Shared electric scooters and electric bikes can reduce traffic in urban centres

Evidence from a policy experiment shows that public safety bans on electric scooters and electric bikes can generate unintended traffic congestion in city centres. The studied ban is found to increase travel times by 9–11% for daily evening commutes and by 37% following stadium events.

This is a summary:
Asensio, O. I. et al. Impacts of micromobility on car displacement with evidence from a natural experiment and geofencing policy. *Nat. Energy* https://doi.org/10.1038/s41560-022-01135-1 (2022).

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The problem

Shared micromobility, such as e-scooters and e-bikes, is an increasingly popular electrification strategy for last-mile travel in cities and is projected to be a US$300 billion global market across China, the European Union and the United States by 2030[1]. However, mixed behavioural evidence that e-scooters can ease traffic congestion or provide sustainability benefits by reducing the number of cars in urban centres has fuelled debates about travel mode substitution[2]. Reliable evidence about micromobility use is crucial for informing safety regulations; identifying changes in urban traffic and mobility patterns; and investigating sustainability issues related to transport emissions and the associated air quality co-benefits. Therefore, studies that assess the social impacts of the adoption of micromobility have received attention from city administrators and policy makers. We explore these issues in the context of a policy intervention that unexpectedly banned the use of micromobility devices in the centre of Atlanta, which gives us a natural experiment to evaluate last-mile travel decisions when scooters are suddenly not available.

The observation

In response to public safety concerns regarding the use of e-scooters and e-bikes, the mayor of Atlanta issued a night-time ban on micromobility devices by introducing 'no ride zones'[3]. This policy involved the deployment of geofencing policies that remotely shutdown shared e-scooter and e-bike devices automatically during the hours of the ban. This technology-assisted approach enabled near-perfect behavioural compliance with the ban across all service-providers. The policy change allowed us to test behavioural theories related to travel mode choice. Additionally, we were given access to Uber Movement — a granular travel times dataset aggregated from over 10 billion trips. When we combined the geofencing imposed by the ban with this high-resolution travel times dataset, we were presented with a rare opportunity to quantify whether urban congestion is affected when micromobility users switch from e-scooters to other modes of transport.

We constructed several quasi-experimental designs that measure the effects of the ban on urban travel times by including multiple counterfactual comparison areas (that is, statistically similar areas unaffected by the ban) (Fig. 1). Using these designs, we confirmed that the restrictions on micromobility use generated unintended increases in travel times of 9–11% for recurring mobility (for example, daily evening travel) and approximately 37% for event-based mobility (such as, travel for sporting events). Our study makes it possible to explore the link between micromobility use and hard-to-observe alternative travel modes such as cars or ridesharing that e-scooters displace. Importantly, this research overcomes some of the key limitations of previous studies that rely on simulations or self-reported data from survey questionnaires to extract behavioural insights. As the micromobility market grows, we anticipate that cities will have to evaluate trade-offs between measures intended to increase public safety and congestion costs in the urban centre.

The implications

Decisions that shape our cities can have unexpected effects. We found that micromobility bans designed to promote public safety can have unexpected tradeoffs in urban traffic congestion and the associated emissions, with costs of up to US$536 million in national value of time lost. When modelling or simulating behavioural responses to new policies, it is rare to have both high-quality outcome measures and near-perfect compliance in impact evaluation. These findings offer conceptual advances on whether e-scooter adoption can generate meaningful emissions reductions by replacing short car trips for last-mile travel.

Our results suggest that when riders substitute micromobility with other travel modes, environmental considerations are not a key factor. Although we cannot rule out the possibility of substitution to other sustainable travel modes such as walking, biking or public transit, we find that the dominant behavioural response is to revert to personal cars and ridesharing, which directly influence urban congestion. Longer-term monitoring is needed to understand the persistence of these effects beyond 90 days and the underlying mechanisms that influence these changes.

This study is part of a larger body of research that is advancing the use of real-time mobility data for consumer discovery in transport electrification[4]. We hope that researchers studying the influence of micromobility in other locations will increasingly turn to field experiments such as ours to model behavioural phenomena and the effect on emissions.

Omar Isaac Asensio
Georgia Institute of Technology, Atlanta, GA, USA.

EXPERT OPINION

"This research offers an interesting contribution to the relevant body of literature by avoiding the hypothetical, hindsight and recency or even the self-serving bias that can be part of the responses of micromobility users. I also believe that this study has great value from a policy perspective as the authors discuss physical and digital infrastructure investments that are required to sustain the growth of micromobility." **Charilaos Latinopoulos, Imperial College London, London, UK.**

FIGURE

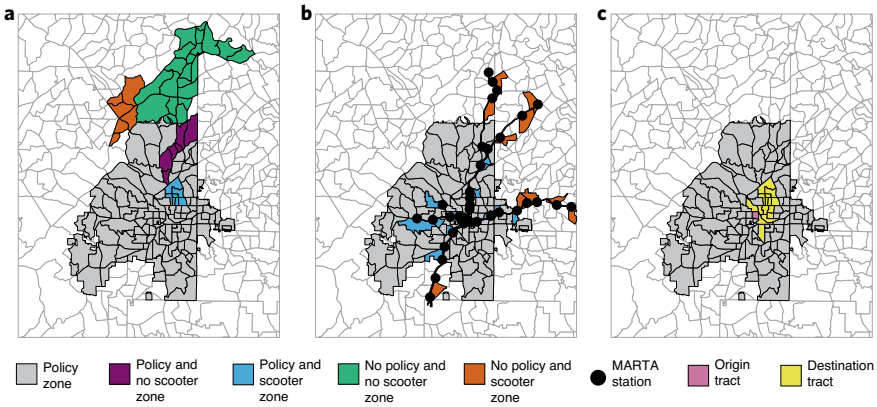

Fig. 1 | Micromobility experimental designs. a,b, Spatial designs to quantify the effect of the micromobility ban on evening travel times. The grey region shows the areas where the ban was enforced, blue is the area where are scooters are available but banned in the evenings and purple, orange and green show regions with and without scooters within and beyond the ban perimeter. The black dots indicate the MARTA subway stations. **c**, A design to investigate travel times from a stadium (pink) to nearby destinations (yellow) following an event. Each of the quasi-experimental designs reveal that the ban substantially increased traffic congestion.

BEHIND THE PAPER

We knew that cross-disciplinary engagement between policy scholars, economists and computer scientists would be essential in this project. Indeed, an understanding of multiple components and methods from policy design and policy process, to data pre-processing and data wrangling, to experimental design choices, as well as econometric modelling were needed in equal measure. One of the more satisfying aspects behind the paper, besides diversity in team science, was that the research team could walk around Tech Square in midtown Atlanta and experience the effects of the policies directly. Sure enough, an e-scooter veering towards the edge of the service territory slowed and stopped automatically. At 9:01pm, the apps shut down and one could no longer reserve an e-scooter or e-bike. This experiential side of our research was motivating and meant that we could observe the impacts even before we could see them through the lens of our data. **O.I.A.**

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   This paper presents the use of real-time mobility data for large-scale consumer discovery in transport electrification.

FROM THE EDITOR

"New modes of transport have appeared in cities in recent years, particularly shared electric bikes and scooters. What is neat about this study is that it uses a natural experiment — No Ride Zones for scooters in Atlanta, USA — to explore some of the unintended consequences of trying to safely manage these changes, offering an interesting case study into the complexities facing transport in our cities." **Nicky Dean, Chief Editor, *Nature Energy*.**