Targeting Incentives Cost Effectively: "*Rebate Essential*" Consumers in the New York State Electric Vehicle Rebate Program

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EVS35 OSL2022

NEW YORK STATE

Center for Sustainable Energy™

State EV Rebate Programs Administered by CSE (as of 7/6/2021)

	CALIFORNIA CLEAN VEHICLE REBATE PROJECT	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE	OREGON CLEAN VEHICLE REBATE PROGRAM	chargeup New Jersey
Fuel-Cell EVs	$4,500 (+2,500*)	$2,500	$7,500 (+$2,000*)	≥ 200 e-miles†: $2,000 ≥ 40 e-miles: $1,000 < 40 e-miles: $500 Base MSRP > $42k: $500	≥ 10 kWh: $2,500 (+$2,500*) < 10 kWh: $1,500 (+$2,500*)	--
All-Battery EVs	$2,000 (+2,500*)	$2,500	$2,250 (+$2,000*)			$25/e-mile†: $2,000 max for MSRP < $55k; $5,000 max for MSRP < $45k
Plug-in Hybrid EVs	BEVx = $2,000 Others = $1,000 (+$2,500*)	BEVx = $2,500 Others = $1,500	$750 (+$1,500*)			
Zero-Emission Motorcycles	$750	--	--	--	$750 (and NEVs)	--
Program Design Elements	* Rebate adder: income-qualified	--	* Rebate adder: qualified by proxy	--	* Rebate adder: income-qualified	--
	--	--	Point-of-sale option	Point-of-sale	Point-of-sale option	Point-of-sale
	Base MSRP: - PEVs ≤ $60k	Purchase price ≤ $50k	Base MSRP: - FCEVs ≤ $60k - PEVs ≤ $42k	Base MSRP > $42k = $500	Base MSRP < $50k	Trim-specific MSRP < $55k
	≥ 30 e-miles†	≥ 25 e-miles†	--	--	--	--
	Income cap	--	• Used EV program ($7.5k/$3k/$1.125k) • $125/$75 dealer sales incentive	--	Used EVs also qualify	--

† Electric miles (e-miles) are U.S.-EPA-rated all-electric miles. BEVx = range-extended battery electric vehicle (BMW i3 REx). NEV = Neighborhood EV.

Outline: Targeting Incentives Cost Effectively

I. Introduction

II. Data and Representativeness

III. Methodology

IV. Results and Discussion

– Descriptive, Logistic, Dominance, Exploration, Profiles

V. Summary, Conclusions & Recommendations

Appendices & Additional Resources

Introduction

Increase Program Cost-Effectiveness

Purpose:

- Target supportive public resources **away from free-riders** and **toward highly-influenced, "true additions**" to the EV market

Objective:

- **Understand** and **amplify** program **participation by *"Rebate Essential"*† consumers**, or those who would not have acquired their vehicle without the state rebate.

Approach:

- **Identify** and **prioritize characteristics** associated with *Rebate Essentiality* **to inform** targeted **messaging, outreach, incentive design,** and other programmatic support of EV adoption.

† C. Johnson, B.D. Williams, Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California's Electric Vehicle Rebate, *Transp. Res. Rec.* 2628 (2017) 23–31. B.D. Williams, J.B. Anderson, Strategically Targeting Plug-in Electric Vehicle Rebates and Outreach Using Characteristics of 'Rebate-Essential" Consumers in 2016–2017, in: 31st Int. Electr. Veh. Symp., Society of Automotive Engineers of Japan, Inc., Kobe, Japan, 2018.

Previous Work

Previous Analysis of EV Adopter Subgroups

Previous analysis of EV adopter subgroups: Summary

- Dua et al. identified several EV clusters:
  - "Typical BEV buyer is a tech savvy, green enthusiast, who leases a BEV as a second vehicle"
  - An important target group is "demanding" car buyer, who value:
    - fuel economy
    - environmental benefits
    - technically innovative, stylish, high-performance cars
- Jenn et al. identified consumer groups in California:
  - High value on purchase incentives: younger, lower-income, purchased something other than a Tesla vehicle.
  - Slight value on *various* incentives: younger, male, fewer vehicles
  - No value on incentives: older, higher-income, likely to choose a Tesla

Dua, R., & White, K. (April, 2020). Understanding latent demand for hybrid and plug-in electric vehicles using large-scale longitudinal survey data of US new vehicle buyers. Energy Efficiency, 13(6), 1063-1074. https://doi.org/10.1007/s12053-020-09865-5

A. Jenn, J. H. Lee, S. Hardman, and G. Tal, "An in-depth examination of electric vehicle incentives: Consumer heterogeneity and changing response over time," Transportation Research Part A: Policy and Practice, vol. 132, pp. 97–109, Feb. 2020, doi: 10.1016/j.tra.2019.11.004.

Previous analysis of EV adopter subgroups in New York: Summary

- Araújo et al. found EV hotspots “in a mix of community types”
  - Around New York City: Westchester, Ulster, Suffolk, Nassau, and New York counties
  - Clinton, Rockland, Putnam, Tempest, Onondaga, and Albany counties.
- Despite the concentration of adoption around New York City, EV ownership levels were “negatively associated with population density, but positively associated with median income, education, and home values.”
- Rames et al. found urban residents in high-density, high-income, high-education “core urban” communities own the largest share of EVs, with suburban residents making up the second-largest group.

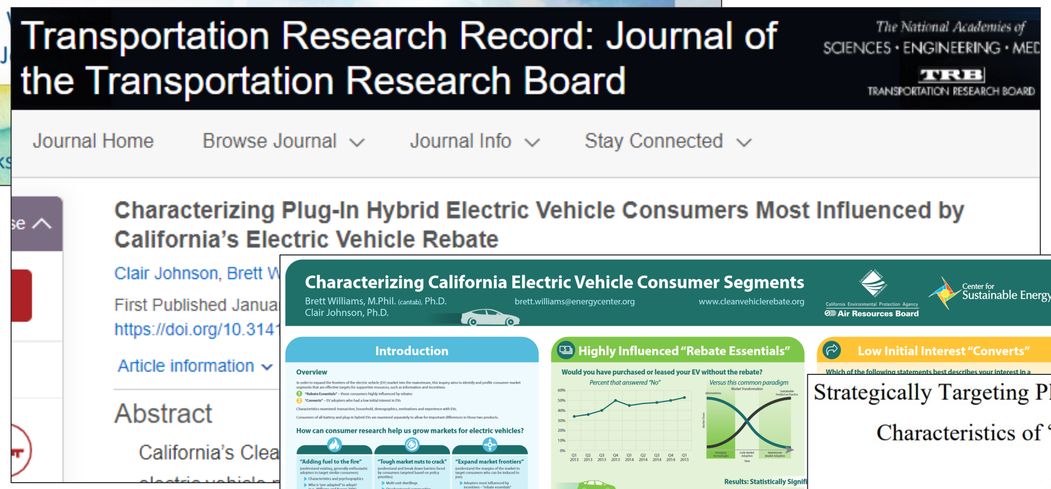
K. Araújo, J. L. Boucher, and O. Aphale, “A clean energy assessment of early adopters in electric vehicle and solar photovoltaic technology: Geospatial, political and socio-demographic trends in New York,” Journal of Cleaner Production, vol. 216, pp. 99–116, Apr. 2019, doi: 10.1016/j.jclepro.2018.12.208.

C. Rames, A. M. Wilson, D. Zimny-Schmitt, C. Neri, J. Sperling, and P. Romero-Lankao, “A data-driven mobility–energy typology framework for New York State,” Environment and Planning B: Urban Analytics and City Science, p. 239980832097403, Nov. 2020, doi: 10.1177/2399808320974032.

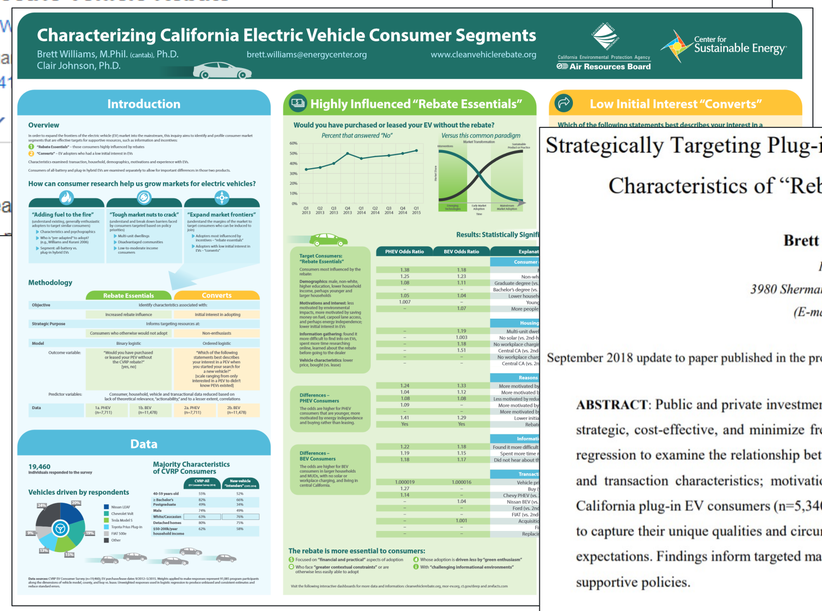
Previous CSE Analysis of Incentive Influence

Previous Work on *Rebate Essentials*: Summary

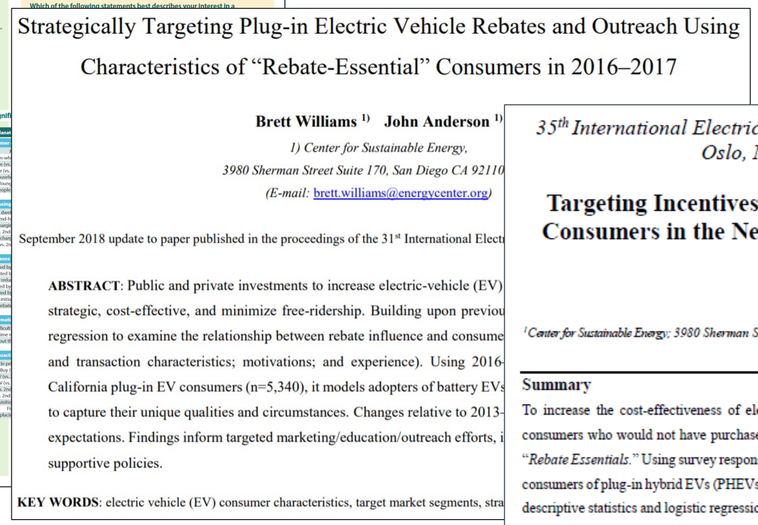
BECC Conference presentation (Williams & Johnson 2016)



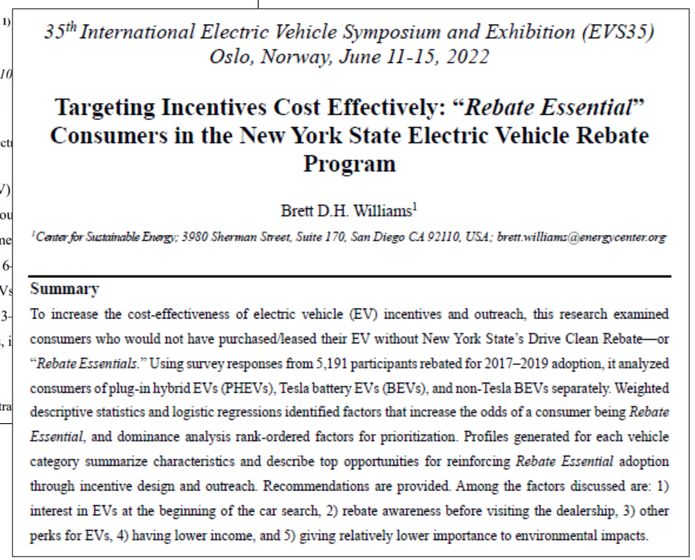
TRR journal article (Johnson and Williams 2017)



National Academies TRB poster (Williams and Johnson 2017)



EVS 31 paper (Williams & Anderson 2018)



EVS 35 paper
(Williams 2022)

Incentive Influence: Select Publications with Related Content

(reverse chronological, as of 5/2022)

- B.D.H. Williams, J.B. Anderson (2022, Jun.), Lessons Learned About Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase, for procs. 35th International Electric Vehicle Symposium and Exhibition (EVS35), AVERE.
- B.D.H. Williams (2022, Jun.), Targeting Incentives Cost Effectively: "Rebate Essential" Consumers in the New York State Electric Vehicle Rebate Program, for procs. 35th International Electric Vehicle Symposium and Exhibition (EVS35), AVERE.
- N. Pallonetti and B.D.H. Williams (2022, Jan.), Evaluating the Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with Statewide Electric Vehicle Rebate Programs in California and Massachusetts in 2019, for *International Energy Program Evaluation Conference 2022*.
- Williams, B. D. H. (2022, Jan.), Brief: PHEV Consumers Most Highly Influenced by the U.S. Federal Tax Credit. Clean Vehicle Rebate Project.
- B. D. H. Williams and J. B. Anderson (2021, Mar.), Strategically Targeting Plug-In Electric Vehicle Rebates and Outreach Using *"EV Convert"* Characteristics, *Energies*, vol. 14, no. 7, p. 1899.
- B.D.H. Williams, J.B. Anderson, A. Lastuka (2020, Sep.), Characterizing Plug-in Hybrid Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase, in: *33rd Electr. Veh. Symp.*, Electric Drive Transportation Association (EDTA), EVS33, and Zenodo, Portland OR.
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition. Clean Vehicle Rebate Project.
- B.D. Williams, J.B. Anderson (2018, Sep.), Strategically Targeting Plug-in Electric Vehicle Rebates and Outreach Using Characteristics of *"Rebate-Essential"* Consumers in 2016–2017, in: *31st Int. Electr. Veh. Symp.*, Society of Automotive Engineers of Japan, Inc., Kobe, Japan.
- C. Johnson, B.D. Williams, J.B. Anderson, N. Appenzeller (2017, Jun.), Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales, Center for Sustainable Energy (CSE).
- C. Johnson, B.D. Williams (2017, Jan.), Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California's Electric Vehicle Rebate, *Transp. Res. Rec*. 2628, 23–31.

Incentive Influence: Select Presentations with Related Content

(reverse chronological, as of 6/7/2022)

- CVRP 2020 Data Brief: Incentive Influence
- CARB Video: "Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with California's Clean Vehicle Rebate Project in 2019 (and 2020)," minutes 2:01-2:31. Slides.
- California Plug-in Hybrid EV Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase
- Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness
- EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts
- What Vehicles Are Electric Vehicles Replacing and Why?
- Electric Vehicle Incentives and Policies
- Proposed FY 2019–20 Funding Plan: Final CVRP Supporting Analysis
- CVRP: Data and Analysis Update
- Cost-Effectively Targeting EV Outreach and Incentives to "*Rebate-Essential*" Consumers
- Electric Vehicle Rebates: Exploring Indicators of Impact in Four States
- Targeting EV Consumer Segments & Incentivizing Dealers
- Yale Webinar: "Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings," 58 minutes. Slides.
- CVRP Income Cap Analysis: Informing Policy Discussions
- Characterizing California Electric Vehicle Consumer Segments

Contributions

Contributions of this work

- Considerably improves and further develops initial consumer-segmentation methodology
- This study is the first:
  - application of those methods to any consumers outside of California,
  - examination outside of California specifically of *Rebate Essentials*,
- Unique Drive Clean Rebate
  - New York State market and cold-weather-climate context
  - Point-of-sale rebate program
    - California allowed consumers to apply for up to 18 months after
- Recent market data: 2017–2019 purchases/leases
  - previous examinations: 2013–2017

Data and Representativeness

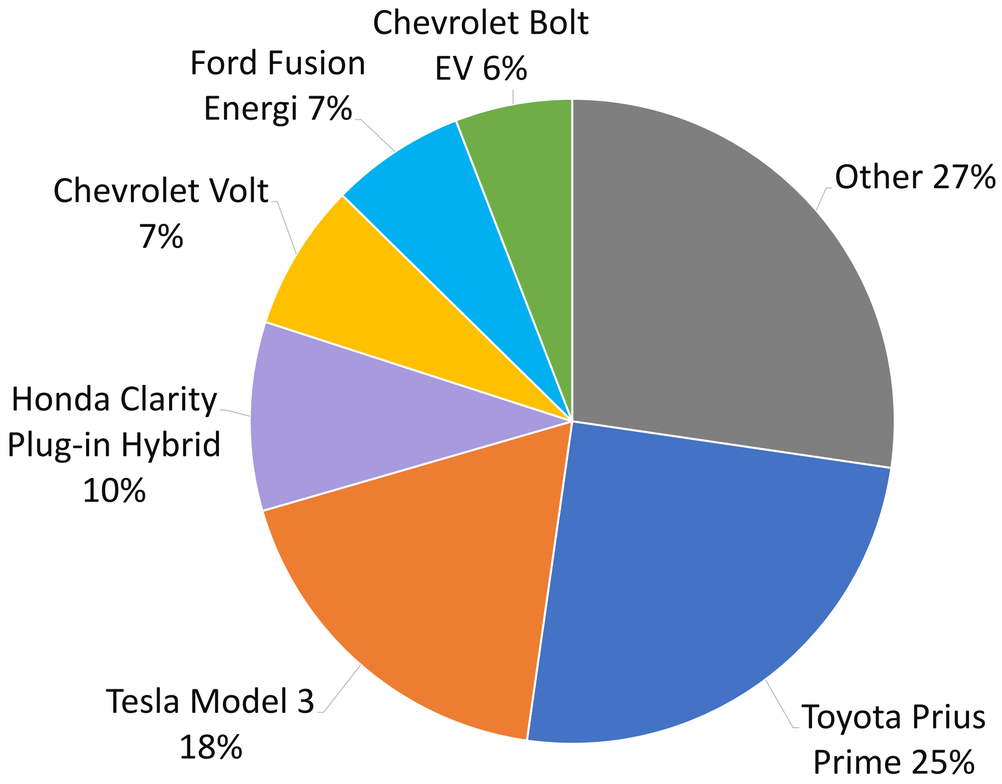
The Period Examined: Mar. 2017 (program launch) – Dec. 2019

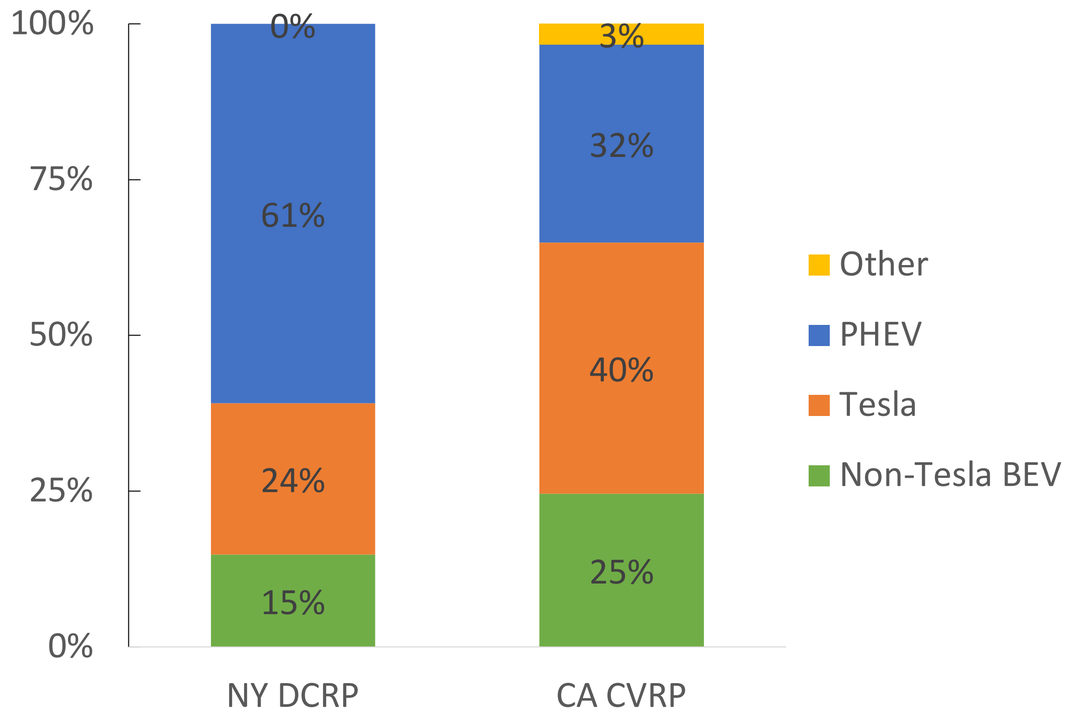
Rebate Design	
Fuel-Cell EVs*	≥ 120 e-miles†: $2,000
All-Battery EVs	≥ 40 e-miles: $1,700
Plug-in Hybrid EVs	≥ 20 e-miles: $1,100
	< 20 e-miles: $500
Additional Elements	Base MSRP > $60k = $500
	Point-of-sale

Program Data	
Vehicle Purchase/Lease Dates	3/23/2017 – 12/31/2019
Program Population (*N*)§	21,843
Survey Responses (*n*)¶	5,474
Program as % of Market**	~56%

* FCEVs eligible but unavailable in NY; none rebated. † Electric miles (e-miles) are U.S.-EPA-rated all-electric miles. § Small numbers of rebated vehicles are not represented in the time frames due to application lags. ¶ Subsequently weighted to represent the program population along the dimensions of vehicle technology (PHEV vs. BEV), model, buy vs. lease, and county. ** Based on EV sales from April 2017 through December 2019 (CSE and AAI 2021)

Rebates by Vehicle Model and Tech Type





CVRP applications received between 24 March 2017 and 31 December 2019 (CSE 2021)

Drive Clean Rebate Program Consumer Data Used

Purchase or Lease Dates	23 March 2017 – 31 December 2019

Program Participants	N = 21,843
	• PHEV: 13,296 (61%)
	• BEV: 8,547 (39%)
	  • Tesla: 5,308 (24%)
	  • Non-Tesla BEV: 3,239 (15%)

Survey Response Dates	8 August 2017 – 30 July 2020

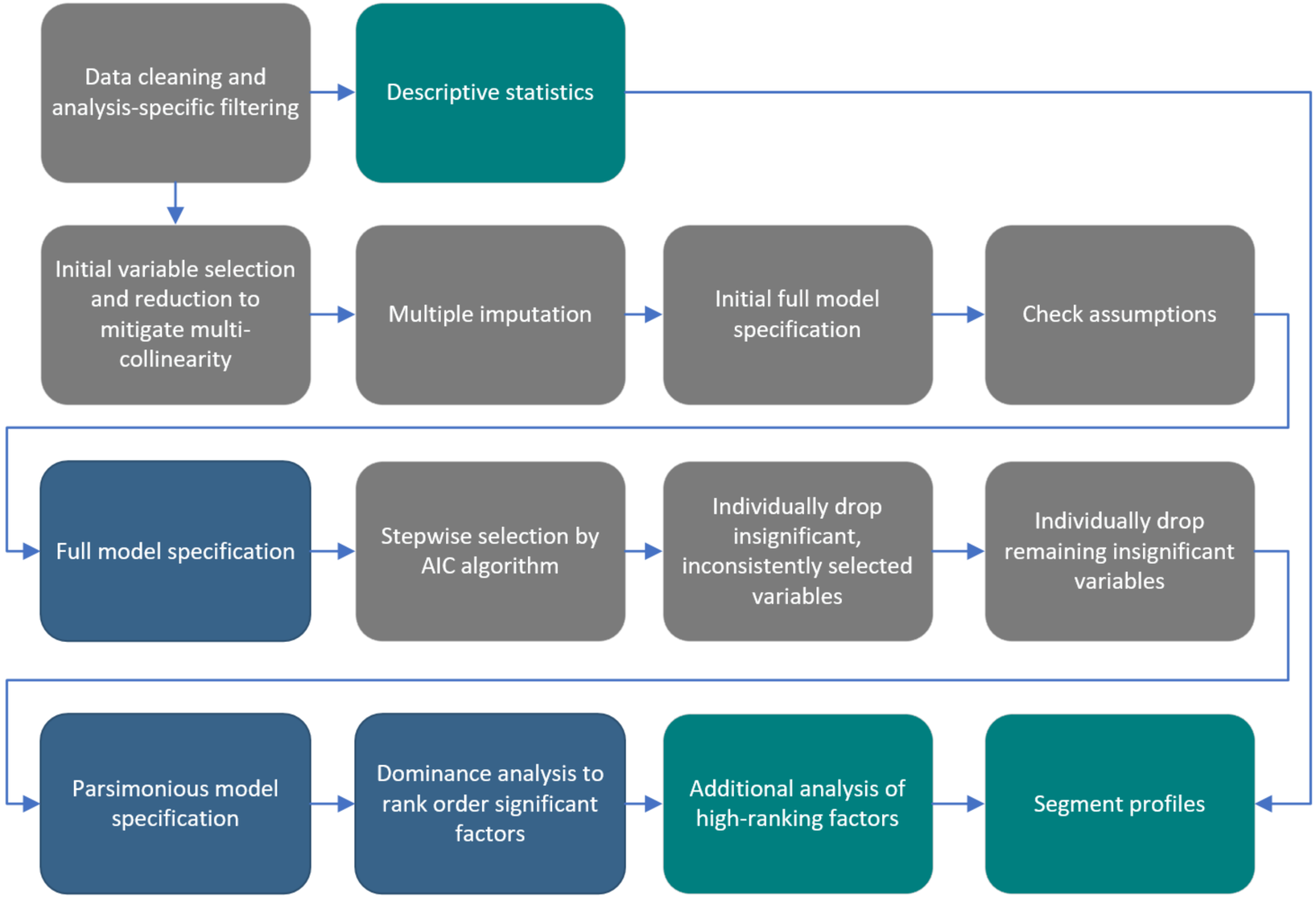
Responses in Dataset	*n* = 5,474
	• PHEV: 2,926 (53%)
	• BEV: 2,548 (46%)
	  • Tesla: 1,507 (28%)
	  • Non-Tesla BEV: 1,041 (19%)

Weighting Method	Iterative Proportional Fitting (aka raking)
Representative Dimensions	Vehicle technology type (PHEV vs. BEV), model, purchase vs. lease, residence county
Program as a % of the EV Market	~56%*

*Based on EV sales from April 2017 through December 2019 (CSE and AAI 2021)

Methodology

Logistic Regression Modeling and Related Analysis

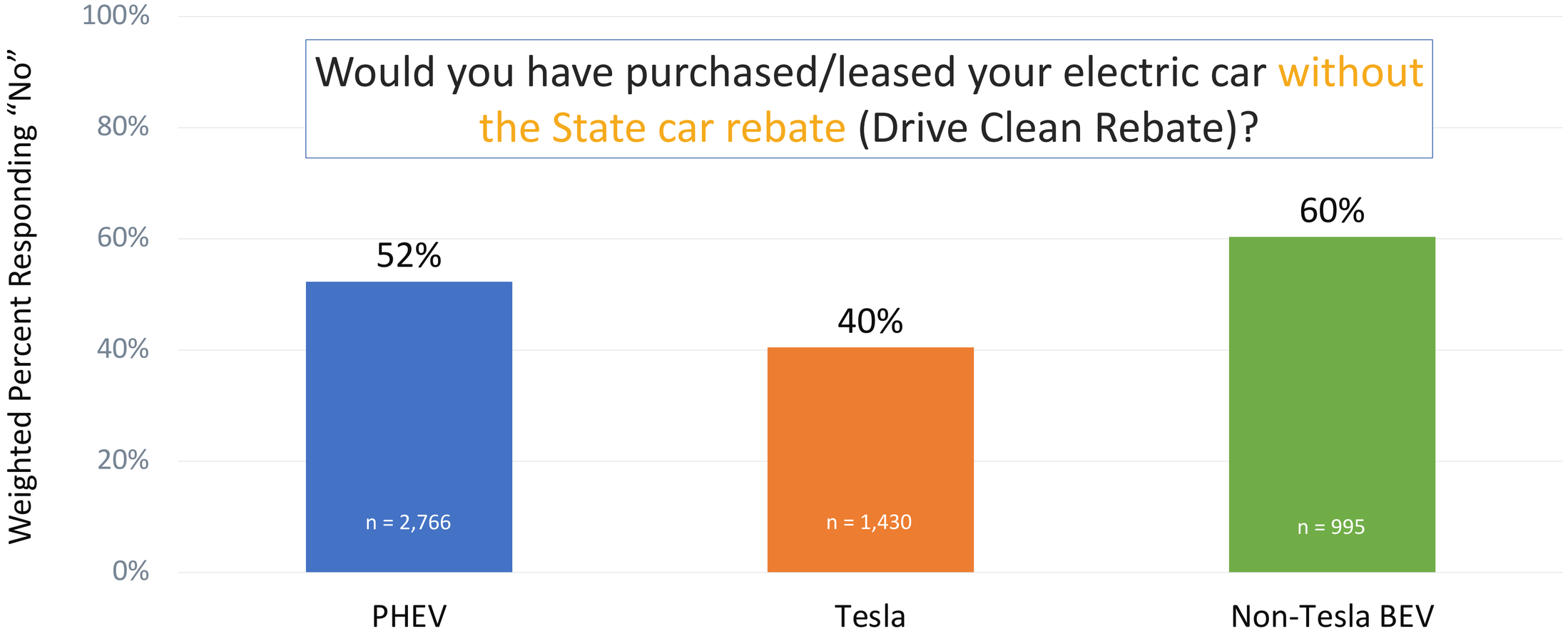


Results and Discussion

Descriptive, Logistic, Dominance, Exploration, & Profiles

Descriptive Results

"Rebate Essentials": Would Not Have Adopted Without Rebate



2017–19 purchases/leases: 5,474 respondents weighted to represent 21,843 participants by county of residence, technology type, vehicle model, and purchase vs. lease, then filtered for analysis.

Descriptive Results (purchases/leases span 2017–19, **weighted**†)

New-Vehicle Buyer Majority Characteristic	PHEV (*n* = 2,766)		Tesla (*n* = 1,430)		Non-Tesla BEV (*n* = 995)		New-Vehicle Buyers
	Not *Rebate Essential*	*Rebate Essential* (52%)	Not *Rebate Essential*	*Rebate Essential* (40%)	Not *Rebate Essential*	*Rebate Essential* (60%)	(2017 NHTS, NY Responses)
Selected solely white/Caucasian	88%**	83%**	71%	68%	87%	84%	75%
Greater than 40 years old	82%**	77%**	72%**	65%**	74%	71%	70%
Bachelor's degree or more	75%	75%	84%	84%	82%*	77%*	65%
Own home	92%**	88%**	85%	88%	91%	88%	75%
≥ $100k HH income	61%	61%	85%	84%	66%	60%	51%
Selected male	63%**	70%**	82%	85%	70%**	76%**	51%

* $p < 0.10$, ** $p < 0.05$: two-sample test (with continuity correction) for equality of proportions between *Rebate Essential* and Not *Rebate Essential* segments

† Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), model, purchase vs. lease, and residence county.

Rebate Essentials Are More Like Mainstream Car Buyers

New-Vehicle Buyer Majority Characteristic	PHEV (*n* = 2,766)		Tesla (*n* = 1,430)		Non-Tesla BEV (*n* = 995)		New-Vehicle Buyers
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Purchases/leases span 2017 – 19.

Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), model, purchase vs. lease, and residence county.

* $p < 0.10$, ** $p < 0.05$: two-sample test (with continuity correction) for equality of proportions between *Rebate Essential* and Not *Rebate Essential* segments

Tesla Consumers Are Already Younger and Less Frequently Identify Solely as White Than Mainstream Car Buyers

New-Vehicle Buyer Majority Characteristic	PHEV (*n* = 2,766)		Tesla (*n* = 1,430)		Non-Tesla BEV (*n* = 995)		New-Vehicle Buyers
	Not *Rebate Essential*	*Rebate Essential (52%)*	Not *Rebate Essential*	*Rebate Essential* (40%)	Not *Rebate Essential*	*Rebate Essential* (60%)	(2017 NHTS, NY Responses)
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Something to Change Rather than Reinforce:
Rebate Recipients Predominately & Persistently Identify as Male

New-Vehicle Buyer Majority Characteristic	PHEV (*n* = 2,766)		Tesla (*n* = 1,430)		Non-Tesla BEV (*n* = 995)		New-Vehicle Buyers
	Not *Rebate Essential*	*Rebate Essential (52%)*	Not *Rebate Essential*	*Rebate Essential* (40%)	Not *Rebate Essential*	*Rebate Essential* (60%)	(2017 NHTS, NY Responses)
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Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), model, purchase vs. lease, and residence county.
* $p < 0.10$, ** $p < 0.05$: two-sample test (with continuity correction) for equality of proportions between *Rebate Essential* and Not *Rebate Essential* segments

Logistic Regression Results

Logistic Regression Odds Ratios:
What Increases or Decreases the Odds of Being *Rebate Essential?*

>45 factors explored:

- Demographic
- Household
- Charging-access
- Motivation
- Purchase-enabling
- Dealer-experience
- Transactional

For example:

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Intercept	0.16**	0.89	0.87
Demographic			
Gender			
Female (vs. male)	0.72**	-	0.68**
Race/ethnicity			
Other non-Latinx, non-Asian selections (individual or multiple), relative to White	-	0.66*	-
Age			
40–49 (vs. 21–29)	1.62**	-	-
Education			
Bachelor's degree (vs. high school or other)	1.68**	-	-
Graduate degree (vs. high school or other)	1.69**	-	-
Household income			
$100,000–$199,999 (vs. < $100k)	1.03	-	0.67**
$200,000–$299,999 (vs. < $100k)	0.70**	-	-
PHEV, Tesla = $300,000–$399,999, Non-Tesla BEV ≥ $300,000 (vs. < $100k)	0.43**	-	0.30**
≥ $400,000 (vs. < $100k)	0.47**	-	NA

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.

Demographics

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Intercept	0.16**	0.89	0.87
Demographic			
Gender			
Female (vs. male)	0.72**	-	0.68**
Race/ethnicity			
Other non-Latinx, non-Asian selections (individual or multiple), relative to White	-	0.66*	-
Age			
40–49 (vs. 21–29)	1.62**	-	-
Education			
Bachelor's degree (vs. high school or other)	1.68**	-	-
Graduate degree (vs. high school or other)	1.69**	-	-
Household income			
$100,000–$199,999 (vs. < $100k)	1.03	-	0.67**
$200,000–$299,999 (vs. < $100k)	0.70**	-	-
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≥ $400,000 (vs. < $100k)	0.47**	-	NA

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: NA = Not applicable

Demographics: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Gender: female (vs. male)	0.73**	0.72**	Not sig.	-	0.71*	0.68**
Race/ethnicity: Other non-Latinx, non-Asian selections (individual or multiple), relative to white	Not sig.	-	0.59**	0.66*	Not sig.	-
Age: 40–49 (vs. 21–29)	1.63**	1.62**	Not sig.	-	Not sig.	-
Education: Bachelor's degree (vs. high school or other)	1.59**	1.68**	Not sig.	-	Not sig.	-
Education: Graduate degree (vs. high school or other)	1.54**	1.69**	Not sig.	-	Not sig.	-
Household income: $100,000–$199,999 (vs. < $100k)	1.00	1.03	Not sig.	-	0.61**	0.67**
Household income: $200,000–$299,999 (vs. < $100k)	0.65**	0.70**	Not sig.	-	0.79	0.81
Household income: PHEV, Tesla = $300,000–$399,999, Non-Tesla BEV ≥ $300,000 (vs. < $100k)	0.44**	0.43**	Not sig.	-	0.22**	0.30**
Household income: ≥ $400,000 (vs. < $100k)	0.49**	0.47**	Not sig.	-	NA	NA

Household

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Household			
Own or rent residence			
Rent residence (vs. own)	1.36*	-	-
Residence type			
Attached house (vs. detached)	-	-	-
Apartment/condo (vs. detached)	-	-	-
Solar			
Solar: Yes (vs. no, but considering installing)	-	-	-
Yes (vs. no plans to install)			
No, but considering installing (vs. no plans to install)			
Household size	-	-	-
Number of licensed drivers in household	-	-	-
Replacement status			
Addition to household fleet (vs. replacement)	1.56**	-	-
First ever car (vs. replacement)	-	-	-
Number of cars in household			
2 (vs. 1)	-	-	1.58**
3 (vs. 1)	-	-	1.96**
4 or more (vs. 1)	-	-	2.13**
Previous EVs owned	-	-	-
NYC Metro Area			
NYC Metro (vs. not)	NC	NC	NC

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: NC = Not considered

Household: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Rent residence (vs. own)	1.31	1.36*	Not sig.	-	Not sig.	-
Residence type	Not sig.	-	Not sig.	-	Not sig.	-
Solar: Yes (vs. no, but considering installing)	Not sig.	-	0.74*	-	Not sig.	-
Household size	Not sig.	-	Not sig.	-	1.18*	-
Number of licensed drivers in household	Not sig.	-	Not sig.	-	Not sig.	-
Addition to household fleet (vs. replacement)	1.48**	1.56**	Not sig.	-	Not sig.	-
Number of cars in household: 2 (vs. 1)	Not sig.	-	Not sig.	-	1.52	1.58**
Number of cars in household: 3 (vs. 1)	Not sig.	-	Not sig.	-	1.81	1.96**
Number of cars in household: 4 or more (vs. 1)	Not sig.	-	Not sig.	-	1.65	2.13**
Not first EV purchased	Not sig.	-	Not sig.	-	Not sig.	-

Charging Access

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Charging Access			
Access to charging at home			
Yes (vs. no, unknown, or not applicable)	-	-	-
Access to charging at or near work			
	-	-	-

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.

Charging Access: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Access to charging at home (vs. no, unknown, or not applicable)	Not sig.	-	Not sig.	-	Not sig.	-
Access to charging at or near work (vs. no, unknown, or not applicable)	Not sig.	-	Not sig.	-	Not sig.	-

Motivating Factors (1 of 2)

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Motivational			
Initial interest in an EV			
Some interest (vs. no knowledge or interest)	4.23**	1.86**	4.27**
Very interested (vs. no knowledge or interest)	2.22**	1.69**	1.81**
Importance of saving money overall			
Very important (vs. slightly or not at all important)	NC	NC	NC
Extremely important (vs. slightly or not at all important)	NC	NC	NC
Importance of saving money on fuel			
Moderately important (vs. slightly or not at all important)	-	1.53*	-
Very important (vs. slightly or not at all important)	-	2.04**	-
Extremely important (vs. slightly or not at all important)	-	1.79**	-
Importance of reducing environmental impact			
Not at all important (vs. extremely important)	MC	NA	NA
Very important (vs. extremely important)	MC	NA	NA
Moderately important (vs. slightly or not at all important)	MC	0.45**	-
Very important (vs. slightly or not at all important)	MC	0.54**	-
Extremely important (vs. slightly or not at all important)	MC	0.44**	-
Importance of HOV lane access			
Slightly important (vs. not at all important)	1.39**	-	-
Extremely important (vs. not at all important)			

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.

Codes indicating variable not included in modeling, due to: C = Correlation (pre-modeling), DV = Dependent variable, MC = Multi-collinearity (VIF), NA = Not applicable, NC = Not considered, PM = Pre-modeling decision

Motivating Factors (1 of 2): Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Importance of saving on fuel: Moderately important (vs. slightly or not at all important)	Not sig.	-	1.49*	1.53*	1.15	-
Importance of saving on fuel: Very important (vs. slightly or not at all important)	Not sig.	-	1.89**	2.04**	1.92**	-
Importance of saving on fuel: Extremely important (vs. slightly or not at all important)	Not sig.	-	1.65**	1.79**	1.62	-
Importance of reducing environmental impact: Moderately important (vs. slightly or not at all important)	RM	-	0.39**	0.45**	Not sig.	-
Importance of reducing environmental impact: Very important (vs. slightly or not at all important)	RM	-	0.39**	0.54**	Not sig.	-
Importance of reducing environmental impact: Extremely important (vs. slightly or not at all important)	RM	-	0.35**	0.44**	Not sig.	-
Importance of HOV lane access: Slightly important (vs. not at all important)	1.36**	1.39**	Not sig.	-	Not sig.	-
Importance of energy independence	Not sig.	-	Not sig.	-	Not sig.	-
Importance of the convenience of charging	Not sig.	-	Not sig.	-	Not sig.	-

Motivating Factors (2 of 2)

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Importance of energy independence			
PHEV/Tesla/All: Not at all important (vs. extremely important)	-	-	-
PHEV/Tesla: Slightly important, non-Tesla BEV: Slightly or less important (vs. extremely important)	-	-	-
Moderately important (vs. extremely important)	-	-	-
Very important (vs. extremely important)	-	-	-
Importance of the convenience of charging			
Slightly important (vs. not at all important)	-	-	-
Moderately important (vs. not at all important)	-	-	-
Very important (vs. not at all important)	-	-	-
Extremely important (vs. not at all important)	-	-	-
Very important (vs. extremely important			
Importance of vehicle performance			
Very important (vs. moderately, slightly, or not at all important)	MC	0.71*	-
Extremely important (vs. moderately, slightly, or not at all important)	MC	0.65**	-
Importance of vehicle styling, comfort and finish			
Very important (vs. slightly or not at all important)	-	MC	-
Importance of desire for the newest technology			
Very important (vs. not at all [PHEV/non-Tesla BEV]; vs. slightly or not at all [Tesla])	-	0.62**	-
Extremely important (vs. not al all [PHEV/non-Tesla BEV]; vs. slightly or not at all [Tesla])	-	0.58**	-

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: MC = Multi-collinearity (VIF), NA = Not applicable, PM = Pre-modeling decision

Motivating Factors (2 of 2): Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Importance of vehicle performance: Very important (vs. moderately, slightly, or not at all important)	RM	-	0.73	0.71*	Not sig.	-
Importance of vehicle performance: Extremely important (vs. moderately, slightly, or not at all important)	RM	-	0.67	0.65**	Not sig.	-
Importance of vehicle styling	Not sig.	-	RM	RM	Not sig.	-
Importance of desire for new technology: Very important (vs. slightly or not at all important)	Not sig.	-	0.58**	0.62**	Not sig.	-
Importance of desire for new technology: Extremely important (vs. slightly or not at all important)	Not sig.	-	0.53**	0.58**	Not sig.	-

Enabling Factors (1 of 2)

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Enabling Factors			
Importance of the federal tax credit	DV Overlap	DV Overlap	DV Overlap
Importance of manufacturer incentives			
Not applicable (vs. not at all important)	DV Overlap	DV Overlap	DV Overlap
Importance of Green Pass or similar toll/E-ZPass discount			
Moderately important (vs. not at all important)	-	1.88**	-
Very important (vs. not at all important)	-	3.13**	-
Extremely important (vs. not at all important)	-	3.13**	-
Not applicable (vs. not at all important)	-	1.66**	-
Importance of EV electricity rates			
Moderately important (vs. not at all important)	-	-	-
Extremely important (vs. not at all important)	1.85**	1.94**	-
Not applicable (vs. not at all important)	1.41**	1.58**	-
Importance of free charging away from home			
Slightly important (vs. not at all important)			
Moderately important (vs. not at all important)			
Very important (vs. not at all important)	1.22	-	2.08**
Extremely important (vs. not at all important)	1.63**	-	2.17**
Not applicable (vs. not at all important)	1.41*	-	NA

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: DV = Dependent variable, MC = Multi-collinearity (VIF), NA = Not applicable

Enabling Factors (2 of 2)

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Importance of parking incentives	-	-	-
Rebate Essential			
Yes (vs. no)	DV	DV	DV
Purchase decision absent rebate			
Would have acquired exact electric car without rebate (vs. wouldn't have)	NC	NC	NC
Would have acquired a less expensive version of same model (vs. wouldn't have)	NC	NC	NC
Consumer awareness of the rebate before first dealership visit			
Not aware (vs. aware)	0.46**	0.37**	0.38**
Satisfaction with the rebate amount			
Slightly satisfied (vs. not at all satisfied)	1.68*	-	-
Moderately satisfied (vs. not at all satisfied)	1.57	-	-
Satisfaction with NY DCRP promotion			
Slightly satisfied (vs. not at all satisfied)	NC	NC	NC
Extremely satisfied (vs. not at all satisfied)	NC	NC	NC

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: DV = Dependent variable, NC = Not considered

Enabling Factors: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Importance of Green Pass/toll: Not applicable (vs. not at all important)	Not sig.	-	1.39	1.66**	Not sig.	-
Importance of Green Pass/toll: Moderately important (vs. not at all important)	Not sig.	-	1.75**	1.88**	Not sig.	-
Importance of Green Pass/toll: Very important (vs. not at all important)	Not sig.	-	2.72**	3.13**	Not sig.	-
Importance of Green Pass/toll: Extremely important (vs. not at all important)	Not sig.	-	2.22**	3.13**	Not sig.	-
Importance of parking incentives	Not sig.	-	Not sig.	-	Not sig.	-
Importance of EV electricity rates: Not applicable (vs. not at all important)	1.27	1.41**	1.39	1.58**	0.62*	-
Importance of EV electricity rates: Extremely important (vs. not at all important)	1.53	1.85**	1.70	1.94**	1.34	-
Importance of free charging away from home: Not applicable (vs. not at all important)	1.40	1.41*	Not sig.	-	NA	NA
Importance of free charging away from home: Very important (vs. not at all important)	1.13	1.22	Not sig.	-	2.10**	2.08**
Importance of free charging away from home: Extremely important (vs. not at all important)	1.41	1.63**	Not sig.	-	1.85**	2.17**

Initial Interest, Rebate Awareness, DCRP Satisfaction: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Initial interest: Some interest (vs. no knowledge or interest)	4.11**	4.23**	1.83*	1.86**	3.85**	4.27**
Initial interest: Very interested (vs. no knowledge or interest)	2.15**	2.22**	1.63**	1.69**	1.42	1.81**
Consumer not aware of the rebate before visiting a dealership (vs. aware)	0.46**	0.46**	0.38**	0.37**	0.35**	0.38**
Satisfaction with rebate amount: Slightly satisfied (vs. not at all satisfied)	1.96**	1.68*	Not sig.	-	Not sig.	-
Satisfaction with rebate amount: Moderately satisfied (vs. not at all satisfied)	1.77**	1.57	Not sig.	-	Not sig.	-

Dealer Experience

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Dealer Experience			
Number of EVs seen at the dealership	-	NA	-
Dealer aware of rebate on first visit			
I don't know (vs. yes)	0.80*	-	0.59**
No (vs. yes)	0.75*	-	0.63**
Dealer knowledge of total cost of ownership	NC	NC	NC
Dealer knowledge of government financial incentives	NC	NC	NC
Dealer knowledge of environmental benefits	NC	NC	NC
Dealer knowledge of home charging	-	-	-
Don't recall or didn't discuss (vs. extremely)	-	-	-
Moderately knowledgeable (vs. extremely)	-	-	-
Very knowledgeable (vs. extremely)	0.78*	-	-
Dealer knowledge of charging away from home			
Don't recall or didn't discuss (vs. extremely knowledgeable)	NC	NC	NC
Slightly or less knowledgeable (vs. extremely knowledgeable)	NC	NC	NC
Moderately knowledgeable (vs. extremely knowledgeable)	NC	NC	NC
Very knowledgeable (vs. extremely knowledgeable)	NC	NC	NC

Red indicates significant odds-decreasing factors (OR<1), green indicates significant odds-increasing factors (OR>1). *$p < 0.10$; **$p < 0.05$.
Codes indicating variable not included in modeling, due to: NA = Not applicable, NC = Not considered, PM = Pre-modeling decision

Dealer Experience: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Number of EVs seen at the dealership	Not sig.	Not sig.	NA	NA	Not sig.	Not sig.
Dealer aware of rebate on first visit: I don't know (vs. yes)	0.84	0.80*	Not sig.	-	0.54**	0.59**
Dealer aware of rebate on first visit: No (vs. yes)	0.76	0.75*	Not Sig.	-	0.62*	0.63**
Dealer knowledge of incentives	Not sig.	-	Not sig.	-	Not sig.	-
Dealer knowledge of home charging: Very knowledgeable (vs. extremely knowledgeable)	0.85	0.78*	Not sig.	-	Not sig.	-

Transactional

	Rebate Essentials		
	PHEV	Tesla	Non-Tesla BEV
Transactional			
Vehicle make			
Chevrolet (vs. Toyota)	-	NA	
Ford (vs. Toyota)	-	NA	NA
Honda (vs. Toyota)	-	NA	NA
Nissan (vs. Chevrolet)	NA	NA	1.56**
Other vs. Toyota (PHEV); vs. Chevrolet (non-Tesla BEV)	-	NA	1.41**
Rebated vehicle financing type			
Purchase (vs. lease)	NC	NC	NC
Vehicle category			
Non-Tesla BEV (vs. PHEV)	NA	NA	NA
Tesla (vs. PHEV)	NA	NA	NA

Red indicates odds-decreasing factors (OR<1), green indicates odds-increasing factors (OR>1) * = $p < 0.10$; ** = $p < 0.05$. † Not individually significant, but variable jointly significant overall

Codes indicating variable not included in modeling, due to:

C = Correlation (pre-modeling), DV = Dependent variable, MC = Multi-collinearity (VIF), NA = Not applicable, NC = Not considered, PM = Pre-modeling decision

Transactional: Full and Parsimonious Models

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
PHEV vehicle make	Not sig.	-	NA	NA	NA	NA
Other BEV makes (vs. Chevrolet BEV)	NA	NA	NA	NA	1.32	1.41**
Nissan BEV (vs. Chevrolet BEV)	NA	NA	NA	NA	1.51**	1.56**

Alternative PHEV model

PHEV Consumer Characteristic	Parse. OR	Alternative Parse. OR
Intercept	*OR* = 0.16**; *p* < 0.01	*OR* = 0.27**; *p* = 0.01
Demographic		
Gender: female (vs. male)	*OR* = 0.72**; *p* < 0.01	*OR* = 0.73**; *p* < 0.01
Age: 30–39 (vs. 21–29)	*OR* = 1.31; *p* = 0.23	*OR* = 1.22; *p* = 0.36
Age: 40–49 (vs. 21–29)	*OR* = 1.62**; *p* = 0.03	*OR* = 1.49*; *p* = 0.07
Age: 50–59 (vs. 21–29)	*OR* = 1.29; *p* = 0.24	*OR* = 1.19; *p* = 0.41
Age: 60–69 (vs. 21–29)	*OR* = 1.10; *p* = 0.66	*OR* = 1.02; *p* = 0.93
Age: 70+ (vs. 21–29)	*OR* = 0.77; *p* = 0.26	*OR* = 0.71; *p* = 0.13
Education: Some college (vs. high school or other)	*OR* = 1.44; *p* = 0.11	*OR* = 1.46*; *p* = 0.096
Education: Associate degree (vs. high school or other)	*OR* = 1.28; *p* = 0.32	*OR* = 1.28; *p* = 0.31
Education: Bachelor's degree (vs. high school or other)	*OR* = 1.68**; *p* = 0.01	*OR* = 1.71**; *p* = 0.01
Education: Graduate degree (vs. high school or other)	*OR* = 1.69**; *p* = 0.01	*OR* = 1.77**; *p* = 0.01
Household income: $100,000–$199,999 (vs. < $100k)	*OR* = 1.03; *p* = 0.78	*OR* = 1.00; *p* = 1.00
Household income: $200,000–$299,999 (vs. < $100k)	*OR* = 0.70**; *p* = 0.02	*OR* = 0.68**; *p* = 0.01
Household income: $300,000–$399,999 (vs. < $100k)	*OR* = 0.43**; *p* = 0.01	*OR* = 0.42**; *p* < 0.01
Household income: ≥ $400,000 (vs. < $100k)	*OR* = 0.47**; *p* = 0.01	*OR* = 0.46**; *p* = 0.01
Household		
Rent residence (vs. own)	*OR* = 1.36*; *p* = 0.051	
Addition to household fleet (vs. replacement)	*OR* = 1.56**; *p* < 0.01	*OR* = 1.53**; *p* < 0.01
Motivational		
Initial interest: Some interest (vs. no knowledge or interest)	*OR* = 4.23**; *p* < 0.01	*OR* = 3.97**; *p* < 0.01
Initial interest: Very interested (vs. no knowledge or interest)	*OR* = 2.22**; *p* < 0.01	*OR* = 2.13**; *p* < 0.01
Importance of reducing environmental impact: Slightly important (vs. not at all important)	RM	*OR* = 0.63; *p* = 0.21
Importance of reducing environmental impact: Moderately important (vs. not at all important)	RM	*OR* = 0.61; *p* = 0.13
Importance of reducing environmental impact: Very important (vs. not at all important)	RM	*OR* = 0.57*; *p* = 0.08†
Importance of reducing environmental impact: Extremely important (vs. not at all important)	RM	*OR* = 0.52**; *p* = 0.04†
Importance of HOV lane access: Slightly important (vs. not at all important)	*OR* = 1.39**; *p* = 0.01	*OR* = 1.43**; *p* < 0.01
Importance of HOV lane access: Moderately important (vs. not at all important)	*OR* = 0.89; *p* = 0.37	*OR* = 0.92; *p* = 0.53
Importance of HOV lane access: Very important (vs. not at all important)	*OR* = 0.98; *p* = 0.91	*OR* = 1.00; *p* = 1.00
Importance of HOV lane access: Extremely important (vs. not at all important)	*OR* = 1.01; *p* = 0.95	*OR* = 1.02; *p* = 0.88
Importance of EV electricity rates: Not applicable (vs. not at all important)	*OR* = 1.41**; *p* = 0.01	*OR* = 1.39**; *p* = 0.01
Importance of EV electricity rates: Slightly important (vs. not at all important)	*OR* = 1.15; *p* = 0.35	*OR* = 1.14; *p* = 0.39
Importance of EV electricity rates: Moderately important (vs. not at all important)	*OR* = 1.09; *p* = 0.56	*OR* = 1.09; *p* = 0.57
Importance of EV electricity rates: Very important (vs. not at all important)	*OR* = 1.24; *p* = 0.16	*OR* = 1.23; *p* = 0.18
Importance of EV electricity rates: Extremely important (vs. not at all important)	*OR* = 1.85**; *p* < 0.01	*OR* = 1.79**; *p* < 0.01
Importance of free charging away from home: Not applicable (vs. not at all important)	*OR* = 1.41*; *p* = 0.08	*OR* = 1.42*; *p* = 0.07
Importance of free charging away from home: Slightly important (vs. not at all important)	*OR* = 1.01; *p* = 0.97	*OR* = 1.02; *p* = 0.91
Importance of free charging away from home: Moderately important (vs. not at all important)	*OR* = 1.14; *p* = 0.35	*OR* = 1.16; *p* = 0.30
Importance of free charging away from home: Very important (vs. not at all important)	*OR* = 1.22; *p* = 0.21	*OR* = 1.26; *p* = 0.14
Importance of free charging away from home: Extremely important (vs. not at all important)	*OR* = 1.63**; *p* < 0.01	*OR* = 1.72**; *p* < 0.01
Consumer aware of the rebate before visiting a dealership (vs. not aware)	*OR* = 2.17**; *p* < 0.01	*OR* = 2.21**; *p* < 0.01
Satisfaction with rebate amount: Not applicable (vs. not at all satisfied)	*OR* = 0.58; *p* = 0.14	*OR* = 0.59; *p* = 0.16
Satisfaction with rebate amount: Slightly satisfied (vs. not at all satisfied)	*OR* = 1.69*; *p* = 0.08	*OR* = 1.86**; *p* = 0.04
Satisfaction with rebate amount: Moderately satisfied (vs. not at all satisfied)	*OR* = 1.57; *p* = 0.104	*OR* = 1.75**; *p* = 0.04
Satisfaction with rebate amount: Very satisfied (vs. not at all satisfied)	*OR* = 1.46; *p* = 0.18	*OR* = 1.65*; *p* = 0.07
Satisfaction with rebate amount: Extremely satisfied (vs. not at all satisfied)	*OR* = 1.52; *p* = 0.14	*OR* = 1.77**; *p* = 0.04
Dealer Experience		
Dealer aware of rebate on first visit: I don't know (vs. yes)	*OR* = 0.80*; *p* = 0.09	
Dealer aware of rebate on first visit: No (vs. yes)	*OR* = 0.75*; *p* = 0.052	
Dealer knowledge of home charging: Don't recall or didn't discuss (vs. extremely knowledgeable)	*OR* = 0.79; *p* = 0.105	*OR* = 0.76*; *p* = 0.06
Dealer knowledge of home charging: Not at all knowledgeable (vs. extremely knowledgeable)	*OR* = 0.99; *p* = 0.96	*OR* = 0.92; *p* = 0.61
Dealer knowledge of home charging: Slightly knowledgeable (vs. extremely knowledgeable)	*OR* = 0.86; *p* = 0.31	*OR* = 0.81; *p* = 0.17
Dealer knowledge of home charging: Moderately knowledgeable (vs. extremely knowledgeable)	*OR* = 1.15; *p* = 0.31	*OR* = 1.13; *p* = 0.38
Dealer knowledge of home charging: Very knowledgeable (vs. extremely knowledgeable)	*OR* = 0.78*; *p* = 0.08	*OR* = 0.76*; *p* = 0.06

RM = removed due to variance inflation factors > 10

† Not jointly significant but retained as variable of interest.

Dominance Analysis Results

PHEV

Characteristic	Odds increasing factor	Average of Average Contributions (R2.e)	Rank
Initial interest in an EV	Some interest or very interested (vs. no knowledge or no interest)	0.037	1
Consumer aware of the rebate before visiting a dealership	Aware (vs. not aware)	0.026	2
Age	40–49 (vs. 21–29)	0.014	3
Importance of special electricity rates for EVs	Extremely important or not applicable (vs. not important)	0.0119	4
Importance of free charging away from home	Extremely important or not applicable (vs. not important)	0.0118	5
Satisfaction with the rebate amount	Slightly satisfied (vs. not satisfied)	0.011	6
Household income	Lower income (vs. higher income)	0.008	7
Dealer knowledge of home charging	Extremely knowledgeable (vs. very knowledgeable)	0.006	8
Addition to household fleet or replacement vehicle	Additional vehicle (vs. replacement)	0.005	9
Dealer awareness of rebate on first visit	Aware (vs. not aware and I don’t know)	0.0048	10
Gender	Male (vs. female)	0.0044	11
Importance of HOV lane access	Slightly important (vs. not important)	0.0038	12
Highest education level	Bachelor's or post-graduate degree (vs. high school or other)	0.0024	13
Own vs. rent residence	Rent residence (vs. own)	0.0022	14

Tesla

Characteristic	Odds increasing factor	Average of Average Contributions (R2.e)	Rank
Importance of Green Pass or similar toll/E-ZPass discounts	More important (vs. not important)	0.040	1
Consumer aware of the rebate before visiting a dealership	Aware (vs. not aware)	0.038	2
Importance of special EV electricity rates	Extremely important or not applicable (vs. not important)	0.023	3
Importance of saving money on fuel	More important (vs. not important)	0.012	4
Race/ethnicity	White or Caucasian, relative to non-Latinx, non-Asian other selections (individual or multiple)	0.009	5 (tied)
Initial interest in an EV	Some interest or very interested (vs. no knowledge or interest)	0.009	5 (tied)
Importance of reducing environmental impact	Slightly or not important (vs. more important)	0.006	7
Importance of access to the latest technology	Slightly or not important (vs. very or extremely important)	0.005	8
Importance of vehicle performance	Moderately, slightly or not important (vs. very or extremely important)	0.003	9

Non-Tesla BEV

Characteristic	Odds increasing factor	Average of Average Contributions (R2.e)	Rank
Consumer aware of the rebate before visiting a dealership	Aware (vs. not aware)	0.029	1
Importance of free charging away from home	Very or extremely important (vs. not important)	0.027	2
Initial interest in an EV	Some interest or very interested (vs. no knowledge or no interest)	0.027	3
Household income	Lower income (vs. higher incomes)	0.023	4
Vehicle make	Non-Chevrolet makes (vs. Nissan or other makes)	0.012	5
Dealer aware of rebate on first visit	Aware (vs. not aware or don't know)	0.010	6
Gender	Male (vs. female)	0.006	7 (tied)
Number of cars in household	Multiple cars (vs. 1 car)	0.006	7 (tied)

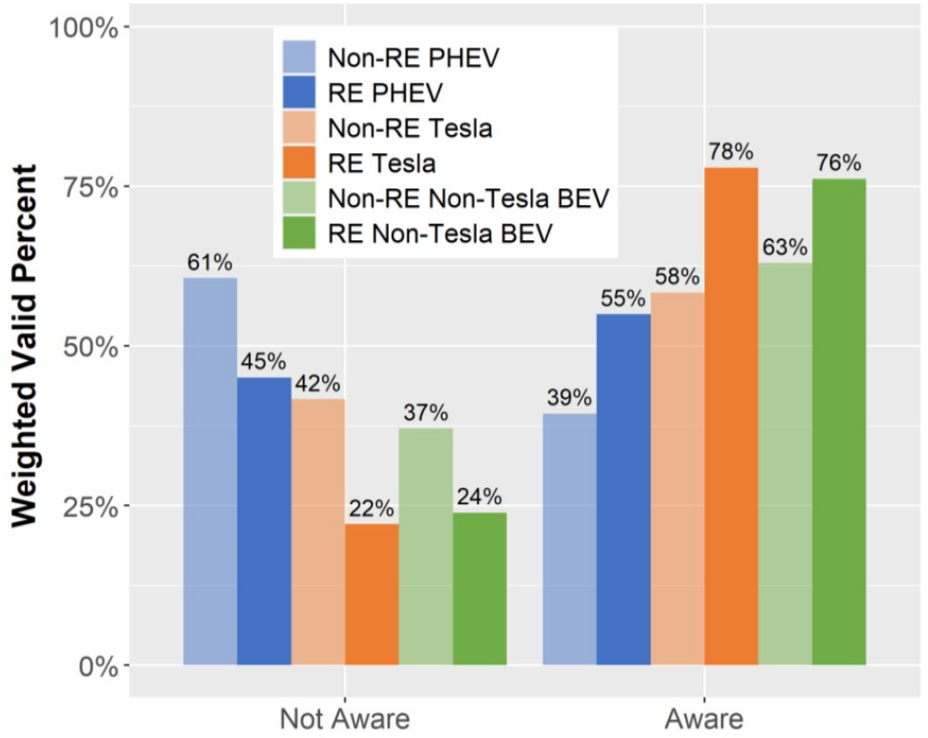
Rank-ordered Factors: *Rebate Essentials*

PHEV	Tesla	Non-Tesla BEV
	Contribution > 0.02	
P01. Initial interest in an EV	T01. Importance of Green Pass/similar	N01. Consumer aware of the rebate before visiting a dealership
P02. Consumer aware of the rebate before visiting a dealership	T02. Consumer aware of the rebate before first dealership visit	N02. Importance of free charging away from home
	T03. Importance of special EV electricity rates	N03. Initial interest in an EV
		N04. Household income
	Contribution > 0.01	
P03. Age	T04. Importance of saving money on fuel	N05. Vehicle make
P04. Importance of special electricity rates for EVs		N06. Dealer aware of rebate on first visit
P05. Importance of free charging away from home		
P06. Satisfaction with the rebate amount		
	Contribution < 0.01	
P07. Household income	T05 (tied). Race/ethnicity	N07 (tied). Gender
P08. Dealer knowledge of home charging	T05 (tied). Initial interest in an EV	N07 (tied). Number of cars in household
P09. Addition to household fleet or replacement vehicle	T07. Importance of reducing enviro. impact	
P10. Dealer awareness of rebate on first visit	T08. Importance of the latest technology	
P11. Gender	T09. Importance of vehicle performance	
P12. Importance of HOV lane access		
P13. Highest education level in household		
P14. Own vs. rent residence		

Additional Exploration

Rebate Essentials:
Consumer Awareness of the Rebate Before First Dealer Visit

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Initial interest: Some interest (vs. no knowledge or interest)	4.11**	4.23**	1.83*	1.86**	3.85**	4.27**
Initial interest: Very interested (vs. no knowledge or interest)	2.15**	2.22**	1.63**	1.69**	1.42	1.81**
Consumer not aware of the rebate before visiting a dealership (vs. aware)	0.46**	0.46**	0.38**	0.37**	0.35**	0.38**



Rebate Essentials: Initial Interest in EVs at the Start of the New Car Search

Characteristic	PHEV		Tesla		Non-Tesla BEV	
	Full OR	Parse. OR	Full OR	Parse. OR	Full OR	Parse. OR
Initial interest: Some interest (vs. no knowledge or interest)	4.11**	4.23**	1.83*	1.86**	3.85**	4.27**
Initial interest: Very interested (vs. no knowledge or interest)	2.15**	2.22**	1.63**	1.69**	1.42	1.81**
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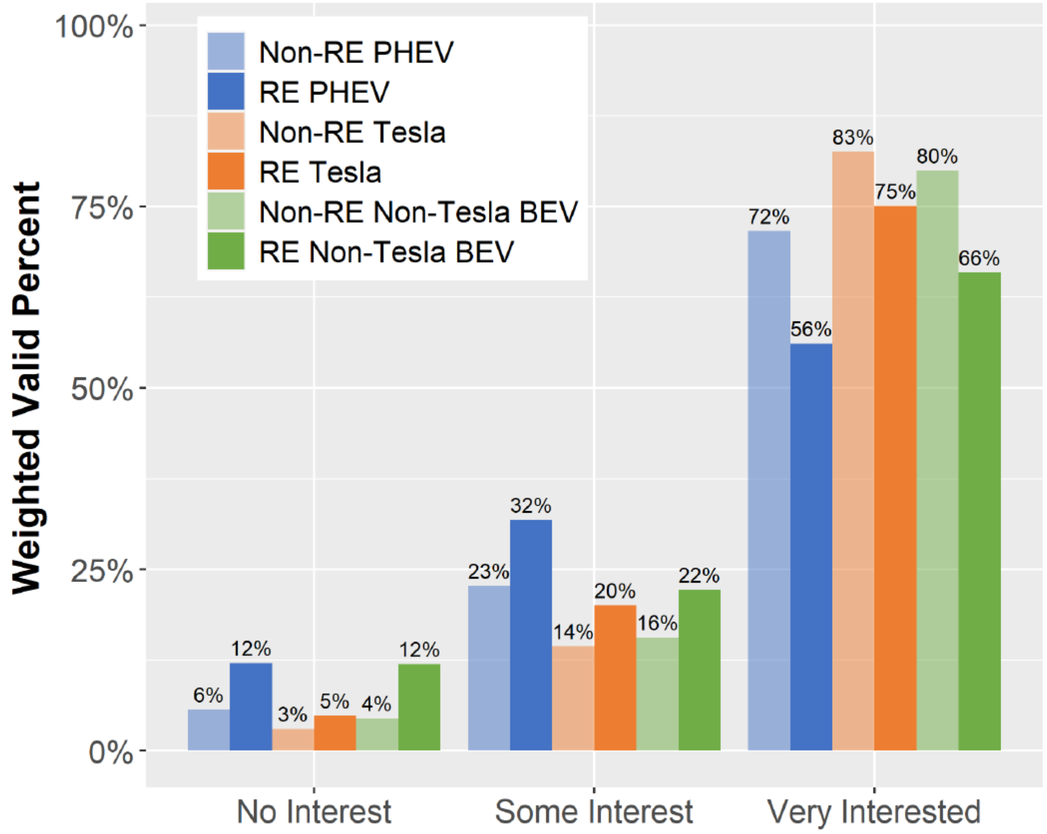
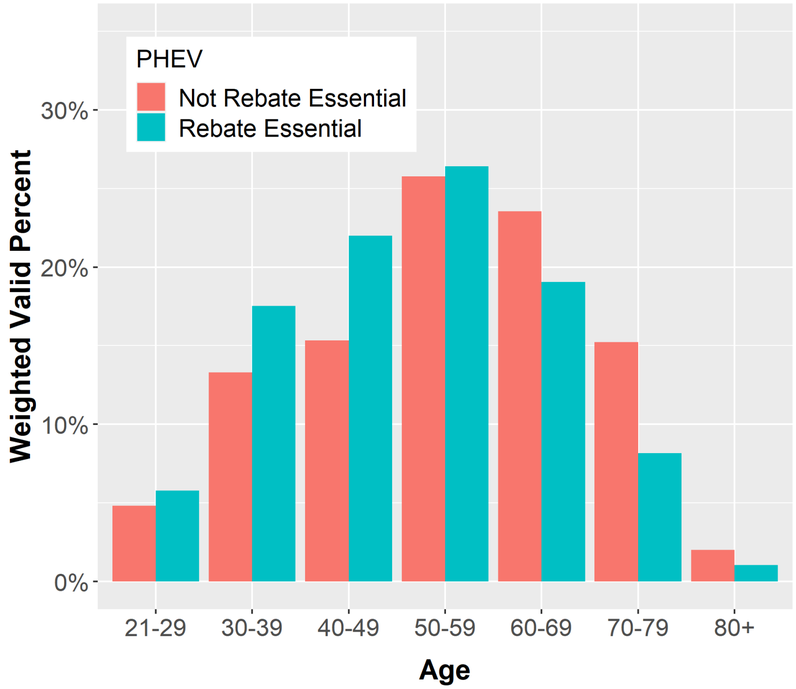
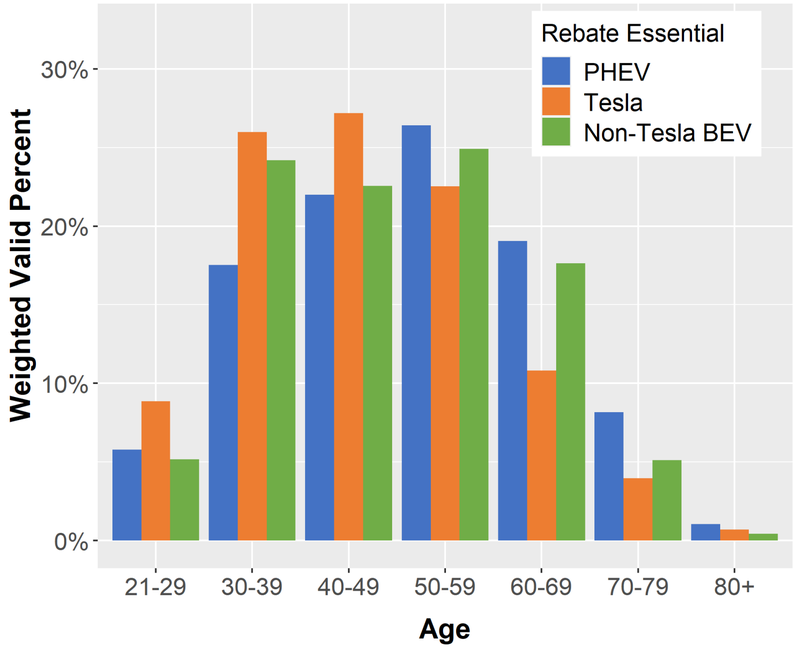


Rebate Essentials: Age

PHEV Consumer Characteristic	Full OR	Parse OR
Age: 30–39 (vs. 21–29)	1.31	1.31
Age: 40–49 (vs. 21–29)	1.63**	1.62**
Age: 50–59 (vs. 21–29)	1.27	1.29
Age: 60–69 (vs. 21–29)	1.07	1.10
Age: 70+ (vs. 21–29)	0.80	0.77





Summary Profiles by Vehicle Category

PHEV Consumer Profile: Descriptive Comparisons

Percent of Program: 61%

***Relative* to rebated BEV consumers:**

Highest vehicle-replacement rates: nearly 90%

↑ More frequently identify as **female**

↑ Tend to be **older**

↓ **Less frequently** have **a Bachelor's degree**

↓ **Lower solar** adoption

↓ **Lower initial interest** in an EV

↓ Rate **environmental impacts less important**

↑ More frequently rate **carpool-lane access** and Green Pass or similar **toll discounts** extremely important

↓ **Lower awareness of rebate** before visiting dealership

PHEV Consumer Profile: Descriptive Comparisons

Percent of Program: 61%

***Relative* to rebated BEV consumers:**

Highest vehicle-replacement rates: nearly 90%

↑ More frequently identify as **female** [34%]

↑ Tend to be **older** [61% > 50 y.o.]

↓ **Less frequently** have **a Bachelor's degree** [75%]

↓ **Lower solar** adoption [15%]

↓ **Lower initial interest** in an EV [64% very interested]

↓ Rate **environmental impacts less important** [58% extremely]

↑ More frequently rate **carpool-lane access** and Green Pass or similar **toll discounts** extremely important [17/18%]

↓ **Lower awareness of rebate** before visiting dealership [47%]

PHEV Consumer Profile: Descriptive Comparisons

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***Relative* to rebated BEV consumers:**

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- ↑ More frequently identify as **female** [34%]
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- ↓ **Lower solar** adoption [15%]
- ↓ **Lower initial interest** in an EV [64% very interested]
- ↓ Rate **environmental impacts less important** [58% extremely]
- ↑ More frequently rate **carpool-lane access** and Green Pass or similar **toll discounts** extremely important [17/18%]
- ↓ **Lower awareness of rebate** before visiting dealership [47%]

Majority Characteristic	PHEV (*n* = 2,766)		New-Vehicle Buyers
	Not *Rebate Essential*	*Rebate Essential (52%)*	(2017 NHTS, NY Responses)
Selected only white/Caucasian	88%**	83%**	75%
Greater than 40 years old	82%**	77%**	70%
Bachelor's degree or more	75%	75%	65%
Own home	92%**	88%**	75%
≥ $100k HH income	61%	61%	51%
Selected male	63%**	70%**	51%

PHEV Consumer Profile & Highest Ranked *R.E.* Predictors

Percent of Program: 61%

***Relative* to rebated BEV consumers:**

Highest vehicle-replacement rates: nearly 90%

↑ More frequently identify as **female** [34%]

↑ Tend to be **older** [61% > 50 y.o.]

↓ **Less frequently** have **a Bachelor's degree** [75%]

↓ **Lower solar** adoption [15%]

↓ **Lower initial interest** in an EV [64% very interested]

↓ Rate **environmental impacts less important** [58% extremely]

↑ More frequently rate **carpool-lane access** and Green Pass or similar **toll discounts** extremely important [17/18%]

↓ **Lower awareness of rebate** before visiting dealership [47%]

Rebate Essential: 52% (of 61%)

PHEV *Rebate Essentials* tend to:

1. Have some [32%] or a lot [56%] of **initial interest** in an EV
2. Be **aware of rebate** before dealership visit [55%]
3. Be **younger**, but **in their 40s** [22%] rather than 20s [6%]
4. Rate special **EV electricity rates** extremely important [22%] or n/a [21%], rather than not important [18%]
5. Rate **free charging away from home** extremely important [28%] or n/a [9%], rather than not important [13%]
6. Be **slightly satisfied** [10%] **with** the **rebate amount**, rather than not [2%]

(7. Have **lower** household **income**)

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

PHEV *Rebate Essentials* vs. all PHEV Rebate Recipients

Rebate Essentials: 52% of PHEV Consumers

PHEV *Rebate Essentials* tend to:

1. Have some [32%, vs 27%] or a lot [56%, vs 64%] of **initial interest** in an EV
2. Be **aware of rebate** before dealership visit [55%, vs 47%]
3. Be **younger**, but **in their 40s** [22%, vs 18%] rather than 20s [6%, vs 5%]
4. Rate special **EV rates** extremely important [22%, vs 18%] or n/a [21%, vs 21%], rather than not important [18%, vs 22%]
5. Rate **free charging away from home** extremely important [28%, vs 23%] or n/a [9%, vs 8%], rather than not important [13%, vs 17%]
6. Be **slightly satisfied** [10%, vs 9%] **with** the **rebate amount**, rather than not [2%, vs 3%]

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

Tesla Consumer Profile & Highest Ranked *R.E.* Predictors

Percent of Program: 24%

***Relative* to other rebated vehicle categories:**

Highest gasoline-vehicle replacement rate: 85%

- ↑ More frequently identify as **male** [83%]
- ↓ **Less frequently** identify as **white**/Caucasian [70%]
- ↑ **Higher** annual **income** [51% > $200k]
- ↓ **Less frequently own** their home [86%]
- ↓ **Less frequently** live in a **single-family residence** [74%]
- ↑ More frequent use of **Level 2 charging at home** [73%]
- ↑ **Higher initial interest** in an EV [80% very interested]
- ↑ Higher importance of **convenience of charging** [43% extmly]
- ↑ Higher importance of **performance** [51% extremely imprt]
- ↑ Higher importance of **styling** [42% extremely important]
- ↑ Higher importance of **the newest tech** [45% extremely]

Rebate Essential: 40% (of 24%)

Tesla *Rebate Essentials* tend to:

1. Rate Green Pass or similar **toll discounts** important [79%], rather than not important [13%]
2. Be **aware of the rebate** before first "dealership" visit [78%]
3. Rate special **electricity rates** extremely important [28%] or n/a [18%], rather than not important [13%]
4. Rate **saving money on fuel** moderately to extremely important [90%], rather than slightly or not important [10%]

(7,8,9: **Environment, tech** & **style slightly** or **not important**)

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

Tesla *Rebate Essentials* vs. all Tesla Rebate Recipients

Rebate Essential: 40% of Tesla Consumers

Tesla *Rebate Essentials* tend to:

1. Rate Green Pass or similar **toll discounts** important [79%, vs 70%], rather than not important [13%, vs 22%]
2. Be **aware of the rebate** before first "dealership" visit [78%, vs 66%]
3. Rate special **electricity rates** extremely important [28%, vs 20%] or n/a [18%, vs 18%], rather than not important [13%, vs 19%]
4. Rate **saving money on fuel** moderately to extremely important [90%, vs 86%], rather than slightly or not important [10%, vs 14%]

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

Non-Tesla BEV Profile & Highest Ranked *R.E.* Predictors

Percent of Program: 15%

***Relative* to other rebated vehicle categories:**

Most-frequently **aware of rebate** before dealership: 70%

- ↑ Higher importance of **environmental impact** [65% extrmly]
- ↑ More importance placed on **state rebate** and **federal tax incentives** [53% and 56% extremely important]
- ↓ **Lower importance** of **carpool-lane access** [7% extrmly imp]
- ↓ **Lower importance** of vehicle **performance** [26% extremely]
- ↓ **Lower importance** of **style, finish, comfort** [14% extremely]
- ↓ **Lower importance** of Green Pass or similar **toll/E-ZPass discounts** [13% extremely important[
- ↑ More **workplace charging access** [28%]
- ↑ More **residential solar** [22%]

Rebate Essential: 60% (of 15%)

Non-Tesla BEV *Rebate Essentials* tend to:

1. Be **aware of rebate** before dealership visit [76%]
2. Rate free **charging away from home** extremely important [29%] or very important [22%], rather than not important [9%]
3. Have some [22%] or a lot [66%] of **initial interest** in an EV
4. Have **lower** household **income**
5. Acquire **non-Chevrolet makes** [67%]
6. Find the **dealer aware of rebate** on first visit [83%]

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

Non-Tesla BEV *Rebate Essentials* vs. all non-Tesla BEV Recipients

Rebate Essential: 60% of Non-Tesla BEV Consumers

Non-Tesla BEV *Rebate Essentials* tend to:

1. Be **aware of rebate** before dealership visit [76%, vs 70%]
2. Rate free **charging away from home** extremely important [29%, vs 25%] or very important [22%, vs 19%], rather than not important [9%, vs 11%]
3. Have some [22%, vs 19%] or a lot [66%, vs 72%] of **initial interest** in an EV
4. Have **household income** < $100k [40%, vs 37%], rather than $100–200k [42%, vs 43%] or > $300k [5%, vs 8%]
5. Acquire **non-Chevrolet makes** [67%, vs 60%]
6. Find the **dealer aware of rebate** on first visit [83%, vs 79%]

[Percentages are weighted to represent the program population along the dimensions of technology type (PHEV vs. BEV), vehicle model, purchase vs. lease, and residence county. Program percentages are in blue; percentages in purple are calculated for *Rebate Essentials* specifically.]

Additional considerations

- Additional, weaker findings:
  - Target PHEV consumers with relatively lower incomes, that rent, and/or that have college degrees
  - Target Tesla consumers placing relatively lower importance on environmental impacts, technology, and/or vehicle performance
  - Target non-Tesla BEV consumers with multiple cars and/or that are male
- Note tradeoffs for each vehicle type, e.g.:
  - Tesla consumers are least frequently *Rebate Essential*, but
    - company may be effectively pre-converting consumers to EV interest and adoption
    - most frequently replace gasoline vehicles
    - are the youngest and least-frequently select solely white/Caucasian

Summary, Conclusions & Recommendations

Caveats

- This work is centered on consumers who overcame their barriers to adoption, purchased/leased an EV, and participated in the DCRP.
- Extrapolating these findings should be done with caution. Additional research is required to understand consumers who have not overcome their barriers to acquiring an EV.

Using the Report Beyond the Project

- Descriptive stats help us better understand rebated adopters and segments
- Logistic regressions and dominance analysis rank-order distinguishing predictors, telling us where to focus first

Summary of Statistically Significant Descriptive Findings
Rebate Essentials

Compared to their non-*Rebate Essential* counterparts:

- PHEV *Rebate Essentials* are more frequently renters and less frequently identify solely as white/Caucasian
- PHEV and Tesla *Rebate Essential* participants tend to be younger
- *Rebate Essential* PHEV and non-Tesla BEV consumers are male more frequently

Summary of Regressions: Common Odds-Increasing Factors

- Across all three vehicle categories:
  - consumer awareness of the rebate before the first dealership visit
  - at least some initial interest in EVs at the beginning of the car search
- For PHEV and non-Tesla BEV *Rebate Essentials*:
  - dealer awareness of the rebate on the first visit
  - the importance of free charging away from home
  - lower income
  - male gender
- For PHEV and Tesla *Rebate Essentials:*
  - the importance of special electricity rates
  - relatively lower importance of reducing environmental impacts (in PHEV alternative modeling)

Summary of Regressions: Notably Not Found Significant
Rebate Essentials

- Across all three vehicle categories:
  - Very few household characteristics, including residence type and access to charging
- For PHEV *Rebate Essential* consumers:
  - More emphasis on demographics
- For Tesla *Rebate Essential* consumers:
  - More emphasis on motivational factors
  - Less emphasis on demographics
- For non-Tesla BEV *Rebate Essential* consumers:
  - Less emphasis on demographics and motivational factors, somewhat more on household, dealer, and transactional factors

Significance by Type of Factor

Of the 45+ factors included in the statistical modeling:

- **Household, charging-access, and dealer-experience factors** distinguished *Rebate Essentials* the least.
- **Demographic:** Controlling for other factors, significance was sparse and low-ranked.
- **Motivators:** Social/enviro motivations and product appeal were less frequently important to *Rebate Essentials.*
- **Transactional/vehicle:** Long electric range may be doing some of the work of the rebate.
- **Financial and practical considerations** may resonate**.**

High-level take-aways to increase cost-effectiveness

- **Support or advertise other incentive programs** (e.g., free charging, toll discounts, EV charging rates) **that reinforce the influence of the rebate**
- **No evidence has been found yet to limit the number of rebates** per individual.
- Descriptively, *Rebate Essentials* trend **relatively younger and lower-income and rent housing**
  - **PHEV** *Rebate Essentials* identify **less frequently** as **white**
- Most impactful to **target outreach to *ranked* characteristics**
  - Or **increase their prevalence**
- **Support consumer awareness** of the rebate during the **pre-dealership**-visit information gathering phase (especially PHEVs).
- **Support rebate awareness among dealers**, who may act as a “backstop” to reinforce consumer awareness or convert the unaware w/rebate

Appendices & Additional Resources

Appendices

Consumer Survey Data
(shows rebates to individuals only)

	CALIFORNIA CLEAN VEHICLE REBATE PROJECT™	MOR-EV Massachusetts Offers Rebates for Electric Vehicles	CHEAPR Connecticut Hydrogen and Electric Automobile Purchase Rebate	NEW YORK STATE	Total
Vehicle Purchase/ Lease Dates	Sep. 2012* – Dec. 2019	Jun. 2014 – Apr. 2020	May 2015 – Sep. 2018	Mar. 2017 – Jul. 2018	Sep. 2012* – Apr. 2020
Survey Responses (total n)**	66,902	6,616	1,565	1,808	76,891
Program Population (N)***	339,200	16,100	3,500	8,600	367,400

Includes fuel-cell EVs (CVRP only).

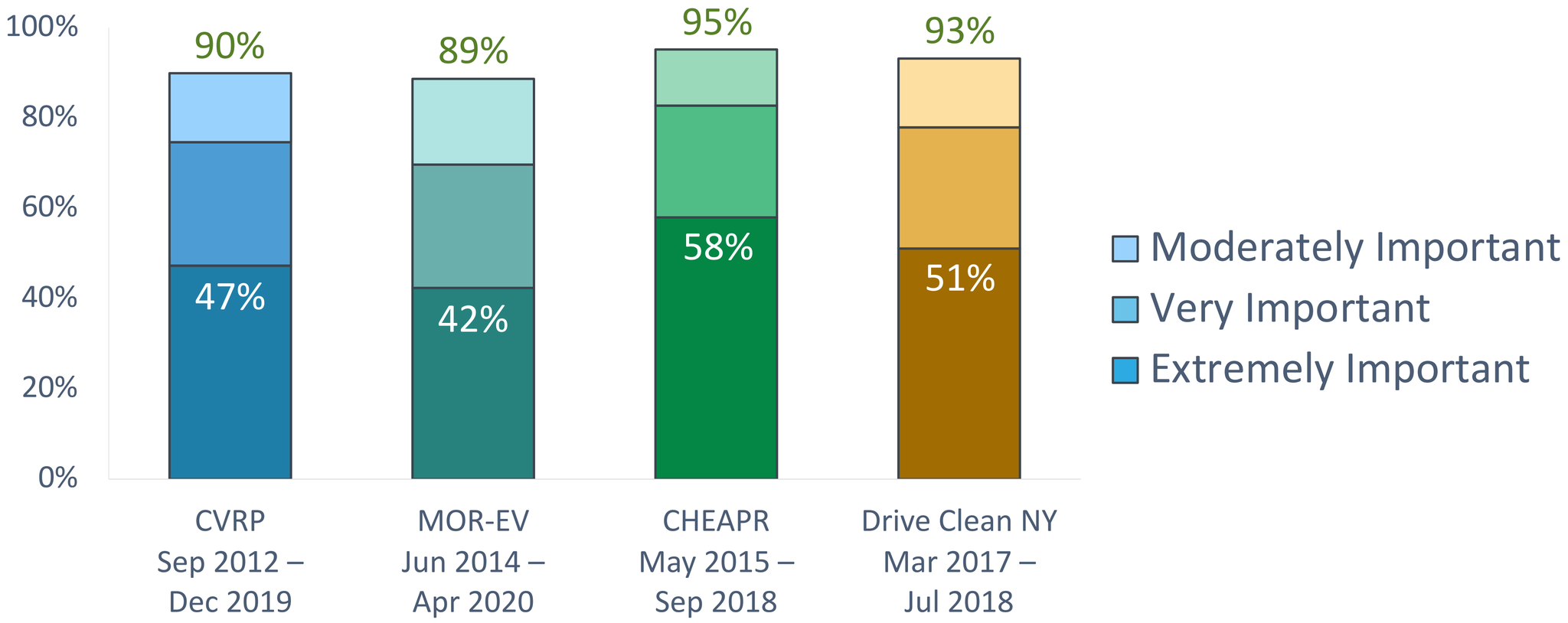
*Two fuel-cell EVs rebated by CVRP with purchase/lease dates from Dec. 2010 – Sep. 2012 are included.

** Subsequently weighted to represent the program population along the dimensions of vehicle category, model, buy vs. lease, and county.

*** Small numbers of rebated vehicles are not represented in the time frames due to application lags. Rounded to nearest 100.

Rebate Influence: Importance

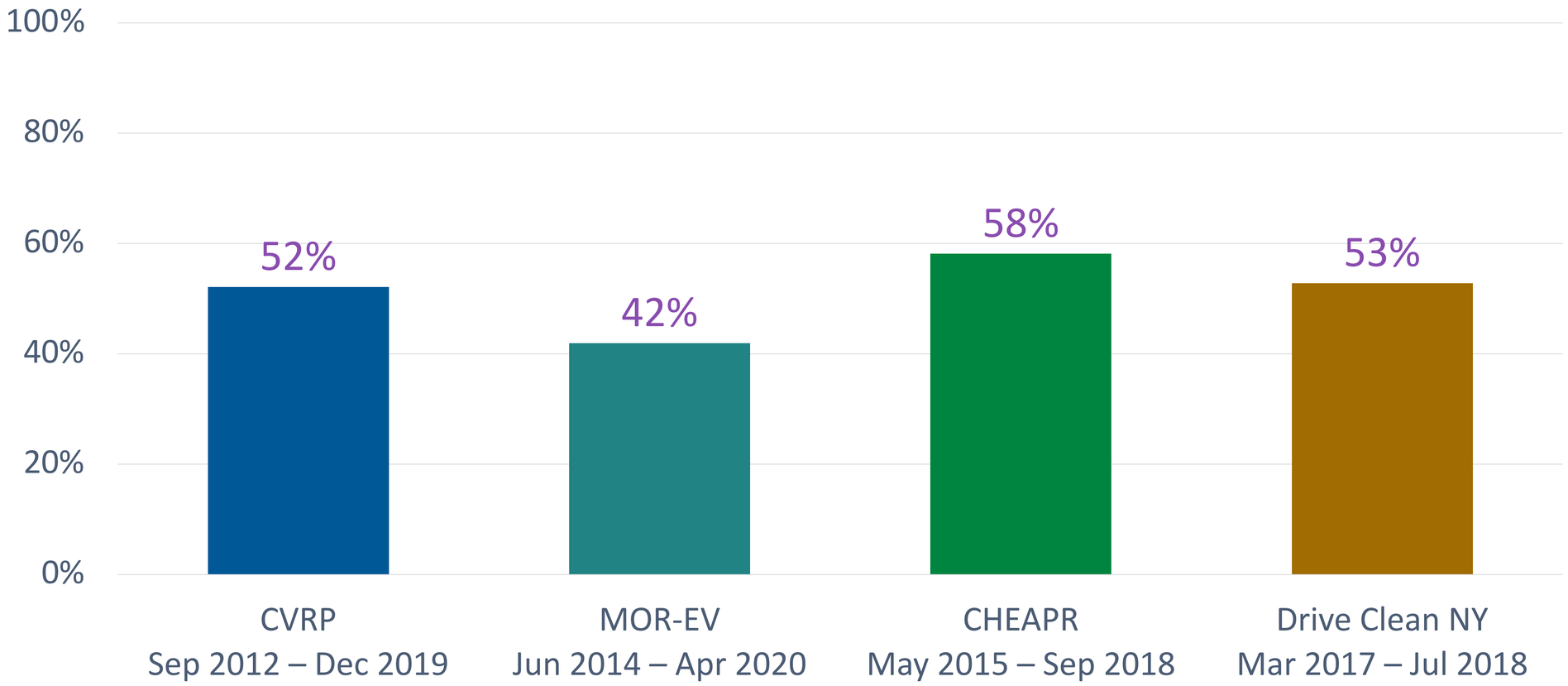
How important was the state rebate in making it possible for you to acquire your clean vehicle?



Includes fuel-cell EVs (CVRP only). Overall datasets: 76,891 total survey respondents weighted to represent 367,400 rebate recipients.

Rebate Influence: Essentiality

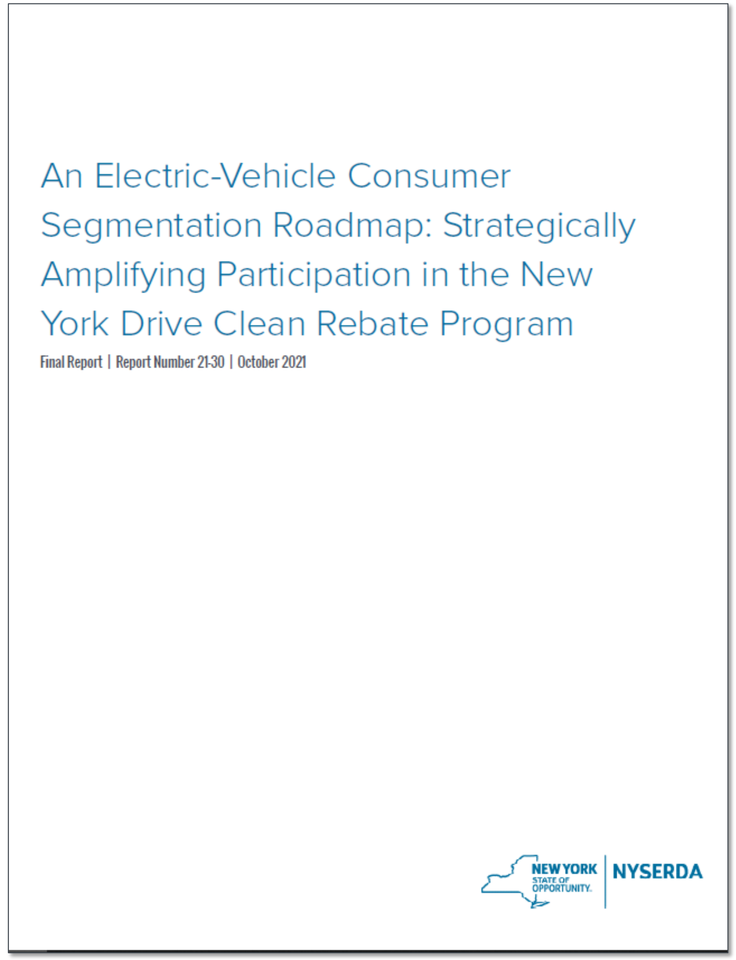
Would not have purchased/leased their clean vehicle without rebate



Includes fuel-cell EVs (CVRP only). Overall datasets: 76,891 total survey respondents weighted to represent 367,400 rebate recipients.

Additional Resources

Roadmap Report



[report link]

Summarizes and integrates distinct, stand-alone EV research projects into a sequence of consumer-segment steppingstones that progress EV markets from enthusiastic early adopters toward mainstream consumers and beyond

Select Publications (Reverse Chronological, as of 5/2022)

- B.D.H. Williams, J.B. Anderson (2022, Jun.), Lessons Learned About Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase, for procs. *35th International Electric Vehicle Symposium and Exhibition (EVS35*), AVERE.
- B.D.H. Williams (2022, Jun.), Targeting Incentives Cost Effectively: "Rebate Essential" Consumers in the New York State Electric Vehicle Rebate Program, for procs. *35th International Electric Vehicle Symposium and Exhibition (EVS35),* AVERE.
- B.D.H. Williams (2021, Oct. [posted in 2022]), An Electric-Vehicle Consumer Segmentation Roadmap: Strategically Amplifying Participation in the New York Drive Clean Rebate Program, NYSERDA Report 21-30.
- Williams, B. D. H. (2022, Jan.), Brief: PHEV Consumers Most Highly Influenced by the U.S. Federal Tax Credit. Clean Vehicle Rebate Project
- N. Pallonetti and B. D. H. Williams (2021, Jul.), "Refining Estimates of Fuel-Cycle Greenhouse-Gas Emission Reductions Associated with California's Clean Vehicle Rebate Project with Program Data and Other Case-Specific Inputs," *Energies*, vol. 14, no. 15.
- B. D. H. Williams and J. B. Anderson (2021, Mar.), "Strategically Targeting Plug-In Electric Vehicle Rebates and Outreach Using '*EV Convert*' Characteristics," *Energies*, vol. 14, no. 7, p. 1899.
- S. Hardman, P. Plötz, G. Tal, J. Axsen, E. Figenbaum, P. Jochem, S. Karlsson, N. Refa, F. Sprei, B.D. Williams, J. Whitehead, B. Witkamp (2019), Exploring the Role of Plug-In Hybrid Electric Vehicles in Electrifying Passenger Transportation, International EV Policy Council, UC Davis Plug-in Hybrid and Electric Vehicle Research Center.
- B.D. Williams, J. Orose, M. Jones, J.B. Anderson (2018, Oct.), Summary of Disadvantaged Community Responses to the Electric Vehicle Consumer Survey, 2013–2015 Edition. Clean Vehicle Rebate Project.
- B.D. Williams, J.B. Anderson (2018, Sep.), Strategically Targeting Plug-in Electric Vehicle Rebates and Outreach Using Characteristics of "*Rebate-Essential*" Consumers in 2016–2017, in: *31st Int. Electr. Veh. Symp.*, Society of Automotive Engineers of Japan, Inc., Kobe, Japan.
- C. Johnson, B.D. Williams, J.B. Anderson, N. Appenzeller (2017, Jun.), Evaluating the Connecticut Dealer Incentive for Electric Vehicle Sales, Center for Sustainable Energy (CSE).
- C. Johnson, B.D. Williams (2017, Jan.), Characterizing Plug-In Hybrid Electric Vehicle Consumers Most Influenced by California's Electric Vehicle Rebate, *Transp. Res. Rec*. 2628, 23–31.

Select Presentations & Videos (Reverse Chronological, as of 6/2022)

- CVRP 2020 Data Brief: Incentive Influence
- CARB Video: "CVRP 2020 Data Brief: Consumer Characteristics," time 1:05:43–1:26:09. Slides.
- CARB Video: "Cost-Effectiveness of Greenhouse Gas Emission Reductions Associated with California's Clean Vehicle Rebate Project in 2019 (and 2020)," time 2:01-2:31. Slides.
- California Plug-in Hybrid EV Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase
- Data from Statewide Electric Vehicle Rebate Programs: Vehicles, Consumers, Impacts, and Effectiveness
- CVRP CY 2019 Data Brief: Vehicle Replacement & Incentive Influence
- CVRP Data Brief: MSRP Considerations
- EV Purchase Incentives: Program Design, Outputs, and Outcomes of Four Statewide Programs with a Focus on Massachusetts
- What Vehicles Are Electric Vehicles Replacing and Why?
- Electric Vehicle Incentives and Policies
- Proposed FY 2019–20 Funding Plan: Final CVRP Supporting Analysis
- CVRP: Data and Analysis Update
- Cost-Effectively Targeting EV Outreach and Incentives to "*Rebate-Essential*" Consumers
- Electric Vehicle Rebates: Exploring Indicators of Impact in Four States
- Targeting EV Consumer Segments & Incentivizing Dealers
- Yale Webinar: "Supporting EV Commercialization with Rebates: Statewide Programs, Vehicle & Consumer Data, and Findings," 58 minutes. Slides.
- CVRP Income Cap Analysis: Informing Policy Discussions

Summary & Select Findings: Rebate Influence*

Context: program design and COVID-19 shaped impacts in 2020

- $60k MSRP cap and $500 decrease in standard rebate amounts as of Dec. 2019
- COVID-19 caused an anomalous year in several respects

2020 Incentive Influence:

CVRP Rebates

- 82% found the rebate an important enabler of their EV acquisition
- 38% would not have purchased/leased without it
  - 31% for Teslas, but 47% for PHEVs, 50% for non-Tesla BEVs, 66% for Increased Rebate recipients
- Rebate influence decreased from 2019 to 2020, primarily for Tesla consumers
- Tesla rebate influence decreases as MSRP increases
- Rebate influence decreases as income increases, particularly for Tesla
- Attractive offerings (including SUVs and Tesla products) have lower *Rebate Essentiality*

Federal-tax-credit (FTC)

- FTC influence more steady
- 50% of FTC-eligible CVRP consumers rated FTC an “Extremely Important” enabler
  - 54% for purchases, 42% for leases (often claimed by the leasing company)
- Data confirm influence decreased for Tesla and GM as FTC phased down and out
- 2019 FTC influence decreases above $50,000 MSRP
- Relative to 2019, 2020 influence increased for MSRP $30k–40k, but *decreased* for MSRP<$30k

* From: CVRP 2020 Data Brief: Incentive Influence

Recommended citation:

Williams, B.D.H., (2022, June). Presentation: “Targeting Incentives Cost Effectively: ‘*Rebate Essential*’ Consumers in the New York State Electric Vehicle Rebate Program,” for the 35th International Electric Vehicle Symposium (EVS35), AVERE, Oslo.

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