



RESEARCH SUMMARY

Gasoline Price Uncertainty and the Design of Fuel Economy Standards

by Ryan Kellogg

KEY TAKEAWAYS

1. Automotive fuel efficiency standards are the principle policy for reducing fuel use and carbon dioxide emissions in the U.S. transportation sector. The current standards were implemented in 2010 and 2012 and are designed to remain in place through 2025.
2. Fixed standards such as these are highly inflexible, and their cost-effectiveness and efficiency in reducing emissions is directly dependent on gasoline prices. If gasoline prices are higher than expected at the time the rules are written, consumers will opt for vehicles that are even more efficient than the rules require, suggesting that the rules are too lenient and are missing out on large emissions savings. If prices are lower than expected, consumers will demand less efficient vehicles, raising compliance costs for automakers.
3. This study finds that because gasoline prices are highly volatile, a superior approach would be a price-based policy indexed to the price of gasoline. When gasoline prices are high, the standards would ratchet up to become binding, achieving maximum, cost-effective fuel and emissions savings. When gasoline prices are low, the standards would ratchet down, avoiding overly burdensome costs for automakers.
4. A more flexible standard would allow automakers to adjust vehicle production volumes to more closely match consumer preferences—for example, by manufacturing fewer small models

when gasoline prices are lower than expected and more small models when gasoline prices are higher than expected. This would not entail changing product portfolios, at least in the short run, but rather adjusting production of existing products to match consumer preferences. In the longer run, a flexible standard could accommodate manufacturers' ability to adjust the fuel economy of their models in response to changes in consumer demand, though it would be important to ensure that the standards only adjust incrementally to avoid implementing standards in a given year for which automakers had not produced suitable vehicles.

5. Adjustable fuel-economy standards could be designed such that they never fall below the level dictated by the expected cost of carbon damages, and only adjust modestly within a relatively narrow band. This approach would ensure maximum, cost-effective emissions reductions.

Introduction

In October 2012, the Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) jointly issued regulations governing light-duty vehicle carbon dioxide emissions and fuel efficiency for the period 2017-2025. These regulations built on prior action by the agencies that set standards from 2012 to 2016. Known collectively as the National Program, the rules envisioned significant improvements in efficiency, growing from a targeted performance of 30.1 miles per gallon (mpg) in 2012 to an estimated combined fleet average of 54.5 mpg in 2025—an increase of 81 percent.¹

These ambitious targets were based on several key assumptions about markets and consumer preferences. Most importantly, the regulators based their estimates of future achieved efficiency levels—as well as program costs and benefits—on government projections of continuously rising oil and gasoline prices over the coming decade. Researchers have demonstrated that as fuel prices rise, consumers tend to prefer more efficient vehicles because the fuel savings associated with such vehicles are greater. Thus, the regulators' expectations about rising fuel prices underpinned their belief that the fleet would achieve high levels of efficiency while saving consumers on fuel and reducing greenhouse gas pollution.

However, gasoline prices are extremely volatile, presenting a serious challenge for regulations that are dependent on that price signal to achieve their optimal cost-effectiveness and environmental benefits, while also by nature being determined years in advance and updated infrequently. If gasoline prices are higher than expected at the time the rules are written, consumers will opt for vehicles that are even more efficient than the rules require, suggesting that the rules are too lenient and are missing out on potentially greater fuel and emissions savings. If prices are lower than expected, consumers will demand less efficient vehicles, raising compliance costs for automakers who must reduce prices for their most efficient models. For these reasons (among others), a wealth of academic literature suggests that fuel-economy standards are a costly and suboptimal approach to regulating environmental harm from vehicle emissions.

These effects are not just theory. Volatile gasoline prices have in fact had a significant impact on fuel economy regulations in recent years. Instead of continuously rising as expected, gasoline prices plummeted from an average of \$3.81 per gallon in October 2012 to as low as \$1.87 per gallon in February 2016 before rebounding slightly. U.S. gasoline prices averaged \$2.25 per gallon in 2016, a sharp divergence from the \$3.54 expected by regulators at the time of the 2012 fuel economy rulemaking.² As a result of this divergence and the ensuing shift in consumer preferences, EPA recently reduced its projection of fleet-wide fuel economy performance in 2025 to 50.8 mpg instead of 54.5 mpg, an estimate that is itself dependent on a return to higher fuel prices.

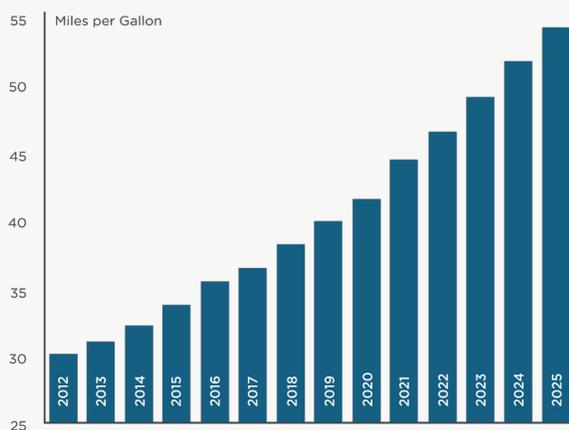
Research Questions

Given that oil and gasoline prices are expected to remain volatile—and without the political will to impose a fuel tax based on the negative social harms caused by these emissions, which economists agree would be the most efficient solution—an important question is whether fuel economy standards could be improved by making them more market-based and flexible.

Indeed, U.S. lawmakers did take several steps to attempt to make the National Program flexible. First, the standards are footprint-based, meaning vehicles with a relatively large wheelbase are assigned a less stringent standard. The standards for light trucks are separate and considerably less stringent than those for cars. Under the footprint-based approach, individual vehicle models are not required to meet their fuel economy target. Instead, each manufacturer must achieve an overall compliance level based on the mix of vehicles it produces for sale in the United States in a given year. That is, some models may under-comply as long as enough models over-comply to offset the deficit. Finally, manufacturers can either trade compliance credits with one another or bank and borrow credits for up to five years.

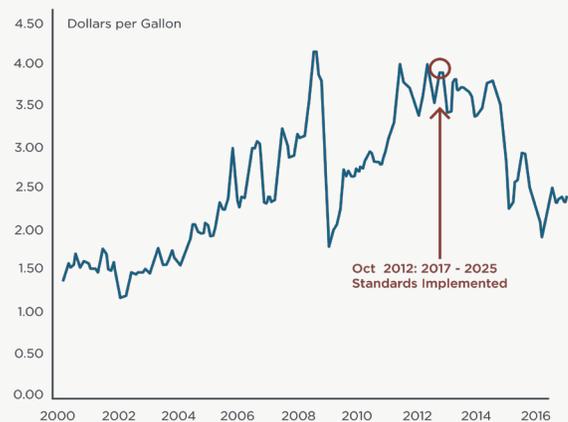
But are these attributes flexible enough to balance the impacts of volatile gasoline prices? Are there more efficient policy designs? And, what are the costs of the current approach to vehicle efficiency

Figure 1 • EPA Fleetwide Fuel Economy Performance 2012-2025



Source: EPA (2010,2012)

U.S. Gasoline Prices - All Grades and Formulations



Source: DOE, EIA

1. 40 CFR Parts 85, 86, and 600. Figures assume automakers meet strict tailpipe emissions standards through efficiency alone.

2. U.S. average retail price, tax included. EIA

regulation? The author evaluates these questions and assesses the best policy approach to ensure fuel-efficiency standards achieve the maximum social benefits at the lowest cost under a landscape of unpredictable gasoline prices.

Using an empirically-grounded model of consumer vehicle choice, the author assesses the following questions:

1. Whether a price-based policy such as a revenue-neutral feebate or fuel-economy standards that are indexed to the price of gasoline would deliver higher overall social benefits;
2. How best to set a fuel-economy standard that cannot change with the price of gasoline and cannot change for several years once it is set (the current policy scenario); and
3. Whether attribute-based standards adequately address the shortfalls of a fixed standard.

Findings

1. Because of gasoline price volatility, fixed standards are less efficient. The current policy approach, in which standards are set far into the future and updated infrequently, has significant shortfalls from a program efficiency standpoint. When gasoline prices exceed the levels projected by the regulator, the standards become non-binding. Consumers choose vehicles that are more efficient than what is required by the fixed standards, but less efficient than what would be needed to account for the social costs of pollution in their purchase decision. When gasoline prices fall below levels expected by regulators, consumers choose vehicles that are less efficient, forcing automakers to reduce prices for their most efficient models and raising the cost of complying with the standards.

2. A price-based policy achieves the greatest benefits. Allowing fuel-economy standards to rise and fall with the price of gasoline more closely equates costs and benefits. When gasoline prices are high, the standards would ratchet up to become binding, achieving maximum, cost-effective fuel and emissions savings. When gasoline prices are low, the standards would ratchet down, avoiding overly burdensome costs for automakers. Such a policy would be equivalent in impact to a revenue-neutral feebate system, but would not require new policy. This market-based approach is shown to be the best option in the absence of a gasoline tax.

3. The flexibility introduced by attribute-based standards does not fully address the distortions introduced by unpredictable gasoline prices. In theory, footprint and weight attributes allow automakers to sell whatever vehicles they prefer while remaining in compliance. The study evaluates whether this flexibility helps the standards achieve optimal social benefits, and finds that the costs of market distortions introduced by attribute-basing exceed the benefits of any flexibility they introduce. Namely, attribute-based standards result in a larger and less efficient overall vehicle fleet than would be produced by a fixed standard or price-indexed standard at the same gasoline price.

Policy Implications

Volatile gasoline prices have raised important questions about the cost-effectiveness of current U.S. fuel economy regulations. This paper offers a market-based pathway to policymakers seeking a cost-effective approach to achieving significant emissions reductions in transportation by designing a system that is flexible in the face of volatile fuel prices. By allowing fuel-economy standards to adjust in tandem with gasoline prices, such a policy would fully leverage consumers' willingness to pay

for fuel efficiency when gasoline prices are high and avoid saddling automakers with compliance costs that exceed program benefits when fuel prices are low. Adjustments could occur on an annual basis.

A legitimate question is whether relaxing the standards at a time when fuel prices are low would forgo needed fuel savings. But it is important to note that an indexed fuel economy standard could adjust within a relatively narrow band, and that the increase in fuel economy above whatever consumers would normally choose on their own should never be less than that determined by climate damages (e.g., the social cost of carbon). The margin of adjustment would fall strictly within the range of private willingness to pay for fuel efficiency, which by definition varies with the fuel price.

A separate question is whether automakers would be able to respond to adjustable standards given product planning cycles that range from three to five years. Here, it is important to note that automakers already naturally adjust product offerings in accordance with consumer preferences and market conditions. Fuel economy standards are simply designed to increase vehicle efficiency above and beyond consumers' base preferences.

In the short term, a more flexible standard would allow automakers to adjust vehicle production volumes to more closely match consumer preferences—for example by manufacturing fewer small models when gasoline prices are lower than expected. When prices are high, a flexible standard would incentivize automakers to increase volumes of efficient vehicles. In the medium term, an indexed standard could potentially allow for even greater flexibility—though it would be important to ensure that standards only adjusted incrementally, to avoid implementing a set of standards in a given year for which automakers had not produced suitable vehicles.



“By allowing fuel-economy standards to adjust in tandem with the price of gas, such a policy would fully leverage consumers' willingness to pay for more fuel efficient cars when gasoline prices are high and avoid saddling automakers with excessive compliance costs when fuel prices are low.”

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