

# EPA's Economic Research Needs for Reducing Vehicle GHG Emissions

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# We use academic research

Sample of citations from U.S. EPA, *Regulatory Impact Analysis: Final Rulemaking for 2017–25 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, EPA-420-R-016, 2012, p. 8–36.

<sup>313</sup> Berry, Steven, James Levinsohn, and Ariel Pakes, "Automobile Prices in Market Equilibrium," *Econometrica* 63(4) (July 1995): 841-940 (Docket EPA-HQ-OAR-2010-0799-0688).

<sup>314</sup> Goldberg, Pinelopi Koujianou, "Product Differentiation and Oligopoly in International Markets: The Case of the U.S. Automobile Industry," *Econometrica* 63(4) (July 1995): 891-951 (Docket EPA-HQ-OAR-2010-0799-0665).

<sup>315</sup> Brownstone, David, and Kenneth Train, "Forecasting New Product Penetration with Flexible Substitution Patterns," *Journal of Econometrics* 89 (1999): 109-129 (Docket EPA-HQ-OAR-2010-0799-0697); Brownstone, David, David S. Bunch, and Kenneth Train, "Joint Mixed Logit Models of Stated and Revealed Preferences for Alternative-Fuel Vehicles," *Transportation Research Part B* 34 (2000): 315-338 (Docket EPA-HQ-OAR-2010-0799-0698); Greene David L., "TAFV Alternative Fuels and Vehicles Choice Model Documentation," prepared by the Oak Ridge National Laboratory for the U.S. Department of Energy, July 2001 (Docket EPA-HQ-OAR-2010-0799-0717); Greene, David L., K. G. Duleep, and Walter McManus, "Future Potential of Hybrid and Diesel Powertrains in the U.S. Light-Duty Vehicle Market," prepared by the Oak Ridge National Laboratory for the U.S. Department of Energy, August 2004 (Docket EPA-HQ-OAR-2010-0799-0718).

<sup>316</sup> Petrin, Amit, "Quantifying the Benefits of New Products: The Case of the Minivan," *Journal of Political Economy* 110 (2002): 705-729 (Docket EPA-HQ-OAR-2010-0799-0699); Berry, Steven, James Levinsohn, and Ariel Pakes, "Differentiated Products Demand Systems from a Combination of Micro and Macro Data: The New Car Market," *Journal of Political Economy* 112 (2004): 68-105 (Docket EPA-HQ-OAR-2010-0799-0689).

<sup>317</sup> Train, Kenneth E., and Clifford Winston, "Vehicle Choice Behavior and the Declining Market Share of U.S. Automakers," *International Economic Review* 48 (November 2007): 1469-1496 (Docket EPA-HQ-OAR-2010-0799-0691).

<sup>318</sup> Bento, Antonio M., Lawrence H. Goulder, Emeric Henry, Mark R. Jacobsen, and Roger H. von Haefen, "Distributional and Efficiency Impacts of Gasoline Taxes," *American Economic Review* 99(3) 2009: 667-699 (Docket EPA-HQ-OAR-2010-0799-0690); Feng, Yi, Don Fullerton, and Li Gan, "Vehicle Choices, Miles Driven and Pollution Policies," National Bureau of Economic Analysis Working Paper 11553, available at <http://econweb.tamu.edu/gan/w11553.pdf>, accessed 5/12/09 (Docket EPA-HQ-OAR-2010-0799-0694).

# OP and OAR

- ▶ Office of Policy (which includes the National Center for Environmental Economics) provides overall guidance and review for regulatory analysis
  - E.g., *Guidelines for Preparing Economic Analyses*
- ▶ Program offices, such as the Office of Air and Radiation (which includes the Office of Transportation and Air Quality), draft the standards and do the detailed analyses
  - E.g., *Regulatory Impact Analysis: Final Rulemaking for 2017–25 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*
- ▶ We have a lot of interaction and collaboration

# GHG Regulations

- ▶ EPA regulates GHGs under the Clean Air Act
  - We collaborate with Dept. of Transportation, which regulates fuel economy, for vehicle rules
- ▶ The Clean Air Act authorizes emissions standards, not carbon taxes
  - We don't have a full toolkit of environmental policy instruments available
  - We commonly build program flexibilities into the rules, such as averaging, banking, trading
- ▶ EPA (in collaboration with NHTSA, coordination with CARB) has issued standards for
  - Light-duty vehicles for model years (MYs) 2012–25
  - Medium- and heavy-duty vehicles for MYs 2014–18

# OTAQ Research Needs for Vehicle GHG Standards: we're not done yet

- ▶ Upcoming:
  - Midterm evaluation of light-duty vehicle standards for MYs 2022–25
    - Final due April 2018
  - Expected new medium- and heavy-duty standards
    - Time line still being assessed
- ▶ See the most recent AERE Newsletter!
  - “Research Needs for Reducing Greenhouse Gas Emissions from Vehicles”



# Some areas EPA has identified for more work (both LD & HD)

- ▶ Impacts of GHG Standards on Vehicle Demand
  - Higher up-front costs, lower operating costs: which dominates?
- ▶ Energy Paradox
  - \$100 bills on the street, or hidden costs?
- ▶ Willingness to pay for vehicle attributes
  - What are tradeoffs associated with performance, range, etc.?
- ▶ Rebound effect
  - Is the response to fuel economy the same as the response to fuel price or fuel cost/mile?
- ▶ Energy security
  - Especially but not only impacts on military
- ▶ Impacts on “affordability”
  - Distributional impacts, access to credit

# Conclusion

- ▶ Thanks for all the work that has been/is being done
- ▶ We look forward to seeing new work
- ▶ Especially medium- and heavy-duty!

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# Appendix



# Vehicle Demand

- ▶ GHG/fuel economy standards create a tradeoff:
  - higher up-front cost
  - lower operating costs
  - How do people evaluate the tradeoffs?
- ▶ Light duty:
  - Lots of models, little assessment
  - How well do the models predict?
- ▶ Heavy duty:
  - Even less is known or modeled
  - Lots of diversity of vehicles



# Energy Paradox and Fuel Economy

- ▶ Engineering estimates find many technologies with short estimated payback periods that have not been in common use in vehicles
- ▶ \$100 bills lying on the streets, or hidden costs?
- ▶ For LD vehicles, we have an experiment going on right now: standards are in place
  - But we don't have an obvious control
  - And the Great Recession is a great confounder
  - Anyone have an idea for how to estimate the effects of the standards?



# WTP for vehicle attributes

- ▶ EPA and DOT include in their costs for meeting the standards the costs of holding performance, size, etc. constant
- ▶ But it could be cheaper to meet the standards by not holding other things equal: e.g.,
  - Reducing performance
  - Reducing gas tank size
  - Reducing range on an EV
- ▶ Fuel savings are monetary, but the value of most other characteristics is hedonic
- ▶ How valuable are these other characteristics relative to fuel economy?



# Rebound effect for vehicle miles traveled

- ▶ When fuel economy improves, it becomes cheaper to drive a mile
  - Therefore, more driving is expected
  - But how much?
- ▶ Most existing studies rely on driver response to fuel cost/price changes rather than fuel economy changes
- ▶ It's unclear whether drivers respond the same way to fuel economy as to fuel price
- ▶ And it's likely to be different for light-duty vs. heavy-duty
  - And possibly even different segments of medium- and heavy-duty



# Energy Security

- ▶ Oil shocks were an original motivation for fuel economy standards
- ▶ 3 ways that fuel economy standards might affect energy security:
  - Reducing macroeconomic disruptions
  - Reducing world price of oil
  - Reducing military expenditures
- ▶ Currently, the agencies include estimates of the impacts of macroeconomic disruptions
- ▶ Are there appropriate ways to estimate and include these other effects?



# Affordability

- ▶ What are appropriate estimates of the distributional impacts of the standards?
- ▶ Some possibilities for the light-duty market:
  - Low-income households
    - They don't account for many new-vehicle purchases
  - Used vehicle markets
    - More common vehicles for low-income households
  - Consumer access to loans
    - Will lenders consider only price increases and not reduced fuel costs?
  - Low-priced new vehicles
    - An entry-level segment for first-time new vehicle buyers
- ▶ For medium- and heavy-duty, access to credit for more expensive vehicles is potentially an issue