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Are Electric Vehicle Subsidies Becoming More Impactful Over Time?

Tamara Sheldon, Rubal Dua and
Omar Abdullah AlHarbi

Februay 2021
Doi: 10.30573/KS--2021-DP04

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Key Points

We explore the evolution of the impact and cost-effectiveness of clean vehicle subsidies over time. As a case study, we consider the United States (U.S.) plug-in electric vehicle (PEV) subsidy between 2011 and 2017. We develop counterfactual simulations based on a vehicle choice model and use annual survey data from new vehicle buyers to estimate the annual share of PEV purchases induced by the subsidy. We calculate the cost per additional PEV sold and the cost per gallon of gasoline saved (i.e., not used) as a result of the policy. We also provide subsidy performance metrics by consumer income level and PEV model. The results suggest that:

> Federal subsidies for battery electric vehicles (BEVs) are becoming less impactful and costlier over time, as purchases of higher-priced BEVs, such as Teslas, are increasingly being subsidized.

> It is more cost-effective to subsidize BEVs rather than plug-in hybrid electric vehicles and to subsidize lower-income consumers.

Summary

Various subsidies for plug-in electric vehicles (PEVs) have been implemented worldwide at the federal, state and regional levels. These subsidies aim to promote PEV adoption to help reduce both local air pollution and greenhouse gas emissions (Hardman 2019). In the United States (U.S.), the federal government began subsidizing PEVs in 2010. Specifically, the U.S. offers a federal income tax credit of $7,500 for battery electric vehicles (BEVs) and up to $7,500 for plug-in hybrid electric vehicles (PHEVs). BEVs run exclusively on electricity, whereas PHEVs have both an electric motor and an internal combustion engine and, thus, operate on either gasoline or electricity. The subsidy for PHEVs scales with the battery capacity.[1]

Recent research suggests that in the U.S., these policies have effectively increased PEV sales but have come at a fairly high cost. Sheldon and Dua (2019a) estimate that the cost of the federal subsidy was $36,000 per PEV purchase induced by the subsidy for model year 2015. Li et al. (2017) use aggregate PEV sales data to estimate that 40% of PEV sales from 2011 to 2013 resulted from the federal subsidy. Using a stated preference approach, Tal and Nicholas (2016) find that over 30% of national PEV sales were induced by the federal tax credit. Moreover, research shows that higher-income consumers often purchase higher-priced BEVs. Although such consumers welcome the subsidy, they may not necessarily need it to make the purchase (Sheldon and Dua 2019a). Such consumers have a lower price elasticity of demand (i.e., they are less price sensitive), and they have strong preferences for these upscale BEVs (DeShazo, Sheldon, and Carson 2017).

This study investigates the federal PEV subsidy in more depth by exploring the evolution of both its impact and cost-effectiveness over time. To understand this evolution, we develop counterfactual simulations based on a vehicle choice model. We utilize annual survey data on new vehicle buyers in the U.S., including data on vehicle characteristics, for model years 2011 to 2017. We estimate the share of PEVs purchased each year that were induced by the subsidy (i.e., vehicles that would not have been purchased in the absence of the subsidy). We then calculate both the cost per additional PEV sold and the cost per gallon of gasoline saved (i.e., not used) as a result of the policy. To the best of our knowledge, this study is the first to evaluate the performance of PEV subsidies over time. We also provide subsidy performance metrics by consumer income level and PEV model. This more granular analysis may improve policymakers' understanding and help them craft more effective PEV adoption policies in the future.

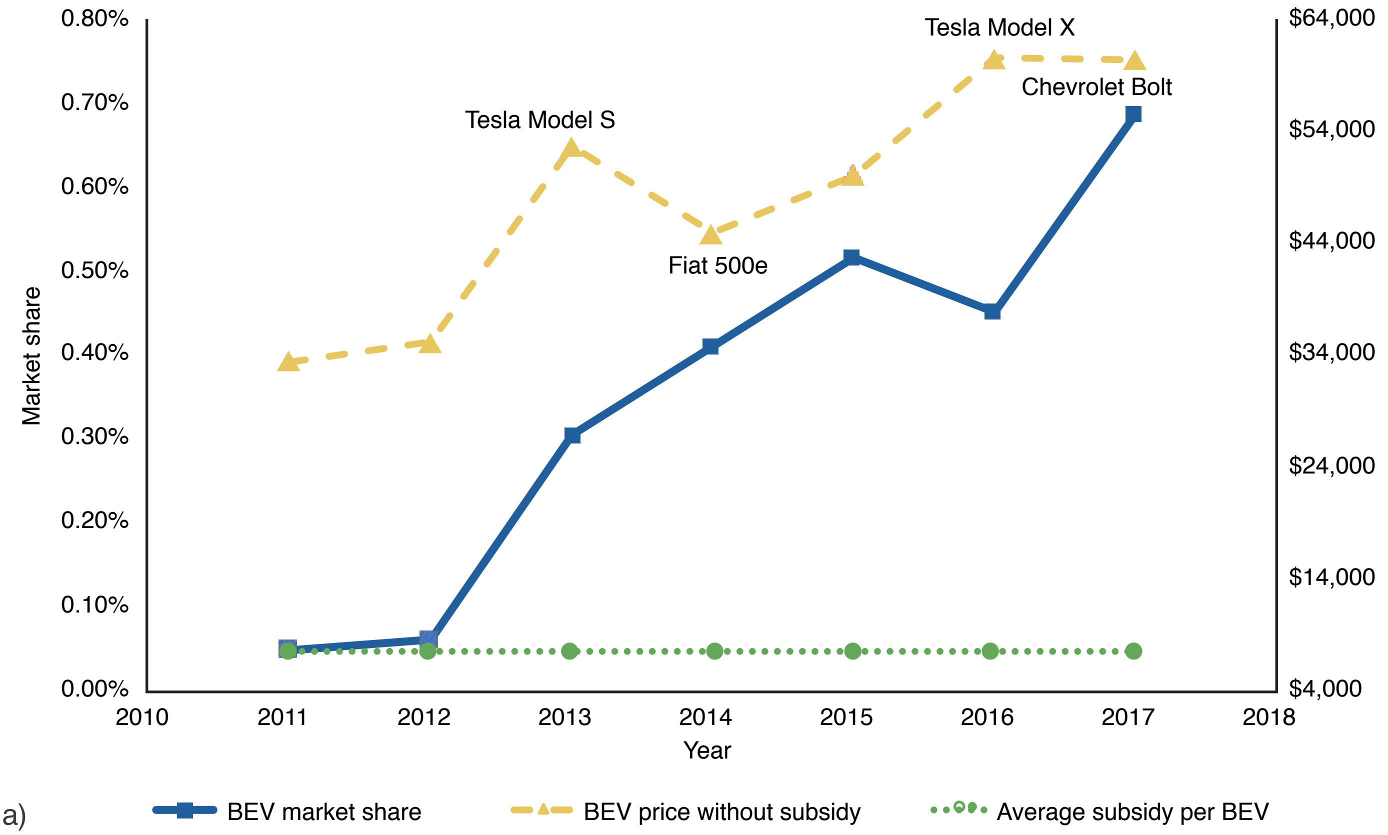
The results of our analysis suggest that federal PEV subsidies are becoming less impactful and costlier over time, as higher-priced BEVs, such as Teslas, are increasingly being subsidized. Our results also suggest that it is more impactful and cost-effective to subsidize BEVs than to subsidize PHEVs. In other words, BEV buyers are less likely to buy a BEV in the absence of a subsidy than PHEV buyers are. Subsidies may be more impactful for incentivizing BEV purchases because of stronger concerns related to BEV purchases (e.g., concerns about range, resale value or refueling requirements).

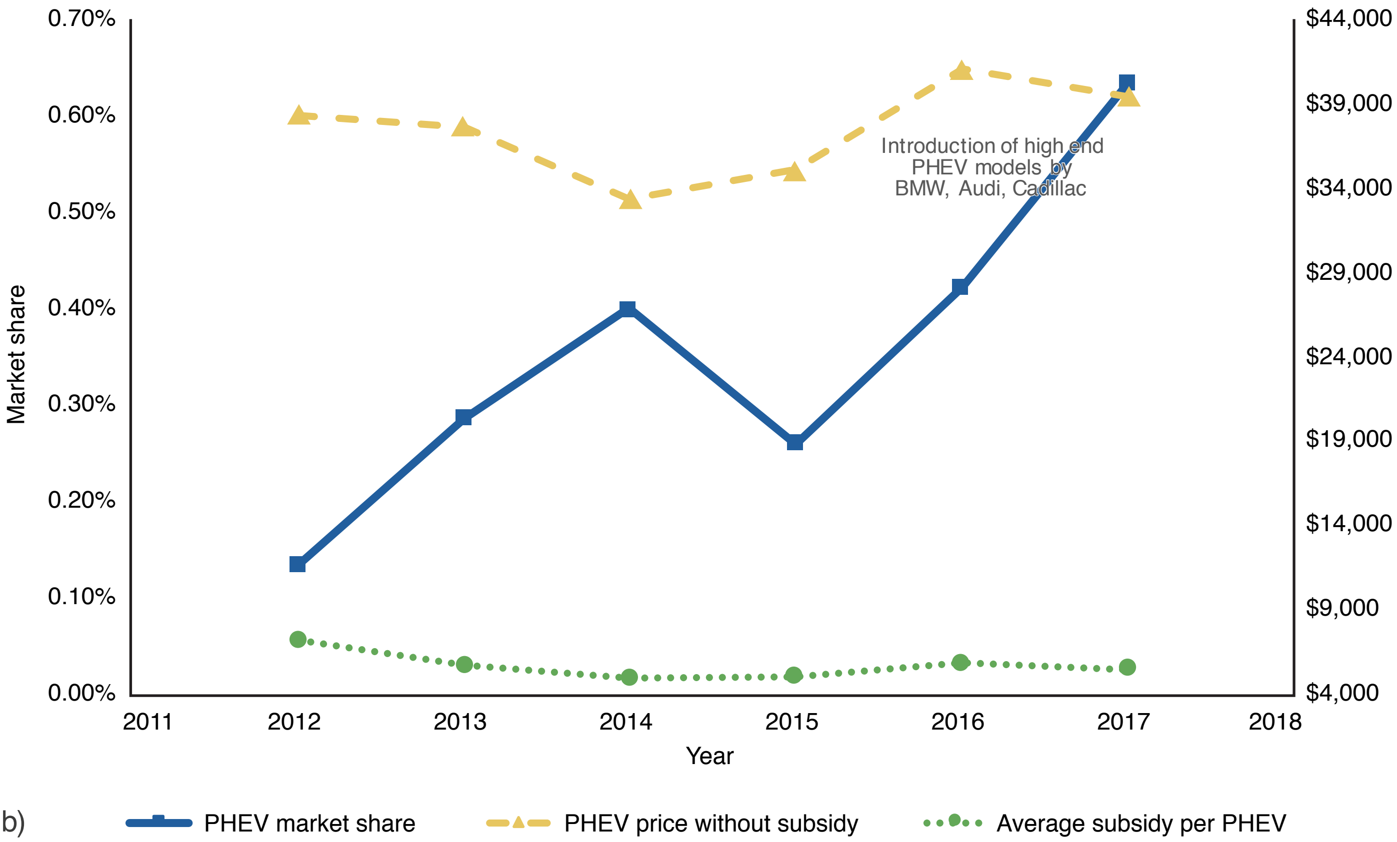
Data

We obtain disaggregated data on new vehicle sales for model years 2011–2017 from Strategic Vision Incorporated.[2] We aggregate the data at the make-model level. These data are derived from a survey of households who purchased new vehicles in the given model year. The survey data cover large representative samples of the United States (U.S.) new vehicle market, as the survey has over 200,000 respondents per model year. Our dataset contains weights corresponding to the ratio of total buyers of each make and model nationwide to the number of survey respondents purchasing the same make and model. We combine these data on sales with data on vehicle characteristics from edmunds.com, cars.com and iseecars.com.

Figure 1 shows the evolution of the shares of BEVs and PHEVs in the U.S. new vehicle fleet over model years 2011–2017. Model year (MY) 2011 corresponds to the introduction of the Nissan Leaf, one of the first PEVs with broad market appeal, to the U.S. Figure 1 also shows the evolution of the sales-weighted average price (i.e., without any subsidy) over time. The sales-weighted average price of BEVs has been rising owing to the introduction and popularity of higher-priced models. Such models include the Tesla Model S in MY 2013, the Tesla Model X in MY 2016 and the Chevrolet Bolt in MY 2017. During the same time period, the sales-weighted average price for non-PEVs increased from $29,500 to $33,800. Conversely, the sales-weighted average price (i.e., without any subsidy) of PHEVs declined from 2012

Figure 1. Market share, sales-weighted price (without any subsidy) and sales-weighted subsidy for (a) BEVs and (b) PHEVs.





b)

Source: KAPSARC analysis.

until 2014 owing to the decrease in the price of the popular Chevrolet Volt. However, the sales-weighted PHEV price began increasing after 2014 because higher-end PHEVs were introduced. These models include the Cadillac ELR, BMW i3, BMW X5 and Audi A3, among others. Finally, the graphs show that the average sales-weighted federal subsidy amount for BEVs stayed constant at $7,500. For PHEVs, however, it varied over time as different models with varying battery capacities were introduced.

Methodology

We assess the evolution of the federal PEV subsidy's impact and cost-effectiveness by building a vehicle choice model and fitting it using both aggregated and disaggregated U.S. sales data. We then use the estimated model to predict the market share of PEVs and fleet gasoline consumption under alternative subsidy scenarios. Among these, we consider a scenario with the current subsidies and another scenario with no subsidies.

We estimate our vehicle choice model using a multi-criteria decision-making random utility maximization framework, following Sheldon and Dua (2020). Within this framework, we estimate a conditional logit model. This model evaluates the probability that a representative consumer purchases the given vehicle out of all available vehicles in the given model year as a function of vehicle attributes. We estimate a conditional logit function where the utility of a consumer that chooses a vehicle of make-model *i*, u_i, is specified as follows.

$$u_i = \beta CPPV_i + ASC_i'\gamma + \varepsilon_i \tag{1}$$

$$CPPV_i = \frac{\left(\frac{P_i}{P_{avg}} + \rho_{DPM}\frac{DPM_i}{DPM_{avg}}\right)}{\left(\frac{Per_i}{Per_{avg}} + \rho_{Range}\frac{Range_i}{Range_{avg}} + \rho_S ln\left(\frac{S_i}{S_{avg}}\right)\right)} \tag{2}$$

The characteristics of the i^{th} make and model are denoted by:

CPPV: Cost per perceived value

P: Price

DPM: Dollars per mile (fuel price divided by vehicle fuel economy)

Per: Performance (horsepower divided by weight)

Range: Range

S_i: Previous year sales (first year sales are used for new make-models whose previous year sales are not available)

ρ_x: Weights for the respective vehicle characteristics

For disaggregated individual-level data, we estimate an alternative specification of the conditional logit model that includes the following utility function. This function uses the group-specific coefficient β_g to allow for heterogeneous preferences.

$$u_i = \beta_g CPPV_i d_g + ASC_i'\gamma + \varepsilon_i \tag{3}$$

The new variables in this function are defined as:

d_g: Group-specific indicator for disaggregated consumer-level data

We estimate the choice model using two-stage constrained, iterative minimization, as outlined by Sheldon and Dua (2020). By applying the estimated choice model for each year in the sample, we can predict BEV and PHEV sales with and without federal subsidies. The policy impact is measured by the additional sales percentage, defined as the fraction of all PEV (either BEV or PHEV) sales that the subsidy induced. This metric is calculated using the following formula:

$$Additional\ Sales\ Percentage_{PEV} = \frac{Sales_{PEV}^{Subsidy} - Sales_{PEV}^{No\ Subsidy}}{Sales_{PEV}^{Subsidy}} * 100, \tag{4}$$

where

$Sales_{PEV}^{Subsidy}$: total PEV (either BEV or PHEV) sales with existing subsidies

$Sales_{PEV}^{No\ Subsidy}$: total PEV (either BEV or PHEV) sales with no subsidies.

We measure the cost-effectiveness of the PEV subsidy in two ways: spending per additional PEV sold and spending per gallon of saved gasoline equivalent. Spending per additional PEV sold reflects the money spent to induce one additional PEV sale. It is calculated by dividing total spending on subsidies by the total number of additional PEV sales, as shown in Equation 5. We then divide the numerator and denominator of this equation by total PEV sales under existing subsidies. This operation shows that this measure of cost-effectiveness is equivalent to the average subsidy per PEV divided by the additional sales percentage. Thus, if the subsidy per PEV is constant, as in the case of BEVs, cost-effectiveness is inversely proportional to the additional sales percentage.

$$Cost\ Eff_{PEV} = \frac{Sales_{PEV}^{Subsidy} * \overline{Subsidy}}{Sales_{PEV}^{Subsidy} - Sales_{PEV}^{No\ Subsidy}} = \frac{100 * \overline{Subsidy}}{Additonal\ Sales\ Percentage_{PEV}}, \tag{5}$$

where

$Cost\ Eff_{PEV}$: cost-effectiveness of a PEV (either BEV or PHEV) subsidy

$\overline{Subsidy}$: average sales-weighted subsidy per PEV

$Sales_{PEV}^{Subsidy}$: total PEV sales with existing subsidies

$Sales_{EV}^{No\ Subsidy}$: total PEV sales with no subsidies.

Spending per gallon of saved gasoline equivalent reflects the money spent to save one gallon of gasoline equivalent. It is calculated by dividing total spending on subsidies by the total gallons of gasoline equivalent saved. The latter quantity is defined as the difference in fleet fuel consumption under existing subsidies and no subsidies. We assume a vehicle life of 16 years (Davis, Diegel, and Boundy 2013) and 11,500 annual miles traveled on average (FWHA 2019) in calculating annual fleet fuel consumption.

$$Cost\ per\ gallon\ of\ gasoline\ equivalent\ saved = \frac{Sales_{PEV}^{Subsidy} * \overline{Subsidy}}{FFC^{Subsidy} - FFC^{No\ Subsidy}} \tag{6}$$

$$FFC = \frac{Sales * VMT * Veh\ Life}{FFE_{Pred}}, \tag{7}$$

where

$\overline{Subsidy}$: sales-weighted average subsidy per PEV

$Sales_{PEV}^{Subsidy}$: total PEV sales with existing subsidies

FFC: total fleet fuel consumption

$Sales$: total annual vehicle sales

VMT: annual vehicle miles traveled (assumed to be 11,500 miles)

$Veh\ Life$: vehicle life (assumed to be 16 years)

FFE: harmonic average fleet fuel economy, calculated using the market shares predicted by the vehicle choice model.

As noted previously, the federal subsidy is $7,500 for all BEVs, whereas the federal subsidy for PHEVs varies depending on the battery capacity. We also calculate the subsidy percentage (Equation 8), defined as the sales-weighted average discount per PEV, where the discount is defined as the subsidy divided by the vehicle price.

$$Subsidy\ Percentage_{PEV} = 100 * \frac{\sum_{i=1}^{n_{PEV}} Sales_i * Discount_i}{\sum_{i=1}^{n_{PEV}} Sales_i} \tag{8}$$

$$Discount_i = \frac{Subsidy_i}{Price_i}, \tag{9}$$

where

$Sales_i$: total sales for the i^{th} PEV (includes BEVs and PHEVs)

$Discount_i$: discount on the i^{th} PEV

$Subsidy_i$: subsidy for the i^{th} PEV

$Price_i$: price (before any subsidy) of the i^{th} PEV.

Results

Table 1 presents the estimated coefficients for each year. According to Haaf et al. (2016), the correlation between observed (e.g., price) and unobserved vehicle attributes (e.g., the alternative specific constants) can measure endogeneity and bias in the coefficient of the observed attribute. Table 1 shows that the correlation between the cost per perceived value and the alternative specific constants ranges from -0.18 to 0.14. The low magnitudes and inconsistent signs of these correlation estimates suggest that the correlation is generally weak. Thus, the estimation bias is unlikely to be significant, implying that an instrumental variables approach, such as the BLP method, is not necessary.

Figure 2 shows the estimated impact of the subsidy policy in terms of additional sales of BEVs and PHEVs. It also shows the policy's cost-effectiveness in terms of cost per additional sale. Across the entire sample period, the federal subsidy was more impactful for BEV purchases than for PHEV purchases. Specifically, the subsidy induced 40% to 60% of BEV purchases but only around 30% of PHEV purchases. This difference may be because more consumers have positive utilities or higher ex-ante values for PHEVs than for BEVs, meaning that more inframarginal PHEV consumers exist (DeShazo, Sheldon, and Carson 2017; Sheldon, DeShazo, and Carson 2017). The greater number of inframarginal PHEV consumers may be due to greater concerns about purchasing a BEV, which may include range anxiety, resale value, and refueling requirements (Dua and White 2020; Dua, White, and Lindland 2019).

Although more consumers may be willing to purchase PHEVs without the subsidy, these consumers still receive the subsidy. Conversely, consumers may be less likely to purchase BEVs in the absence of the subsidy. Despite this greater willingness to purchase PHEVs, the cost per

Table 1. Conditional logit estimation results.

Year	β_g	ρ_{DPM}	ρ_{Range}	ρ_S	ASC_i	Correlation between ASC_i and $CPPV_i$
2011	-3.31*** (0.0018)	1.00	1.00	0.38	Y	0.13
2012	-4.33*** (0.0023)	0.68	0.91	0.35	Y	0.06
2013	-4.55*** (0.0024)	0.27	1.00	0.27	Y	-0.18
2014	-4.84*** (0.0020)	0.22	0.91	0.19	Y	0.12
2015	-3.95*** (0.0020)	0.29	0.75	0.15	Y	0.12
2016	-4.61*** (0.0023)	0.15	1.00	0.18	Y	0.14
2017	-4.46*** (0.0019)	0.35	1.00	0.26	Y	0.11

Standard errors are given in parentheses. *** p<0.01.

Source: KAPSARC analysis.

Figure 2. Evolution of the impact and cost-effectiveness of the federal subsidies for (a) BEVs and (b) PHEVs.

Source: KAPSARC analysis.

additional PHEV sale was higher than the cost per additional BEV sale in each year. However, the cost per additional BEV sale increased from just over $12,000 in 2011 to $17,500 in 2017. The cost per additional PHEV sale, in contrast, decreased from nearly $22,000 in 2012 to just under $18,000 in 2014, although it has since risen by nearly $1,000.

Past research shows that higher-priced BEVs are often purchased by higher-income consumers. Although these consumers welcome the subsidy, they may not necessarily need it to purchase a BEV (Sheldon and Dua 2019a). These consumers have both a lower price elasticity of demand (i.e., they are less price sensitive) and stronger preferences for upscale BEVs (DeShazo, Sheldon, and Carson 2017). In other words, higher-income consumers are more likely to buy BEVs even if the subsidy is not provided. Subsidizing higher-income consumers' purchases of higher-priced vehicles is therefore likely to reduce the policy's effectiveness.

To test this hypothesis, we run separate policy simulations for consumers whose incomes are below and above the median.[3] The results are shown in Figure 3. We find that the federal subsidy promotes PEV adoption more impactfully and more cost-effectively for lower-income consumers. For both BEVs and PHEVs, the additional sales percentage is considerably higher for consumers below the median income than for those above the median income. The respective additional sales percentages are around 70% versus 40% for BEVs and around 40% versus 20% for PHEVs. The costs per additional PEV sale of $10,000 for BEVs and $13,000 for PHEVs are correspondingly much lower for consumers below the median income. These values are roughly half the cost per additional PEV sale to consumers above the median income. We note also that the 'combined' lines, which represent the full sample, are closer to the lines for consumers above the median income because more of these consumers buy cars.

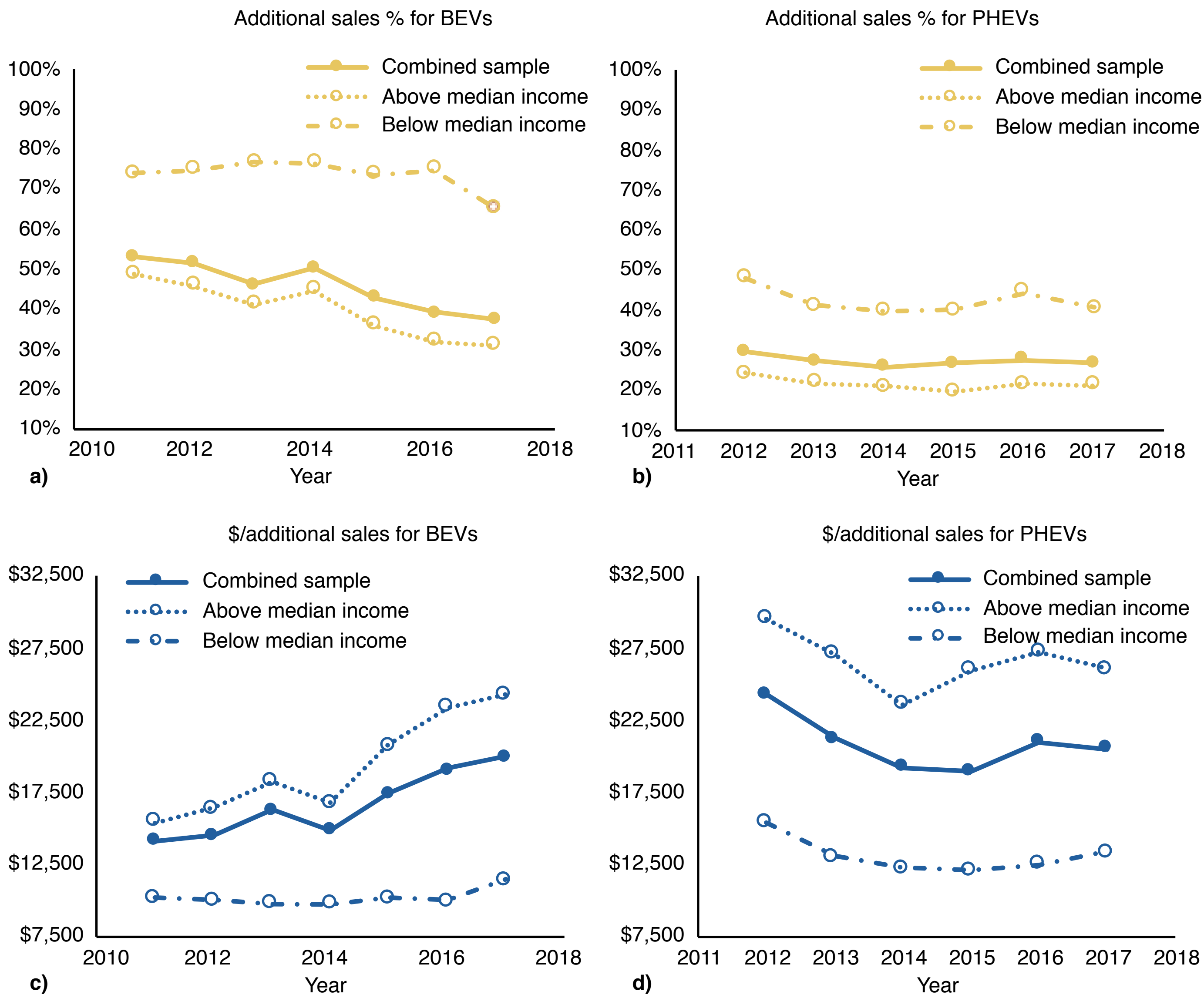
To explain the overall trends in Figure 3, we calculate policy performance metrics for three popular models: the Nissan Leaf (BEV), the Tesla (BEV, including models S and X) and the Chevrolet Volt (PHEV). Figure 4 shows the additional sales percentages and costs per additional sale for these three vehicle models. The Nissan Leaf has had the most additional sales (~50%) as a result of the federal subsidy. Correspondingly, it has the lowest cost per additional sale (~$15,000). The Leaf's policy metrics have remained fairly stable over time. The policy has resulted in the fewest additional sales of Teslas (25%-30%), and, thus, these models have the highest cost per additional sale (~$30,000). Both policy metrics improved for the Tesla from 2013 to 2014 but worsened by 2014 and flattened thereafter.

The decline in the federal subsidy policy's impact and cost-effectiveness for BEVs is partially explained by the introduction and higher sales of more expensive BEVs, including the Tesla. The higher-priced Tesla Model S, Tesla Model X and Chevrolet Bolt were introduced in model years 2013, 2016 and 2017, respectively. These introductions are associated with falls in the policy's impact and corresponding rises in its cost. This decline in policy performance as these models were introduced and Tesla's market share rose may be expected owing to the corresponding decline in the subsidy percentage. The subsidy percentage declined because the percentage discount on the vehicle price as a result of the subsidy is lower for higher-priced vehicles than for lower-priced vehicles. As the sales-weighted price of BEVs rose over time as more expensive BEVs were introduced, the federal subsidy amount remained constant at $7,500, as Figure 1 illustrates. For example, for a Nissan Leaf costing around $30,000, a federal subsidy of $7,500 provides a 25% discount.

For a Tesla Model S costing around $75,000, that same federal subsidy provides only a 10% discount.

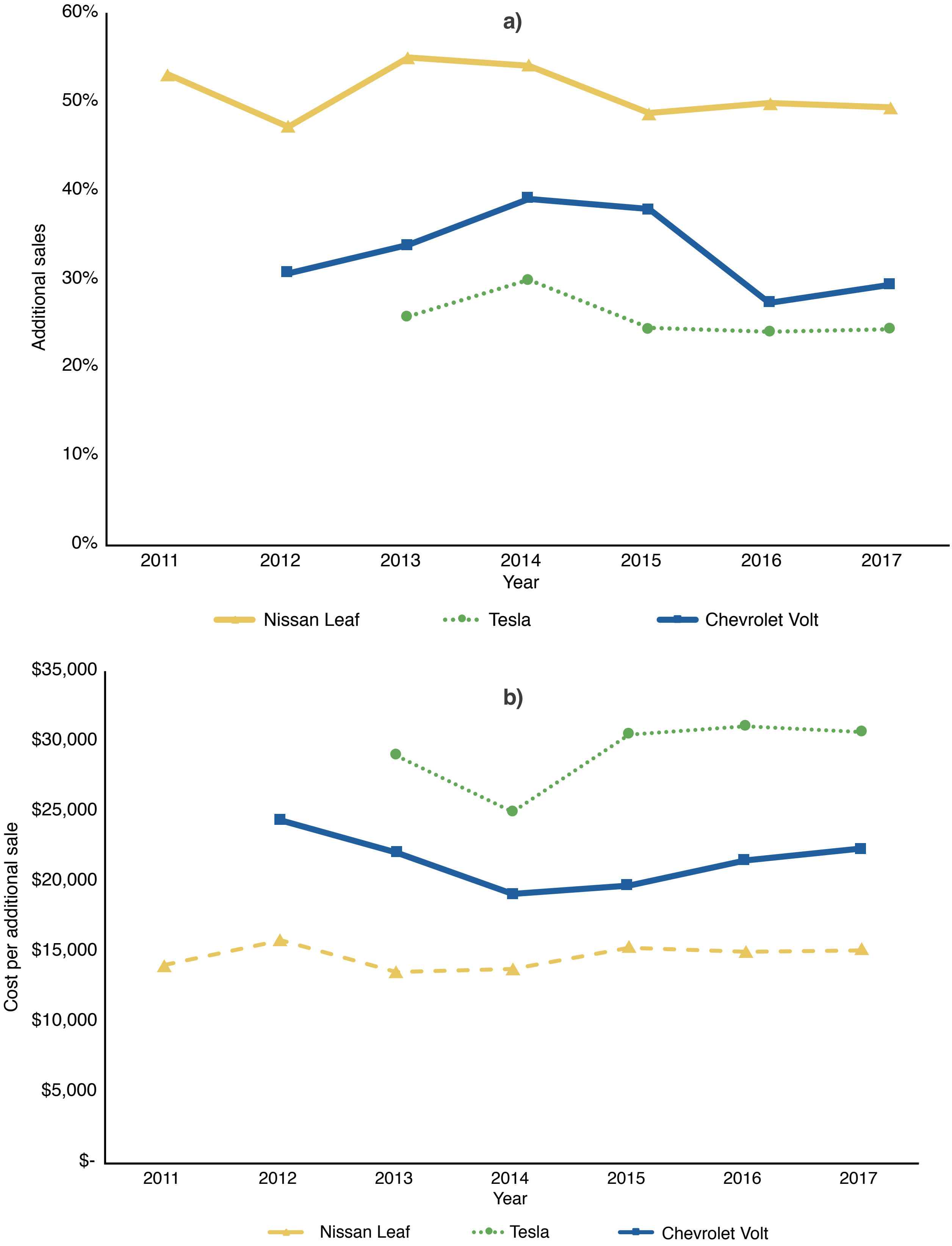
Unlike BEV subsidies, PHEV subsidies vary by battery capacity. Thus, the subsidy percentage for PHEVs has two sources of variation. Both the sales-weighted PHEV price and the subsidy amount per PHEV vary over time as different PHEV models with varying battery capacities are introduced. Like the BEV subsidy's impact, the PHEV subsidy's impact, measured as the additional sales percentage, correlates with the PHEV subsidy percentage. However, unlike the cost-effectiveness of the BEV subsidy, the cost-effectiveness of the PHEV subsidy does not inversely vary with the PHEV subsidy's impact. This difference is because the average subsidy per PHEV is not constant over time.

Figure 3. Evolution of the federal subsidy's impact and cost-effectiveness for consumers with incomes below or above the median.



Source: KAPSARC analysis.

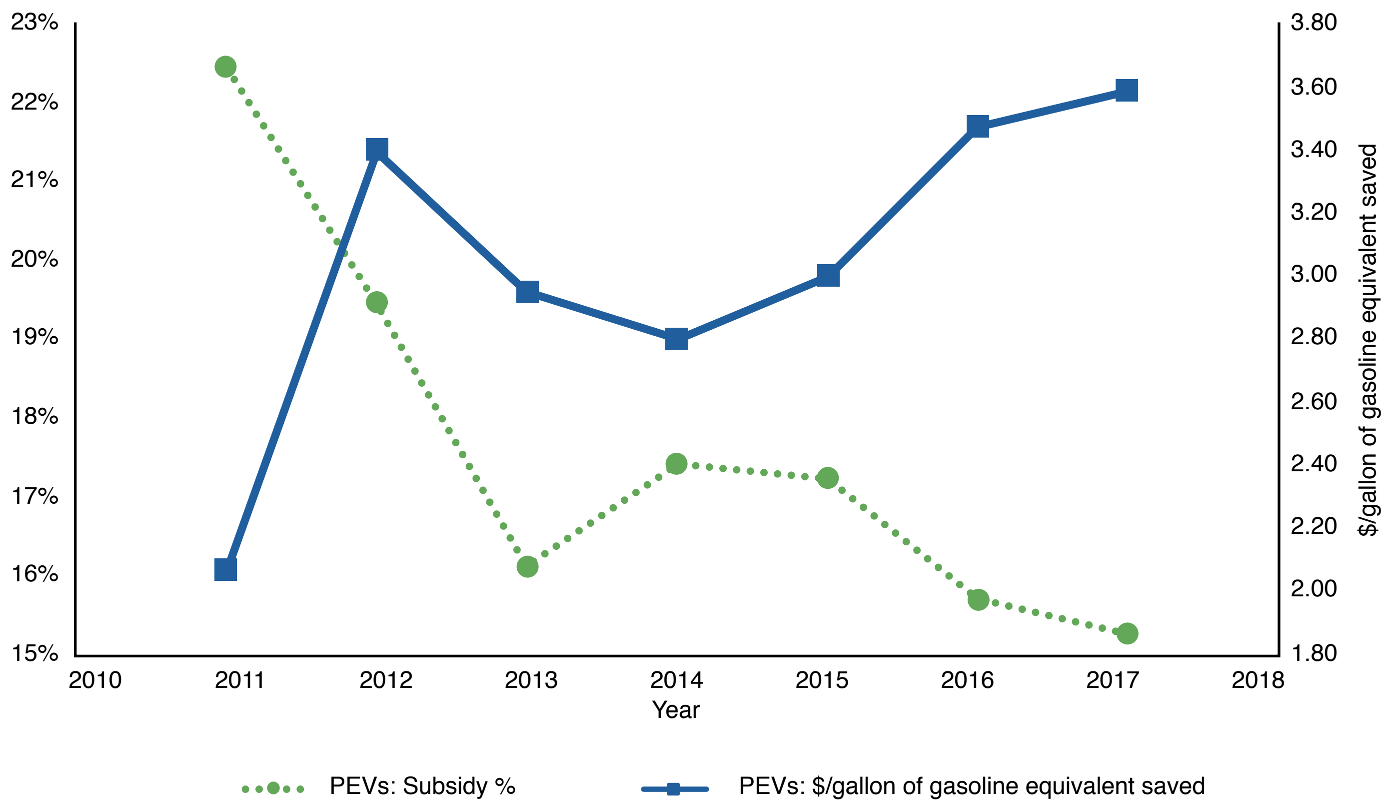
Figure 4. Evolution of the federal subsidy's (a) impact and (b) cost-effectiveness for specific vehicle models.



Source: KAPSARC analysis.

Lastly, the policymaker's objective may be to maximize environmental benefits (i.e., reducing local air pollution and greenhouse gases) rather than maximizing PEV adoption, subject to the policy budget. In that case, a more relevant metric is the policy cost in terms of dollars per gallon of gasoline equivalent saved through PEV adoption (Sheldon and Dua 2018). The evolution of the federal subsidy's cost-effectiveness, as measured by gasoline savings, is presented in Figure 5. The subsidy is becoming costlier over time, with the initial peak in 2012 coinciding with the introduction of PHEVs. In numerical terms, it cost around $3.20 to save an additional gallon of gasoline by subsidizing PEVs in 2017. For comparison, the cost of gasoline in 2017 was around $2.40/gallon. Based on greenhouse gas equivalence factors from the Environmental Protection Agency (EPA 2019), the 2017 policy cost translates to ~$399/tonne of CO2 equivalent avoided. This cost is roughly an order of magnitude higher than the social cost of carbon. The policy's cost-effectiveness correlates positively with the cost per additional PEV sale and negatively with the subsidy percentage (i.e., the average sales-weighted discount percentage).

Figure 5. Evolution of the federal PEV subsidy's cost-effectiveness, measured in terms of the cost to save an additional gallon of gasoline by subsidizing PEVs.



Source: KAPSARC analysis.

Conclusion

In summary, our results suggest that the U.S. federal PEV subsidy policy has become less impactful and costlier over time. To improve the policy's impact and cost-effectiveness, policymakers can adopt a more targeted subsidy design. Specifically, subsidies can be reduced or eliminated for higher-priced PEVs, such as the Tesla models S and X, or for higher-income consumers (Sheldon and Dua 2019b). In December 2019, California amended its subsidy to apply only to PEVs priced below $60,000 (Hussain 2019). At the federal level, the subsidy is already effectively restricted for Teslas because the per-automaker ceiling of 200,000 qualifying purchases has been reached (Lekach 2019). Ironically, this ceiling means that buyers of the lower priced Tesla Model 3, who may have been influenced by the federal subsidy, cannot use it. Instead, most of the federal subsidies for Tesla buyers were utilized for higher-priced Tesla models. Tesla and General Motors have asked to extend the federal subsidy beyond this ceiling, but their request has been ignored by Congress (Gardner 2019).

There are several caveats to our results. First, the general decline in subsidy effectiveness that we observe may partly be due to consumers' changing preferences and awareness. For example, early adopters may have been skeptical about the technology and, thus, may have been less likely to purchase a PEV without the subsidy. In contrast, later adopters with more knowledge and understanding may be more willing to purchase a PEV regardless of the subsidy. Second, although the subsidy may appear less cost-effective in terms of spending per additional PEV sale or per gallon of gasoline saved, it may be justified by knowledge spillovers (e.g., learning by doing). Finally, consumers only receive the full subsidy (e.g., $7,500) if they pay at least that amount in federal taxes in the year of a PEV purchase. If their federal tax bill is less than the subsidy amount, the residual credit does not roll over into a future year. Thus, although our analysis implicitly assumes that all consumers receive the full subsidy, some low-income consumers may effectively only receive a portion of it. Incorporating this fact would impact the absolute numbers in our simulations by income level. However, the relative performance of the subsidy for consumers with incomes below and above the median level would not change.

Endnotes

[1] The PHEV subsidy starts at $2,500. It increases by $417 for the first five kilowatthours (KWh) of battery capacity and by another $417 for each subsequent KWh of capacity, with a maximum of $7,500. More details can be found at https://www.irs.gov/businesses/irc-30d-new-qualified-plug-in-electric-drive-motor-vehicle-credit. According to https://www.fueleconomy.gov/feg/taxevb.shtml, the 2012–2015 models of the Toyota Prius Plug-in Hybrid qualify for a subsidy of $2,500. The Ford Fusion Energi qualifies for a subsidy of around $4,000, and the popular Chevrolet Volt qualifies for the full subsidy of $7,500.

[2] More information about the survey can be obtained by contacting Strategic Vision Incorporated at www.strategicvision.com.

[3] We aggregate the disaggregated new vehicle sales data by make and model separately for consumers with below median, above median and missing incomes. Here, the median income is the median income of the representative sample of new car buyers, which is approximately $90,000. This income is clearly greater than the median income of the general U.S. population. After creating the three groups of consumers, we estimate the choice model separately for each group. The model estimation results are shown in Table A1 in the appendix. In the policy simulations, we use the estimated models to predict total PEV purchases by each consumer group both with and without the federal subsidy.

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Appendix

Table A1. Results of conditional logit estimation using disaggregated data.

Year	Consumer group	β_g	ρ_{DPM}	ρ_{Range}	ρ_S	*ASC$_i$*	*Correlation between ASC$_i$ and CPPV$_i$*
2011	Below median	-4.82*** (0.0036)	1.00	1.00	0.38	Y	0.24
	Above median	-2.41*** (0.0023)					0.06
	Missing	-3.29*** (0.0042)					0.09
2012	Below median	-6.76*** (0.0046)	0.68	0.91	0.35	Y	0.09
	Above median	-2.97*** (0.0029)					0.01
	Missing	-3.69*** (0.0051)					0.01
2013	Below median	-7.29*** (0.0050)	0.27	1.00	0.27	Y	-0.18
	Above median	-3.02*** (0.0030)					-0.18
	Missing	-3.92*** (0.0060)					-0.30
2014	Below median	-7.52*** (0.0041)	0.22	0.91	0.19	Y	0.11
	Above median	-3.41*** (0.0026)					-0.15
	Missing	-3.80*** (0.0044)					-0.13
2015	Below median	-6.41*** (0.0039)	0.29	0.75	0.15	Y	0.13
	Above median	-2.48*** (0.0023)					0.05
	Missing	-3.13*** (0.0058)					0.05
2016	Below median	-7.62*** (0.0047)	0.15	1.00	0.18	Y	0.12
	Above median	-2.81*** (0.0027)					0.03
	Missing	-4.02*** (0.0074)					0.05
2017	Below median	-6.99*** (0.0042)	0.35	1.00	0.26	Y	0.14
	Above median	-3.02*** (0.0025)					0.04
	Missing	-4.26*** (0.0042)					0.07

Standard errors are given in parentheses. *** p<0.01.

Sources: GAStat (2018); KAPSARC analysis.

Notes

Notes

About the Authors

Tamara Sheldon

Tamara is a visiting researcher at KAPSARC and an assistant professor of economics in the Darla Moore School of Business at the University of South Carolina. Her research interests include environmental and energy economics and how these fields interact with public policy. She holds a Ph.D. in Economics from the University of California, San Diego.

Rubal Dua

Rubal is a research fellow at KAPSARC, working on vehicle regulatory policy and shared mobility research from the consumer perspective. He holds a Ph.D. from KAUST, Saudi Arabia, an M.Sc. from the University of Pennsylvania, U.S. and a B.Tech. from the Indian Institute of Technology, Roorkee.

Omar Abdullah AlHarbi

Omar Abdullah AlHarbi was a visiting researcher at KAPSARC. His research focuses on consumer choice of alternative technologies and public policy implications. He holds a bachelor's degree in mechanical engineering from Liverpool University.

About the Project

Promoting the adoption of energy-efficient vehicles has become a key policy imperative in both developed and developing countries. Understanding the impact of various factors on adoption rates of energy-efficient vehicles forms the backbone of KAPSARC's research into light-duty vehicle demand. These factors include (i) consumer-related factors – demographics, behavior, and psychographics; (ii) regulatory factors – policies, incentives, rebates, and perks; and (iii) geo-temporal factors – weather, infrastructure, and network effects. Our team is currently developing models at different levels: micro-level models using large-scale data comprising new car buyers' profiles, and macro-level models using aggregated adoption data to understand and project the various factors that affect the adoption rate of energy-efficient vehicles.

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