Regulating Untaxable Externalities: Are Vehicle Air Pollution Standards Effective and Efficient?

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How has regulation has affected environmental innovation for passenger vehicles over the last 60 years and what are the consequences of potential future additional regulation? Because observing and taxing vehicle air pollution emissions is technologically infeasible, most countries instead rely heavily on exhaust standards that limit air pollution emissions per mile for new vehicles. These standards differ substantially from fuel economy regulations. We assess the effectiveness and efficiency of these standards and counterfactual policies. We show that the emission rate of new US vehicles has fallen by more than 99 percent since standards began in 1967. Several research designs applied to a half century of data suggest that exhaust standards have caused a majority of this decline. In an analysis of mechanisms, we find that exhaust standards do not change basic vehicle attributes (size, horsepower, torque, fuel economy, etc.). We decompose the change in emission rates into the share that comes from forcing manufacturers to install cleaner existing types of engines and pollution control technologies, and the share from innovation that drives the installation of new and cleaner types of engines and pollution control technologies. Exhaust standards are not cost-effective in part because they give no incentive to scrap old vehicles, which account for a large share of emissions. To study counterfactual policies, we develop analytical and quantitative models of the new and used vehicle fleets. We are using these models to study how changing ownership fees and technology-forcing regulations would decrease emissions and increase welfare.