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Do Electricity Prices Affect Electric Vehicle Adoption?

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Issue

The operational costs of electric vehicles are lower than those of gas-powered vehicles. This advantage is often cited by manufacturers, advocates, and policy-makers as a significant benefit of driving electric vehicles. Yet, the question of how consumers value operational costs when purchasing an electric vehicle is largely unexplored. While prior research has suggested that gasoline prices are an important factor for conventional vehicle buyers, consumers may not have the same awareness of electricity prices as they do for salient gasoline prices. The question of whether consumers accurately assess the costs and benefits of using electricity as a transportation fuel has important implications for electric vehicle adoption and for achieving deep decarbonization of the transportation sector through electrification.

To answer this question, researchers at UC Davis compared the rate of household electric vehicle adoption in census block groups along the boundaries between the three major investor-owned utilities in California (Pacific Gas and Electric, Southern California Edison and San Diego Gas and Electric) and neighboring municipal-owned utilities. Electricity prices in municipal-owned utility territories are often a fraction of those in the investor-owned utility territories (Figure 1). By comparing the rate at which households adopt electric vehicles in municipal utility service territories (low-price locations) and investor-

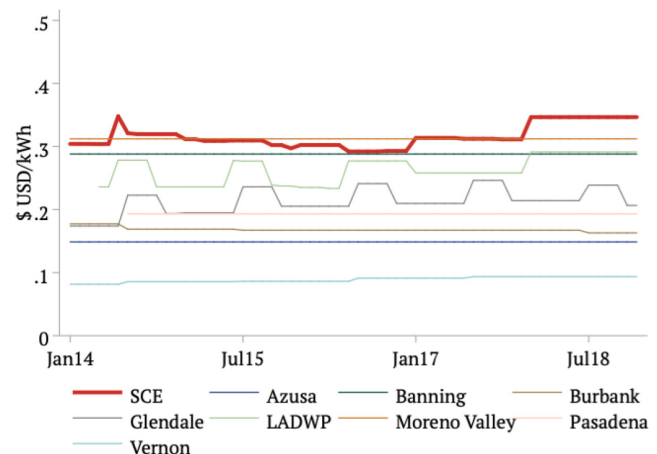


Figure 1. Top-tier residential electricity rates for Los Angeles-area utilities (2014-2017). Southern California Edison (SCE) is an investor-owned utility and the others are municipal-owned utilities.

owned utility service territories (high-price locations), the researchers provide the first evidence on how electricity prices affect electric vehicle purchase decisions.

Key Research Findings

Electric vehicle sales respond to electricity prices. Electric vehicle adoption is modestly higher in census block groups in low-cost municipal utility territories compared to neighboring census block groups in a high-cost investor-owned utility territories. An increase of 1 cent per kilowatt-hour is associated with a roughly 2 percent lower rate of electric vehicle adoption.

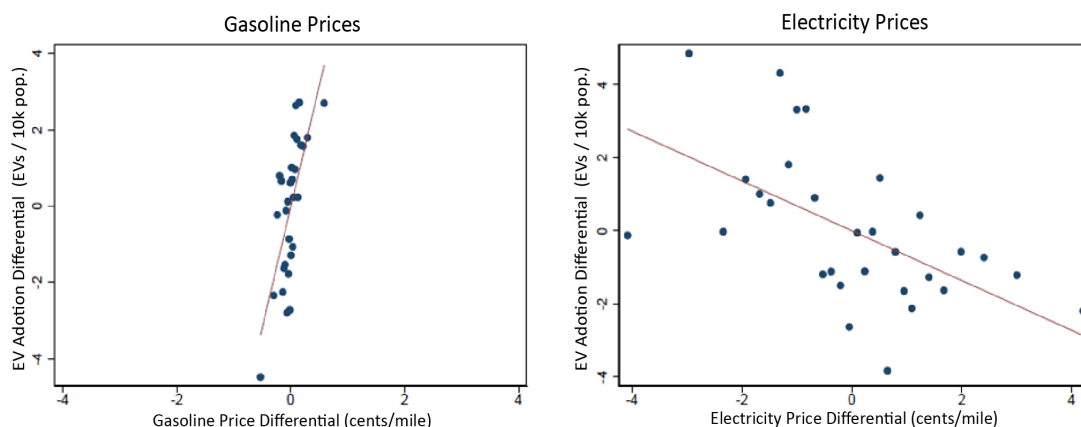


Figure 2. The responsiveness of electric vehicle sales to gasoline and electricity prices where the unit for both horizontal axes is cents per mile. Electric vehicle adoption (measured on the vertical axis) changes much more in response to changes in gasoline prices than to commensurate changes in electricity prices.

Electric vehicle sales also respond to gasoline prices.

When comparing electric vehicle sales across areas of California that have higher or lower gasoline prices, the researchers found that electric vehicle adoption is greater in areas with higher gasoline prices. Analogously, as gasoline prices rise and fall over time, rising gasoline prices stimulate electric vehicle purchases, while electric vehicle sales fall during periods of falling or lower gasoline prices. A 1 cent per gallon increase in gasoline prices is associated with an increase in electric vehicle adoption by roughly 1.5 percent.

Electric vehicle sales respond to gasoline prices at a rate roughly four to six times greater than the response to electricity prices, when fuel costs are measured on a cents-per-mile basis (Figure 2). This suggests that rates of electric vehicle purchase are less responsive to low or high electricity prices than they are to low or high gasoline prices.

Policy Implications

These results are consistent with research showing that consumers are less aware of electricity prices than gasoline

prices. However, as consumers gain more experience with owning and charging electric vehicles, it's possible that consumer awareness of electricity prices may increase and electricity prices may play a bigger role in consumers' vehicle choices. If electricity prices become more salient to electric vehicle buyers, electricity rates may provide another policy lever to encourage (or discourage) electric vehicle adoption.

More Information

This policy brief is drawn from the report "Do Electricity Prices Affect Electric Vehicle Adoption?" prepared by James Bushnell, Erich Muehlegger and David Rapson with the University of California, Davis. The report is available on the UC ITS website at: www.ucits.org/research-project/2020-12.

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

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