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Peer Review

Review of: "Electric Vehicle Fleet Penetration and Air Pollution Mortality in Europe"

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The manuscript presents a study of a relevant topic, namely the potential decrease in excess mortality related to air pollution associated with the transition to electric vehicles (EV). However, the assessment is based on a simple correlation analysis that offers very little evidence of potential causal associations.

Specific comments:

- The figures for premature deaths from PM2.5 exposure reported by the European Environment Agency (EEA) are simply computed by using published estimates of risk functions and measured levels of PM2.5. These figures are therefore simply proportional to the total PM2.5 concentration in each country, not just the component linked to non-EV vehicles. Their correlation with EV penetration is therefore a questionable proxy for a causal association.
- The simple correlation between high pollution-related excess mortality and EV penetration across European countries does not account for the historical differences in air pollution levels that predate the adoption of EV. The low PM2.5 levels in Nordic countries and the very high concentrations in Eastern Europe have been known for decades, and they have nothing to do with EV penetration.
- There are many plausible mechanisms of bias in this simple correlation analysis. For instance, poorer areas of Europe (for instance, Eastern countries) have at the same time less developed clean energy infrastructures and fewer financial incentives for EV adoption. As another example, countries promoting the transition to EV can also implement stricter regulations on PM2.5 sources, resulting in a decrease in concentration that is parallel but independent from the increase in EV use.
- A simple example can clarify the risk of bias in this correlation analysis. If the assessment is repeated for regions of Italy, the result is likely to be the opposite, with EV penetration higher in Northern

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regions where PM2.5-related premature deaths are higher. This result is simply due to the stronger adoption of EV in richer Italian regions that happen to be in the very polluted Po Valley.

- A stronger study design than this cross-sectional correlation analysis should try to isolate the differences in air pollution actually due to the adoption of EV. For instance, a longitudinal analysis of the change in PM2.5-related premature deaths and the rate of EV adoption would at least remove any bias due to baseline differences in air pollution levels. Still, this analysis can be biased by concurrent policies aiming at decreasing pollution levels, which can well be correlated with EV adoption.

Declarations

Potential competing interests: No potential competing interests to declare.