



MANUFACTURER RESPONSES TO FUEL ECONOMY/GHG STANDARDS

IDENTIFYING RESEARCH PRIORITIES FOR THE MIDTERM REVIEW

RESOURCES FOR THE FUTURE

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PREMISE:

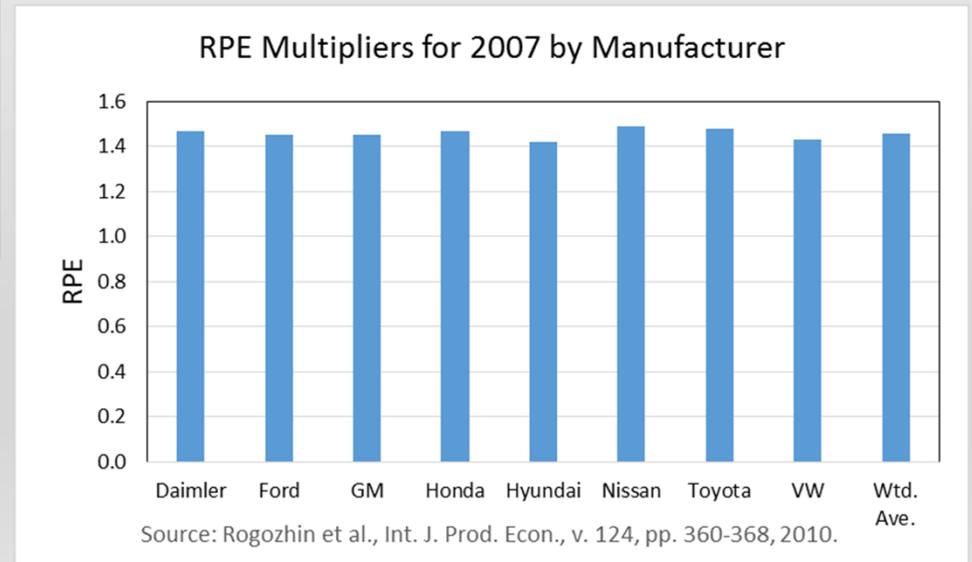
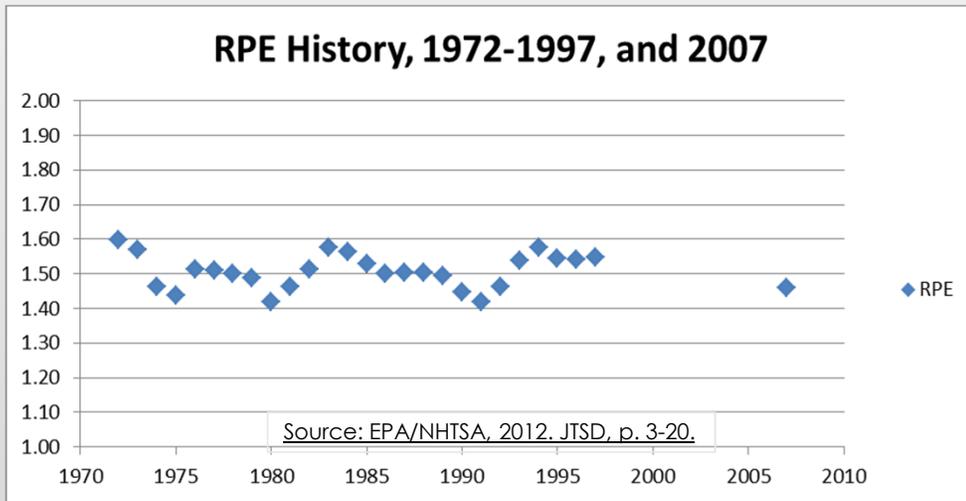
OEMS WILL ATTEMPT TO MAXIMIZE THE VALUE OF THEIR PRODUCTS TO THEIR CUSTOMERS.

- *Is it true? Is the industry oligopolistic, monopolistically competitive, or competitive?*
- *At time of purchase or over the life of the vehicle?*
- **$\Delta V = \Delta W - \Delta C(1+M)$**
- Net change in value = change in willingness to pay – change in manufacturing cost times markup to retail price.
- If the standards are binding (“cost-effective” technology & credits are inadequate) manufacturers will institute “feebate” pricing reflecting the shadow price of the constraints. True?
- **So, what do we need to know?**
 - How does the market for automotive fuel economy work?
 - What are **ΔW** , **ΔC** , and **M** ?

M: RPE OR ICM?

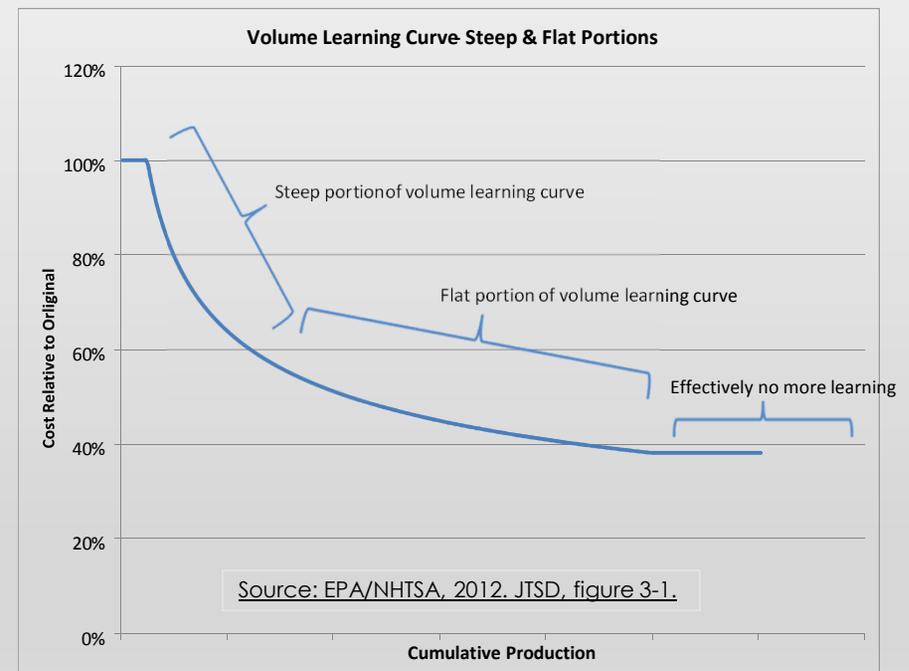
- RPE multipliers assign all technologies the average industry markup.
- Different technologies will affect indirect costs differently.
 - Warranty, R&D, depreciation & amortization, maintenance, repair, G&A, employee benefits, transport, marketing and dealer costs.
- $RPE = \sum_{i=1}^{13} ICShare_i$: calculated from historical data, about 1.5.
- $ICM_T = \sum_{i=1}^{13} (ICShare_i \times ICAAdj_{iT})$: EPA estimates S-R 1.24-1.77; L-R 1.19-1.50
- Because many $ICAdj = 0$, $ICM_T < RPE$ in long run, for most technologies
- The case for use of ICMs rests on:
 - How important the differences among technologies are
 - How accurately effects can be predicted
 - Whether indirect costs can decrease/increase with added content
- ICMs and warranty costs.

WILL ADDING FUEL ECONOMY TECHNOLOGY DECREASE THE INDUSTRY RPE MULTIPLIER?



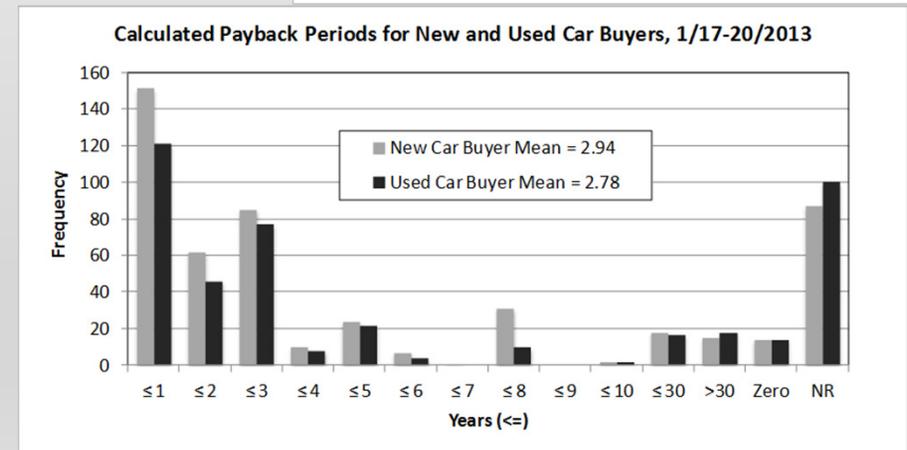
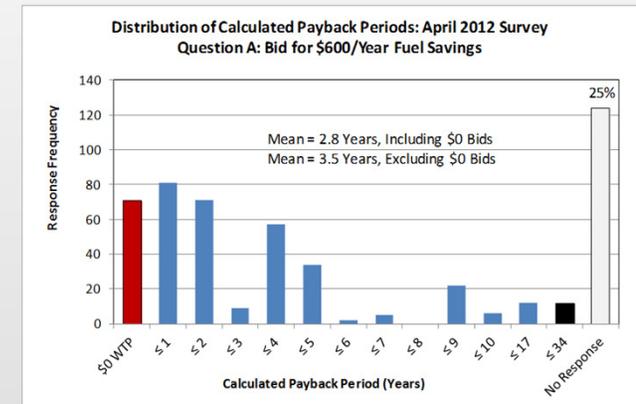
LEARNING: “CAN'T FORECAST IT, CAN'T FORECAST WITHOUT IT.”

- 20% cost reduction with 2X cumulative production (actually after 2 years) for first 4 years (2 steps).
- “Steep learning” for: hybrid and plug-in components, A/C refrigerant, low RR tires.
- “Flat learning” for most:
- 3%/yr. reduction for 5 years.
- 5 more years at 2%/yr.
- Finally 5 years at 1%/yr.



WHAT ARE CONSUMERS WILLING TO PAY FOR HIGHER FUEL ECONOMY?

- Why does this matter?
 - No effect on B/C estimates
 - Affects order of implementation
 - Affects impacts on industry
 - Affects rationale for regulation
- 2010 Literature review: 50/50.
- Loss aversion?
 - Not irrational
 - Not ignorant
 - Not limited in ability
 - Dislike risky bets



Greene, D.L., D.H. Evans and J. Hiestand, "Survey evidence on the willingness of U.S. consumers to pay for automotive fuel economy", *Energy Policy*, vol. 61, pp. 1539-1550, 2013.
 Greene, D.L., "Uncertainty, Loss Aversion and Markets for Energy Efficiency", *Energy Economics*, vol. 33, pp. 608-616, 2011.
 Greene, D.L., *How Consumers Value Fuel Economy: A Literature Review*, EPA-420-R-10-008, U.S. Environmental Protection Agency, March 2010.

OTHER ISSUES: THERE ARE LOTS OF THEM.

- Stranded capital
 - New research method
 - Handled by redesign (5yr) and refresh (2-3yr) cycles?
- Technological change
 - Phase-in rates and caps
 - Conservative bias?
- Use of credits and flexibility provisions
- Test (compliance) vs. real world MPG
- Differential impacts on manufacturers
 - Technical capabilities differ?
 - Access to capital differs?

A RESEARCH AGENDA

- How do consumers value fuel economy?
- Can ICMs be estimated with sufficient accuracy?
- Is there a better way to predict learning for different technologies?
- Will the required rates of changes in vehicle technology and design increase capital turnover (strand capital)?
- Is the (global) automotive industry monopolistically competitive, oligopolistic or competitive?

THANK YOU.