

Consumer Responses to Fuel Economy/GHG Standards

RFF Workshop on CAFE/GHG Standards

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Topics I Will Address Today

- Some thinking on the “rebound effect”
 - Microeconomic
 - Macroeconomic
- Relevant work-in-progress

Time permitting:

- Vehicle choice modeling results on vehicle price and cross-price elasticities

Rebound Effect

These thoughts are primarily from a paper co-authored with David Rapson and Gernot Wagner (in review at REEP)

Key questions:

- When we increase fuel economy...
 - How much more will people drive?
 - How much will they spend on other goods and services?
 - How much will other countries increase oil consumption?
 - How much substitution to vehicles will there be?

Microeconomic Rebound Effect

This is just the substitution and income effect

- Lower the cost per mi of driving and consumers substitute towards more driving
- If they spend less on driving, they may spend more on other energy-using goods or services

Both will reduce energy and GHG savings...

...question is “how much?”

Microeconomic Rebound Effect

To quantify:

- Use price elasticities of demand for the substitution effect and “a slice” of the income effect (direct effect)
 - Not perfect, several caveats
 - Estimates range widely
 - Our view: most reliable estimates range from -0.05 to -0.3
- Ideally use estimates of where the next marginal dollar is spent for the remaining income effect (indirect effect)
 - Estimates using *average* spending tend to hover around 0.1

Note a *higher* direct effect means a *lower* indirect effect

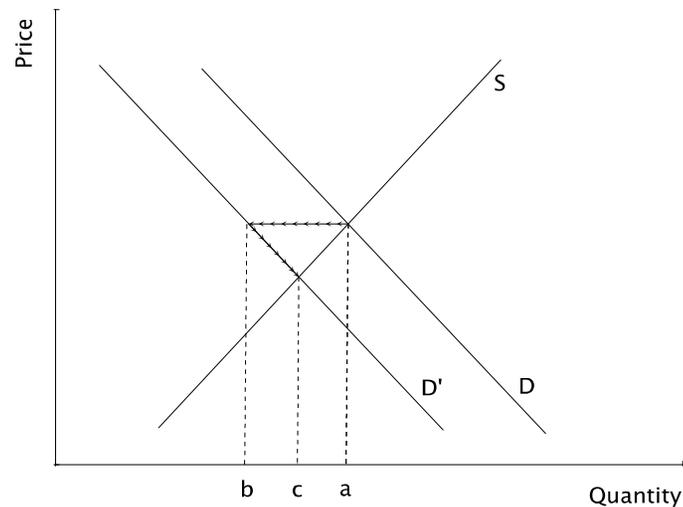
What We Want to Know

- Can we use a fuel price elasticity of driving demand?
 - Or do consumers respond differently to fuel prices than to changes in fuel economy?
- How does this effect vary...
 - Across states?
 - Across different income groups?
 - Across different geographic areas?
 - Across different types of vehicles (Chris' work)
- Will the increase in vehicle cost from standards eliminate the income/indirect effect?

Macroeconomic Leakage Rebound

Consider the global oil market

- If we reduce oil use in the US, what happens?
 - Oil demand shifts in and the global price drops
 - Other countries demand more oil as the market re-equilibrates



- This effect *could* be large and should be examined more carefully

Macroeconomic Growth Rebound

1. Sectoral Reallocation

- Substitution effects at a macro level
- Size depends on whether energy services and other goods/services are complements or substitutes

2. Induced Innovation

- Is there induced innovation that leads to more energy use?
- No solid evidence currently, also depends on counterfactual
- Note clearly welfare-improving

3. Fiscal Multiplier effect

- Exacerbates above effects when there are “idle resources”
- Debate in macro literature as to magnitude

Macroeconomic Growth Rebound

One key point:

If the energy efficiency policy has a significant cost, we should not worry about the macro growth rebound effect

But unanswered questions with little to guide us:

- How large is the sectoral reallocation?
- Do we really see induced innovation leading to more energy use?

Work-in-Progress on the Elasticity of Driving

- Heterogeneity by demographics (CA data)
 - Distributional consequences of policy
- Difference in fuel price and fuel economy elasticity
 - Plan to examine across several states (CA/CT/MA)
- Heterogeneity in the elasticity of driving (PA data)
- Prius Fallacy
 - MA annual inspection data
- Driving elasticity and access to public transport
 - Data from Denmark

Other Relevant Work-in-Progress

- Dynamic modeling of fleet turnover and utilization
 - Modeling the purchase, use, and scrappage decision in CA
- Dynamic modeling of the diffusion of EVs
 - Modeling the buy-or-wait decision of EV purchasers in CA
- Theoretical work on feebates versus CAFE standards
 - A feebate can be designed to exactly match any CAFE standard
 - A parallel distinction between feebates versus CAFE and a carbon tax versus a cap-and-trade under uncertainty

Price Elasticities of Demand for Cars

Two components

1. Own-price elasticity: how will the sales of vehicles change?
2. Cross-price elasticities: how will the sales of different vehicles change when prices of other vehicles change?

Useful for understanding how the fleet will evolve under CAFE/GHG standards.

- Of course, complicated by other attribute changes

Price Elasticities of Demand for Cars

Gillingham (2012) estimates a vehicle choice model for *new* vehicles in California

These estimates are updated preliminary estimates based on the latest estimation:

- Own-price elasticity: varies by make/model, but is largely in the range of 1
- Cross-price elasticity: again varies by make/model. Key point is that it is small across classes and large within classes

These estimates are consistent with older estimates (e.g., BLP)