumers and automakers, while providing little or no benefit to the public.

Many analyses have proclaimed that this announcement would have profound effects on consumers, oil consumption, oil imports, and greenhouse gas emissions. One think tank, for example, told the Financial Times that US oil consumption, which was nearly 20 million barrels per day (bpd) in 2017, would be 1.5 million bpd higher in 2025 if the 2022–2025 fuel economy standards were rolled back.[3]

In addition to such bold—and often incorrect—pronouncements, there has been little discussion of the hurdles the agencies have to clear before they can finalize new standards. At the very end of the Obama administration, in early 2017, the EPA concluded that the 2022–2025 standards are technologically feasible and appropriate under the Clean Air Act. In setting new standards that survive legal challenge, the agencies will have to explain why the previous analysis was wrong, either by providing new information or reassessing earlier information. In an analysis conducted in 2016, the EPA and the NHTSA also concluded that the economic and societal benefits of the 2022–2025 standards—which include fuel cost savings to consumers and greenhouse gas reductions, among others—far exceed the costs.

Although the agencies may eventually ease fuel economy standards less than a full rollback of the standards to 2021 levels would imply, we assess the implications of a full rollback for gasoline consumption, oil imports, and carbon emissions. Given that the agencies' 2016 analysis suggests that a full rollback would harm society on balance, we discuss which changes to the 2016 analysis might lead the agencies to conclude that a rollback benefits society. To facilitate discussion of these important public policy issues, this paper makes two points about the EPA's announcement:

Due to the gradual turnover of the on-road vehicle fleet, eliminating the tighter fuel economy standards for 2022–2025 would have small effects on gasoline consumption, greenhouse gas emissions, and oil imports during those years and even out to 2030. However, the ultimate impact of the weaker standards could be greater, especially if they hurt the progress of new technologies and the political momentum for tighter standards in the

United States and in other countries over the longer term.

Changes in the social cost of carbon, fuel prices, miles traveled, and market shares of light trucks since the 2016 analysis are unlikely to cause the benefits of rolling back the standards to exceed the costs. If the agencies conclude that the benefits of rolling back the standards exceed the costs, the reasoning will likely be based on other factors, such as consumer willingness to pay for fuel-saving technologies or the cost and effectiveness of those technologies.

Our conclusions in this paper rest on our analysis of recent documents from the EPA and the NHTSA and from projections by the EIA.

BACKGROUND

Fuel economy standards for light trucks have been tightening since 2005, and standards for cars have been tightening since 2011. The Obama administration set corporate average fuel economy (CAFE) standards for passenger vehicles, first for model year 2011 (finalized in 2009), then for model years 2012–2016 (finalized in 2010), and finally for model years 2017–2025 (finalized in 2012).

Following a 20-year period of essentially unchanged standards, the standards between 2012 and 2025 would roughly double new vehicle fuel economy. Because each vehicle's fuel economy target depends on its footprint and class (car or light truck), the actual level of fuel economy that the new vehicles achieve depends on the mix of vehicles that automakers sell. The fuel economy targets are generally higher for cars than for light trucks and are higher for smaller vehicles than for larger ones. Therefore, if light trucks account for a larger share of sales, then the level of fuel economy that the standards require would be lower than if light trucks account for a smaller share. In their 2012 analysis, the agencies estimated that the 2025 standards would achieve 54.5 miles per gallon. This number refers to the result of fuel economy tests that the EPA conducts. These tests typically overstate the fuel economy that a vehicle might actually achieve in real-world conditions so that 54.5 miles per gallon translates to about 35–40 miles per gallon on the window stickers displayed at car dealerships—roughly twice the fuel economy on window stickers in 2012.

In setting the higher fuel economy standards, the Obama administration agreed that in 2018 the federal government would complete a midterm evaluation of the current 2017–2025 standards to determine whether the targets for model years 2022–2025 need readjustment in either direction. The evaluation could change other aspects of the program, such as the manner of crediting plug-in and fuel cell vehicles. In one of the last acts of the Obama administration, the EPA (led by administrator Gina McCarthy at the time) completed the required midterm evaluation in a compressed timeframe and finalized the standards through 2025 in January 2017. The decision referred to a benefit-cost analysis that the EPA and the NHTSA had performed in mid-2016, which showed that the benefits far exceed the costs. In March 2017, however, the Trump administration's EPA reopened the midterm evaluation process, claiming that the current standards are "costly for automakers and the American people."[4] Note that a new benefit-cost analysis will accompany new 2022–2025 standards, but regulatory procedures do not require that the benefits of those standards exceed the costs.

WHAT DID THE EPA DO IN ITS RECENT ANNOUNCEMENT?

In the wake of the EPA's April 2 announcement, many commentators mistakenly described the impacts of "rolling back fuel economy standards" by citing data about the total oil consumption and greenhouse gas reductions of all the fuel economy increases enacted by the Obama administration.[5] Such estimates are misleading because the EPA has not announced that it will eliminate all of the Obama administration's fuel economy increases. Rather, it has announced, pursuant to the scheduled midterm evaluation, that it will reconsider the planned increases for cars and light trucks in model years 2022–2025. The EPA must go through a notice-and-comment process to set new standards, and it remains to be seen how the agency will modify the planned 2022–2025 standards—and how sharply it will roll them back. Below, we estimate the impacts of rolling back entirely the planned 2022–2025 increases, although the actual impacts may turn out to be less significant.

The EPA and the NHTSA have coordinated their standards until now, and presumably they will continue to do so. Even if the agencies roll back the planned increases between 2022 and 2025 entirely, it is important to note that California retains the legal authority to set stricter standards than the national ones, and other states can adopt California's standards. Currently, 13 other states follow California's tighter standards for cars and light trucks.[6] These states—together with California—represent about 35 percent of US sales of new passenger vehicles.[7] An open question is whether the Trump administration will revoke the waiver that gives California this authority. If the EPA does not revoke the waiver, then the California standards would differ from the federal standards, which would be economically inefficient because one set of standards or the other would be redundant, and total compliance costs would be higher than if there were uniform standards. On the other hand, revoking the waiver would set up a contentious legal and political battle.

THE ESTIMATED IMPACTS OF MODEL YEAR 2022–2025 STANDARDS ON US FUEL CONSUMPTION AND NET PETROLEUM IMPORTS

According to the EPA's 2016 analysis, the current 2022–2025 standards will reduce fuel consumption by 1.2 billion barrels (50.4 billion gallons) of gasoline over the lifetime of the vehicles sold in those model years.[8] For context, in 2017 the United States consumed about 7.3 billion barrels of oil and 140 billion gallons of gasoline per year.

Table 1 shows the effects of the standards on consumption by calendar year. The effects are relatively modest in the first several years of the standards because the standards raise the fuel economy of new vehicles only, and new vehicles typically account for about 10 percent of miles traveled in any given year. However, the magnitude of the reductions grows over time as the older vehicles with low fuel economy are replaced by newer vehicles subject to the standards.

The EIA projects that gasoline consumption will begin declining after 2020. Relative to that projected decline, the EPA's 2016 analysis indicates the impact of rolling back the 2022–2025 standards entirely: increased consumption of about 249,000 bpd of gasoline in 2025, rising gradually to 626,000 bpd in 2030; 923,000 bpd in 2035; 1.1 million bpd in 2040; 1.3 million bpd in 2045; and 1.4 million bpd in 2050 (see figure 1).[9] Thus, rolling back the standards to 2021 levels would have a small effect on consumption through 2025 and even 2030, relative to projected consumption levels.

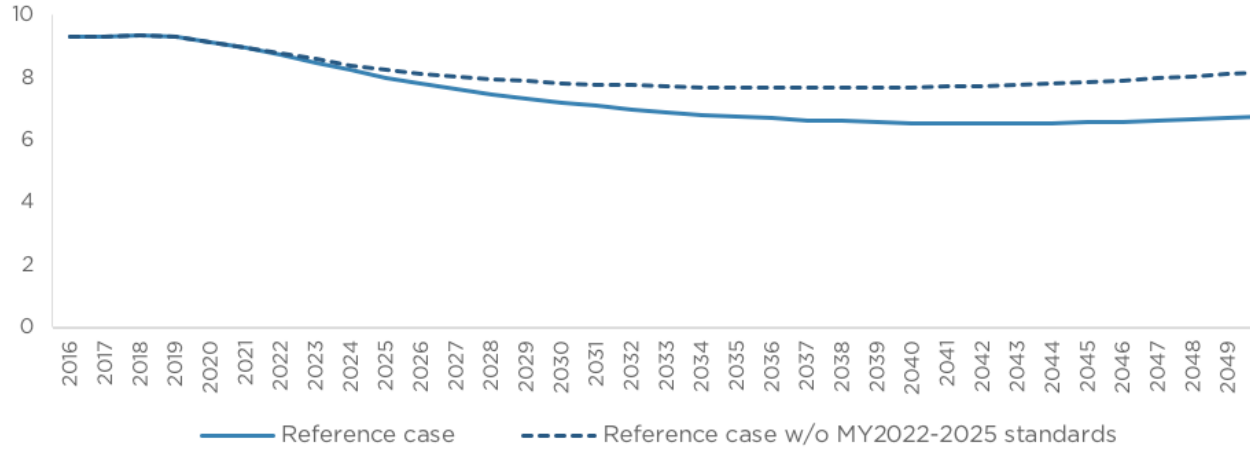
Note that the sum of the annual impacts in table 1 through 2050 is significantly greater (at around 9.25 billion barrels) than the estimated aggregate fuel consumption impact of vehicles sold in model years 2022–2025 alone. This is because the EPA's annual estimates assume (reasonably) that fuel economy standards will continue to apply post-2025, and thus the savings associated with the model year 2022–2025 standards will continue to accrue to vehicles sold beyond these model years as well.[10]

Table 1: Annual impacts of the 2022–2025 standards on US fuel consumption

Calendar Year	Gasoline Consumption *(billion barrels)*	Gasoline Consumption *(thousand bpd)*
2021	-0.01	-16
2022	-0.02	-50
2023	-0.04	-100
2024	-0.06	-167
2025	-0.09	-249
2026	-0.12	-329
2027	-0.15	-408
2028	-0.18	-485
2029	-0.20	-557
2030	-0.23	-626
2031	-0.25	-691
2032	-0.28	-755
2033	-0.30	-814
2034	-0.32	-870
2035	-0.34	-923
2036	-0.36	-973
2037	-0.37	-1,018
2038	-0.39	-1,060
2039	-0.40	-1,098
2040	-0.41	-1,134
2041	-0.43	-1,169
2042	-0.44	-1,201
2043	-0.45	-1,227
2044	-0.46	-1,262
2045	-0.47	-1,290
2046	-0.48	-1,318
2047	-0.49	-1,346
2048	-0.50	-1,374
2049	-0.51	-1,402
2050	-0.52	-1,430

Source: EPA

Figure 1: US gasoline consumption in the EIA Annual Energy Outlook (AEO) 2018 reference case with and without MY 2022–2025 standards (million barrels per day)



Source: EIA, EPA

The EPA estimates the incremental impact of the proposed 2022–2025 standards on net oil imports to be 169,000 bpd in 2025, 420,000 bpd in 2030, 685,000 bpd in 2035, 880,000 bpd in 2040, and 1.119 million bpd by 2050 (see table 2).[11] As an approximation, the EPA assumes that 90 percent of the oil consumption impact will translate to net import reductions.[12]

Table 2: US oil import reductions due to the 2022–2025 standards

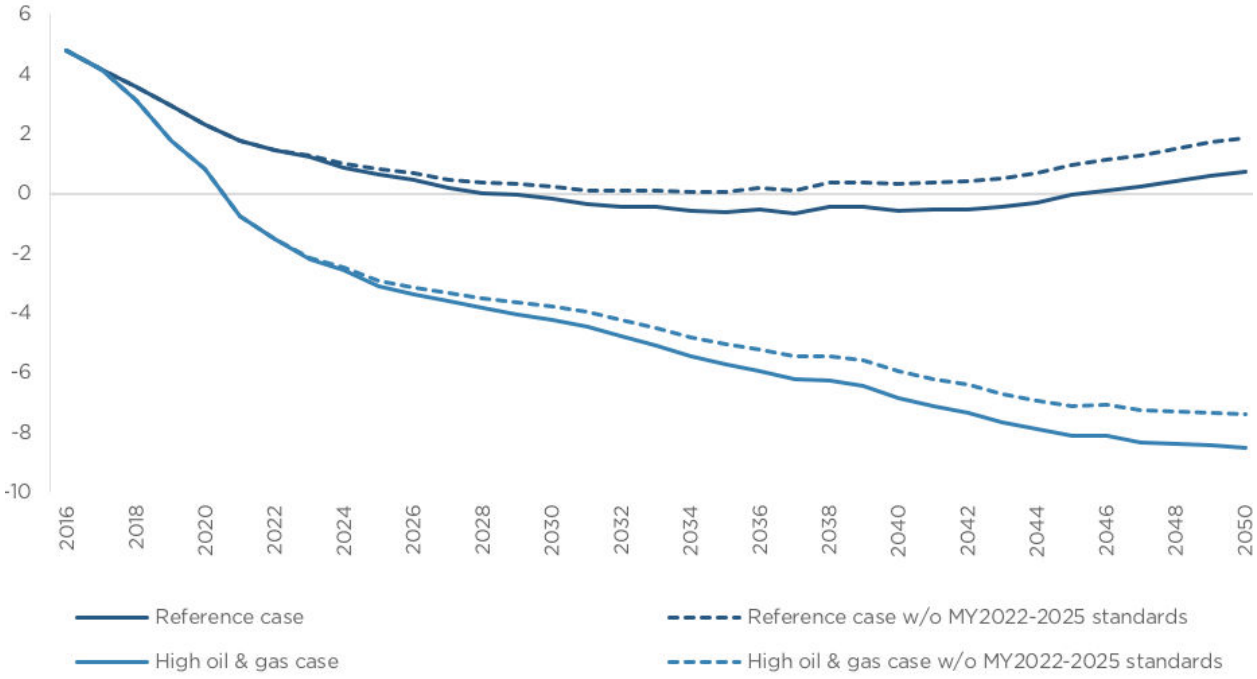
Calendar Year	Reduction of Oil Imports *(thousand bpd)*
2022	19
2023	55
2024	106
2025	169
2030	420
2035	685
2040	880
2050	1,119

Source: EPA

According to the EIA, the United States will become a net oil exporter in 2029 (i.e., negative net imports). If the 2022–2025 standards are rolled back entirely, according to EIA reference case projections, the resulting higher US oil consumption means that the United States never

becomes a net exporter of oil (see figure 2). To date, US oil and gas production has exceeded EIA projections, and in a scenario with higher oil and gas production, the United States becomes a net oil exporter in 2021 and remains one regardless of what happens to fuel economy standards, although weaker standards reduce the magnitude of net exports (for example, around 400,000 bpd in 2030).

Figure 2: US net imports of crude oil and petroleum products in the EIA's AEO 2018, projections with and without MY 2022–2025 standards (millions of barrels per day)



Source: EIA, EPA

THE ESTIMATED IMPACT OF MODEL YEAR 2022–2025 STANDARDS ON GHG EMISSIONS

In 2016, the EPA estimated that the 2022–2025 standards would reduce emissions by about 540 million tons of CO2 equivalent for passenger vehicles sold in those model years (see table 3).[13]

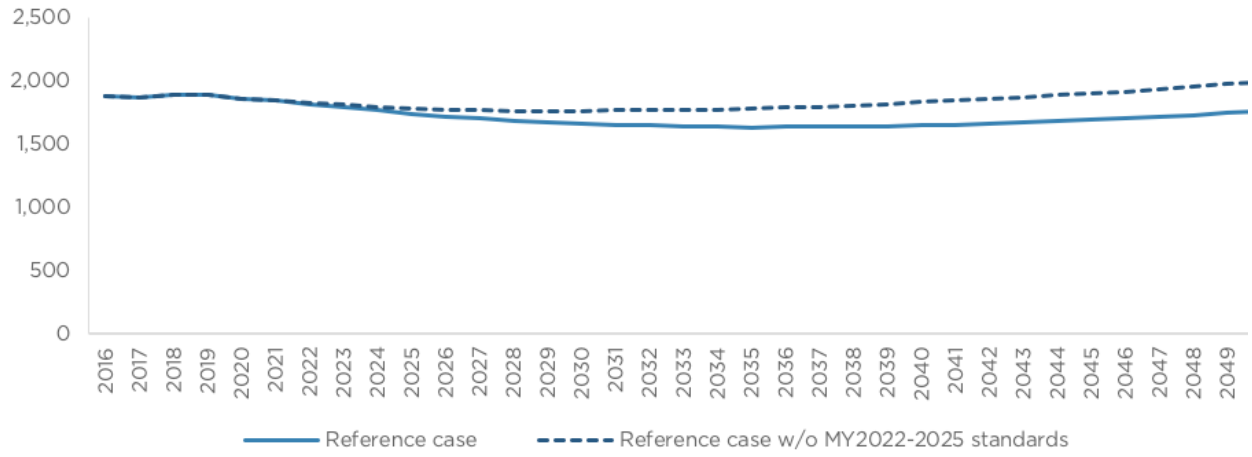
Table 3: Model year lifetime emission reductions due to the 2022–2025 standards in the United States

Model Year	GHG Emissions *(million tons of CO2 eq.)*
2021	34
2022	71
2023	108
2024	144
2025	181
Total	**538**

Source: EPA

Completely rolling back the model year 2022–2025 standards to 2021 levels and maintaining the standards at 2021 levels after 2025 would increase emissions by about 41 million tons of CO2 equivalent in 2025, 102 million tons in 2030, 186 million tons in 2040, and 234 million tons in 2050 (see figure 3 and table 4).[14] Through at least 2025, these emissions reductions are small compared to transportation sector emissions.

Figure 3: US transport sector emissions in the EIA AEO 2018 reference case with and without MY 2022–2025 standards (million tons of CO2 equivalent)



Source: EIA, EPA

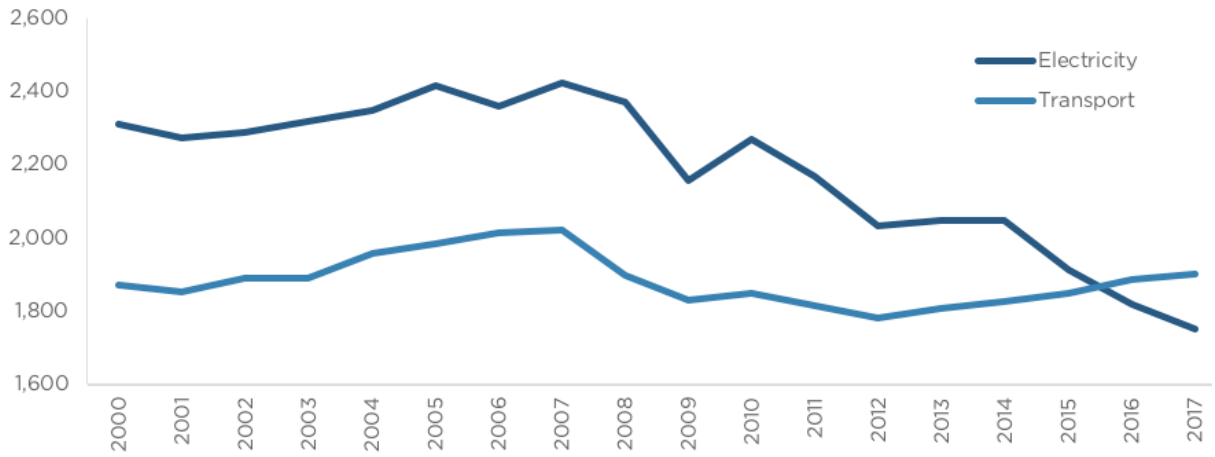
Table 4: Annual emission reductions due to the 2022–2025 standards in the United States

Model Year	GHG Emissions *(million tons of CO2 eq.)*
2022	8.2
2025	40.8
2030	102.0
2040	186.0
2050	234.0

Source: EPA

In announcing the midterm evaluation decision to reconsider the 2022–2025 standards, EPA administrator Scott Pruitt noted that the United States has led the world in greenhouse gas reductions and said that "the auto sector…has been the leader in achieving that."[15] That is untrue. US transportation sector emissions have been rising and recently surpassed power sector emissions, which have been falling, according to EIA data (figure 4).

Figure 4: US transport and electricity sector emissions (million tons of CO2 equivalent)



Source: EIA Monthly Energy Review

What is true is that many countries, such as Canada, link their fuel economy or emissions standards to the US standards. If the United States relaxes its standards, some of those countries may also decide to relax theirs. In that case the effect on global emissions of weakening US standards could be greater than suggested in table 4. However, the estimates presented above suggest that absent such global responses, rolling back US standards would have modest effects on gasoline consumption, net petroleum imports, and emissions through at least 2025.

HOW MIGHT THE AGENCIES CONCLUDE THAT WEAKER STANDARDS BENEFIT SOCIETY?

Although the EPA explained the reasoning behind its decision, it will have to provide additional analysis to accompany the final standards. A series of executive orders require benefit-cost analysis when agencies issue economically significant rules (typically with benefits or costs exceeding $100 million). The new regulations would certainly meet this threshold. Although a new regulation does not have to strictly pass a benefit-cost test, the agencies would have to conduct one, and at any rate it would be highly unusual for the agencies to finalize a regulation whose costs exceed the benefits. For example, when the EPA proposed repealing the Clean Power Plan, it published a benefit-cost analysis showing positive net benefits (benefits minus costs) from the repeal. In all likelihood, net benefits of the new standards (relative to maintaining current standards) would need to be positive, meaning that society is better off with the new standards than with the current ones.

In 2016, the EPA and the NHTSA provided a draft Technical Assessment Report, which included a benefit-cost analysis of the 2022–2025 standards. The agencies compared the benefits and costs of achieving those standards rather than maintaining the standards at the 2021 levels for the model years 2022–2025. The EPA and the NHTSA conducted separate analyses, and both concluded that the benefits exceed the costs (see table 5). Therefore, if one maintained the exact same assumptions as in the agencies' 2016 analyses, one would conclude that setting standards at 2021 levels rather than the current 2022–2025 levels would have negative net benefits. Consequently, if the agencies are to estimate positive net benefits for rolling back the standards to 2021 levels, then the agencies must use different assumptions than they used in 2016.

Table 5: EPA and NHTSA cost and benefit estimates from 2016 (billion 2017 dollars)[16]

	EPA *(Includess MY 2021-2025 vehicles)*	NHTSA *(Includess MY 2017-2025 vehicles)*
Total costs	**37.88**	**91.54**
Total benefits	**136.79**	**184.14**
Fuel savings	93.65	126.27
CO_2 benefits	19.57	28.41
Other benefits	23.57	29.46
Net benefits	**98.91**	**92.59**

Source: Authors' own estimates based on EPA, NHTSA assessment reports

Because fuel cost savings account for most of the benefits in table 5, the agencies may

reconsider whether and how such savings are counted in the benefit-cost analyses. In their 2016 analysis, the agencies argue that there is a market failure for fuel economy, which is sometimes referred to as the energy efficiency gap or energy paradox. The agencies argue that without fuel economy standards, the automakers would provide too little fuel economy from consumers' perspectives. This market failure could occur if consumers act irrationally when choosing vehicle fuel economy, but there is disagreement about whether consumers act irrationally and the market failure exists.[17] Without a market failure for fuel economy, the standards would not make consumers better off (even if society benefits from lower emissions and oil imports). Given the importance of fuel cost savings in the estimated benefits of the standards, changing the assumptions on the market failure for fuel economy could substantially reduce net benefits of the current standards. If the agencies argue there is no market failure for fuel economy, such a change could have implications for many other regulations, such as energy efficiency standards, and this issue is beyond the scope of the paper.

In this section, we assess more straightforward changes to assumptions: whether changes in the estimated social cost of carbon dioxide (SCC), expected gasoline prices, miles traveled, or the share of light trucks in total sales could result in positive net benefits.

The SCC measures the long-term damage in US dollar terms caused by emitting one metric ton of carbon dioxide into the atmosphere in a particular year. Equivalently, the SCC measures the societal benefit of reducing emissions by one metric ton. Federal agencies have used the SCC to estimate the benefits of many regulations that reduce carbon emissions. Two important inputs into the computation of the SCC are whether global—as opposed to US—benefits of carbon reductions are included and the rate used to discount future benefits. Prior to the Trump administration, the preferred value of the SCC included global benefits and used a 3 percent discount rate as the central estimate. In contrast, the Trump administration has included only US rather than global benefits, which reduces the SCC by about 87 percent. The administration has also reported an SCC using a 7 percent discount rate in addition to the 3 percent discount rate.[18]

Given these changes in the SCC, we assume that an updated benefit-cost analysis of rolling back the 2022–2025 standards would use domestic benefits. Table 6 shows the effects on the estimated net benefits of including only US benefits in the SCC. Comparing net benefits in tables 5 and 6, the net benefits are about 17–27 percent lower using the lower SCC, although they remain positive.

We use a 3 percent rather than a 7 percent discount rate for the SCC to maintain consistency with the other benefit and cost numbers in table 5, all of which use a 3 percent discount rate.

Although not shown in the table, using a 7 percent rather than a 3 percent discount rate for the SCC would further reduce the net benefits, but they would remain positive. To understand the importance of discount rates, imagine that climate change damages in 2100 totaled $1 trillion. Using a 3 percent discount rate, that would be worth spending $83 billion in 2017 to prevent; using a 7 percent discount rate, it would be worth only $4 billion. In effect, high discount rates mean that we place relatively little value on the harm our current actions cause to future generations.

Table 6: Effects of updated social cost of carbon on estimated net benefits (billion 2017 dollars)[19]

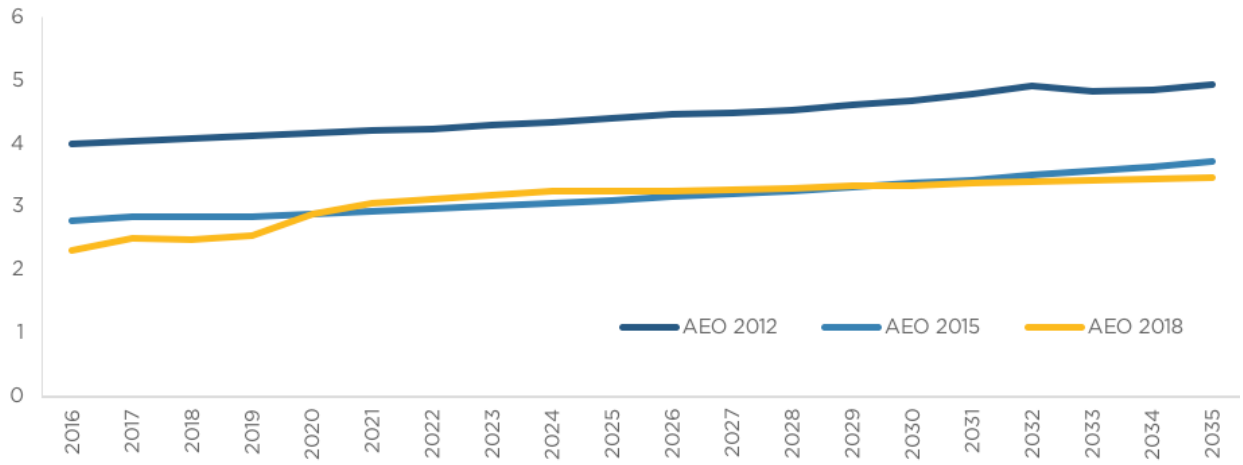
	EPA	NHTSA
CO_2 benefits (global)	19.57	28.41
CO_2 benefits (domestic)	2.61	3.79
Updated net benefits	**81.95**	**67.98**

Source: Authors' own estimates based on EPA, NHTSA assessment reports

The 2016 analysis used EIA projections from the AEO 2015. As the agencies noted in 2016, gasoline price projections were substantially lower than the prices the agencies used in the original benefit-cost analysis of the 2017–2025 standards that they conducted in 2012. Between the AEO 2012 and the AEO 2015, expected gasoline prices decreased about 25 percent. The lower prices reduce the value of fuel savings, and they also have indirect effects on benefits and costs.[20] The lower value of fuel savings dominates the other effects, and that drop in expected gasoline prices between 2012 and 2015 reduced the benefits of the standards roughly in proportion to the price change.[21]

The 2016 analysis included the effects on net benefits of the 2012–2015 gasoline price decrease. But if prices dropped further after 2015, this could further reduce benefits. However, figure 5 shows that the most recent price projections in the AEO 2018 are very similar to those in the AEO 2015. Consequently, updating gasoline price projections would not affect net benefits.

Figure 5: Retail gasoline prices in various EIA Annual Energy Outlook editions (2017 $/gallon)

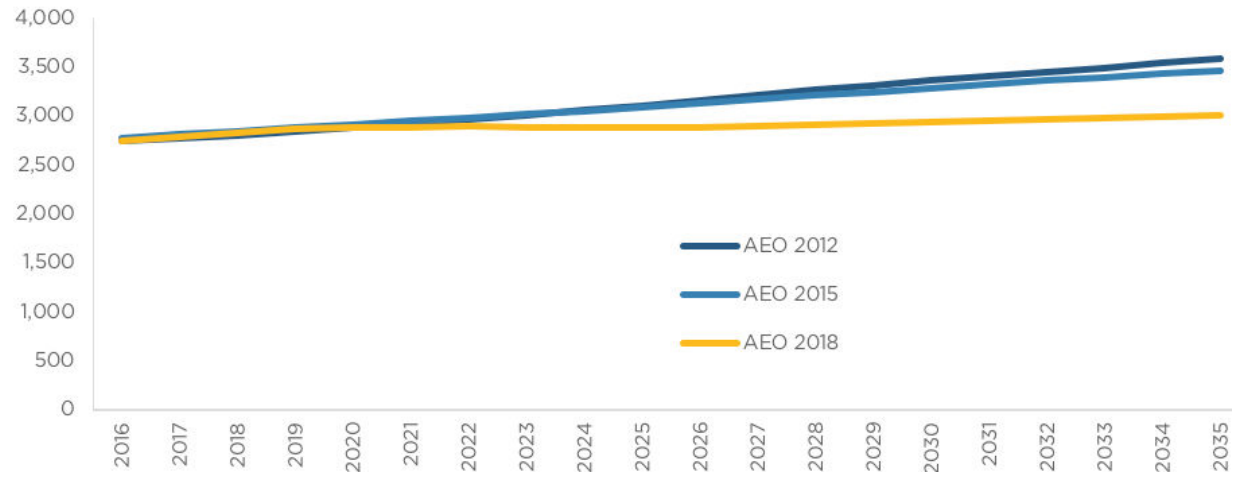


Source: EIA

The estimated benefits also depend on miles traveled. For a given fuel economy improvement caused by standards, higher miles traveled implies larger fuel savings and carbon reductions. For example, suppose the standards reduce average emissions rates of new vehicles sold in a particular year by 10 grams of carbon dioxide per mile. The total carbon emissions reductions for vehicles sold in that year equal the change in emissions rate (10 grams per mile) multiplied by the number of vehicles sold and the average miles each of those vehicles is driven. Likewise, fuel savings depend directly on miles traveled, and a drop in miles traveled reduces estimated benefits.

Although the EPA does not use the EIA AEO to project miles traveled of vehicles affected by regulation, it is instructive to compare AEO projections to assess whether the agencies might change their vehicle miles traveled (VMT) assumptions for their analysis of the standards. Figure 6 shows that between the AEO 2015 and the AEO 2018, projected VMT for the years 2021–2035 decreased by an average of about 9 percent.[22] This decrease implies that the value of fuel savings and carbon reductions in those years would be about 9 percent lower, reducing benefits proportionately.

Figure 6: Vehicle miles traveled in various EIA Annual Energy Outlook editions (billion miles)

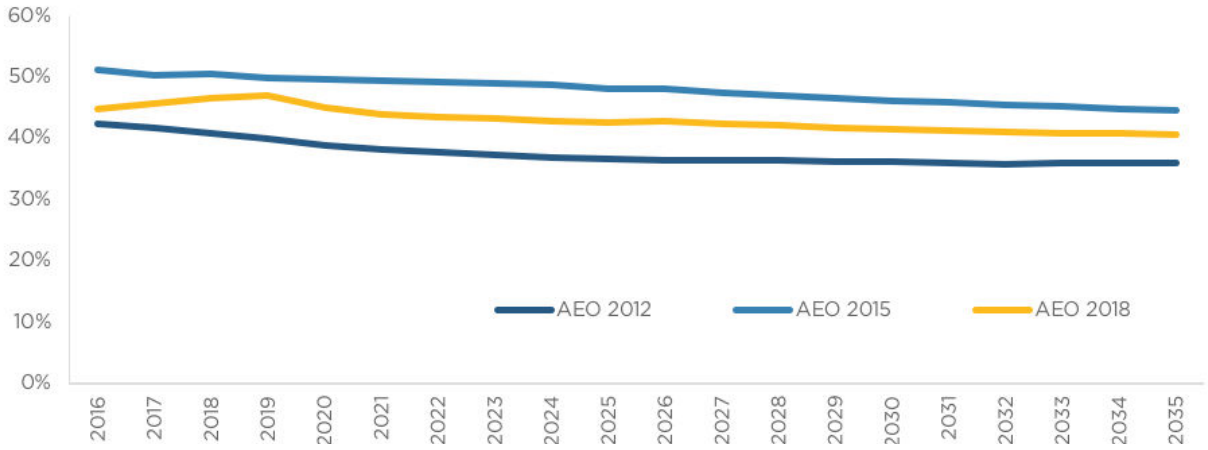


Source: EIA

The share of light trucks in total sales can also affect the compliance costs. In their 2016 analysis, the agencies estimated that the average cost per vehicle would be substantially higher for light trucks than for cars. For example, the EPA estimated that average costs would be about 50 percent higher for light trucks than for cars. More generally, it is often more technically challenging to add fuel-saving technology to light trucks than to cars, and many truck consumers are less willing to pay for hybrids and other fuel-saving technologies than are car consumers. Consequently, many of the public comments that the EPA received on its reconsideration of the midterm evaluation argued that a shift in consumer demand from cars to light trucks would increase the total costs of achieving the standards.

Since 2014 there has been a pronounced shift in new vehicle sales, from cars to light trucks. Gasoline prices appear to explain much of this shift, but other factors, such as rising incomes, may also play a role.[23] Figure 7 shows a roughly 10 percentage point increase in light truck share between the 2012 and 2015 AEO editions.[24]

Figure 7: Percentage of light trucks in total passenger vehicle sales in various EIA Annual Energy Outlook editions (% of total)



Source: EIA

Without running the agencies' models, one can get a sense of the effects of a rise in light truck shares on compliance costs. Table 7 shows that using the EPA's estimated costs for cars and light trucks, the shift between the AEO 2012 and the AEO 2015 would imply about a 5 percent increase in average costs per vehicle. The decrease in the light truck shares between the AEO 2015 and the AEO 2018 implies a slight decrease in average costs. We note that this is a rough calculation based on aggregate cost estimates reported by the agencies, and it does not consider changes in market shares within classes.

Table 7: Effect of light truck market share on estimated per-vehicle costs by model year (2017 dollars)[25]

Model Year	Cars	Light Trucks	Average (using AEO 2012 light truck shares)	Average (using AEO 2015 light truck shares)	Average (using AEO 2018 light truck shares)
2021	166	242	195	204	200
2022	321	492	386	406	396
2023	476	743	575	607	591
2024	632	994	765	808	787
2025	787	1,245	955	1,007	982
Average	**477**	**743**	**575**	**606**	**591**

Source: Authors' own estimates based on EPA and EIA

Putting these calculations together, a complete rollback of the 2022–2025 standards compared to maintaining current standards would not pass a benefit-cost test, even when accounting for changes in the SCC and projections of gasoline prices, vehicle miles traveled, and light truck sales shares. Using the Trump administration's lower SCC would reduce benefits by no more than 15 percent and net benefits by 17–27 percent.[26] Of the other three factors, only declining miles traveled would have a noticeable effect, reducing benefits by about 9 percent and net benefits by about 10 percent. Changes in projected gasoline prices and the light truck market share between the AEO 2015 and the AEO 2018 have negligible effects on estimated net benefits. Even combining the SCC and miles traveled effects would still result in negative net benefits of a full rollback.

Consequently, the agencies would need additional arguments—either quantitative or qualitative—if the benefits of rolling back the standards are to exceed the costs. The EPA provided a number of possible arguments in its April 2 decision. For example, it may reconsider the adverse effects of tighter standards on the likelihood and severity of traffic accidents. As noted above, the agencies may also reconsider their treatment of the standards' private benefits to consumers, which account for most of the societal benefits in the agencies' 2016 analysis (see table 5). In its April 2 decision, the EPA also presented qualitative arguments that consumer benefits may actually be lower than previously estimated.[27] Finally, the sharp decline in US oil imports reduces the macroeconomic benefits of lowering oil use, as the macroeconomic vulnerability to oil price shocks is lower when net imports are lower because of the reduced terms of trade effect.[28] We have not considered these arguments here, as it is unclear at the moment how the EPA might incorporate these arguments in its benefit-cost framework.

CONCLUSION

The paper offers a common set of facts to inform the upcoming policy discussion about whether to ease the fuel economy standards from 2022–2025. Eliminating the fuel economy increases for 2022–2025 would have small effects on gasoline consumption, greenhouse gas emissions, and oil imports during those years and even out to 2030. However, the ultimate effects of weaker standards could be greater over time, especially if they hurt the progress of new technologies and the political momentum for tighter standards in the United States and in other countries in the longer term.

This paper does not provide a full analysis to determine whether recent market changes and new information on compliance costs mean that the benefits of maintaining the planned tightening of the 2022–2025 fuel economy standards no longer exceed the costs. But it sufficiently demonstrates that changes to the social cost of carbon methodology and projections of gasoline prices, vehicle miles traveled, and light truck sales shares are unlikely to justify a complete rollback of the 2022–2025 standards.

NOTES

1. U.S. Environmental Protection Agency, "EPA Administrator Pruitt: GHG Emissions Standards for Cars and Light Trucks Should Be Revised," press release, April 2, 2018, https://www.epa.gov/newsreleases/epa-administrator-pruitt-ghg-emissions-standards-cars-and-light-trucks-should-be.
2. Ibid.
3. Ed Crooks and Patti Waldmeir, "US aims to relax vehicle emissions rules," *Financial Times*, April 2, 2018, https://www.ft.com/content/f83bb1b6-36ac-11e8-8b98-2f31af407cc8.
4. U.S. Environmental Protection Agency, "EPA to Reexamine Emission Standards for Cars and Light Duty Trucks -- Model Years 2022-2025," press release, March 15, 2017, https://www.epa.gov/newsreleases/epa-reexamine-emission-standards-cars-and-light-duty-trucks-model-years-2022-2025.
5. See for example Dylan Yalbir, "Why Fuel Economy Standards Matter to U.S. Energy Dominance," Council on Foreign Relations, March 13, 2018, https://www.cfr.org/blog/why-fuel-economy-standards-matter-us-energy-dominance.
6. Stephen Edelstein, "Which states follow California's emission and zero-emission vehicle rules?," *Green Car Reports*, March 7, 2017, https://www.greencarreports.com/news/1109217_which-states-follow-californias-emission-and-zero-emission-vehicle-rules.
7. This is the authors' own estimate based on state level and national new vehicle sales data provided by the Alliance of Automobile Manufacturers, https://autoalliance.org/in-your-state/.
8. U.S. Environmental Protection Agency (2017), "Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation," January 2017, p.6, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf.
9. U.S. Environmental Protection Agency (2016a), "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," July 2016, p.12–61, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF.
10. Ibid., p.1–21.
11. U.S. Environmental Protection Agency (2016b), "Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation: Technical Support Document," November 2016, p.3–24, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100Q3L4.pdf.

12. Ibid., p.3–23.
13. U.S. Environmental Protection Agency (2017), p.6; a more detailed breakdown is available here: U.S. Environmental Protection Agency (2016a), p.12–61.
14. U.S. Environmental Protection Agency (2016a), p.12–63.
15. Eric Kulisch, "EPA's Pruitt, automakers in lockstep over fuel economy standards," *Automotive News*, April 3, 2018, http://www.autonews.com/article/20180403/OEM11/180409894/epas-pruitt-automakers-in-lockstep-over-fuel-economy-standards?cciid=read-next-link.
16. Note: Numbers in table 5 are computed from tables ES-6, ES-7, 12.82, and 13.25 in the Draft Technical Assessment Report. The CO2 benefits refer to the 3 percent average social cost of carbon numbers in the corresponding tables. All numbers have been converted to 2017 dollars using the Consumer Price Index. Costs are reported as positive numbers, and net benefits are the difference between benefits and costs.
17. See for example Ted Gayer and W.Kip Viscusi (2013), "Overriding consumer preferences with energy regulations," Journal of Regulatory Economics, June 2013, Vol. 43, Issue 3, p.248-264, https://pdfs.semanticscholar.org/1c0b/c21ff5f260df3224f8a614026ead43b991a0.pdf.
18. For more discussion of the rationale for these choices and their implications, see Jason Bordoff, "Trump vs. Obama on the Social Cost of Carbon–and Why It Matters," *Wall Street Journal*, November 15, 2017, https://blogs.wsj.com/experts/2017/11/15/trump-vs-obama-on-the-social-cost-of-carbon-and-why-it-matters/.
19. Note: "CO2 benefits (global)" refers to the CO2 benefits reported in the Draft Technical Assessment Report. "CO2 benefits (domestic)" computes the CO2 benefits using the estimated social cost of carbon (3 percent discount rate) reported in the Regulatory Impact Analysis for the proposed repeal of the Clean Power Plan.
20. See Benjamin Leard, Joshua Linn, and Virginia McConnell (2017), "Fuel Prices, New Vehicle Fuel Economy, and Implications for Attribute-Based Standards," *Journal of the Association of Environmental and Resource Economists*, September 2017, Vol. 4, Number 3, p.659-700, https://www.journals.uchicago.edu/doi/abs/10.1086/691688.
21. See Joshua Linn, Virginia McConnell, and Benjamin Leard (2016), "How Do Low Gas Prices Affect Costs and Benefits of US New Vehicle Fuel Economy Standards?," Resources for the Future, September 2016, http://www.rff.org/research/publications/how-do-low-gas-prices-affect-costs-and-benefits-us-new-vehicle-fuel-economy.
22. The lower VMT in the AEO 2018 reflects the California greenhouse gas emissions reduction targets through 2035, as well as updated travel data from the Federal Highway Administration.
23. See Benjamin Leard, Joshua Linn, and Virginia McConnell (2017), "Fuel Prices, New Vehicle Fuel Economy, and Implications for Attribute-Based Standards," Journal of the Association of Environmental and Resource Economists, September 2017, Vol. 4, No. 3, p.659-700, https://www.journals.uchicago.edu/doi/abs/10.1086/691688.

24. The decrease in the light truck share between the AEO 2015 and the AEO 2018 reflects updated sales data used to calibrate the model, as well as lagged responses to fuel prices and other factors.

25. Note: Per-vehicle costs by model year are from table 12.18 and 12.19 in the Draft Technical Assessment Report and are converted to 2017 dollars using the Consumer Price Index. The average costs are computed using the projected market share of light trucks from the indicated AEO edition, as depicted in figure 7.

26. This calculation uses a 3 percent discount rate. Using a 7 percent discount rate would reduce benefits by an additional 2 percent.

27. U.S. Environmental Protection Agency, "Mid-term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022-2025 Light-duty Vehicles," Federal Register Notice, April 2, 2018, p.2-3, https://www.epa.gov/sites/production/files/2018-04/documents/mte-final-determination-notice-2018-04-02.pdf.

28. United States, Council of Economic Advisers (2016), Economic Report of the President 2016, U.S. Government Publishing Office, February 2016, p.55-58, https://obamawhitehouse.archives.gov/sites/default/files/docs/ERP_2016_Book_Complete%20JA.pdf; also see Christiane Baumeister and Lutz Kilian (2016), "Lower oil prices and the U.S. economy: Is this time different?," *Brookings Papers on Economic Activity*, Fall 2016, p.32-33, https://www.brookings.edu/wp-content/uploads/2016/09/5_baumeisterkilian.pdf; also see Alan J. Krupnick et al. (2017), "Oil Supply Shocks, US Gross Domestic Product, and the Oil Security Premium," Resources for the Future, November 2017, http://www.rff.org/research/publications/oil-supply-shocks-us-gross-domestic-product-and-oil-security-premium.

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