Minimizing Fleet Emissions through Optimal EV Subsidy Design and Vehicle Replacement

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Abstract

The bulk of federal- and state-level subsidy programs for electric vehicles (EV) offer these funds at a flat rate. If the goal of these initiatives is to minimize vehicle emissions, the flat subsidy design ignores several issues a more efficient program should feature. The first is that funds should target marginal consumers whose likelihood to purchase EVs increase most with the vehicle subsidy. The second that the subsidies are directed toward consumers most likely to impact emissions by replacing less energy efficient vehicles. To address these two points, we propose a subsidy design which maximizes the expected reduction of emissions per dollar spent by targeting marginal consumers with the highest impact on vehicle emissions. Our analysis exploits spatial discontinuities in California's local subsidy programs and utilizes zip code-level vehicle purchase data to estimate demand with rich heterogeneity across consumers. We then characterize the marginal consumers for EVs along key demographics, such as income and vehicle ownership. Using vehicle stock and replacement behavior, we then sort these consumers by how much their vehicle replacement would reduce emissions.

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