Estimating the Impact of the Inflation Reduction Act on Used and New Vehicle Markets: Combining Theory and Fieldwork

Lucas Woodley (Harvard University)

Abstract

I examine a novel component of the Inflation Reduction Act: a $4,000 tax credit for used electric vehicle (EV) purchases. **How effectively does this policy increase EV demand? And, who benefits?** I address these questions using a theoretical model of markets with linked supply and demand and survey data on hypothetical vehicle purchasing decisions.

I find the used EV tax credit's **benefits accrue exclusively within new vehicle markets**. I also leverage demographic-based variation in demand elasticities and driving behaviors to assess how public policy can offer more efficient emissions reductions per dollar spent.

Introduction

- Driving an EV produces fewer emissions than a gasoline-powered vehicle, but EVs are more polluting to manufacture.
  - All else being equal, more vehicles miles travelled (VMT) = larger EV emissions benefits.
  - New findings suggest EVs' emissions benefits may require utilization as a used vehicle (1).
- Historically, the US has offered up to $7,500 in tax credits for new EV purchases.
- IRA offers a $4,000 tax credit for used EV purchases, which is novel among EV incentives.

How do used vehicle incentives affect vehicle markets?

Theory

Short Run

Key assumption: Used vehicle supply is fixed (perfectly inelastic) at a level determined by *past* new vehicle sales.

- Used EV subsidies cannot increase sales, must increase price;
- Price increases by subsidy's amount (i.e., $4,000) to equilibrate;

Thus, **used EV subsidies** do not affect used vehicle purchasers' realized price. Instead, **benefits exclusively go to new EV owners** who sell to the used market.

Long Run

Key assumption: Since EV sales are very small relative to the overall vehicle market, new gasoline vehicle prices are unaffected by changing EV prices (exogenous).

- Used EV subsidies increase new EVs' resale value;
- Benefit of a used EV subsidy to potential new EV purchasers is the subsidy's time-discounted value;

Based on existing discount rates (2), a **$4,000 used EV subsidy is equivalent to a $3,160 subsidy for new EV owners**.

Empirical Methods

The environmental impact of an EV subsidy depends demand elasticity and VMT, which both vary along demographic factors (3, 4). Precise estimates for VMT exist (3), but not for elasticities.

- Discrete choice survey with 4,068 hypothetical vehicle purchasing decisions (N = 226) via Prolific;
- Participants are US adults currently in the market for a vehicle.
- Choice between vehicle powertrain / tax credit incentive pairings, or "None of the above"

	Vehicle Type	Vehicle MSRP	Tax Credit Amount
Vehicle A	Internal Combustion Engine (Gasoline)	$31,000	$1,000
Vehicle B	Battery Electric	$31,000	$5,500
None of the above	–	$0	$0

- Own- and cross-price elasticity are estimated via mixed logit models.
- EVs' emissions benefits as a function of VMT are estimated via GREET.

How can public policy target EV incentives to maximize emissions reductions per dollar spent?

Four policy targeting methods are explored, leveraging information on demographic factors:

1. **No Targeting**: All US adults are eligible;
2. **Simple Targeting**: Households targeted based on income, existing vehicle count, and intended powertrain type (based on previous vehicle);
3. **Advanced Targeting**: All previous demographics, plus sex, age, and household size;
4. **Perfect Targeting**: All previous demographics, plus unobservable characteristics including one's internal beliefs (e.g., "EVs will be important to the future of transportation").

References

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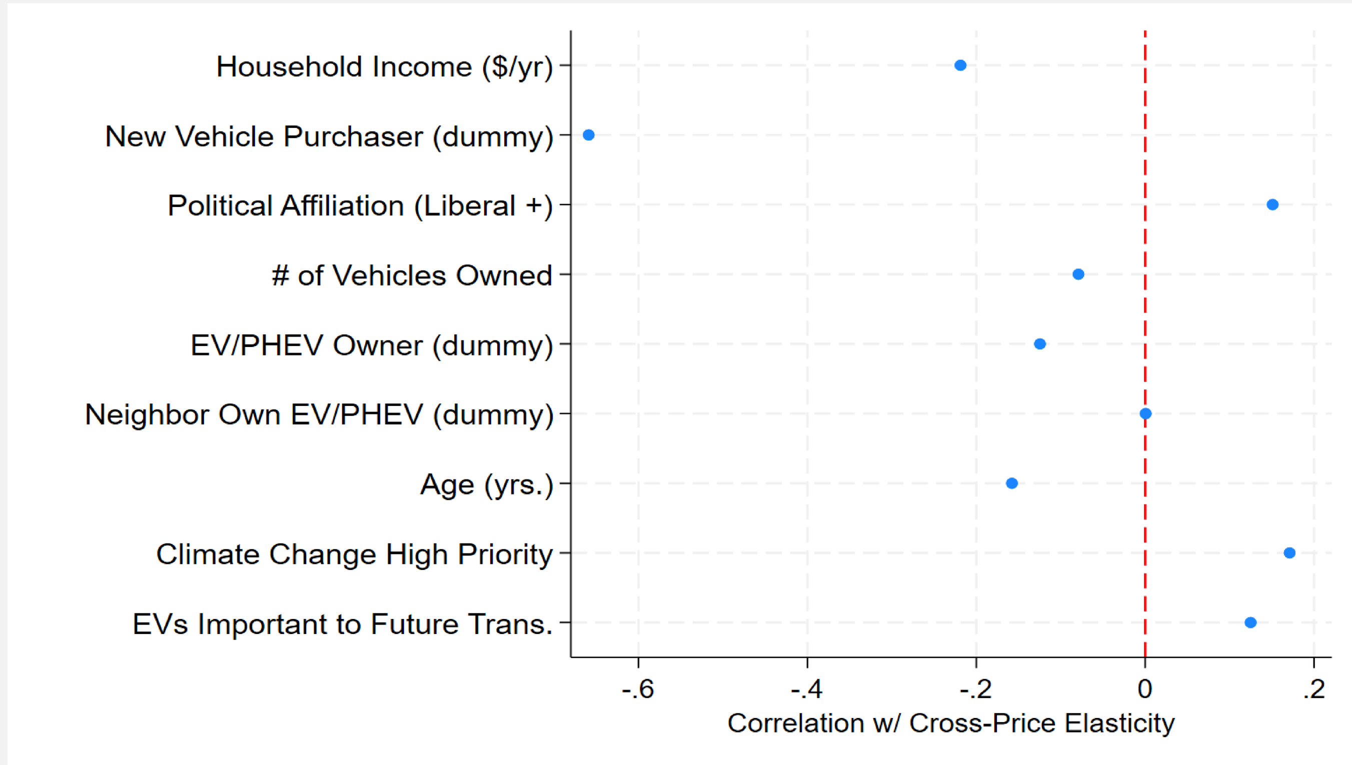
Presenter: Lucas Woodley, lucaswoodley@g.harvard.edu
Advised by James H. Stock & Martin Koenen
(Department of Economics, Harvard University)

Empirical Results & Discussion

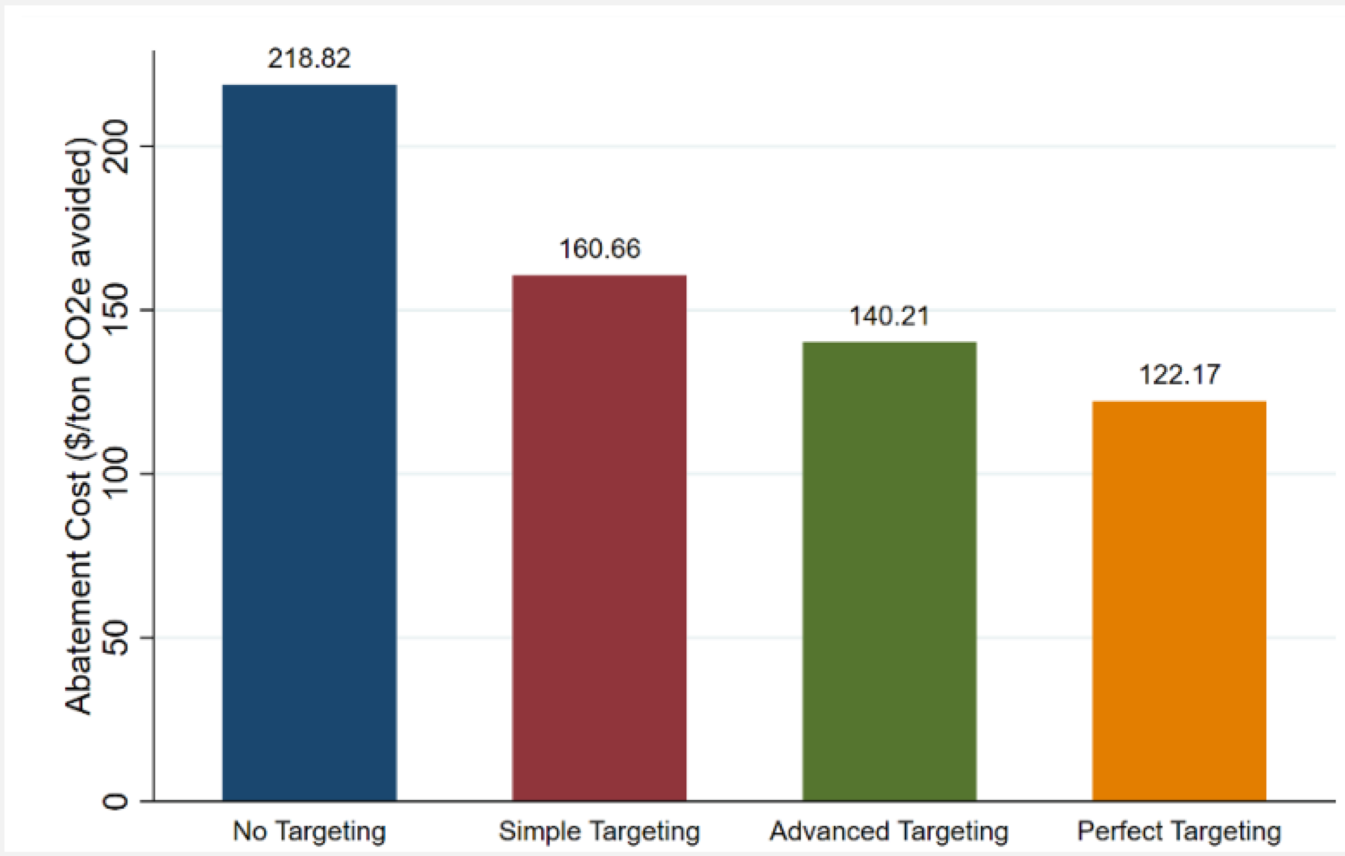
Demand Elasticity

- Average own-price demand elasticity for new EV purchasers = 0.414
- Average cross-price demand elasticity for new ICEV purchasers = 0.430
- Significant elasticity variation by demographic variables



Reducing Emissions Costs via Targeting

- Targeting policy by demographics can reduce abatement costs ($/ton CO2e avoided) from $218 to $122, at the cost of reduced total emissions benefits



- **Partial demographic-based targeting** can preserve total emissions benefits while reducing policy costs by up to 22.2%, generating over **$293 million in savings**.