Uncovering the discrepancies in estimates of compliance costs with fuel economy standards between the 2016 TAR and the 2018 NPRM

Following the Energy Independence and Security Act of 2007, the Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) set fuel standards to achieve a fleet-wide fuel economy of 35 mpg by 2016, and a projected 27 to 55 miles per gallon between 2012 and 2025. As part of the 2017-2025 standards issued by the agencies in 2012, the EPA and NHTSA were required to conduct a midterm review of the fuel economy improvements affecting model years 2022-2025. The 2016 technical assessment report (TAR) concluded that these 2022-2025 standards were technologically feasible, and that benefits far exceeded costs.

Recently, the Trump Administration in a 2018 Notice of Proposed Rulemaking (NPRM) finds that the costs of these Obama-era standards now exceed benefits, and proposes to freeze them at model year 2020 levels through 2025.

In relation to the 2016 TAR, while the 2018 NPRM reports overall lower benefits, the major substantial change comes from the estimation of the costs of compliance with the standards. Specifically, compliance costs with the corporate average fuel economy (CAFE) standard are 2.8 times higher in the 2018 proposal than the 2016 NHTSA analysis (and, in turn, even in the 2016, NHTSA projected compliance costs 2.6 times higher than the simulation models used by the EPA). And compliance costs with the GHG emissions standard are 7.5 times higher in the 2018 proposal, an increase from $35 billion in the 2016 TAR to $253 billion in the 2018 NPRM.

The purpose of this paper is to uncover the discrepancies that drive the differences in estimates of compliance costs with fuel economy standards between 2016 TAR and the 2018 NPRM. We have just obtained access to the EPA and NHTSA models (the VOLPE Model), as well as most of the input data used to estimate these models. We propose to disentangle the sources of these drastic changes in compliance costs into two main categories: changes due to modeling assumptions, and changes due to baseline input data used in the models. Since these are engineering models, with technology cost curves developed are compared for hundreds of technologies, their ability to capture important economic features that can influence costs of compliance is limited. For example, it is not immediately clear how the resulting price of new vehicles is determined in the absence of a more complete model that integrates these engineering technology cost curves with a behavioral/consumer choice model that reflects the willingness to pay for different vehicle attributes. The model used by the California Air Resources Board (CARB) to calculate the costs of these standards includes a consumer choice model. Our goal is to also get access to this model, so we can infer the important of modeling explicitly consumer choices and willingness to pay for vehicle attributes.

It is also not clear that these engineering models have the ability to fully capture changes in technology costs that occur over time, including through learning-by-doing.

Therefore, in the end, our overall goal is to provide a critical assessment of these models and identify places where improvements are needed. In turn, we believe this exercise will also inform the economics profession on the importance of technology that are often missing in economic analysis, and contribute to our overall understanding of the costs of compliance with fuel economy standards.
Finally, by contrasting the input data used in both analyses against the literature, we hope to be able to conduct robust sensitivity analysis, which will inform the relative importance of various changes that occurred between the analyses.

We have assembled a team of scholars with vast expertise in this topic and computational modeling experience. In addition, the four of us were just part of a larger team that concluded a more qualitative analysis of the differences between the 2016 TAR and the 2018 NPRM. This study, which is now resubmitted for publication in Science, is also attached to this proposal.

To further motivate the policy relevance of the proposed study, we briefly summarize some of the findings of our recent study as it relates to the costs of compliance with the standards, and highlight how the proposed study will shed light on the empirical magnitudes of some of these findings.

Typically, these engineering models consider how manufacturers combine technologies using least cost algorithms. Four important aspects appear to influence compliance costs: First, assumptions of what technologies are available. Second, how automakers apply them when choosing a ‘technology path’, and whether the model allows for the re-optimization of these ‘technology path’ choices when standards become more stringent (or other exogenous factors that influence costs change). Third, assumptions related to the time required to redesign vehicles to meet standards. And finally, for the case of electric vehicles assumptions related to battery lifetime and capability.

Based on our more qualitative rapid assessment paper, we note the following key differences:

- The 2018 NPRM predicts significantly higher deployment of more-expensive technologies: 24% of vehicles in the 2018 analysis are projected to be strong hybrids by MY 2025 whereas only 2.6% are in the 2016 analysis;
- The 2018 NPRM assumes longer time periods required to redesign vehicles, requiring manufacturers to add fuel-saving technologies earlier, thereby incurring higher costs for more years;
- The 2018 NPRM reports costs for electric vehicles that are 20-50% higher than in the 2016 analysis due to different battery assumptions.

Perhaps even more interesting to economists and policy analysts, we also note and plan to explore the role of the following important sources:

- Even in the 2016 TAR analysis of the GHG standards, cost estimates by the EPA are less than half the costs for the same rule estimated by NHTSA. We suspect that this is in part because EPA assumes that California and other states’ Zero Emission Vehicle (ZEV) mandate will be in place in future years. In contrast, NHTSA implicitly assumes there is no ZEV mandate, which leads to higher calculated costs. The 2018 NPRM does the same.
- Automakers can comply with the regulations by transferring fuel economy “credits” between their passenger car fleet and their light truck fleet, so that if one fleet over-complies with the regulations, the other can under-comply within some limit. Credit transferring is also possible across years, so that if an automaker exceeds fuel economy performance in one year, it can meet a less stringent standard in another year. These flexibilities were not included in the 2018 analysis for MY 2021-2025 (although credit transferring was possible from years before 2021), raising the estimated costs.