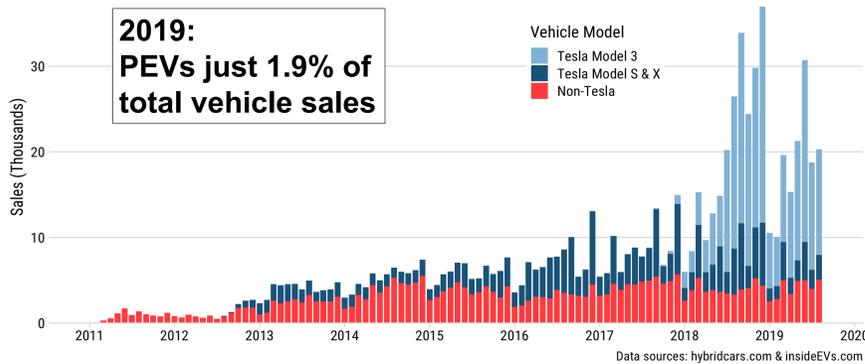


Research Questions

1. How do different types of vehicle buyers value and prioritize different aspects of PEV financial incentives?
2. How can these preferences be used to design incentives that are both more efficient & equitable for encouraging PEV adoption?

Despite environmental promise, plug-in electric vehicle (PEV) adoption remains low

U.S. Monthly Sales of Battery Electric Vehicles



High up-front cost is an established PEV adoption barrier; Government subsidies help bridge gap

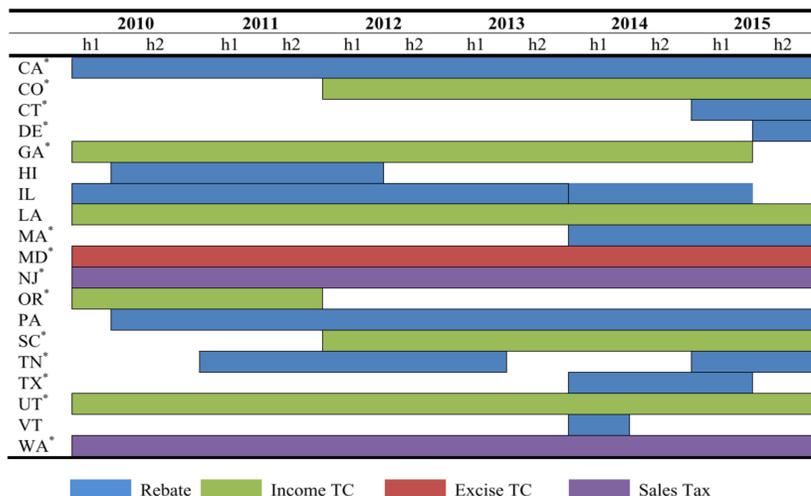
- Willingness to pay for PEVs lower than cost of PEV
- PEV financial incentives drive consumer adoption, including direct positive impact on PEV market share

Federal

Tax credit of \$7,500 [IRS] capped at 200,000 sales per OEM

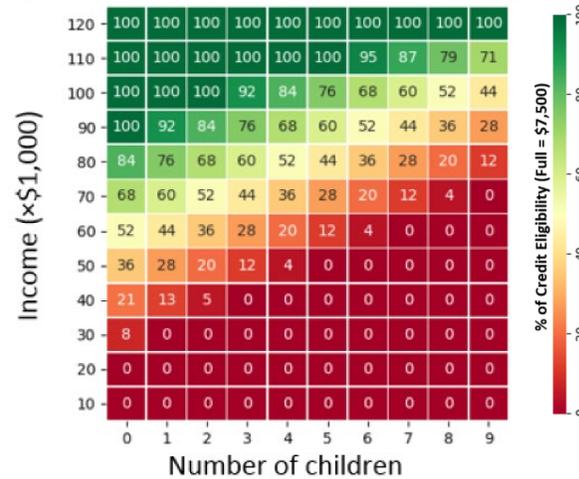
State

Varies; including rebates, income tax credits, excise tax credits, sales tax exemptions & other incentives [1]



Roadblock: Families with children and lower incomes are less eligible to receive full EV tax credit

Income Eligibility for Federal Credit Married Filing Jointly (MJ) [2]



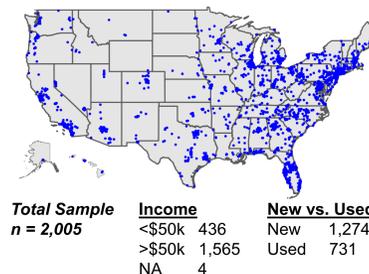
Approach: Conjoint Analysis

- Field choice-based conjoint survey via *Dynata* online survey platform, targeting US respondents in vehicle market (Sept. 2021)
- Estimate logit model and willingness-to-pay for incentive attributes: type, time frame and source & compare differences in preferences among sample demographics

Survey Design

Incentive Attributes and Levels				
Type	Sales Tax Exemption	Tax Credit	Tax Deduction	Rebate
Amount	100%-50% of est. sales tax	\$1,000 - \$8,000 (\$500 increments)		
Time Frame	Time of Sale	Time of Sale; At Tax Filing	At Tax Filing	Time of Sale; 2 weeks after; 6 weeks after
Source	Gov't	Gov't	Gov't	Gov't; Auto Manufacturer; Dealer

Sample



Example Survey Question

Which incentive option would you choose?

Sales Tax Exemption	Tax Credit	Tax Deduction	Rebate from Auto Manufacturer
Amount: \$1,500	Amount: \$6,500	Amount: \$7,500	Amount: \$4,000
Time Frame: Time of Sale	Time Frame: Time of Sale	Time Frame: At Tax Filing (approx. April 2022)	Time Frame: 6 weeks after purchase
			From: Auto Manufacturer

Discrete Choice Model

Random utility model:

$$U_{nj} = \beta' x_{nj} + \varepsilon_{nj}$$

Utility to person n from choosing alternative j

Estimated partworth utility weight

Observed attributes

Unobservables

Multinomial logit: estimate the probability of choosing a given alternative in the choice set and allows for flexible substitution patterns.

$$P_{nj} = \frac{\exp(\beta' x_{nj})}{\sum_{k \in J} \exp(\beta' x_{kj})}$$

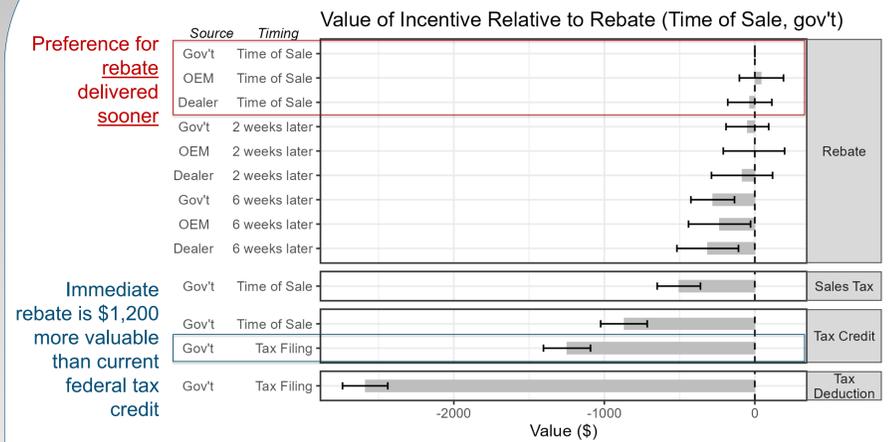
Willingness to Pay: convert model coefficients across amount in order to discern value

$$WTP: \omega_n = \beta_n / \alpha_n$$

Non-price coefs

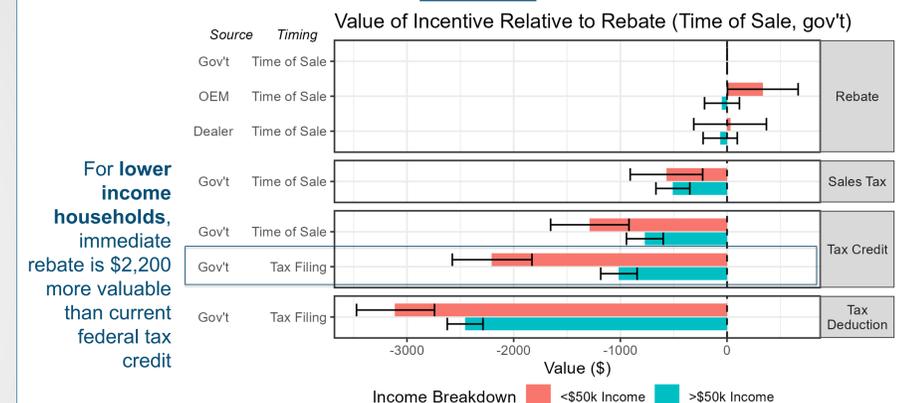
Price coef

Valuation of Incentive Attributes



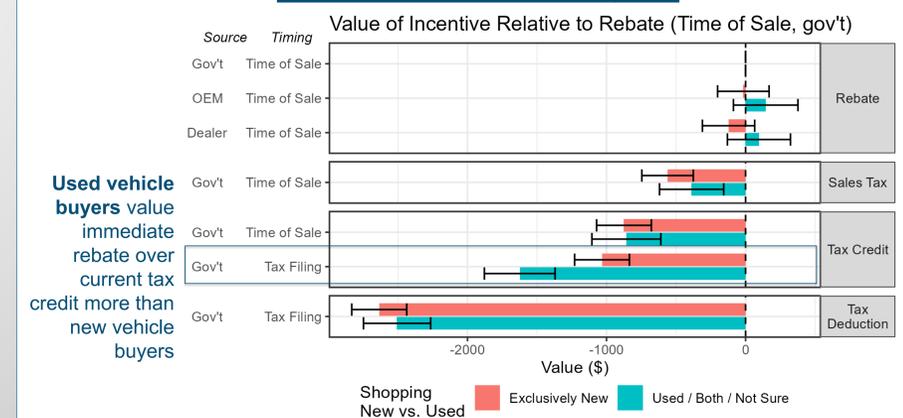
Immediate rebate is \$1,200 more valuable than current federal tax credit

Income



For lower income households, immediate rebate is \$2,200 more valuable than current federal tax credit

New vs. Used Car Buyers



Used vehicle buyers value immediate rebate over current tax credit more than new vehicle buyers

References

1. Wee, S., Coffman, M., & Croix, S. L. (2019). Data on U.S. state-level electric vehicle policies, 2010–2015. Data in Brief, 23. <https://doi.org/10.1016/j.dib.2019.01.006>
2. Liu, H., Guensler, R., & Rodgers, M. (2021). Equity Assessment of Plug-In Electric Vehicle Purchase Incentives With a Focus on Atlanta, Georgia. (E. Center for Transportation Decisions & Dollars (CTEDD). University of Texas, U. of T. at Arlington, & U. States. D. of Transportation. U. T. C. (UTC) Program, Eds.). Retrieved from <https://rosap.nrl.bts.gov/view/dot/54630>

Policy Implications

- Today's federal PEV tax credit does not align with consumer preferences especially lower income & used shoppers
- Consideration for PEV rebates delivered sooner would further incentivize PEVs

Further Work

- Further heterogeneity modeling & simulation
- Additional sampling < \$50k income