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My name is Cinzia Cirillo, and I am a professor of civil and environmental engineering at the University of Maryland. I have held that position since 2006. I would like to comment on the Safe Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026: Passenger Cars and Light Trucks.

I reviewed parts of the Notice of Proposed Rulemaking associated with the proposed rulemaking and noted that it cites a paper entitled "An Integrated Model for Discrete and Continuous Decisions with Application to Vehicle Ownership, Type and Usage Choices", *Transportation Research Part A*, 2014, 69, pp. 319-328, by Liu,Y., Tremblay, J.M, and Cirillo C. (Liu et al.). I directed the research that resulted in the paper and was one of its co-authors.

It is necessary to clarify the following points:

The paper Liu et al. (2014) is the result of independent research. The study was not financed by any public agency or private entity.

The paper focuses on the technical aspects of the vehicle ownership and use problem and proposes a comprehensive framework to model the number of vehicle owned by US households, their type and vintage and the total annual vehicle miles traveled (VMT). The paper is mainly methodological, although the econometric analysis offers the base to calculate a number of indicators, for instance the willingness to pay for specific vehicle characteristics and elasticity to fuel price, density, and income.

In particular, the results from the vehicle-use model allow for the calculation of elasticity to fuel price. In our study, based on NHTS 2009 data for the Washington Metropolitan Area, we calculate that elasticity to fuel price is 0.394. In the Notice of Proposed Rulemaking, page 43103, this value is called rebound effect. In economics, "rebound effect" is the reduction in expected gains from new technologies that increase the efficiency of resource use. In the case of vehicle use, the rebound effect expected from the adoption of more efficient vehicles is an increase in VMT. Elasticity to fuel price (which is calculated in Liu et al., 2014) and rebound effect are not the same concept. It is necessary to make a distinction between the rebound effect expected from (1) the introduction in the market place of more efficient vehicles and their use and (2) the rebound effect from energy policy aiming at reducing VMT by for example increasing fuel cost. Our model is constructed in order to study the latter. This consideration can be also found in Gillingham et al. (2016), which distinguishes between the rebound effect from a costless exogenous energy efficiency improvement—a zero-cost breakthrough—and the rebound effect from an actual (typically costly) energy efficiency policy. According to the same authors, the most common approach in the literature for estimating the rebound effect is to empirically estimate fuel-price or operating-cost elasticities of demand (as it was done in the EPA report). However, it is very important to recognize this distinction for correctly interpreting estimates in the literature, which often conflate the two, leading to inappropriate conclusions and an exaggerated rebound effect.

Linn (2013), whose paper is cited by the EPA report, actually estimates the effect of fuel price, fuel economy and other vehicles' fuel economy on VMT. The paper shows that the three effects can be estimated and that they are actually different. The same analysis could be repeated with our data and our methodology by estimating a coefficient for vehicle efficiency in the continuous part of the model.

Moreover, the following aspects should be taken into consideration when using our results.

- The elasticity to fuel price is moderately higher than the values reported in the literature. As we say in the paper this can be explained by the fact that the model is estimated on NHTS 2009, that was collected from March 2008 to April 2009. In May 2008 prices shot up to nearly $4 a gallon; by August, the cost was still as high as $3.74 and started to fall only in November. When the fuel price is high, a higher percentage of the income is used to pay for fuel, and this causes a higher elasticity to fuel cost. This is well known in economics and the same argument is used in Liu et al., 2015 to justify the value of elasticity estimated on 2009 NHTS data.
- In our analysis we do not have data on new technology and efficient vehicles, the average age of the vehicles in our data set is actually quite high (8.6 years).
- We calculate the elasticity to the total vehicle miles driven in a household, this does not allow to distinguish if the newer (technology) vehicle is used more with respect to the older vehicles in the same household.

A new wave of NHTS data, collected in 2017, is available. The data contains information about more efficient cars, including hybrid and electric vehicles. Rigorous modeling techniques can be applied to update elasticity to fuel cost, to calculate rebound effects, and VMT for vehicles of different fuel efficiency in the same household.

Sincerely,

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References

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