Federal Review of Clean-Car and Fuel-Efficiency Standards: 
The “Rebound Effect” Explained

In June 2018, Analysis Group researchers prepared a report1 to assess the “rebound effect” and analyze its implications for the federal government’s current reassessment of previously adopted carbon-pollution and fuel-economy standards.

After reviewing more than three dozen studies, the authors concluded that a rebound effect of no more than 10 percent is appropriate. They observed that the cost/benefit studies conducted in support of the current federal vehicle standards relied upon this 10-percent rebound effect assumption.

This fact sheet is intended to provide an explanation of the rebound effect and why it is relevant to the setting of vehicle standards designed to reduce vehicles’ fuel use and their greenhouse gas (GHG) emissions.

What is the federal vehicle standard that is being reassessed?

Federal agencies responsible for setting clean-car and fuel-economy standards have been reassessing whether to keep the current standards in place or roll back the standards for model years 2021–2025.

The federal government’s Corporate Average Fuel Economy (CAFE) standards promote cost-effective energy conservation by mandating that each manufacturer’s fleet of vehicles sold in the US each year meets a fuel-economy requirement. Federal Clean Air Act standards also require that car companies’ fleets meet GHG emission standards.

Responsibility for setting GHG emission standards rests with the US Environmental Protection Agency (EPA); the National Highway Traffic Safety Administration (NHTSA) has responsibility for setting the fuel-economy standard. Also, under the Clean Air Act, California (and only California) has the opportunity to set emissions standards more stringent than EPA’s, and has done so for decades, with 12 other states and the District of Columbia having opted into the California program (with an additional state having recently committed to joining it).2

After a 2009 agreement by NHTSA and EPA to work together with California to adopt coordinated standards for all vehicles sold in the US, the federal agencies and the California Air Resources Board (CARB) in 2012 established those standards for new passenger and light-duty vehicles produced in the US sold in model years 2017–2025. This national program allows automobile manufacturers to build a single light-duty national fleet that meets the requirements of EPA, NHTSA, and CARB.

On what basis do the agencies establish vehicle standards?

The process of establishing new vehicle standards involves each agency’s review of an extensive record of technical studies and public comments. EPA’s and NHTSA’s separate determinations follow their respective statutory obligations – to address dangerous air pollution and to conserve energy – and take into account numerous additional factors, such as the cost of adding technologies to vehicles so that they get better miles per

2 Colorado has recently committed to joining the program, which already includes: Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Jersey, Oregon, Pennsylvania, Rhode Island, New York, Vermont, Washington. As of 2016, these “California Car” states accounted for one third of all automobiles registered in the United States.
gallon and emit fewer GHG emissions, and impacts on things like consumers’ fuel costs, overall vehicle miles traveled, vehicle safety, and others. In addition, these agencies conduct an analysis to assess the benefits and costs of achieving the standards. The rebound effect is relevant in assessing these benefits and costs.

Although NHTSA and EPA operate pursuant to different legal requirements – with NHTSA obligated to set fuel-economy standards at the maximum feasible level, and EPA required to address dangerous air pollutants from vehicles to protect public health and welfare – the agencies found as recently as the summer of 2016 that the vehicle standards adopted in 2012 would save energy and lower consumers’ fuel costs, decrease GHG emissions, and lead to economic savings and public health benefits in the US EPA made its final determination to adopt those GHG standards in January 2017.

What is the “rebound effect”?

The rebound effect is shorthand for the phenomenon in which a reduction in the price of a product or service leads to greater consumer demand for and use of that product or service. With respect to vehicle standards, the rebound effect describes how drivers respond (in terms of driving more or less miles) in response to changes in the cost of driving (e.g., lower gasoline prices, tighter fuel economy standards that lessen the amount of fuel per mile driven).

Some economists refer to the rebound effect as the “price elasticity of demand”: when consumers face a higher or lower price for a product, their demand for that product will change. The question of how consumers respond to changes in prices is a frequent subject of academic research. That is the case for the rebound effect related to changes in gasoline prices and changes in fuel-economy standards.

What is the relevance of a rebound effect to the agencies’ setting of vehicle standards?

In the context of NHTSA and EPA cost/benefit analyses, the agencies take the rebound effect into account when they estimate the amount of fuel savings and GHG emissions reductions that would result from setting the vehicle standards at one level of stringency or another.

For example, if a change in a fuel-economy standard were to lower the amount of gasoline needed to drive a certain distance by, say, 20 percent, what would one expect in terms of the miles traveled by consumers, taking into account the rebound effect as part of the analysis (and assuming the price-per-gallon of fuel remains constant)? If the rebound effect were zero, then there would be no change in vehicle miles traveled and the vehicle standard would reduce fuel use (and GHG emissions) by 20 percent. But if there were a rebound effect of, say, 30 percent, then the consumer would end up driving 6 percent more miles in response to the 20-percent reduction in the cost of driving. In the latter case, the additional driving would chip away at the net reduction in societal fuel use that would otherwise result from the more stringent new vehicle standard. (However, it might also produce other benefits to consumers as a result of the additional trips.) These effects would change the overall results of cost/benefit analyses for a given change in a vehicle standard.

The “rebound effect” is thus a critical element in cost/benefit analyses of changes in vehicle standards.

When EPA and NHTSA estimated the benefits and costs of the federal vehicle standards established in 2012, what did they assume the rebound effect would be?

Based on a careful analysis of the best information available at that time, the agencies assumed a 10-percent rebound effect, meaning that for every 10-percent reduction in the cost of driving, consumers would respond by driving 1 percent more miles.
What did Analysis Group observe in its recent review of the literature on the rebound effect?

The authors and their colleagues reviewed 35 studies, most of which estimated the rebound effect as reflected primarily in changes in vehicle miles traveled in response to changes in the price of gasoline (i.e., fuel costs). Some of these studies explored driving behavior in places outside of the US; some looked at data for one year, while others examined behavior over many years. Some of the studies are quite old, and others observe more recent behavior.

The varied empirical contexts, methods, and data used in these studies has led to a wide array of estimates of the rebound effect. But many studies use methods and data that render them more or less relevant for use in setting national standards in the US.

The Analysis Group authors concluded that it does not make sense to place the same weight (for policymaking purposes) on all of the studies. This is the problem, for example, with a recent literature review conducted by Carlson et al., in which the authors calculated a 20-percent rebound effect based on simply averaging the results of many studies. Such an approach ignores meaningful and significant differences among the studies in terms of their method and relevance.

The Analysis Group authors identified the studies that are more generalizable and relevant for setting national vehicle standards. These are studies that focus on data reflecting broad parts of the US, and analyses that rely on multiyear (time series) data rather than single-year data. (Notably, many recent studies looked at national data on vehicle use in the US during the year 2009. In light of the extraordinary economic conditions that existed that year, the results of these studies make it harder to generalize from their results for use in predicting rebound effects for future years.)

The multiyear analyses of US consumers’ responses to changes in the cost of driving (or fuel expenditures) tend to show that the rebound effect has been decreasing over time as baseline vehicle fuel economy has improved.

What did the Analysis Group study conclude with regard to the use of a 10-percent rebound effect in cost/benefit analyses prepared for the purpose of setting national vehicle standards?

Based on their assessment of the more relevant and generalizable studies (i.e., using data that span multiple years and represent all or a large portion of the US car and light-truck market), the authors concluded that these studies suggest that the rebound effect has gotten smaller in recent years and, if current trends persist, it is likely to continue to shrink in future years.

The likelihood that the rebound effect will continue to decline is further reinforced by the fact that real personal income – which has been found to be more important than fuel prices in estimating a rebound effect – is anticipated to rise in the years ahead, and therefore consumers will become less sensitive to changes in fuel economy and the cost of driving than they have been in the past.

All of these facts support an estimate of rebound effect no greater than that reached by EPA, NHTSA, and CARB in their analyses performed as part of the original rulemakings that adopted the current clean-car and fuel-economy standards for model years 2021–2025 – namely, an average rebound effect of 10 percent.

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