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Understanding the Distributional Impacts of Vehicle Policy: Who Buys New and Used Electric Vehicles?

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Issue

Policy makers consider electric vehicles (EVs) an important policy lever to reduce urban air pollution, lower carbon emissions, and reduce overall petroleum consumption. The need to understand purchase patterns for EVs is especially important in light of the bold policy targets set for increasing EV penetration or phasing out internal combustion engines (ICEs) entirely in countries around the world and in California.

This project analyzes data on every EV, including plug-in hybrid (PHEV) and battery electric vehicle (BEV), purchased in California from 2011 to 2015 and random samples of comparable conventional and hybrid vehicles. It examines the proliferation of EVs during a period in which the market has matured to include new technologies, a growing secondary market has evolved, and a suite of policies has been put in place to promote switching away from gasoline-powered cars. Researchers analyze the data to answer two questions. First, is the conventional wisdom, which suggests that EV adoption is more common among high-

income households and less common among minority groups, reflected in purchase data? Second, do two plausible barriers impede low-income and minority car buyers' adoption of EVs: price discrimination against groups traditionally unlikely to purchase EVs and availability of EVs at dealerships near low-income or minority communities.

Key Research Findings

Confirming conventional wisdom, rates of EV adoption are correlated with income during this period. For comparably sized ICE and hybrid cars, buyers with household incomes below \$100,000 account for 72% of ICE purchases and 63% of hybrid purchases, counting both new and used sales. In contrast, 56% of EVs during this period are purchased by buyers with incomes above \$100,000 (Figure 1). These results confirm related analysis by Borenstein and Davis (2015) that suggests high income buyers captured a disproportionate share of federal EV incentives.

Non-Hispanic white and Asian buyers are also more likely to purchase EVs than other minorities. Hispanic and non-Hispanic whites comprise roughly equal fractions of ICE buyers in the data at 38% and 41% respectively.

But non-Hispanic whites purchase 55% of the EVs, whereas Hispanics purchase 10% of EVs (Figure 2). Buyers of Asian ethnicity show similar patterns to non-Hispanic whites, accounting for a relatively high fraction of EV purchases relative to their share of traditional vehicle purchases.

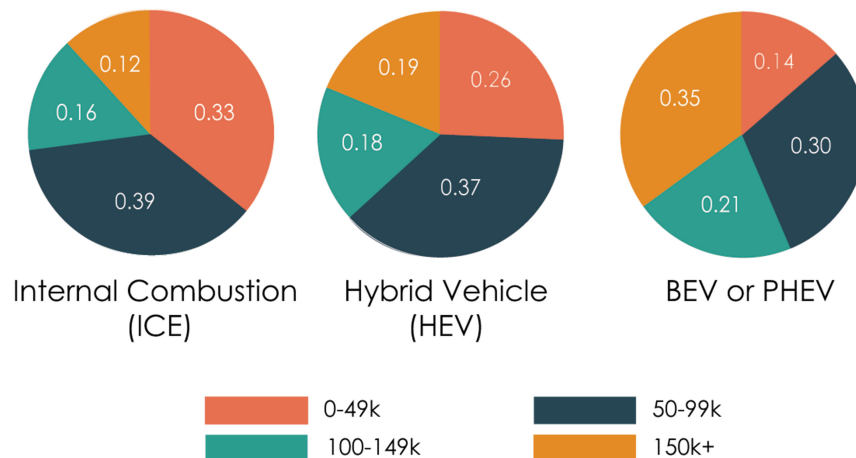


Figure 1. Fraction of sales by household income. Graphs by Vehicle Drive Technology.

Different demographic groups appear to pay modestly different prices, but price discrimination does not appear to be a significant impediment to new EV adoption.

During the period between 2011 and 2015, low-income customers did not seem to face higher prices when negotiating the price of a new EV. If anything, when negotiating over identical vehicles, low-income customers purchased these cars at a slight discount relative to high-income customers. Even in cases where the estimates are statistically significant they are small in magnitude. Similarly, there is little evidence that Hispanics and African Americans paid a price premium when purchasing new EVs.

There is mixed evidence that minority buyers pay different prices in the nascent used EV market.

African Americans, Hispanics and other ethnicities pay significantly higher income-unadjusted prices for used PHEVs than non-Hispanic whites, however, minority buyers pay lower prices on average for used BEVs than non-Hispanic whites. These effects seem to be most prevalent for low income members of minority groups; the effect diminishes with income, disappearing for households with incomes at roughly \$75,000. Although the results are statistically significant, caution should be used in drawing conclusions from these results because the used vehicle market has changed and grown substantially since the 2011–2015 timeframe of this analysis.

There is little evidence that lack of local availability of EVs presents a barrier to purchase. Researchers

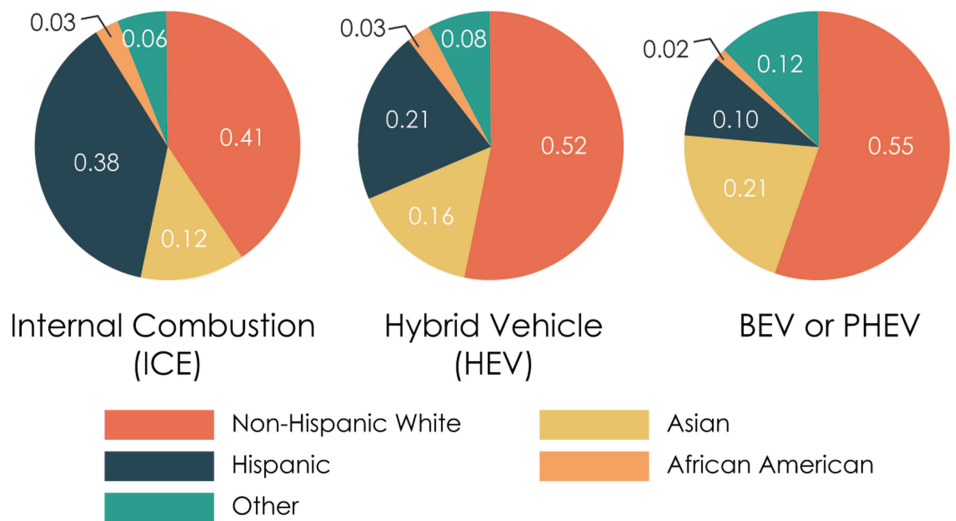


Figure 2. Fraction of sales by ethnicity. Graphs by Vehicle Drive Technology.

examined the distance between zip codes of buyers and dealerships for multiple ethnic groups and found no evidence of a disparity in the distance traveled to purchase a new EV.

More Information

This policy brief is drawn from “Understanding the Distributional Impacts of Vehicle Policy: Who Buys New and Used Alternative Vehicles?” a research report from the National Center for Sustainable Transportation, authored by Erich Muehlegger and David Rapson of the University of California, Davis. The full report can be found on the NCST website at <https://ncst.ucdavis.edu/project/understanding-distributional-impacts-vehicle-policy-who-buys-new-and-used-alternative>.

For more information about the findings presented in this brief, please contact Erich Muehlegger at emuehlegger@ucdavis.edu.

Further Reading

Severin Borenstein and Lucas W. Davis, “The Distributional Effects of US Clean Energy Tax Credits,” *Tax Policy and the Economy* 30 (2016): 191-234. <https://doi.org/10.1086/685597>

Muehlegger, E. J., & Rapson, D. S. (2018). Subsidizing Mass Adoption of Electric Vehicles: Quasi-Experimental Evidence from California. *UC Office of the President: University of California Institute of Transportation Studies*. Retrieved from <https://escholarship.org/uc/item/00j7f0t8>

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