EXAMINING THE AFFORDABILITY IMPACTS OF LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSION STANDARDS

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Studying issues we face, whether or not they’re amenable to real or quasi-experiments

- Light-duty vehicle GHG standards are expected to:
  - Increase costs of vehicles
  - Reduce fuel costs
- Public comments raised questions about the effects of light-duty vehicle GHG standards on vehicle affordability
- This presentation describes how we sought to address those questions
This Talk

- Definition(s) of affordability and applicability to transportation
- Light-duty (LD) vehicle greenhouse gas (GHG) and fuel economy standards
- How to examine affordability impacts of LD vehicle GHG standards
  - Low-income households
  - Used vehicle market
  - Access to credit
  - Low-priced new vehicle segment
Affordability Definitions

■ “The Vexed Question of Affordability” (Wilcox 1999):
  - “. . . jumbles together in a single term a number of disparate issues” (Quigley & Raphael 2004)
  - “. . . a vague concept. . . a subjective notion” (Bradley 2008)
  - “. . . a new ‘alien’ concept penetrating the field of contract and consumer law” (Bartl 2010)

■ Nevertheless, some common themes to the topic
  - *Some level of the good is a necessity*
  - *People should be able to access that level of the good*
    ■ Ability to pay is at least as important as willingness to pay for that level

■ Some goods for which definitions of affordability have been attempted:
  - *Housing, energy, food, telephone service, health insurance*
Implementing Affordability: Some of the “vexed questions”

- How should a minimum necessary level be determined?
- How should affordability be measured?
  - Low/reasonable price for the minimum necessary level
  - Purchasing the necessity does not prevent purchase of other necessities
  - Expenditures on the necessity are less than a specified share of income
- How does quality of the good come into play? E.g.,
  - Is a home affordable if someone spends < 1/3 of income on it but it is in bad shape?
  - Is a low-cost diet of low-nutritional-quality food affordable?
- Short-run (up-front, access) vs. long-run (ongoing, user) costs?
  - E.g., for housing, how should asset appreciation (or depreciation) come into play?
LD Vehicle GHG/Fuel Economy Standards: A Brief Detour

- Harmonized national program
  - **EPA** regulates GHG emissions
  - **National Highway Traffic Safety Administration (DOT)** regulates corporate average fuel economy (CAFE)

- The standards ratchet down GHG emissions/ratchet up fuel economy for new vehicles every model year from 2012 to 2025.
  - **Vehicle costs increase**
  - **Payback period on fuel savings** ~3 years on average
    - Using fuel price estimates at the times of the rulemakings in 2010 and 2012

- The GHG emissions/mpg limits are defined separately for each auto company based on the footprints of the vehicles they sell
  - **Smaller-footprint vehicles** have more stringent targets than **larger-footprint vehicles**

- Fleetwide averaging; banking; trading of credits across manufacturers.
Examining Affordability Impacts of the Standards

- There are many thorny issues involved in defining, studying, and achieving affordability
  - What is the socially defined minimum acceptable level of transportation?
  - Does that level require access to personal vehicles?
    - Or is access to public transportation sufficient?

- The standards apply only to new vehicles
  - Effects of the standards on other forms of transportation are likely to be small
  - The most direct effects are in the new and used vehicle markets

- In practice, how might we examine affordability impacts of the standards?
  - We have not been able to identify a counterfactual to allow us to do a quasi-experiment
  - That doesn’t absolve us from examining the issue
Four Questions for Impacts of the Standards

In considering the impacts of the standards on affordability, we came up with 4 potential impact areas:

- *Effects on low-income households*
  - The most vulnerable population

- *Effects on the used-vehicle market*
  - Where most lower-income people buy vehicles

- *Effects on access to credit*
  - If lenders consider only up-front costs, and not fuel savings, what will higher prices do to buyers’ abilities to get loans?

- *Effects on lower-priced vehicles*
  - Entry-level cars for the new vehicle market
Effects of the Standards on Low-Income Households

- Consumer Expenditure Survey (Bureau of Labor Statistics)
- How to define low-income households:
  - Split by median after-tax household income (in 2013, $33,371 per household)
- In 2013, for lower-income households (50% of households),
  - They bought 32% of new vehicles
  - Amount spent on gasoline: $2,154 vs. $3,175
  - Amount spent on all vehicles: $670 vs. $1,428
    - Amount spent on used vehicles: $362 vs. $638
    - Amount spent on new vehicles: $308 vs. $790
- Used vehicles appear to be more important to lower-income households than new vehicles
- And gasoline expenditures are larger than new or used vehicle expenditures
Effects of the Standards on the Used Vehicle Market

- Effects on the used vehicle market depend on effects of the standards on the new vehicle market
  - Used vehicles are substitutes for new vehicles
  - Increased (decreased) sales of new vehicles should decrease (increase) used vehicle prices

- We have not been able to estimate the effects of the standards on new vehicle sales
  - Higher up-front costs due to the standards should decrease sales, all else equal
  - But better fuel economy due to the standards should increase sales, all else equal
  - Sales have increased steadily since 2009, probably due primarily to recovery from the Great Recession
Sales, with new & used vehicle prices from Consumer Price Index (US BLS, 2013=100, adjusted for inflation)

New vehicle prices have barely moved since 2008
Used car prices increased 2009-11, and have dropped slightly since
Whether or not the standards have affected used vehicle prices, there hasn’t been a major change
Access to Credit

  - How many drivers live in households whose debt-to-income ratio is below 40% for a loan of $11,750, but not $14,750?
    - $11,750 based on lowest-priced new vehicle with $1000 down payment
    - Increased cost ($3000 or more) was higher than the agencies’ estimates.

- Is the debt-to-income barrier a solid barrier?

- Are there benefits in the loan market for more efficient vehicles?

Debt-to-income ratio

- Lending sources say that they avoid giving loans to consumers with over 36% DTI
  - Bankrate.com, Zillow.com, TheNest.com
- But, CES data show new vehicle purchasers with DTI > 36%
- 2007-2013, pooled:

<table>
<thead>
<tr>
<th></th>
<th>Lower Income</th>
<th>Higher Income</th>
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</thead>
<tbody>
<tr>
<td>&lt; or equal to 36% DTI</td>
<td>51%</td>
<td>88%</td>
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<tr>
<td>&gt;36% DTI</td>
<td>49%</td>
<td>12%</td>
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- 2013 alone:

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<th>Lower Income</th>
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<tr>
<td>&lt; or equal to 36% DTI</td>
<td>46%</td>
<td>89%</td>
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<tr>
<td>&gt;36% DTI</td>
<td>54%</td>
<td>11%</td>
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</table>

The DTI isn’t a solid barrier
Green auto loans

- Some lenders give discounts for loans to purchase more fuel-efficient vehicles
- Internet search on “green auto loans” July 2015:
  - 6 banks, 53 credit unions, 2 aggregators offer discounts for “green” vehicles
  - E.g., U.S. Bank offers 0.5% off the interest rate for a “new or used EPA Certified SmartWay Vehicle”
  - E.g., Oak Ridge National Laboratory Federal Credit Union offers 0.25% discount off the lowest rate for an electric, hybrid, or alternative fuel vehicle
- The standards may affect access to credit, but the loan market does not appear to be as limiting as NADA suggested.
Low-priced cars

- Automakers may want to preserve the low-priced segment as a potential entry point into new vehicle market
- We defined a low-priced vehicle as < $15,000 MSRP in 2013$  
  - Based on a review of “cheap” cars in various websites
- How many vehicles are offered in the low-priced segment?
- What is the lowest-priced vehicle offered?
- Are the attributes of the low-priced vehicle changing?
Number of vehicles < $15K (2013$)

Ward’s data 2007-15

Max = 18
Min = 8
13 in 2015
No obvious trend
Minimum MSRP (2013$)
Ward’s data 2001-2015

Lowest = $10,979 (2007)
Highest= $12,780 (2013)
Too soon to say whether increases since 2011 are permanent or temporary

Might features contribute to the price changes?
## Standard features on Nissan Versa

(Lowest-priced vehicle in 6 of the last 9 years)

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<td>Traction Control</td>
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<td>Bluetooth Wireless Datalink</td>
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<tr>
<td>Audio Controls on Steering Wheel</td>
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<td>Speed Sensitive Volume Control</td>
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<td>x</td>
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<td>x</td>
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<td>x</td>
<td>x</td>
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<tr>
<td>MPG City/Hwy</td>
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<td>30/34</td>
<td>26/34</td>
<td>26/34</td>
<td>26/35</td>
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<td>27/30</td>
<td>27/36</td>
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<tr>
<td>Horsepower</td>
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<td>122 hp @ 5200 rpm</td>
<td>107 hp @ 6000 rpm</td>
<td>107 hp @ 6000 rpm</td>
<td>107 hp @ 6000 rpm</td>
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<td>11401</td>
<td>11288</td>
<td>11094</td>
<td>11926</td>
<td>12780</td>
<td>12621</td>
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</table>

More features are standard and may explain some of the cost increase.
### Standard features on lowest-priced vehicle

<table>
<thead>
<tr>
<th>Year</th>
<th>Model</th>
<th>4-wheel ABS</th>
<th>Emergency Braking Assist</th>
<th>Stability Control</th>
<th>Traction Control</th>
<th>Auxiliary Audio Input</th>
<th>Bluetooth Wireless Datalink</th>
<th>Audio Controls on Steering Wheel</th>
<th>Speed Sensitive Volume Control</th>
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<th>MPG City/Hwy</th>
<th>Horsepower</th>
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<tr>
<td>2007</td>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>27/37</td>
<td>103 hp @ 6000 rpm</td>
<td>10965</td>
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<tr>
<td>2008</td>
<td>Chevy Aveo</td>
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<td></td>
<td>24/34</td>
<td>103 hp @ 5800 rpm</td>
<td>11352</td>
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<tr>
<td>2009</td>
<td>Nissan Versa</td>
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<td></td>
<td>26/34</td>
<td>107 hp @ 6000 rpm</td>
<td>11401</td>
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<tr>
<td>2010</td>
<td>Hyundai Accent</td>
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<td>x</td>
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<td></td>
<td>28/36</td>
<td>110 hp @ 6000 rpm</td>
<td>11267</td>
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<td>2011</td>
<td>Nissan Versa</td>
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<td>2012</td>
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<td>2014</td>
<td>Nissan Versa</td>
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<td>109 hp @ 6000 rpm</td>
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<tr>
<td>2015</td>
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<td>109 hp @ 6000 rpm</td>
<td>12621</td>
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Same pattern as for the Versa (because the Versa is the lowest-priced vehicle most years)
Summary: Effects of the Standards on Affordability

- There are no particular guidelines for applying the concept of affordability to new vehicle standards
  - Are new vehicles a necessary good?

- EPA has instead assessed 4 questions to address affordability
  - Effects on low-income households
    - Impacts on this segment are most likely to be felt through the used car market
  - Effects on the used vehicle market
    - No obvious effects so far
  - Effects on access to credit
    - No obvious effects so far
  - Effects on low-priced segment
    - No obvious effects so far

- It’s difficult to separate the effects of the standards from broader macroeconomic conditions

- If the standards have affected affordability, market adjustments may mitigate these effects
  - E.g., via access to credit

- And there will be reductions in fuel expenditures