

BRIEF:

Consumers Most Highly Influenced by the U.S. Federal Tax Credit

Analysis of 2016–2018 Rebated Plug-in Hybrid Electric Vehicle Purchases in California

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INTRODUCTION

Background. The U.S. federal tax credit (FTC) of up to \$7,500 for the purchase of plug-in electric vehicles (EVs) has been phased out for GM and Tesla vehicles. A ten-year extension and changes to the incentive are being considered as part of the Build Back Better bill. What can analysis of those most highly influenced by the FTC say about the incentive? Who found the FTC most influential?

Analysis Overview and Scope Limitations. This brief summarizes and provides additional context for findings of a paper¹ published by the 33rd Annual Electric Vehicle Symposium. It analysed survey responses from 3,452 recipients of California’s state-wide EV rebate (CVRP) who purchased a plug-in hybrid EV (PHEV) from November 2016 through December 2018. The beginning of the date range marks a major CVRP program change (introduction of income-based eligibility) and the end marks the most recent data available at the time of analysis—i.e., the data constituted the most recent “current-program” era. Data weights were used to make the survey more representative of all program participants, and the program constituted roughly half of the California EV market at the time.

The analysis evaluated a wide range of factors (demographic, household, regional, motivational, and transactional) to identify and rank-order those found statistically associated with increased odds of being a consumer that rated the FTC “Extremely Important” to making their PHEV purchase possible (Figure 1). As such, these “*FTC Extremes*” were the most highly influenced and might not have been able to adopt their EV without the FTC. Respondents who selected “Not at all important,” “Slightly important,” or “Moderately important” were grouped to form the non-extreme status. Further details are in the paper.

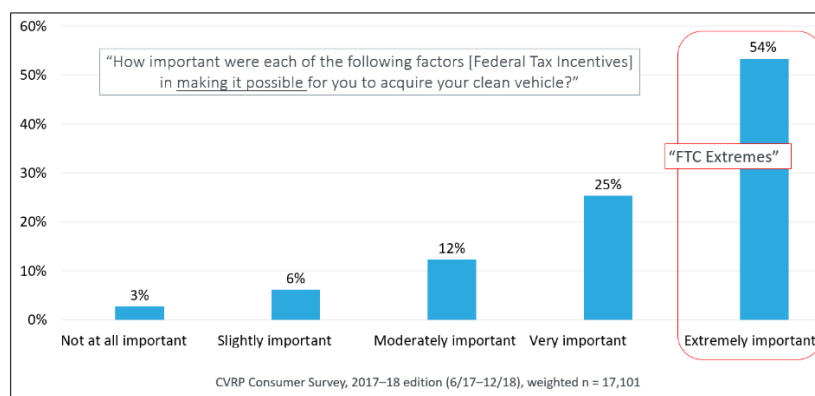


Figure 1: The Importance of the Federal Tax Credit in Enabling the EV Acquisition of CVRP Participants

¹ Williams, B. D. H., Anderson, J. B., & Lastuka, A. (2020, September 9). Characterizing Plug-in Hybrid Electric Vehicle Consumers Who Found the U.S. Federal Tax Credit Extremely Important in Enabling Their Purchase. *33rd Electric Vehicle Symposium (EVS33)*. <https://doi.org/10.5281/ZENODO.4021408>

RESULTS

Influence: Scale and Trend Over Time. A majority of rebated survey respondents rated the FTC as extremely influential (Figure 1). Notably, this majority is *increasing*, a trend that runs counter to typical paradigms about phasing-out of EV incentives over time [1].

Demographics. Descriptively, *FTC Extreme* PHEV purchasers resemble the new-car buying market as a whole on some dimensions (race/ethnicity and age) but remain distinct, like other EV adopters, on other dimensions (male gender identification, home ownership, and, to a lesser extent, higher household income) (Table 1).

Table 1 Summary of *FTC Extreme* Segment Characteristics

Characteristic	<i>FTC Extremely Important to PHEV Purchase</i> (weighted n = 2,213)	CA New-Vehicle Buyers MYs 2016–17 (2017 NHTS CA add-on*)
Selected solely White/Caucasian	51%^	51%
≥ 50 Years Old	50%^	46%
≥ \$100k HH Income	67%^	56%
Own Residence	81%	63%
Selected Male	70%	50%

* NHTS is weighted to represent the population, not the new-vehicle subset. New-vehicle buyers identified based on a within-100-mile match between odometer and miles driven while owned.

^ Significant difference ($p < 0.05$) between *PHEV FTC Extremes* and PHEV consumers *without* extreme FTC importance.

Significant differences were found between *FTC Extremes* and non-*Extremes* in individual descriptive statistics for race/ethnicity, age, education, and income (indicated where present in Table 1 by carets in the *FTC Extreme* column). However, when simultaneously controlling for other factors using logistic regression, only higher educational attainment and male gender identification were found to distinguish *FTC Extremes*, and both factors were low-ranking (Table 2, which uses dominance analysis to rank the importance of significant variables in the most succinct, “Parsimonious Model”).

High-Ranking Factors Associated with FTC Influence. *FTC Extremes* were found to be highly motivated by financial savings and charging availability, along with carpool-lane access (Table 2). It is not surprising that placing extreme importance on an incentive goes hand-in-hand with the size of that incentive, the importance of other financial benefits such as saving money on fuel, and prerequisites for realizing those benefits, such as charging availability. But the predominance of these factors in explaining segment membership is such that it paints a very practical, arguably single-minded, focus on PHEVs as metaphorical vehicles of tangible, direct benefits rather than the reduced environmental impacts that highly motivate EV adopters overall. Indeed, choosing environmental impacts as the *most* important reason motivating the PHEV purchase *reduced* the odds of being *FTC Extreme* in the “Full Model,” which contained all variables examined. Further, other predictors significant in the Full Model that did not survive the reduction down to the Parsimonious Model include: being highly influenced by state EV rebates (*Rebate Essentials* [2–5]) and *not* having received an increased state rebate that is only available to consumers with household incomes too low to fully benefit from the FTC.

The financial and practical-use theme is also reinforced by findings indicating reduced odds of being *FTC Extreme* when buying PHEV brands that are more “BEV-like” (the Chevrolet Volt and Honda Clarity PHEV), compared to more “hybrid-like” (the Toyota Prius Prime and luxury PHEVs). This is consistent with conceptions of the latter category as high-MPG/high-efficiency fuel savers more than transformational and socially beneficial all-electric products. Finally, *FTC Extremes* exhibit faint echoes of characteristics seen in *Rebate*

Essentials, such as higher educational attainment, purchase of lower-priced vehicles, and being somewhat more frequently male (albeit with almost trivial contributions being made by those factors).

Table 2: Summary and Rank-Ordering of Key *PHEV FTC Extreme* Predictors

Variable Description	Odds-Increasing Examples	Average of Pseudo-R ² Average Contributions	Rank
Importance of saving money on fuel	Very or extremely important (vs. Not)	0.045	1
Importance of charging availability at work	Very or extremely important (vs. Not)	0.039	2
Importance of carpool/HOV lane access	More important	0.027	3
Importance of charging availability at/near destinations other than home and work	Very or extremely important (vs. Not)	0.027	4
FTC incentive amount (\$1,000s)	Larger amount	0.022	5
Importance of charging availability at home	Extremely important (vs. Not) Not important (vs. Slightly)	0.020	6
Vehicle make	Not Chevrolet nor Honda (vs. others)	0.011	7
Importance of increased energy independence	Extremely important	0.007	8
Purchase quarter	Later in year	0.006	9
Education	Higher educational attainment	0.005	10
Purchase price	Lower price	0.004	11
Tax filing status	Single (vs. Married filing separately)	0.003	12
Gender	Male	0.001	13

Non-significance. *PHEV FTC Extremes* do not appear to be distinguished by race/ethnicity, unlike *PHEV Rebate Essentials* [3]. Interestingly, household income also does not predict the odds of being an *FTC Extreme*. Perhaps this indicates that CVRP’s income cap has sufficiently blunted any impact differences in income might otherwise have in differentiating incentive influence amongst program participants. As with *Rebate Essentiality*, only the large step-function difference in income represented by receiving CVRP’s Increased Rebate for households under 300% of the federal poverty level (or not), helps predict FTC importance. Opposite to *Rebate Essentiality*, being below that threshold actually *decreases* the importance of the FTC incentive, consistent with the likelihood that such households have insufficient tax liability to fully benefit from the FTC.

Even more broadly, *no* household or regional characteristics studied were associated with the odds of being an *FTC Extreme*. Neither were vehicle performance or the desire for new technology. Lower initial interest in EVs, the definition of an *EV Convert* [2,6–8], does not help predict *Rebate Essentiality* or *FTC Extreme Importance* for PHEV consumers. This might mean that these incentives have recently not been “converters” of consumers into having interest in an PHEV, so much as enablers of purchases by at least moderately interested shoppers.

RECOMMENDATIONS

- FTC influence was *increasing*, indicating it was too early to phase the FTC out.
- FTC influence was not found to be related to the number of EVs previously owned, indicating insufficient evidence upon which to limit the number of times an individual or household is eligible for the FTC.
- Having lower income was associated with *decreased* FTC influence, indicating the incentive should not depend on tax liability
- FTC influence increases with purchase quarter, indicating the incentive might be more effective if moved closer to the point of sale.
- Outreach profile: Resonant messages include financial savings, convenience benefits (e.g., carpool-lane access) and charging availability—and to a lesser extent, energy independence.
- FTC influence increases for lower-priced vehicles, indicating an opportunity to limit the benefit for luxury-priced EVs and/or increase the benefit for lower-priced EVs.

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