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 <u>after-tax</u> household income (in 2013, $33,371 per household)*
- In 2013, for lower-income households (50% of households),
  - *They bought 32% of new vehicles*

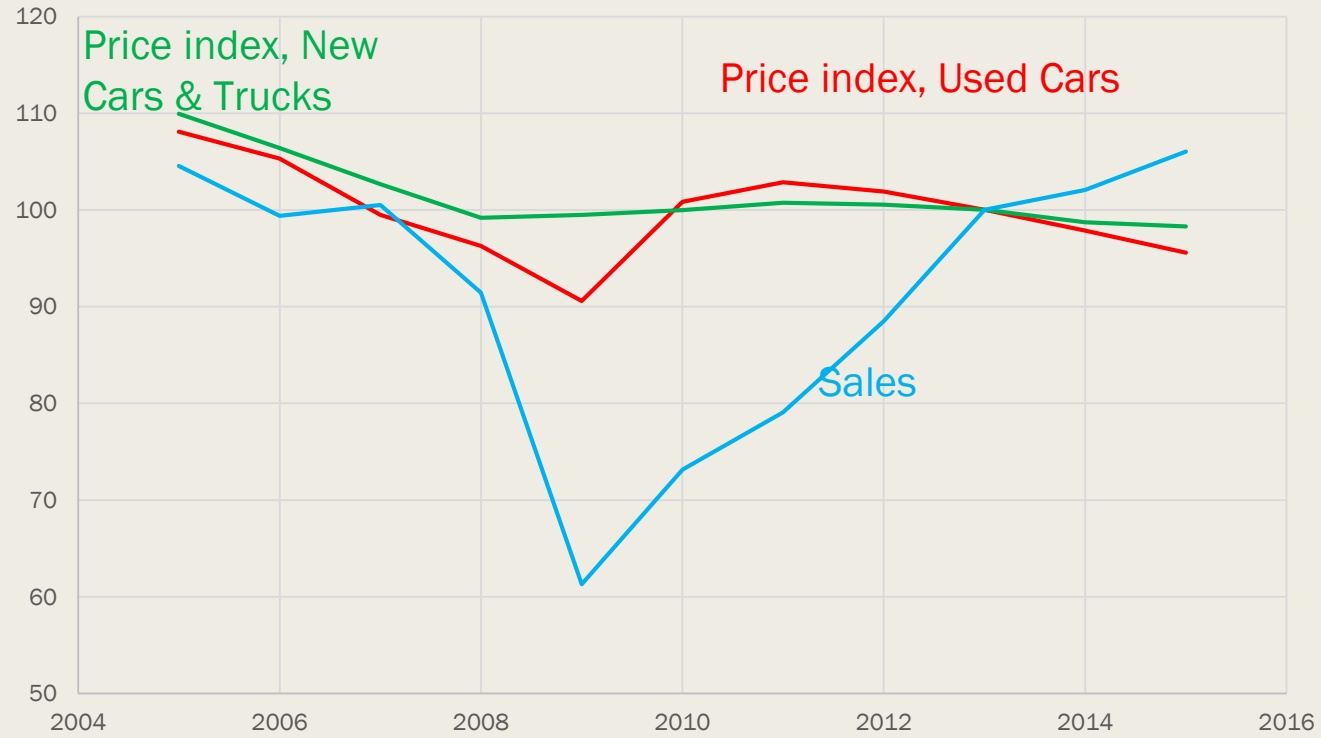
	Lower income	Higher income
– *Amount spent on gasoline:*	*$2,154*	*$3,175*
– *Amount spent on all vehicles:*	*$670*	*$1,428*
■ Amount spent on used vehicles:	$362	$638
■ Amount spent on new vehicles:	$308	$790

- 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

- National Automobile Dealers Association: “Proposed Fuel Economy Rules Cut 7 Million Car Buyers Out of New-Vehicle Market”*
  - *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?

*http://www.nadafrontpage.com/NADA_Proposed_Fuel_Economy_Rules_Cut_Millions_of_Car_Buyers_Out_of_Market.xml

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:

	Lower Income	Higher Income
< or equal to 36% DTI	51%	88%
>36% DTI	49%	12%

- 2013 alone:

	Lower Income	Higher Income
< or equal to 36% DTI	46%	89%
>36% DTI	54%	11%

The DTI isn't a solid barrier

Green auto loans

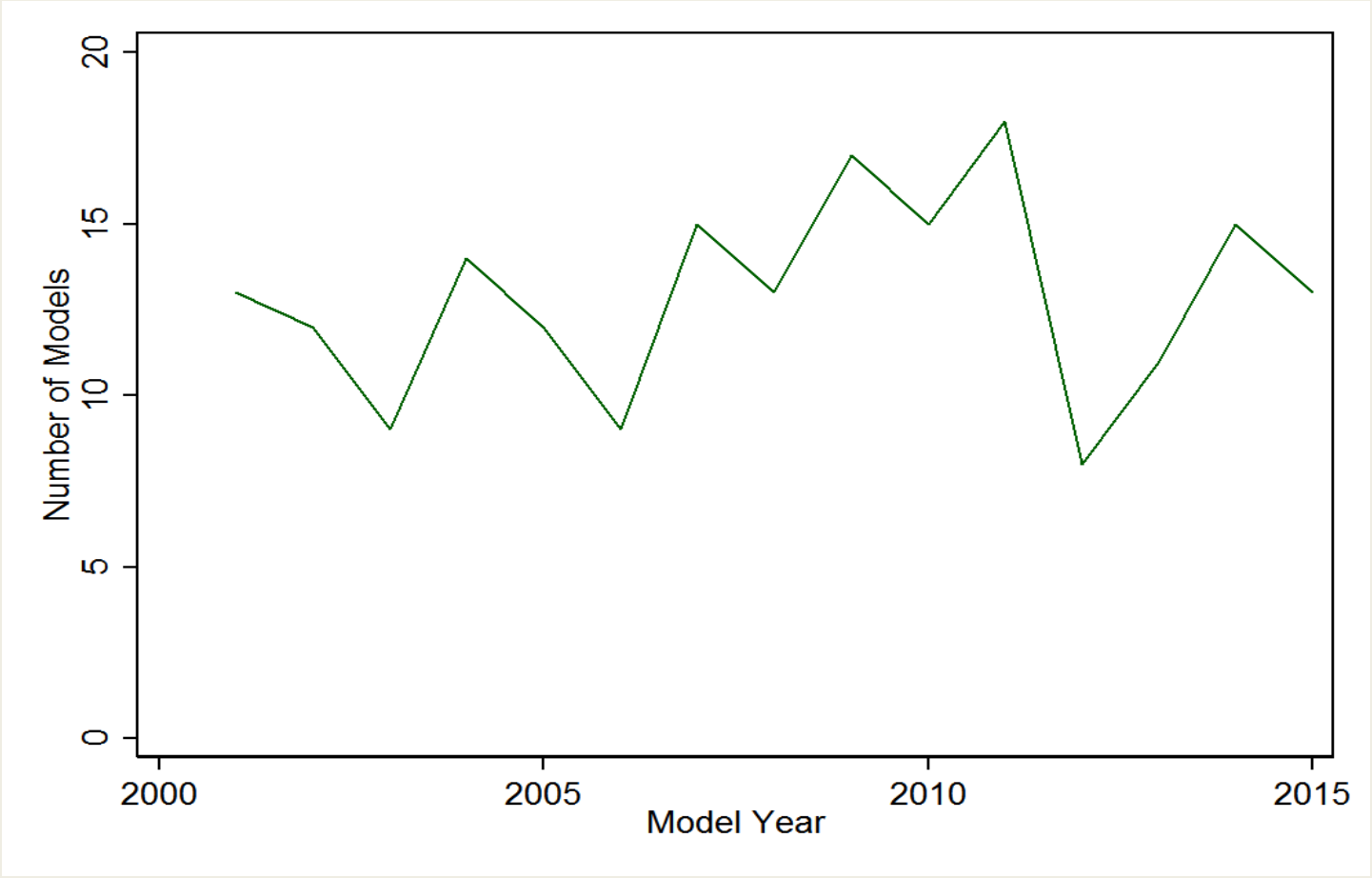
- Some lenders give discounts for loans to purchase more fuel-efficient vehicles
- Internet search on “green auto loans” July 2015:
  - *6 banks, 53 credit unions, 2 aggregators offer discounts for “green” vehicles*
  - *E.g., U.S. Bank offers 0.5% off the interest rate for a “new or used EPA Certified 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

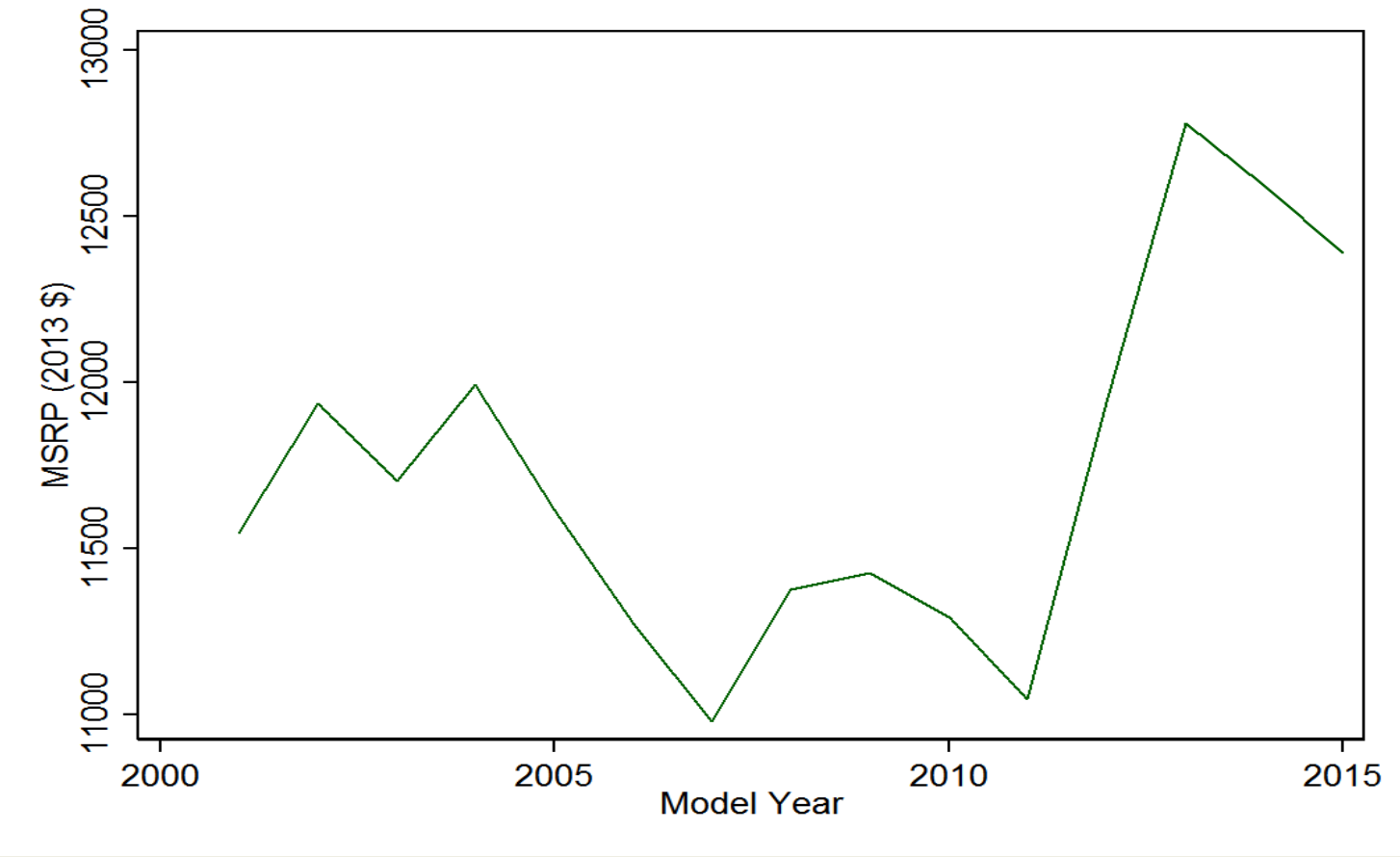
Min = 8

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)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
4-wheel ABS						x	x	x	x
Emergency Braking Assist						x	x	x	x
Stability Control						x	x	x	x
Traction Control						x	x	x	x
Auxiliary Audio Input						x	x	x	x
Bluetooth Wireless Datalink									x
Audio Controls on Steering Wheel									x
Speed Sensitive Volume Control									x
Air Conditioning	x	x	x	x	x	x	x	x	x
MPG City/Hwy	30/34	30/34	26/34	26/34	26/35	27/30	27/30	27/36	27/36
Horsepower	122 hp @ 5200 rpm	122 hp @ 5200 rpm	107 hp @ 6000 rpm	107 hp @ 6000 rpm	107 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm
MSRP	14332	14249	11401	11288	11094	11926	12780	12621	12621

More features are standard and may explain some of the cost increase

Standard features on lowest-priced vehicle

	2007 Chevy Aveo	2008 Chevy Aveo	2009 Nissan Versa	2010 Hyundai Accent	2011 Nissan Versa	2012 Nissan Versa	2013 Nissan Versa	2014 Nissan Versa	2015 Nissan Versa
4-wheel ABS						x	x	x	x
Emergency Braking Assist						x	x	x	x
Stability Control						x	x	x	x
Traction Control						x	x	x	x
Auxiliary Audio Input						x	x	x	x
Bluetooth Wireless Datalink									x
Audio Controls on Steering Wheel									x
Speed Sensitive Volume Control									x
Air Conditioning			x		x	x	x	x	x
MPG City/Hwy	27/37	24/34	26/34	28/36	26/35	27/30	27/30	27/36	27/36
Horsepower	103 hp @ 6000 rpm	103 hp @ 5800 rpm	107 hp @ 6000 rpm	110 hp @ 6000 rpm	107 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm	109 hp @ 6000 rpm
MSRP	10965	11352	11401	11267	11094	11926	12780	12621	12621

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