Do shared e-scooter services cause traffic accidents? Evidence from six European countries

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Findings

1. Introduction of shared e-scooter services causes an 8% increase in monthly accidents with injuries.
2. No effect on cities with more bike lanes.
3. Cities vary in capacity to safely increase the modal share of micro-mobility users.
Motivation

- Accidents are expensive and a deterrent.
- Introduction of shared e-scooter services uniquely identifiable shock increase to micromobility mobile share.
- Pan-European Master Plan for Cycling aims to increase modal share.
Data: Shared e-scooter service launch date

- All 93 cities in 6 European Countries.
- Quasi-random staggered treatment, Jan 2018-Jun 2021.
Outcome data: Traffic accidents with personal injury

- Monthly city police reported accidents.
- Must involve a moving vehicle and personal injuries.

**Figure:** Monthly city accidents over time

Figure 4: After applying the natural logarithm, the seasonality in accident numbers runs parallel.
Outcome data: Traffic accidents with personal injury

Benefits of looking at all accidents:

- Estimates incorporate substitution effects.
- Not all e-scooter accidents result in an injured e-scooter user.
- Little/low quality data on e-scooter accidents.
Treatment definition

- Binary treatment variable for months after shared e-scooter roll-out.
- Treatment status is permanent.
- Estimates average effect for all months after roll-out.
Empirical setup

- Causal identification strategy: Staggered difference-in-difference.
- Later treated and never-treated cities serve as controls.
- Key assumptions: Parallel trends, no anticipation.
Testing parallel trends

Figure: Placebo tests using treatment dates shifted by 24 months.

- Shows % change in accidents relative to treatment month.
- No indication of differential trends 3 years from introduction.
Introduction of shared e-scooter services cause an 8% increase in monthly accidents with injuries.
Falsification and alternative specifications

- Winter months: 1.9% increase. Insignificant.
- Non-winter months: 11.5% increase.
Falsification and alternative specifications

- First twelve months: 5.3% increase.
- Excluding COVID lockdown: 5.7% increase.
Heterogeneity analysis

Splitting the sample at country-median by ...

- Bike lane density (infrastructure).
- Bicycle modal share (safety in numbers).
- Cars per capita (car dependency).

... and comparing differences in treatment effect.
Heterogeneity analysis: Results

1. More bike lanes ⇒ no increase in accidents.
2. Fewer bike lanes ⇒ large increase in accidents.
3. Bicycle modal share and cars per capita: No significant difference.
No change in severity of accidents

Figure: Percentage change in accident severity over time

- Reported e-scooter accidents likely just as severe and costly.
We suspect the increase in accidents is driven by e-scooter/automobile conflict because:

- No increase in accidents for cities with more bike lanes.
- No change in accident severity.
Some cities are better able to safely increase the modal share of micro-mobility users.

- Cities with higher bike lane density.
- Correlated policies or behaviors could drive effect.
Conclusions continued

- Other cities less prepared to safely increase modal share.
- No evidence to support the Safety in Numbers theory.
Limitations

- No information on unreported e-scooter accidents.
- Not an estimate of marginal effects.
Limitations continued

- Not long-run effects.
- Not a comparative risk assessment of different transport types.
- Cannot say which road users are responsible for accidents.