



Clean Vehicle Market Share Trends



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Overview

California is promoting clean vehicle adoption to engender environmental and economic benefits including reductions in air pollution and greenhouse gas emissions. The Clean Vehicle Rebate Project (CVRP) promotes clean vehicle adoption by offering rebates for the purchase or lease of new zero-emissions vehicles including plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs), range-extended battery electric vehicles (BEVx vehicles) and fuel-cell electric vehicles (FCEVs) across the state. Here we examine trends in the clean vehicle market share in California to gauge the progress that has been made with respect to the electrification of passenger vehicles and fleets. We pay particular attention to the market share before and after income-based eligibility requirements were implemented by CVRP in 2016 that included increased rebates for low- and moderate-income (LMI) households and an income cap for high-income households. The analysis shows that the clean vehicle market share has grown by approximately 0.8% per year since 2010, reaching nearly 8% in 2019. That said, the growth in the clean vehicle market share was inconsistent across time and was punctuated by a large spike in 2018. Further, despite the income-based eligibility requirement changes that decreased eligibility status among higher income households, the clean vehicle market share continued to increase in these populations after these changes were implemented. An increase in the market share for LMI populations also occurred following increased rebates for these populations, but not to the extent of those observed in higher income populations. This suggests the loss of eligibility for rebates was not a major deterrent to clean vehicle adoption for high income consumers, but suggests significant challenges continue to inhibit LMI consumers from purchasing new clean vehicles.

Approach

We estimated the market share, or the ratio of new clean vehicles purchased to the total number of vehicles newly purchased by year in California for 2010 to 2019.¹ We define “clean vehicles” as vehicles that can operate in zero emission mode which include PHEV, BEVx, BEV, and FCEV vehicle makes and models. We focus the analysis on PHEVs and BEVs given their preponderance in the clean vehicle market. A goal of the analysis was to assess the impact of the income-based eligibility requirements implemented in 2016 on market shares. These eligibility requirements established an increased rebate levels for low-/moderate- income (LMI) consumers and excluded households with higher-incomes (i.e., an income cap).² Accordingly, we closely examine changes to the clean vehicle market shares before and after these income eligibility requirements to assess their impact on the market. We perform the analysis at the census tract level since this is the most resolved level of newly purchased vehicle registration data available. We also assessed trends in market share by income. Since income data for each consumer was not available, we used the census tract corresponding to each consumer’s residence and 5-year estimates of median household income by census tract from the 2018 American Community Survey to estimate consumer household income levels. The census tracts were grouped into quintiles based on median household income (Table 1).

Table 1. Description of quintiles of annual median household income for census tracts across California.

Name	Percentiles	Median Household Income
High Income	80-100	>\$115,295
Higher-Middle Income	60-80	\$90,082-\$115,294
Middle Income	40-60	\$71,9589-\$90,081
Lower-Middle Income	20-40	\$54,817-\$71,958
Low Income	0-20	<\$54,816

Clean Vehicle Market Share Trends

The clean vehicle market share of newly purchased vehicles for January 2010 through December 2019 averaged approximately 4.9%, increasing from nearly 0% in 2010 to nearly 8% in 2019 (Figure 1). The trend in clean vehicle market share has not been consistent, with relatively steady growth from 2010 to 2014,

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² More information about eligibility is available on the program website: <https://cleanvehiclerebate.org/eng/eligibility-guidelines>

limited growth in 2015 and 2016, and a large spike in 2018. Following the large increase in 2018 the clean vehicle market share increased slightly in 2019.

The vast majority of clean vehicles purchased over the study period were BEVs and PHEVs, with average respective market shares of 2.2% and 1.5% (Table 2). From 2010 through 2017 the increase in the clean vehicle market share was fairly evenly divided between BEVs and PHEVs; but the substantial spike in the clean vehicle market share in 2018 can primarily be attributed to BEVs and, more specifically, Tesla vehicles (Figure 1). Indeed, in 2019 nearly 50% of new clean vehicles sold were Tesla vehicles.

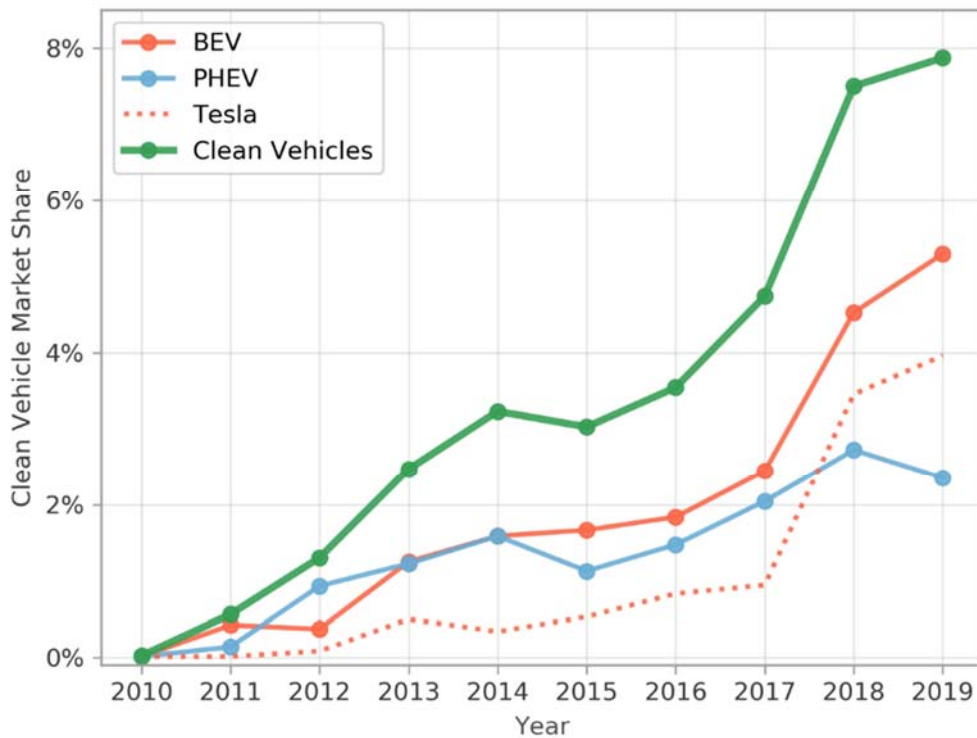


Figure 1. Annual clean market share by vehicle type. Tesla vehicles also included due to its large impact on overall market share.

Table 2. Counts and market share of newly purchased vehicles by vehicle type for 2010-2019.

Type	Clean Vehicle	Count	Market Share
Internal Combustion Engine	No	15,661,433	90.9%
Hybrid Electric Vehicle	No ³	911,046	5.3%
Battery Electric Vehicle (BEV)	Yes	373,298	2.2%
Plug-in Hybrid Electric Vehicle (PHEV)	Yes	260,409	1.5%
Battery Electric Vehicle Extended Range (BEVx)	Yes	17,407	0.1%
Fuel Cell Electric Vehicle (FCEV)	Yes	7,963	0.0%

There were significant differences in clean vehicle market share between lower and higher income tracts (Figure 2). All income strata have generally followed the overall clean vehicle market share growth trajectory, i.e., consistent growth from 2010 to 2014, a slowdown in 2015, and growth from 2016 through 2019. However, growth in the market share was consistently more rapid for higher income tracts. For example, from 2015 to 2019 the clean vehicle market share increased from approximately 7% to 16% for High Income tracts, but only 2% to 4% for Low Income tracts.

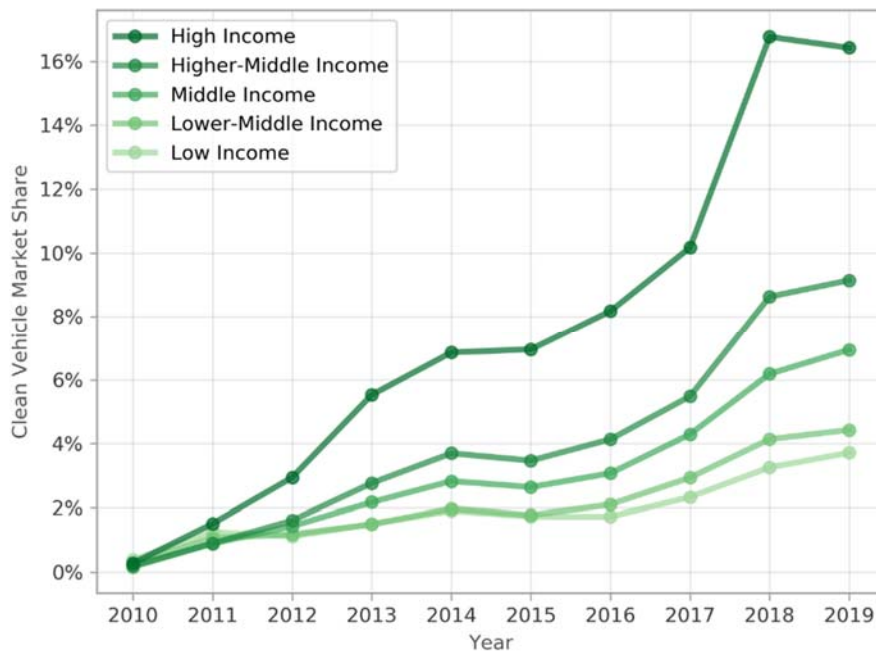


Figure 2. Clean vehicle market share by income and year.

The difference in the growth rate of clean vehicle market share between income strata caused a significant gap in market shares by 2019, with market shares over 4 times greater for High Income tracts than Low

³ Hybrid electric vehicles were not considered a “clean vehicle” since they cannot run in electric-only mode.

Income tracts (Figure 2). This increasing gap in clean vehicle market share across income strata was almost entirely driven by the BEV market since 2016. Indeed, although market shares increased across every vehicle type and income stratum pair from 2013-2015 to 2017-2019, the increase in the market share for PHEVs was relatively consistent across income strata; whereas the increase in market share for BEVs increased with increasing income (Figure 3). For instance, the BEV market share changed from 3.7% to 9.7% for High Income tracts and 0.9% to 1.5% for Low Income tracts between these periods. The large increase in BEVs beginning in 2018 can largely be attributed to Tesla vehicles which increased from a 39% share of the BEV market in 2017 to a 76% share for 2018-2019 (Figure 1).

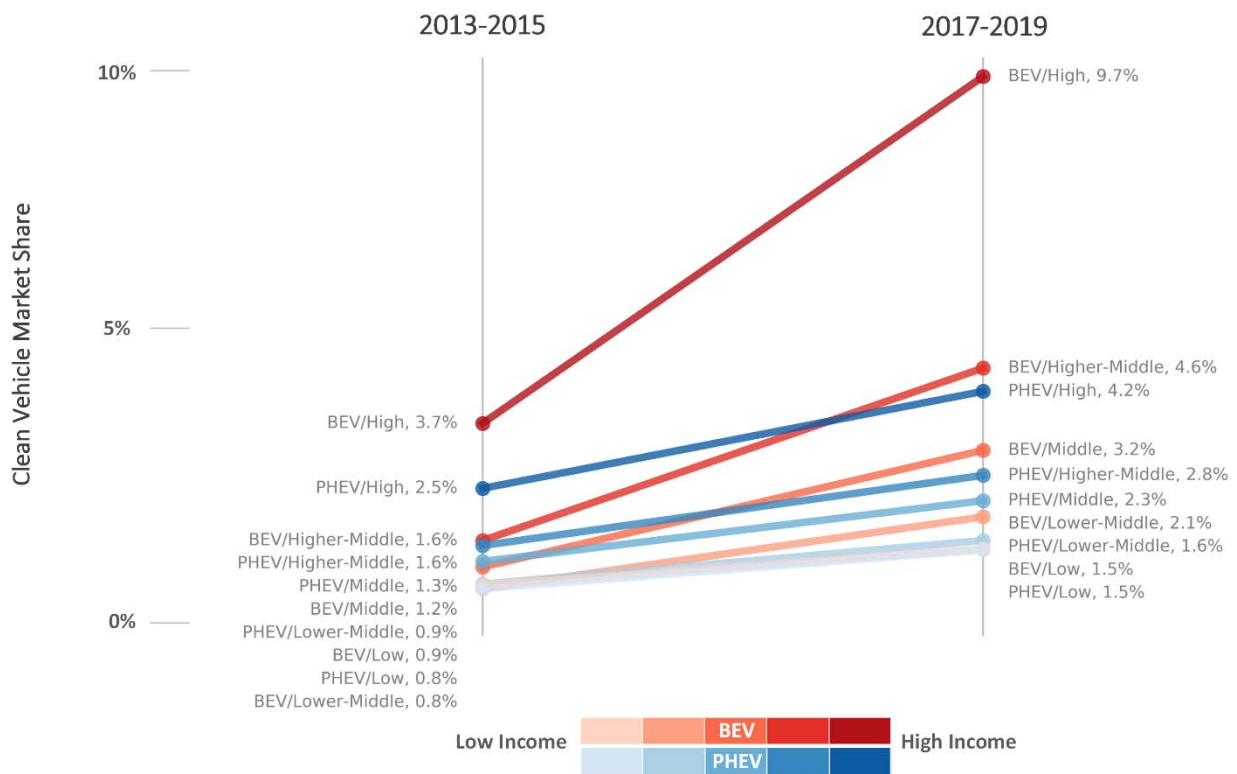


Figure 3. Average clean vehicle market share by vehicle type and household median income (census tract level) from 2013-2015 to 2017-2019.

Summary and Discussion

The clean vehicle market share in California increased by an average of approximately 0.8% per year since 2010 (Figure 1). However, this trend was inconsistent and included periods of low and high growth, and

varied by median income and vehicle type. The growth in clean vehicle market shares across the study period increased with increasing income which resulted in vastly different clean vehicle market shares by 2019 (Figure 2). Further, since 2018 the BEV market has increased more rapidly than the PHEV market with BEVs becoming nearly 65% of all new clean vehicle sales in 2019. The increase in the BEV market share was largely driven by higher Tesla sales in higher income tracts (Figures 1, 2 and 3).

The large increase in clean vehicle sales occurred in 2018, after the implementation of income-based eligibility requirements in 2016. Paradoxically, market shares increased rapidly in higher income populations following the implementation of the income cap with clean vehicles (Figure 2). This increase in the market share in higher income tracts likely resulted from several factors including the arrival of the Tesla Model 3 in 2017 and a favorable economic environment which, together, outweighed any inhibiting effects of the income cap on clean vehicle purchases.⁴

On the other hand, the increased rebates for LMI households coincided with an increase in clean vehicle market share for LMI tracts. But these increases were minor compared to those observed in higher income tracts (Figure 2). This suggests major obstacles remain between LMI households and new clean vehicles despite the increased rebates. It is likely that affordability is a primary obstacle for LMI households with other factors, such as charging availability and consumer familiarity with clean vehicles, also contributing to low adoption. There are several tools available to increase clean vehicle adoption in LMI households including stackable incentives, access to low-cost financing, and additional outreach. That said, a new vehicle—let alone a new electrical vehicle—is not affordable for many LMI households and programs aimed at assisting in the adoption of used clean vehicles in these populations should be considered.

A major limitation of this analysis is the absence of household level income information for consumers of new vehicles. As such, we relied on census tract level income data to estimate consumer's income. The premise for this approach is that households with similar incomes tend to cluster together in the same neighborhoods, thus, using the median household income of a census tract should be a reasonable estimate for a single household in the tract. That said, household incomes across a census tract are not completely homogenous and this approach undoubtedly results in inaccurate estimates of income potentially biasing the results. For example, it is possible that the clean vehicle market share among low income households is lower than for low income tracts since higher income households living in these

⁴ It should also be noted that federal tax credits were still available for all consumers regardless of income for Tesla and other eligible clean vehicle models, but tax credits for Tesla models began to step down at the beginning of 2019 and ended in 2020.

tracts may have disproportionately contributed to new vehicle purchases and increased the clean vehicle market share. Nevertheless, the trends observed in market share at the population level are likely to be highly indicative of trends at the household level.

Conclusion

The clean vehicle market share in California has grown significantly from 2010 through 2019. Increases in BEV purchases have been most impactful as PHEV purchases have leveled off. The market share varies strongly across income levels with higher incomes corresponding to higher market shares, and this difference in market shares by income has been increasing with time. Interestingly, this divergence in market shares between income levels could be considered contrary to the expectations of the CVRP's income-based eligibility requirements implemented in 2016 and indicates that higher income populations are more rapidly overcoming obstacles to clean vehicle adoption than lower income populations.



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