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# Estimating the impact of monetary incentives on PEV buyers

Alan Jenn

Scott Hardman

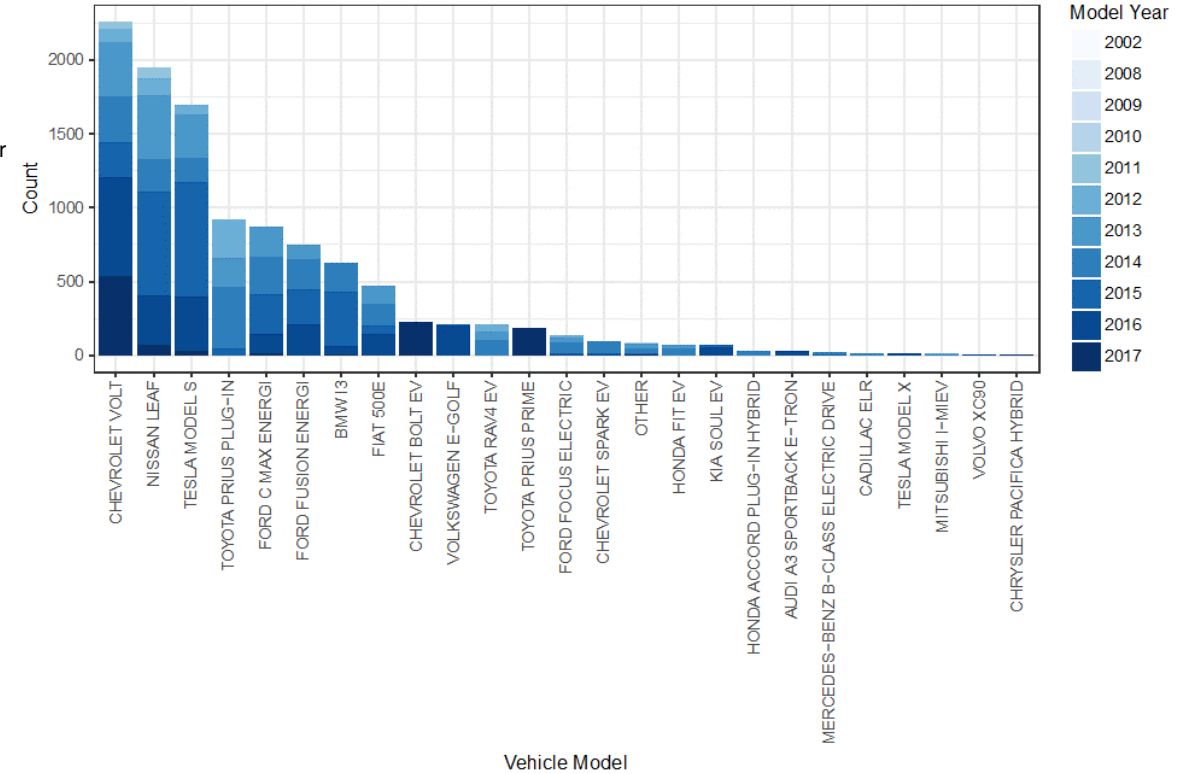
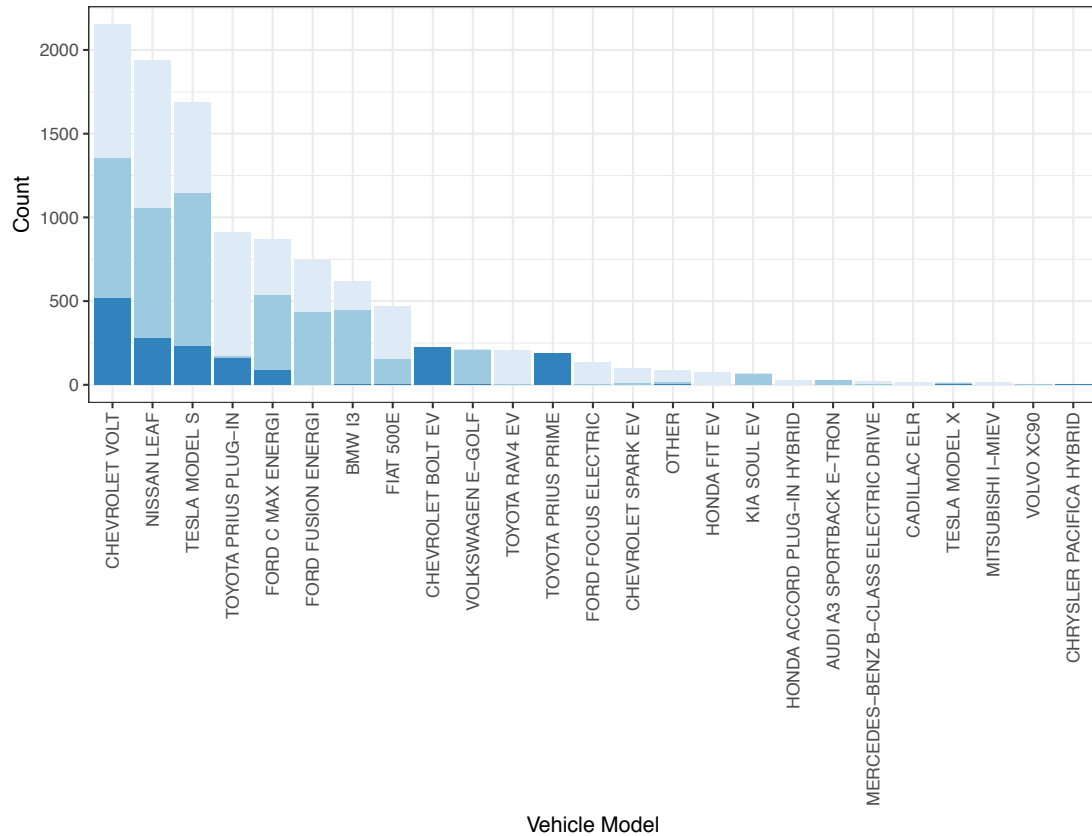
Gil Tal

STEPS Fall 2017 Symposium

# Goal: A better understanding of incentive impacts

- We employ a stated preference (survey based) modeling approach using a comprehensive survey dataset of over 10,000 respondents
- Provides a more nuanced view of incentives than would normally be available through market-based revealed preference data
- Our analysis focuses on changes in purchase intention due to the presence of incentives

# CVRP based surveys 2015-2017 N=14,000




# Likert Scale and Slider Bars: Estimating the Importance of Incentives

In the next set of questions we will ask about the decision you made when buying/leasing your car. Please try to answer the following questions based on the knowledge you had when making your car purchase.

**Plug-in cars are eligible for different local, state, and federal incentives. How important were those incentives in your decision to buy the TESLA MODEL S? (If the incentive was not available for you please move the slider bar to "Not Applicable")**

Federal Tax Credit

Not Important Important Not Applicable No answer



What is the dollar value of this incentive for your household? \$ 7500

State Rebate


Not Important Important Not Applicable No answer



What is the dollar value of this incentive for your household? \$ 1000

Local Rebate

Not Important Important Not Applicable No answer



What is the dollar value of this incentive for your household? \$ XXX.XX

# Design Game web survey (SP survey)

## Section 4: Page 3

When some people buy a new car, they have a few alternatives in mind in case they find a better deal, the incentives they want are not available, or other considerations. Please describe your options:

You can start with a specific make and model from the dropdown menu or use a generic body style, fuel type, and price range. Please add all relevant options you had at the time of buying your TESLA MODEL S. You can select up to 4 cars.

### Alternative Vehicle Choices

Vehicle 1:

Year: 2014

Body: Sedan (4-door)

Fuel: Gasoline

✘ Remove Vehicle

Vehicle 2:

Year: 2014

Make: BMW

Model: 650i xDrive Gran Coupe

✘ Remove Vehicle

Vehicle 3:

Year: 2015

Make: Nissan

Model: Leaf

✘ Remove Vehicle

Vehicle 4:

Select using

Select a Generic Vehicle

OR

Select a Specific Make/Model

Please mark your decision assuming that your most important incentive is not available.

Federal Tax Credit: \$7500.00

Workplace Charging

Dedicated Parking

State Rebate: \$1000.00

Subsidy for Installing Home Charger: \$250.00

High Occupancy Vehicle (HOV) Lane Access

I would like to go back to the vehicle selection page

Choose one of the following answers

TESLA MODEL S: I will buy this car

2014 Sedan (4-door): I will buy this car

BMW 650i xDrive Gran Coupe: I will buy this car

Nissan Leaf: I will buy this car

I will not buy a new car

# Importance of Incentives

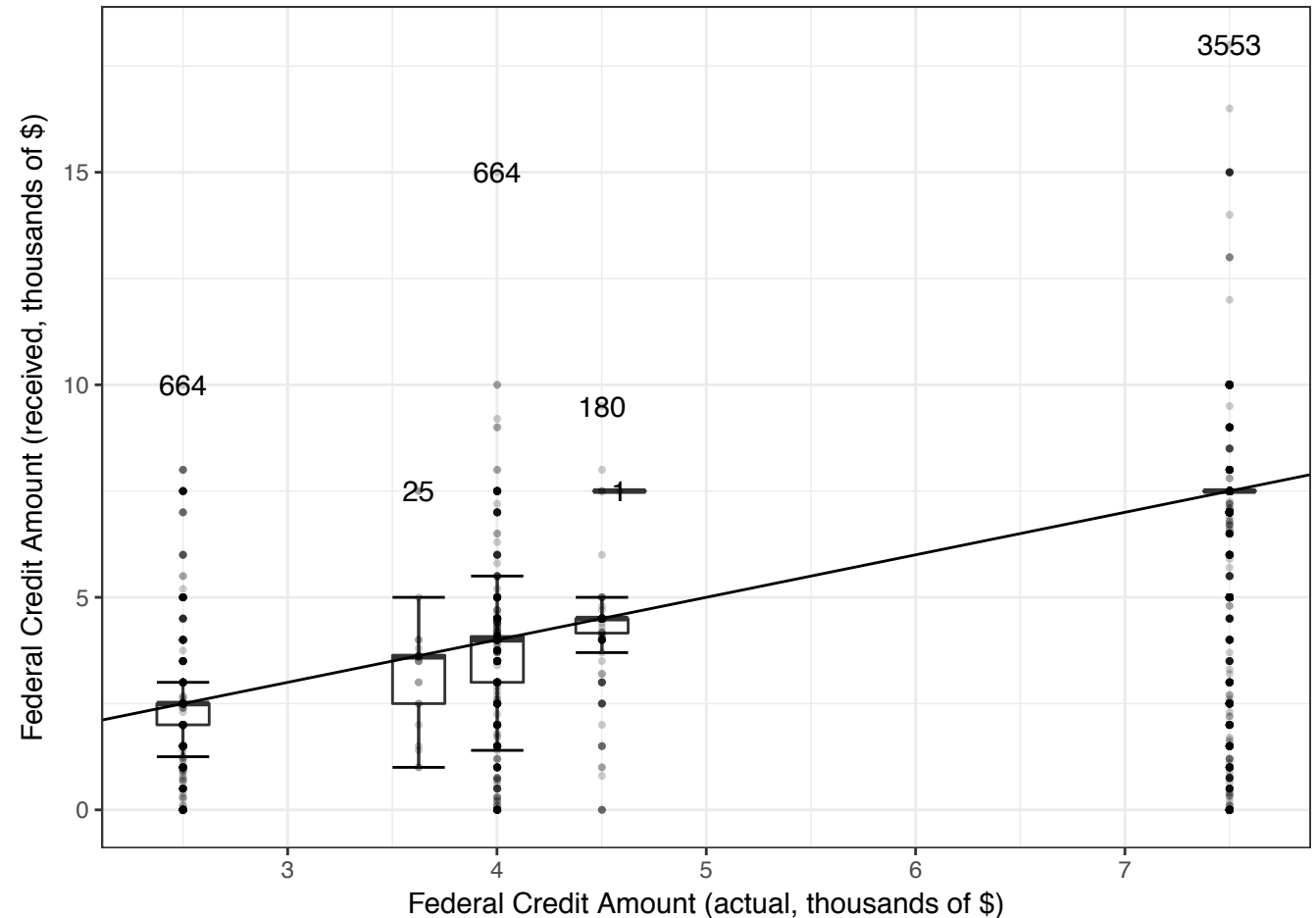
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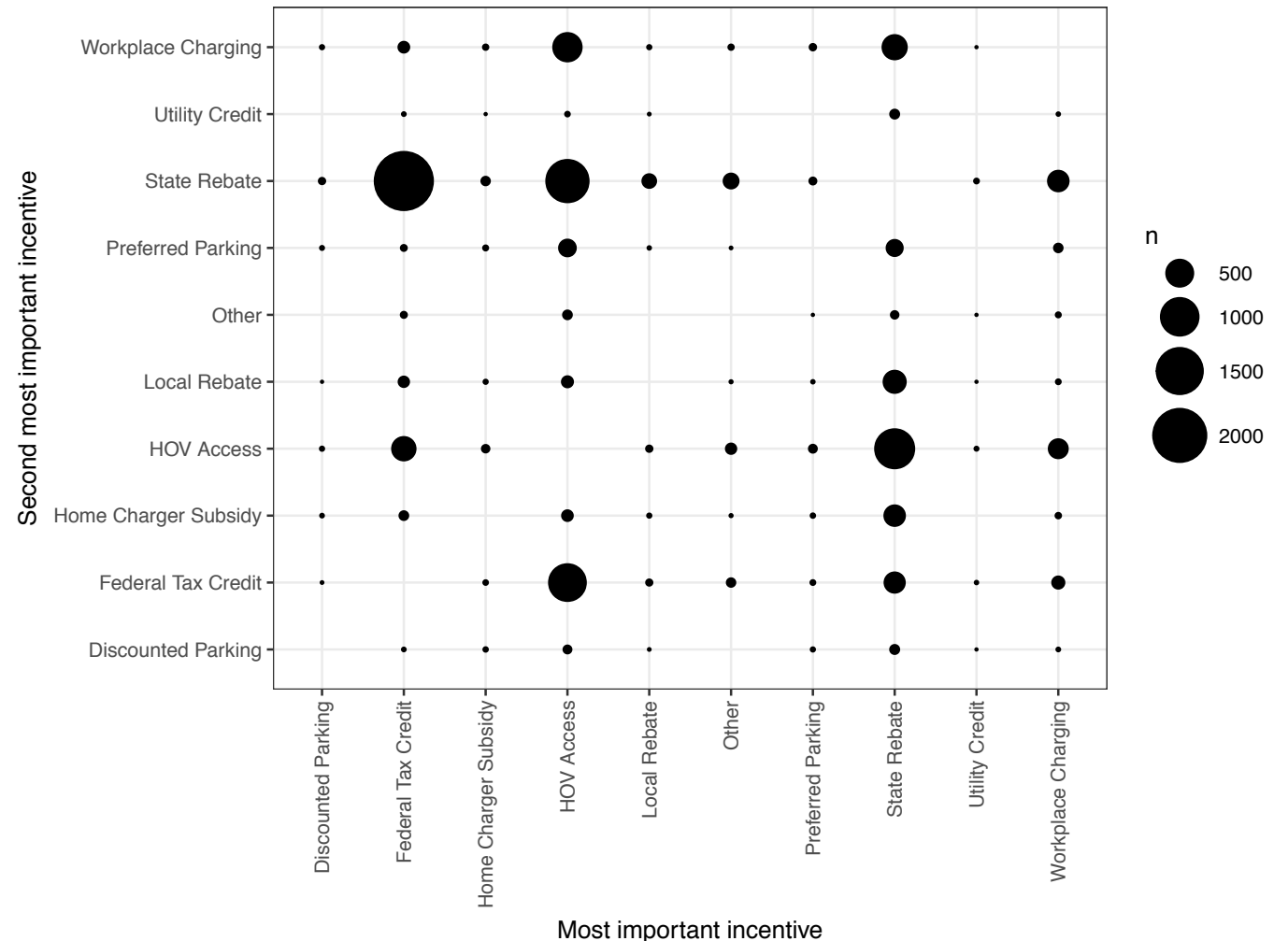
# Claims for federal credits varies widely

- The line indicates what a respondent *should have* received
- The downward bias is likely a result of individuals who are unable to claim the full tax credit
- Incorrect claims (particularly upward biased) may still be processed unless audited by the IRS



# What are the two most importance incentives?

- Respondents rate the importance of a number of incentives to their purchase decision
- The graph depicts respondents' top two incentives
- The federal tax credit, CVRP, and HOV access account for 95.7% of top two incentives

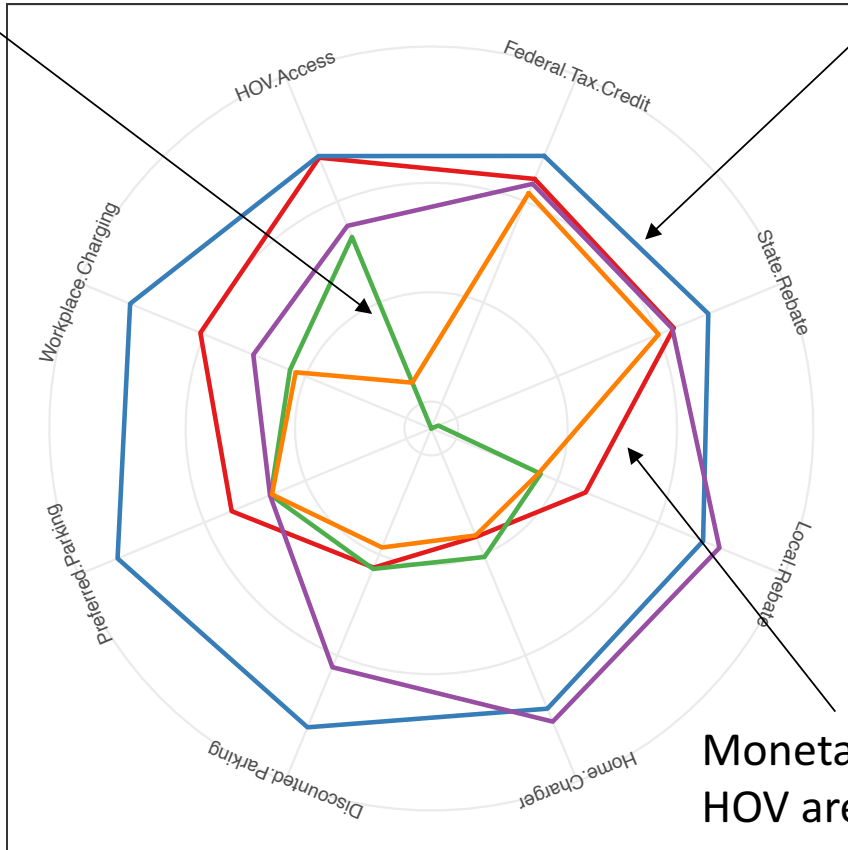




# Distinct clusters of incentive importance

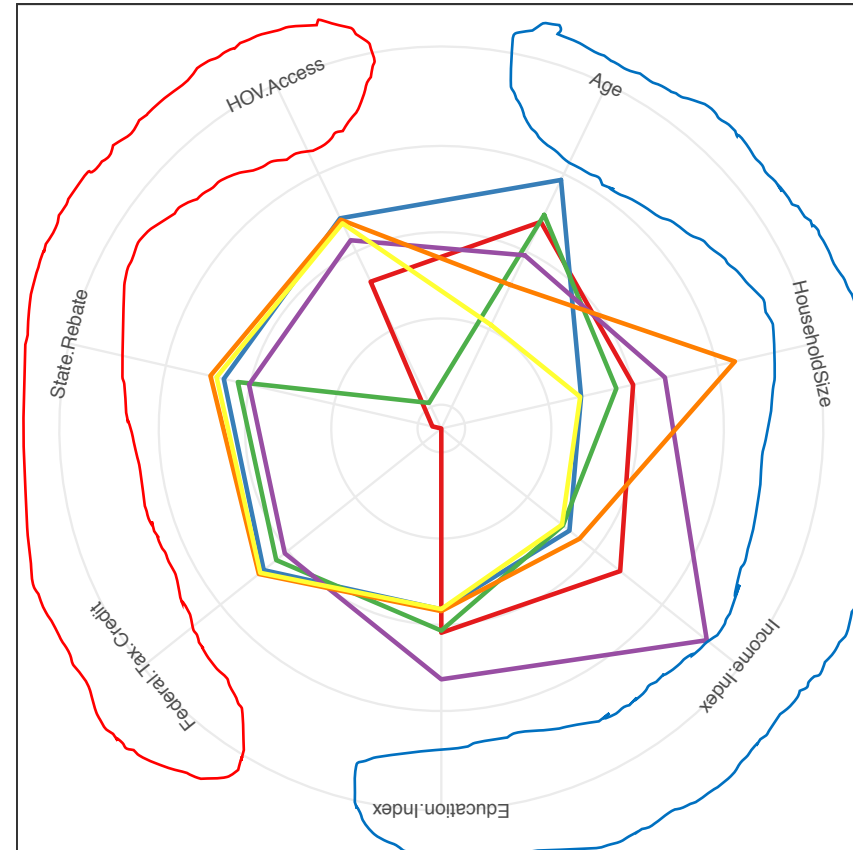
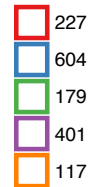
Only HOV are important

All incentives are important

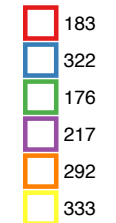


Monetary and HOV are important

Size of Cluster



Size of Cluster



Incentives vs Demographics

# Purchase Intentions

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# Understanding purchase intentions via MNL analysis

Removing an incentive can affect purchase decision in the following ways:

- No change
- Not to buy/lease a vehicle at all
- Instead purchase a conventional vehicle
- Instead purchase a non plug-in hybrid
- Instead purchase another plug-in vehicle
- Other

How do these decisions change across factors of:

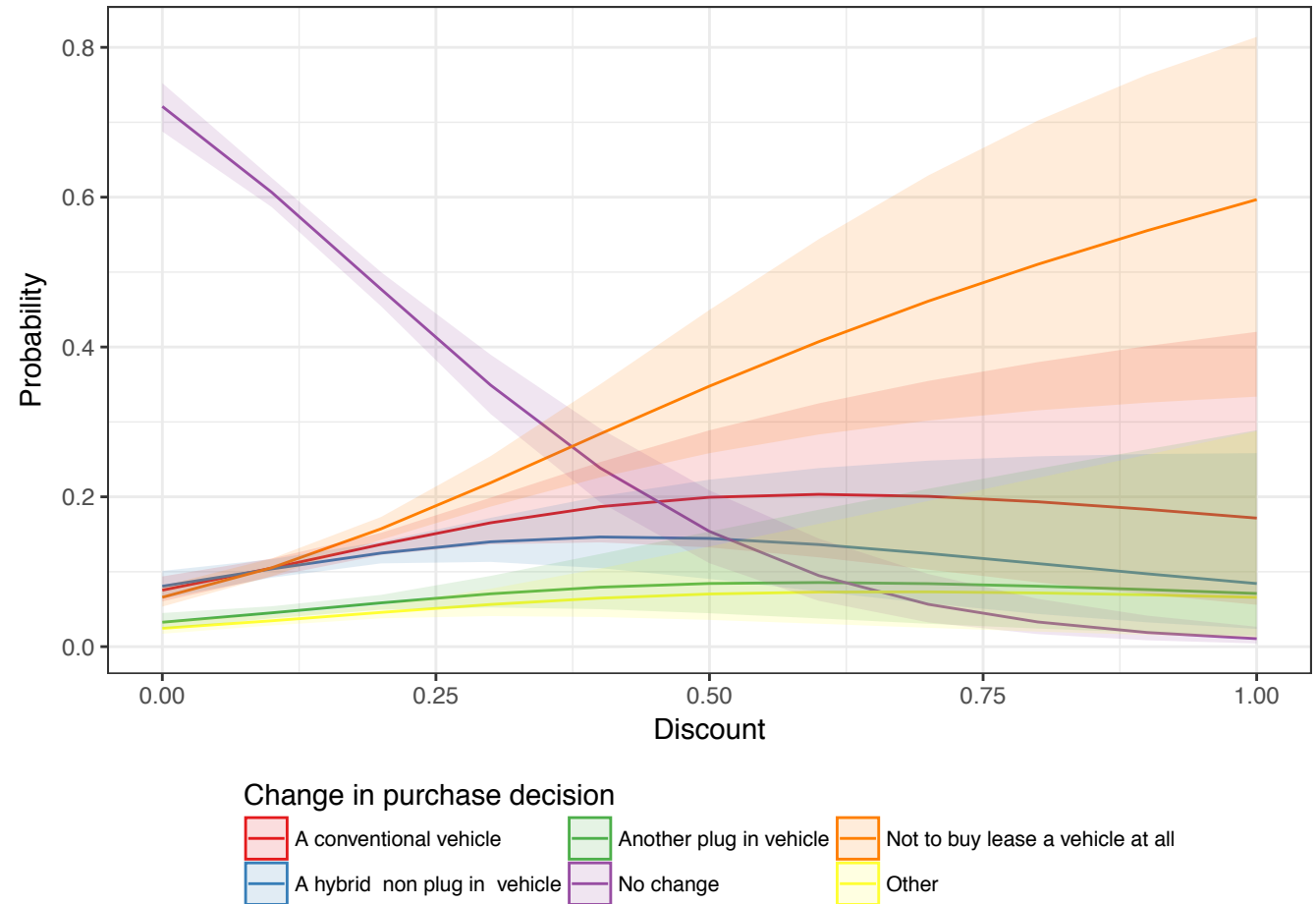
- % discounted from incentive
- Buyer generation
- PEV Type
- Demographics: age, income, education, household size

The following slides display graphical summaries of large scale models that incorporate all of the mentioned factors

# The federal tax credit affects various PEVs differently

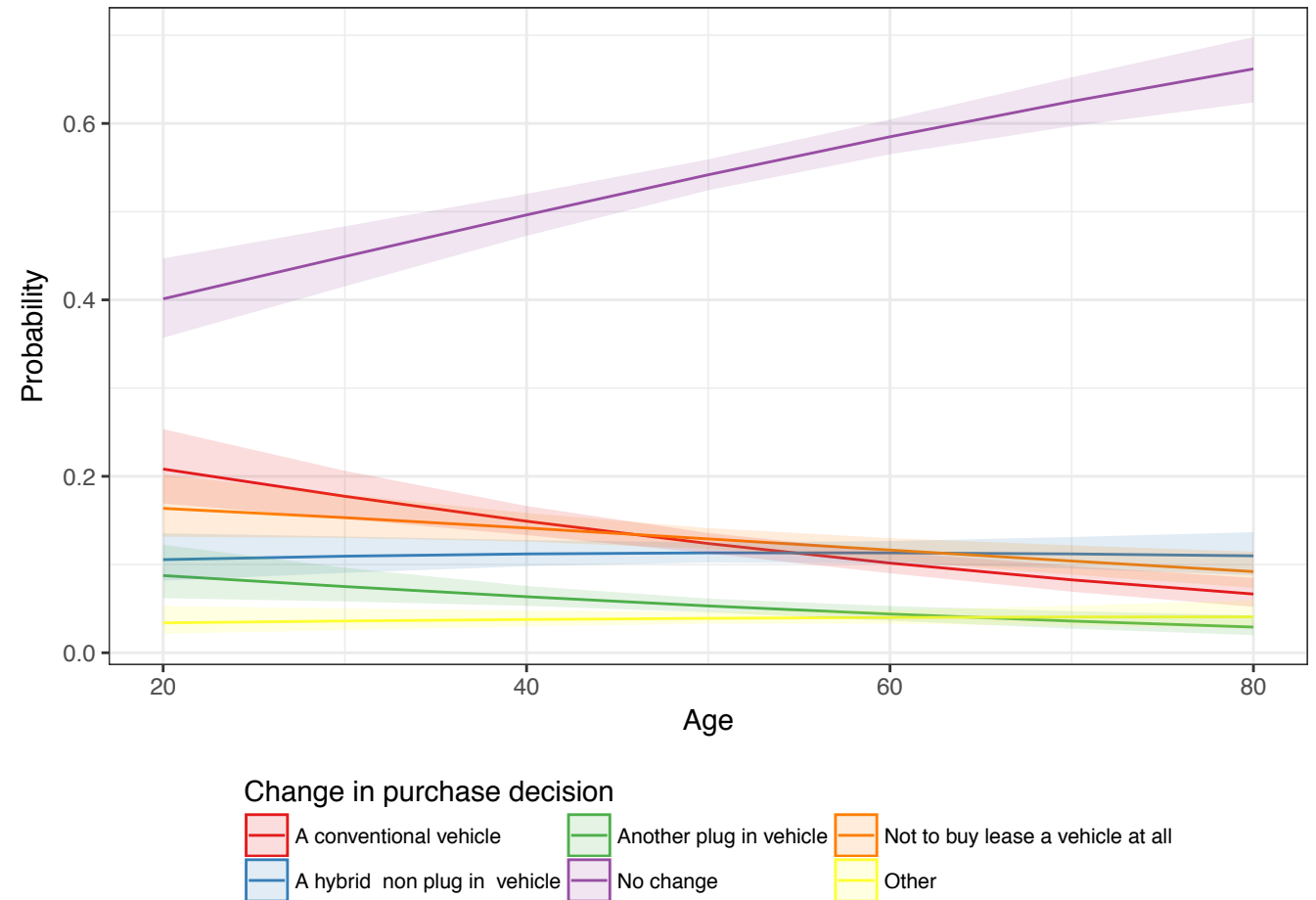
The discount percentage has a very large difference in purchase behavior:

- \$7,500 is only 7% of a Tesla Model S:
  - 65% - “No change”
- \$7,500 is 23% of a Nissan Leaf:
  - 40% - “No change”,
  - 20% - “Won’t buy/lease a car”,
  - 15% - “Buy conventional vehicle”



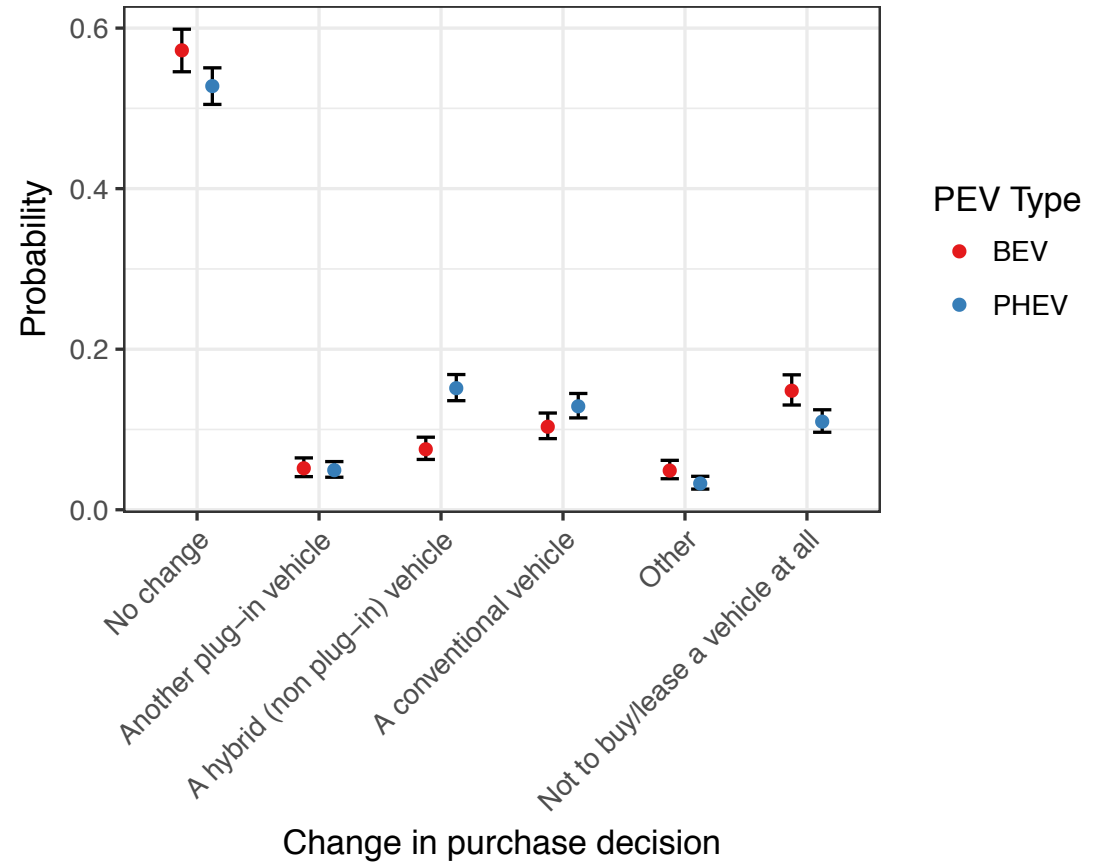
# Age appears to be an important determinant

- Even controlling for income, older respondents are substantially less likely to change their minds without the incentive compared to younger respondents
- Substitution between conventional vehicle and not buying a car switches at older age ranges



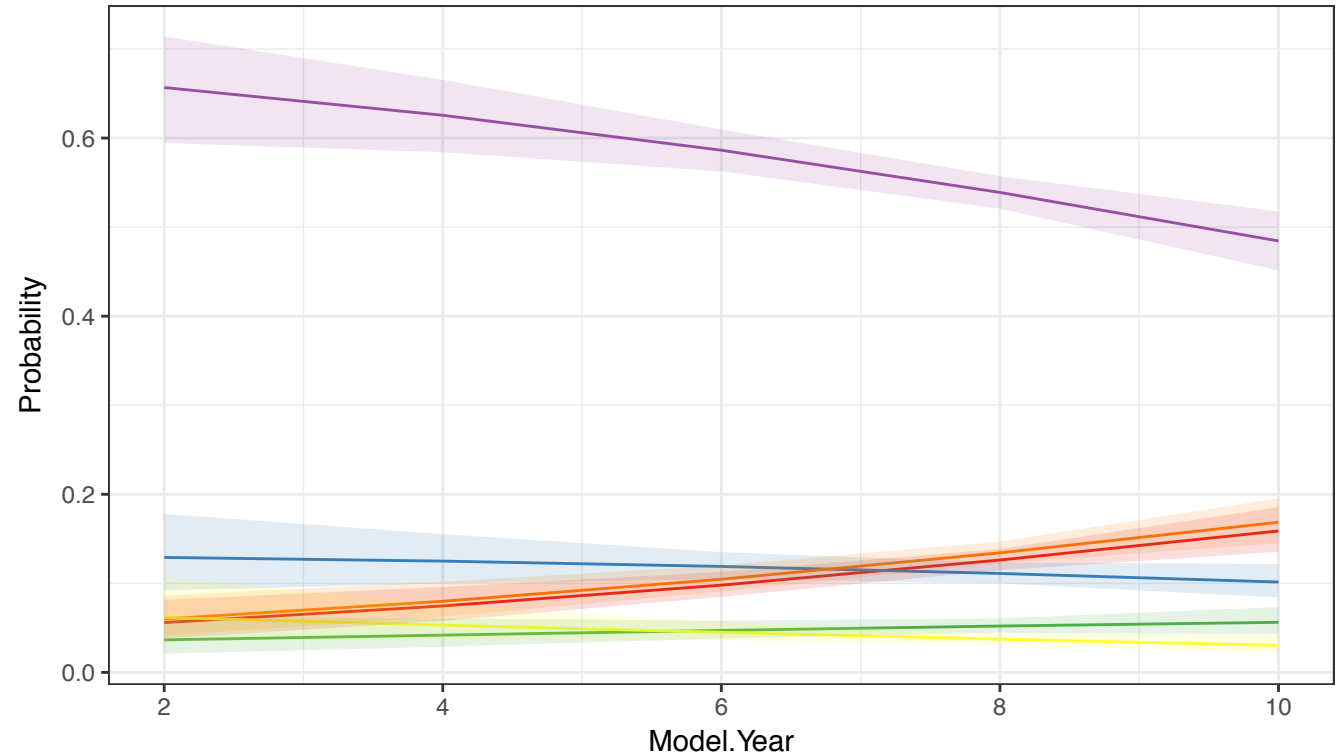
# Slight differences by PEV type

- There are significant differences between PEV decision types when removing the incentive
- PHEVs are more likely to buy a hybrid vehicle and a conventional vehicle
- BEVs are more likely to not buy/lease a vehicle at all



# Incentives are more important for new generation of buyers

- Newer generations of buyers are more likely to change their decision about purchasing a PEV without the federal tax credit
- Respondents are increasingly likely to “buy a conventional vehicle” or “not buy/lease a vehicle at all” as time passes

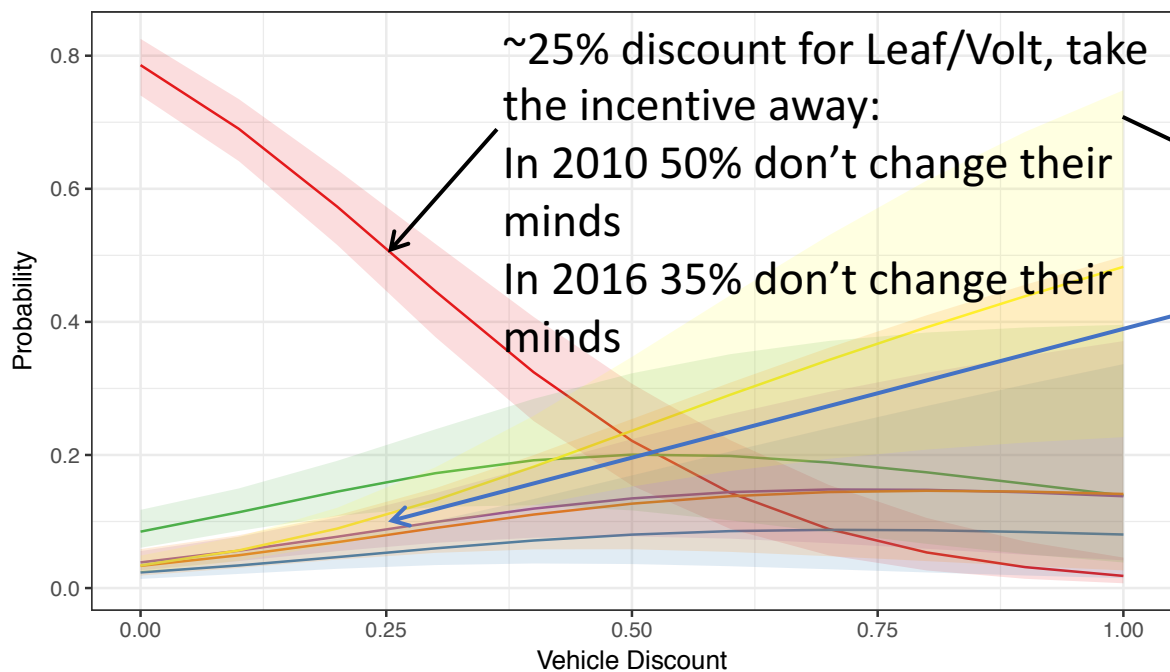


### Change in purchase decision

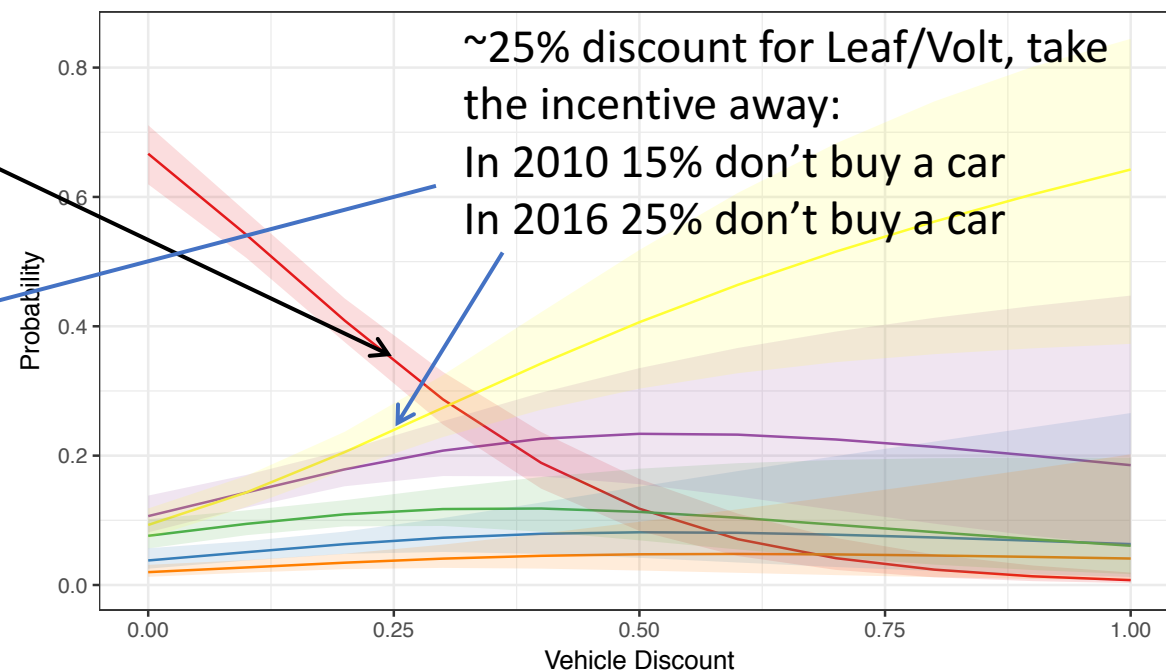
- A conventional vehicle
- A hybrid non plug in vehicle
- Another plug in vehicle
- No change
- Not to buy lease a vehicle at all
- Other

# Incentives are becoming more important over time

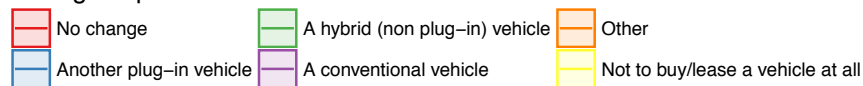
Model Year 2010



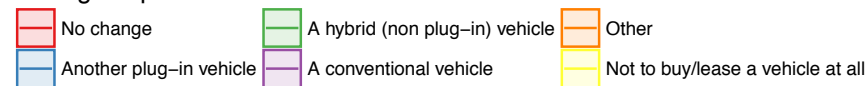
Model Year 2016



Change in purchase decision



Change in purchase decision





# Other findings of interest

- Unsurprisingly, the federal tax credit has substantially greater influence on purchase decisions than the CVRP
- When removing either the federal credit or CVRP:
  - PHEVs are more likely to switch to conventional vehicles or hybrids
  - BEVs are more likely to forego purchasing/leasing a vehicle
- Neither household size or education provide much variation in purchase decision changes

# Discussion and take-aways

- The importance of incentives is growing over time. When can we expect it to change?
  - What is the impact of lower MSRP?
  - Larger PEVs?
  - Lower income household who buy PEVs?
- Do we need to incentivize BEVs more than PHEVs?

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Thank you