

The distributional effects of low emission zones: Who benefits from cleaner air?

By Björn Bos, Moritz A. Drupp, and Lutz Sager*

December 17, 2025

Abstract

Low emission zones (LEZ) represent a key environmental policy instrument to address air pollution in cities. LEZs have reduced air pollution and associated health damages in regulated areas, but it remains unclear who has benefited from cleaner air. To examine the distributional effects of LEZs, we combine gridded data on resident characteristics, including income and a proxy for ethnicity, with high-resolution estimates of fine particle (PM_{2.5}) concentrations in Germany, the country with the largest number of LEZs. We estimate heterogeneous treatment effects with a difference-in-differences approach and show that PM_{2.5} pollution reductions are distributed unequally across society. While residents with German name origins experience larger improvements within LEZs, residents with foreign names disproportionately live in LEZs and thus benefit more when assessed at a nationwide scale. Monetizing air quality benefits following governmental guidance, we find that they are distributed pro-poor within LEZs, disproportionately benefiting lower-income residents. From a nationwide perspective, however, benefits are distributed almost proportionally, while the sign is sensitive to how benefits from cleaner air scale with income. Overall, our results suggest that LEZs have nuanced distributional implications that differ sharply between a national perspective and local assessments that focus on effects within LEZs.

JEL codes: J15, Q52, Q53, Q58

Keywords: Air pollution, distributional effects, low emission zones, traffic regulation

*Bos: University of Hamburg, Germany (email: bjoern.bos@uni-hamburg.de); Drupp: ETH Zürich, Switzerland; University of Gothenburg, Sweden; University of Hamburg, Germany; CESifo Munich, Germany; CEPR, UK (email: mdrupp@ethz.ch); Sager: ESSEC Business School & THEMA, France; CESifo Munich, Germany (email: sager@essec.edu). We are grateful for helpful comments by Piero Basaglia and Andreas Lange as well as seminar participants at the MEEP 2024 Workshop, the University of Maastricht, AERE 2024 Annual Conference, CEE-M Montpellier, ESSEC Business School, Toulouse School of Economics, Paris School of Economics, the Auroe 2025 Workshop, Paris Dauphine University - PSL, EAERE 2025, and the 2025 INRAe Workshop Transport and Pollution. This project received financial support from the Joachim Herz Foundation through the “Mapping the Effects of Environmental Policy (MEEP)” project grant.