National Center for Sustainable Transportation

POLICY BRIEF

Exposure to Electric Vehicle Technology at Home and Work Can Fuel Market Growth

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Issue

Sales of plug-in electric vehicles (PEVs), which include battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), have grown substantially in recent years (Figure 1), but market growth will need to accelerate significantly to meet California's target of 5 million zero-emission vehicles by 2030. To encourage PEV adoption, policymakers have offered monetary incentives for new PEV purchases, invested in charging infrastructure, and provided use-based incentives like High-Occupancy Vehicle (HOV) lane access and parking benefits. But questions remain regarding where, for how long, and how much promotion and government support might be necessary to achieve the state's targets. An improved understanding of the factors determining vehicle market dynamics can shed light on how PEV technology is spreading and the policies that are needed to foster continued market growth.

Existing research on technology diffusion indicates that exposure through neighbors, workplace peers, and other acquaintances can legitimize new technology for the mass market and accelerate its market penetration. However, the effect of technology exposure has not been well-studied for the PEV market. Moreover, the effect is likely not confined to a residential location since vehicles are mobile. Researchers from the University of California, Davis and Irvine examined the adoption of PEVs in California between 2014 and 2016, both spatially and temporally, to gain a better understanding of the technology diffusion process and the effect of technology exposure, while controlling for sociodemographic factors and the effect of PEV incentive programs on PEV adoption in the state.

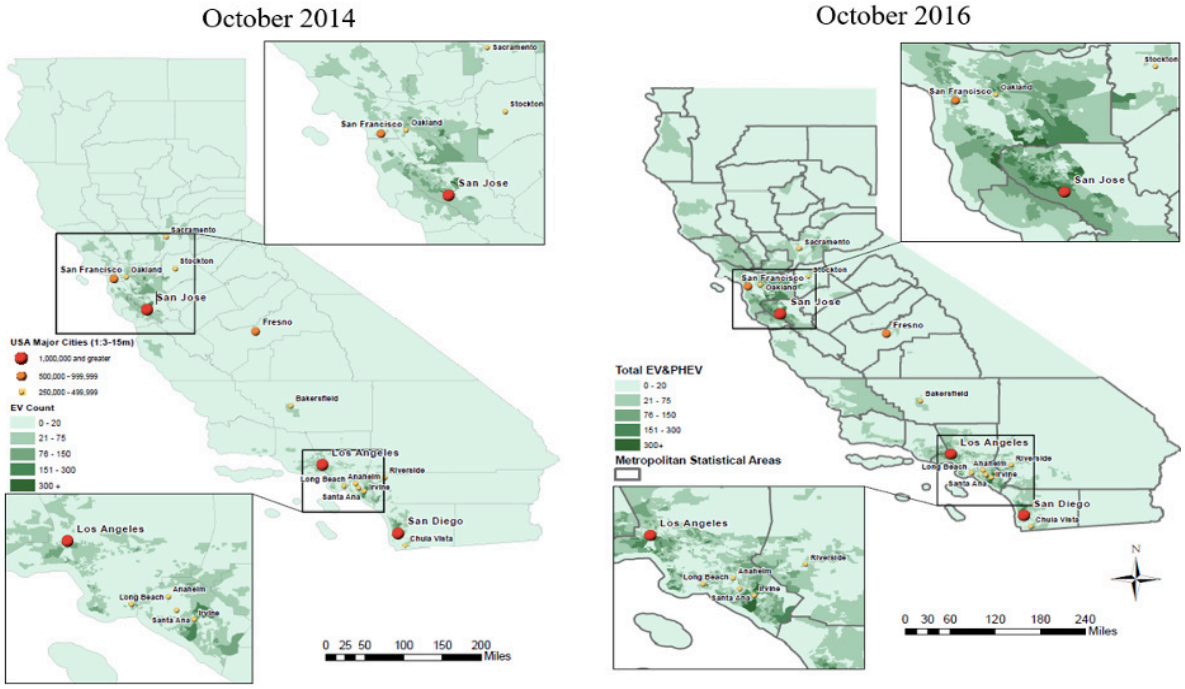

Figure 1. The progress of PEV adoption in California from 2014 to 2016, with market expansion to the Sacramento, Santa Rosa, Bakersfield, and Fresno areas

Key Research Findings

Exposure to PEVs at both the residential location and the workplace contributes to PEV market growth. An additional BEV or PHEV within a 1-mile radius of a census block group is associated with a 0.2% increase in BEV sales in the block group, and one additional PHEV within 1-mile raises the rate of PHEV sales by 0.5%. The effect is even more pronounced at the workplace; an additional PEV at a commute location yields an 18% increase in BEV sales and 8.5% increase in PHEV sales in a census block group.

Consistent with expectations, both BEV and PHEV sales are higher in areas with higher median income, median age, and share of bachelor's degree holders. The effect of these sociodemographic factors is larger in the case of BEVs than PHEVs. A dollar increase in the median income of a census block group is associated with 0.6% increase in new BEV sales and 0.4% increase in PHEV sales, likely due to the high purchase costs of these vehicles.

A higher share of renters in a census block group is associated with lower sales of PEVs, but for a given share of renters in an area, presence of Level 2 public charging can dampen this effect. These results should be interpreted with some caution. (There can be a strong correlation between the number of PEVs in a census block group and the number of chargers and vice versa). But despite uncertainty about the quantitative effect of public chargers on PEV adoption, access to charging has a positive impact on PEV adoption, particularly in areas with a large share of renters.

The Clean Air Vehicle decal program has contributed to PEV market growth. The decal allows single-occupancy PEVs to use HOV lanes in California. A unit increase in the share of commuters with access to carpool lanes in their commute route in a census block group is associated with an approximately 34.5% increase in the rate of new BEV sales and 56% increase in the rate of new PHEV sales.

The effect of the Clean Cars 4 All program on PEV sales is more complicated. Designed to help lower-income vehicle buyers shift to more fuel-efficient vehicles, the program had a positive effect on the rate of BEV sales but a negative effect on PHEV sales in the San Joaquin Valley. On the other hand, the program had no clear effect on BEV sales and a positive effect on PHEV sales in the South Coast Air Basin. These differences may be caused by the different incentive amounts offered for BEVs and PHEVs in the two regions, the extent of outreach efforts for the new program, the number of participating dealerships, and the stock of vehicles available at the participating dealerships.

Policy Implications

PEV market dynamics are influenced by a combination of sociodemographic, policy, and built environment factors along with exposure to the technology at home and work. These findings suggest that policymakers should consider targeted programs and investments to boost the impact of technology exposure on PEV sales. Such efforts could include policies or infrastructure support that encourages commuters to drive their PEVs to work and putting workplace chargers in high-visibility areas to generate exposure. When paired with incentive programs and availability of adequate charging, technology exposure can also accelerate market growth in lower-income areas that have seen slow PEV adoption to date.

More Information

This policy brief is drawn from "Plug-in Electric Vehicle Diffusion in California: Role of Exposure to New Technology at Home and Work," a report from the National Center for Sustainable Transportation, authored by Debapriya Chakraborty, David S. Bunch, Bingzheng Xu, and Gil Tal of the University of California, Davis and David Brownstone from the University of California, Irvine. The full report can be found on the NCST website at https://ncst.ucdavis.edu/project/identification-dynamic-effects-california-consumer-vehicle-market-response-greenhouse-gas.

For more information about the findings presented in this brief, contact Debapriya Chakraborty at dchakraborty@ucdavis.edu.

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