Effects of Life Cycle Cost Information Disclosure on the Purchase Decision of Hybrid and Plug-In Vehicles

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Summary of Presentation

Higher initial purchase price but lower operating cost for plug-in electric vehicles compared to gasoline vehicles

- Do consumers process information with respect to five-year fuel cost savings?
- Do consumers process information with respect to total monthly cost of ownership?

Results

- Consumers do not respond to five-year fuel cost savings.
- Consumers' preference ranking of vehicles change if total cost of ownership information is available.

Introduction

Promotion of alternative fuel vehicles due to concerns about

- Energy security
- Greenhouse gas emissions

State and federal policies to increase adoption

- Federal income tax credit of up to $7,500
- Corporate Average Fuel Economy (CAFE) standards
- Non-monetary policies, e.g., access to HOV lanes, discount on registration fees, etc.

Obstacles to the widespread adoption of alternative fuel vehicles:

- Limited range
- Long charging time
- High purchase price

Research Motivation

Issue of "energy-efficiency paradox/gap"

- Consumers' refusal to buy net-cost saving appliances due to high initial cost

Difference in operating cost between gasoline vehicle and alternative fuel vehicle

- Electricity is relatively cheaper than gasoline.
- Surveys indicate that the vast majority of respondents believe that fuel economy is an important vehicle attribute.

Possibilities to address the "energy-efficiency paradox/gap"

- Raise consumers' awareness of the cost savings by calculating the cost savings

Research Questions

Recent label re-design by the U.S. Environmental Protection Agency (EPA) to include five-year fuel cost savings compared to the average new car.

- Do consumers process the information of fuel cost savings over five years?

Total cost of ownership, i.e., initial purchase price and operating cost over vehicle lifetime

- Does information about total cost of ownership change the consumers' ranking of four alternative fuel vehicles?

Method

Focus on four fuel types and two car sizes:

- Gasoline (GAS), hybrid (HYB), plug-in hybrid (PHV), and battery electric vehicle (BEV)
- Mid-sized car and small SUV

Total cost of ownership for generic vehicles:

- Incremental cost including purchase price, fuel expenditure, insurance, maintenance, financing, depreciation, and tax credit
- For plug-in hybrid and battery electric vehicle: PHEV40 and BEV100

Survey Design

Online panel in 32 large U.S. metropolitan areas

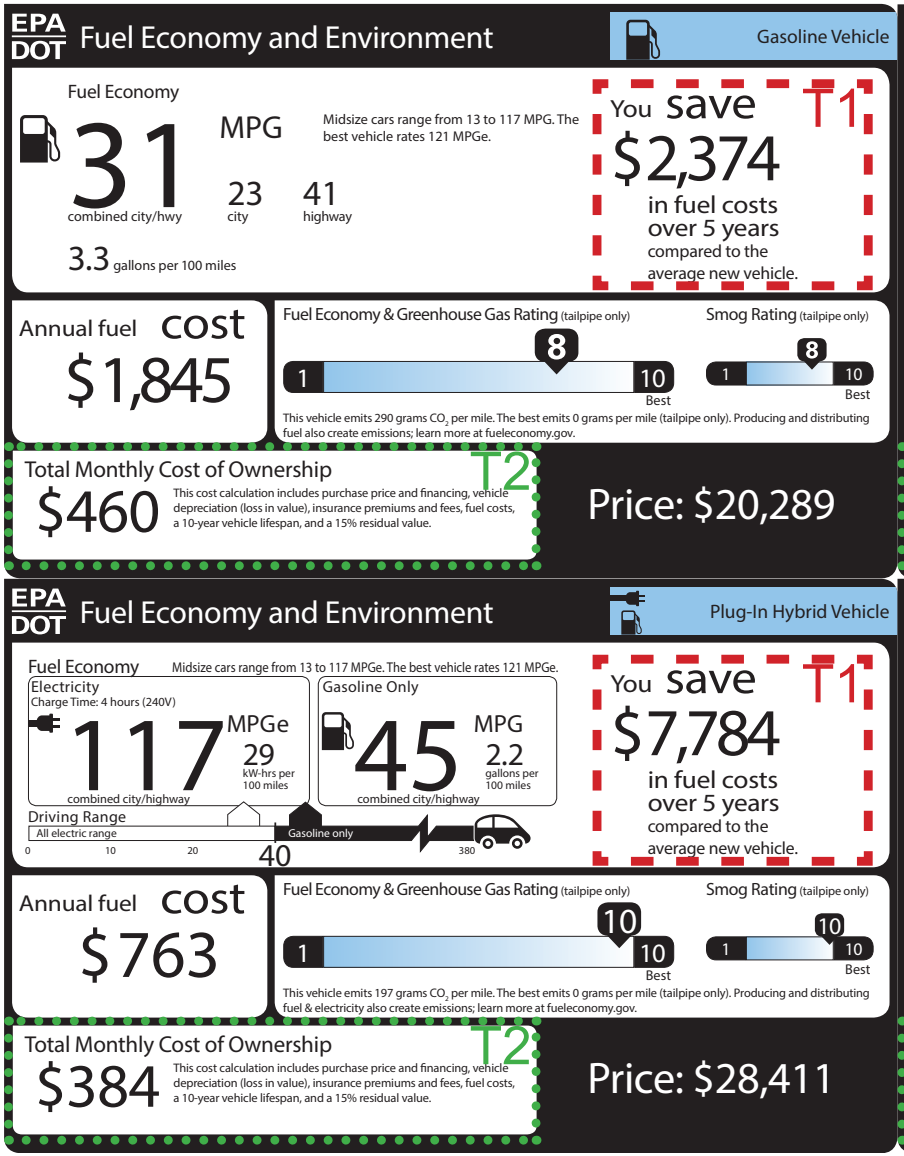
- Self-selection into mid-sized car and small SUV category
- Identical information to all respondents except for the modified EPA labels

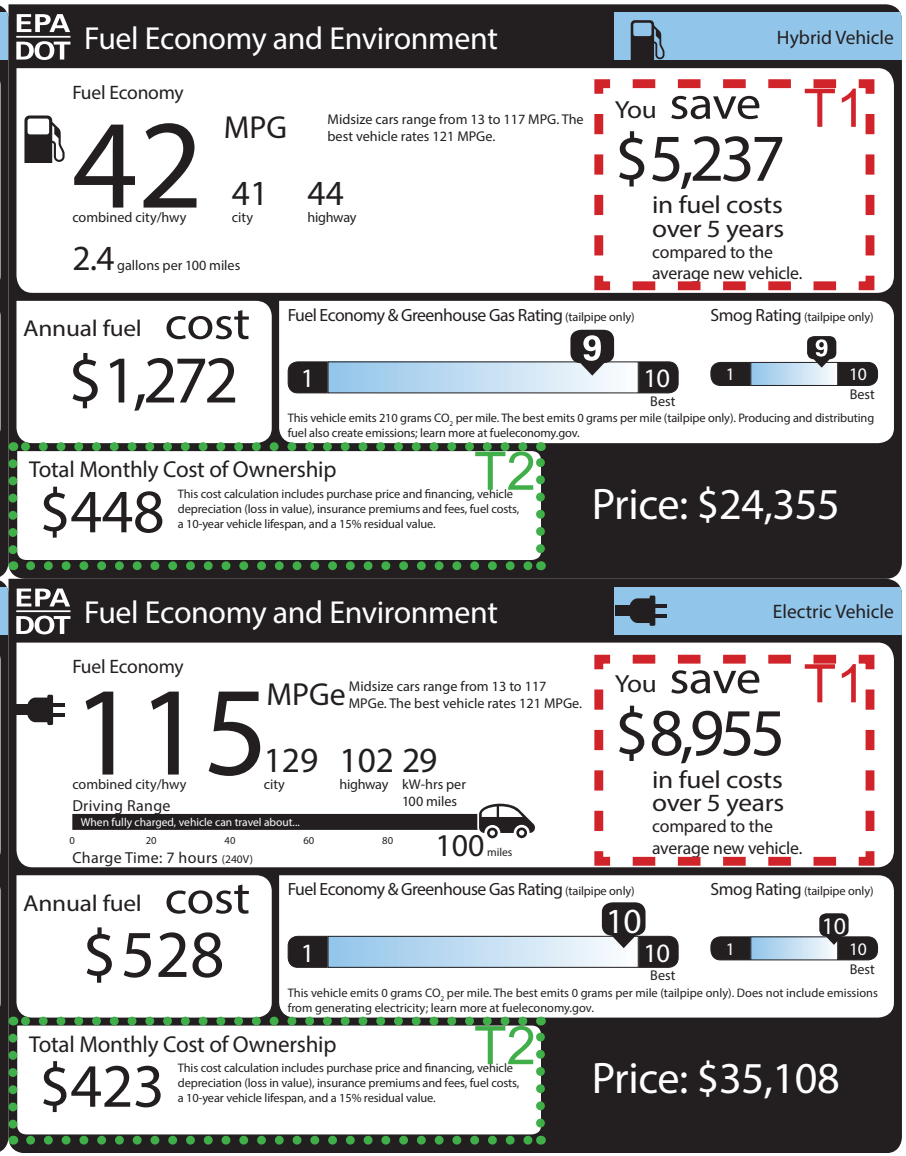
Random selection of respondents in one of three groups

- Control: "No information"
- Treatment 1: Control group information plus "You save X in fuel expenditures over 5 years compared to the average new vehicle."
- Treatment 2: Treatment group 1 information plus "Total Monthly Cost of Ownership"

Rank ordering of the four vehicles types (gasoline, hybrid, plug-in hybrid, and battery electric) in terms of preference

EPA Labels and Treatment Groups





Data and Respondents Characteristics

	Control		Treatment 1		Treatment 2	
	CAR	SUV	CAR	SUV	CAR	SUV
Observations	498	409	507	433	494	418
	Respondents Characteristics					
Age	40.22	43.41	40.69	43.29	41.87	42.71
Level 2	25.46%	30.62%	30.40%	25.64%	30.60%	29.88%
Number of cars	1.86	2.01	1.80	1.96	1.85	1.91
Gender	63.77%	65.84%	57.82%	63.21%	59.22%	64.71%
Education	46.79%	52.70%	47.14%	50.35%	49.19%	52.87%
Income ($> \$100k$)	22.42%	26.04%	20.00%	28.47%	22.92%	25.90%
	Previous vehicle ownership					
Gasoline	93.17%	97.31%	94.67%	96.07%	94.13%	95.22%
Hybrid	5.42%	7.33%	8.88%	3.70%	7.09%	5.02%
Plug-in Hybrid	0.60%	0.98%	1.58%	1.39%	1.42%	0.96%
Battery Electric	1.20%	0.73%	0.59%	0.46%	1.21%	0.48%

Results

Variable	Type	CAR	SUV	CAR	SUV
Own		+++	o	+++	++
Age	BEV	- - -	- - -	- - -	- - -
	HYB	-	o	-	o
	PHV	- - -	- - -	- - -	—
Level 2	BEV	+++	+++	+++	+++
	HYB	++	+++	o	++
	PHV	+++	+++	+++	+++
# of cars	BEV	o	o	o	o
	HYB	o	o	o	o
	PHV	-	o	o	o
Education	BEV	o	o	o	-
	HYB	+	o	o	o
	PHV	o	o	o	o
Income	BEV	o	++	o	o
	HYB	o	o	o	-
	PHV	o	o	- -	o
Group	BEV	o	o	++	o
	HYB	o	o	+	o
	PHV	o	o	+++	o

Discussion

Research question 1: Five-year fuel cost savings

- Not statistically significant for any vehicle or group
- Difficulty comparing the vehicle of interest to the "average car".
- Inconsistent with European study analyzing the impact of five-year fuel cost savings.

Research question 2: Total monthly cost of ownership

- Statistical significance for the mid-sized car but not the small SUV
- Consistent with previous studies finding that "the purchase likelihood of products with higher initial and lower operating costs increases when life cycle cost comparisons are provided." (Kaenzig and Wüstenhagen, 2009)

Policy Implications and Conclusion

Policy implications

- Possibility to compare five-year fuel cost savings to the car in the same size category because EPA already categorizes cars into different classes.
- Total cost of owner as part of the label but potential difficulty to consent on the assumptions and parameters.

Conclusion

- Possibility to cost-effectively promote plug-in electric vehicles by the type of information provided.