Parking Regulations to Harmonize Dockless E-scooters. An Empirical Analysis From Paris

(Work in progress)

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Outline

1. Introduction
2. Literature review
3. Data and methodology
4. Results
5. Discussion and conclusion

1. Introduction

- The car-oriented paradigm rose social and environmental concerns.
  - ✓Gas emissions and local pollutants, traffic congestion, spatial inequalities, negative health outcomes.
- Cities welcomed new mobility services aiming to provide alternatives.
  - ✓Reduce car dependency, tackle travelers' dilemmas, and improve accessibility.
- However, they were introduced without regulation preventing communities to unlock all their potential.
- Governments are issuing new rules to better integrate new services with the rest of the mobility mix.
  - ✓Empirical evidence evaluating these rules is limited.

1.1 Dockless electric scooters

- Dockless e-scooters are a relative recent innovation for urban mobility.
  - ✓Introduced in 2017 in San Franciso CA.
- Dockless ⇒ users pick-up and drop-off vehicles at any location within a geographic region (geofence).
- Shared ⇒ users have short term access to transport on an as-needed basis.
- Potential to solve concerns:
  - ✓Improve accessibility to public transport.
  - ✓Enhance multimodal behavior.
  - ✓Demand is growing.

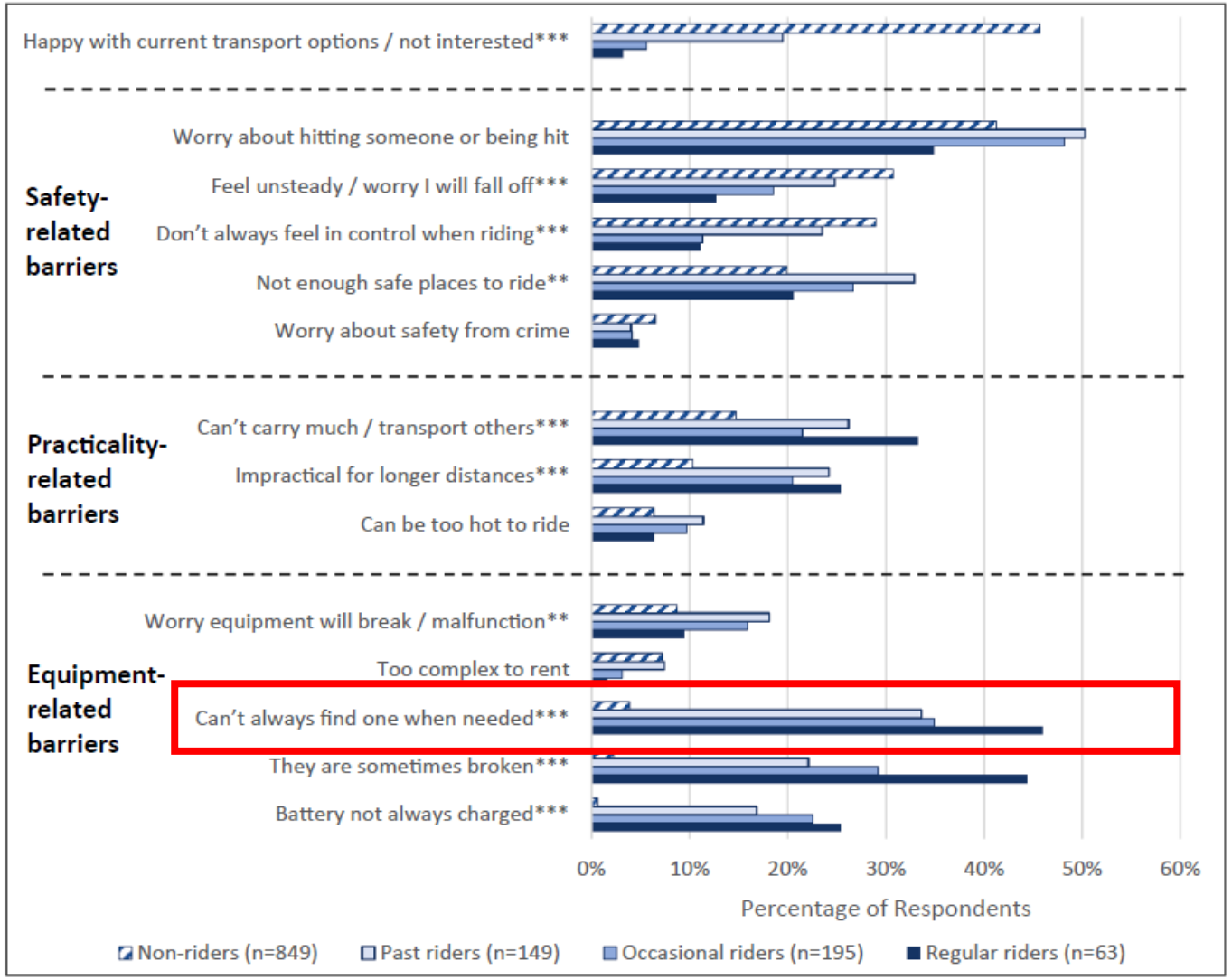
1.2 Barriers: mis-parking

- Many have pointed out barriers especially when regulation is lacking.
- Improper parking and cluttering (random parking) are the most frequent.
  - ✓Drawbacks for public acceptance, damage adoption and demand.
  - ✓Banned in cities such as San Francisco, Barcelona, and Miami.

- Parking on sidewalks imposes external costs on other users.
- Dockless mobility re-opened the debate about curb-space management:
  - ✓We must reconsider the concept of street as a space for people, green mobility, and public transport (Banister, 2008).

1.2 Barriers: accessibility

- Another important barrier is accessibility of vehicles around the trip starting point.
  - ✓The 6t (2019) found that 24% of renters have given up for that reason.
- Sanders et al. (2020) surveyed 1,256 University staff in Tempe, AZ.



1.3 Scope

- We focus on dockless e-scooters in Paris and on the parking regulations that were issued to harmonize the service.
  - ✓April 2019: Construction of 2,500 parking bays.
  - ✓July 2019: Parking rules (Arrêté No 2019 P 16391). More on the regulation
- Evaluate the regulation and investigate unintended effects (accessibility and mis-parking).

1.3 Hypothesis

- H1: Providing infrastructure in the form of dedicated parking zones is effective reducing improper parking.

Dedicated parking zones

- Reduce cluttering:
  - ✓ Improves public acceptance.
- Other benefits:
  - ✓ Increases predictability, safety and access for other users.
  - ✓ Better curb space management.
  - ✓ Less conventional parking.

1.3 Hypothesis

- H2: Parking bays limit pick-up and drop-off points concentrating vehicles in certain spots harming accessibility.

Dedicated parking zones

- Cost:
  - ✓ Harms accessibility of vehicles.
  - ✓ Decrease demand: 63% believe they will decrease the frequency of use (6t, 2019).
- Other costs:
  - ✓ Opportunity cost of public space.

2. Literature review and contribution

- Barriers and drivers to adopt dockless e-scooters (Gössling, 2020).

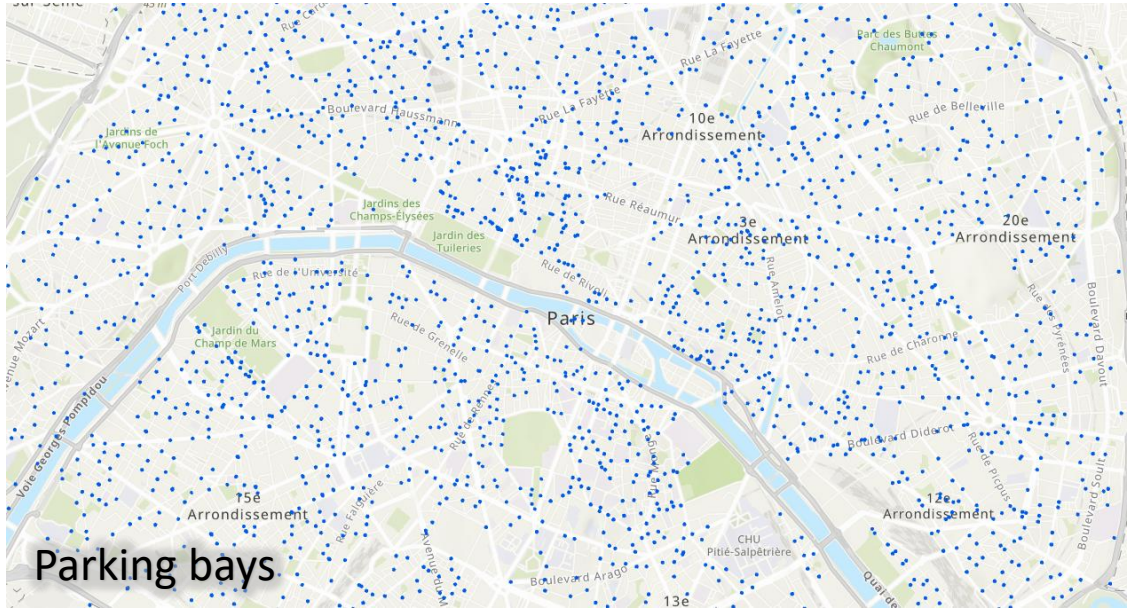
- We provide evidence on how public intervention might address social concerns
  - ✓Policy kits and best practices (Shaheen and Cohen, 2019).

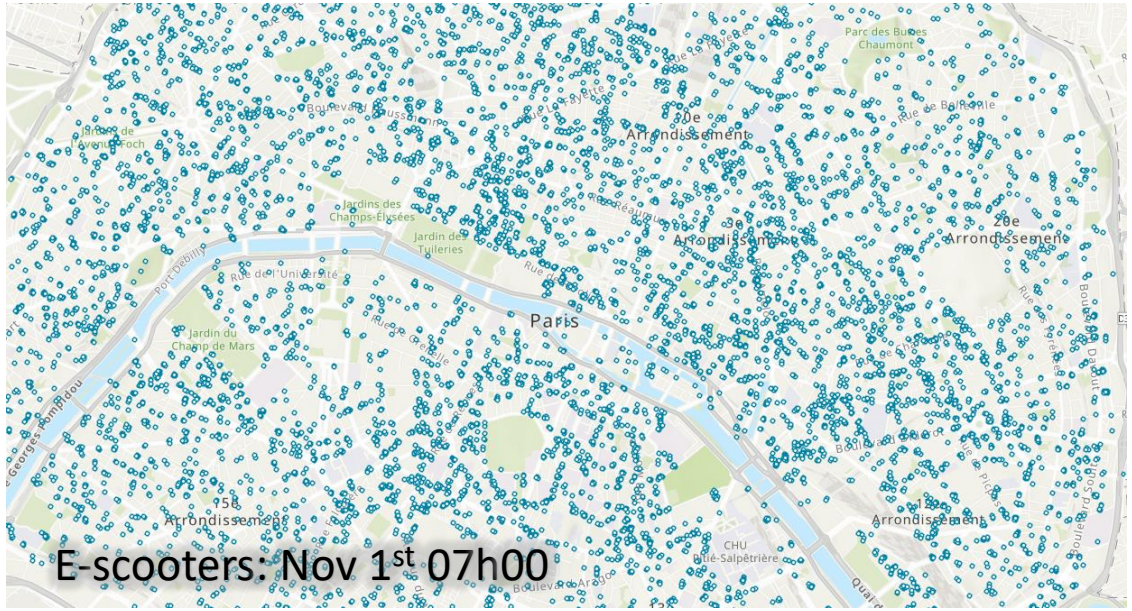
- Our paper is also informative about the range of regulatory strategies.
  - ✓Brown (2021) reviews parking rules across US cities.
  - ✓Moran et al. (2020) study regulations in Vienna.

- We study unintended effects of parking regulations
  - ✓Effects on accessibility (Sanders et al., 2020; 6t, 2019).
  - ✓Mis-parking and persistence (Brown et al., 2020; Brown et al., 2021).

4.1 Data

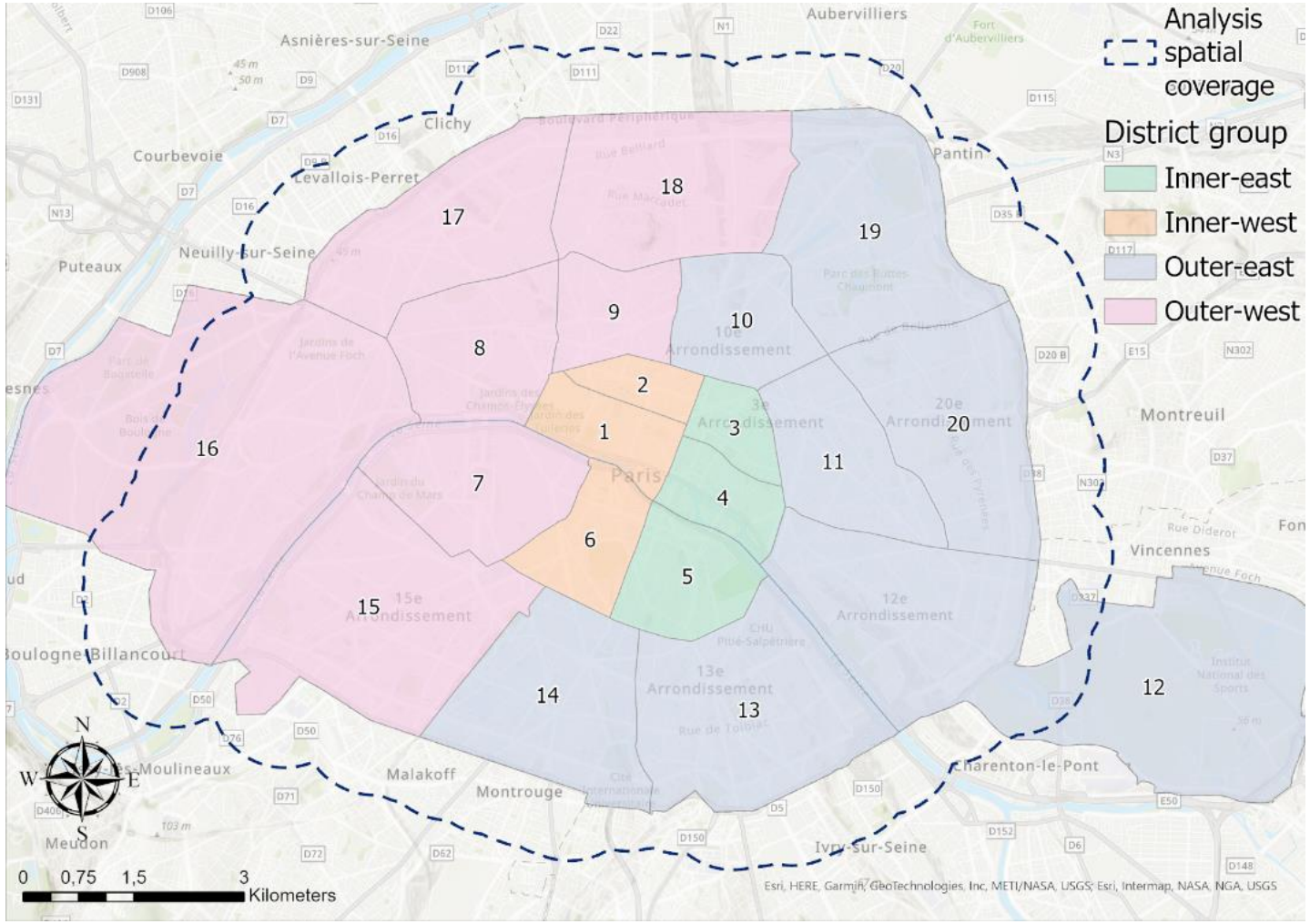
- Format SIVU: Dockless e-scooters geo-location in the city (45M obs.).
  - ✓Collected daily each 3 hrs since August 2019.
  - ✓Status: **parking (≈92%),** riding, nonoperational.
  - ✓Anonymized IDs for scooters and operators.
  - ✓Other limits are GPS inaccuracies Go and scaling techniques Go .
- Parking bays' geo-location was collected from the city's open-data site.





4.2 Methodology – Spatial analysis

- KPIs based on the spatial relation between e-scooters and parking bays.
  - ✓City and district level analysis.



4.2 Methodology – Definitions

- Mis-parking:
  - ✓We approach it in the sense of cluttering.

- Accessibility:
  - ✓Distance to find the closest e-scooter.
  - ✓In line with the first/last mile dilemma - Inconvenient when start and end points are located beyond a comfortable distance (Lesh, 2013).

- Type of users depending on the number and location of parking bays:
  - ✓Complier - Always comply with the rule.
  - ✓Opportunistic - Park properly when parking bays are convenient.
  - ✓Unlawful - Never follows the rules.

4.2 Methodology – Key Performance Indicators

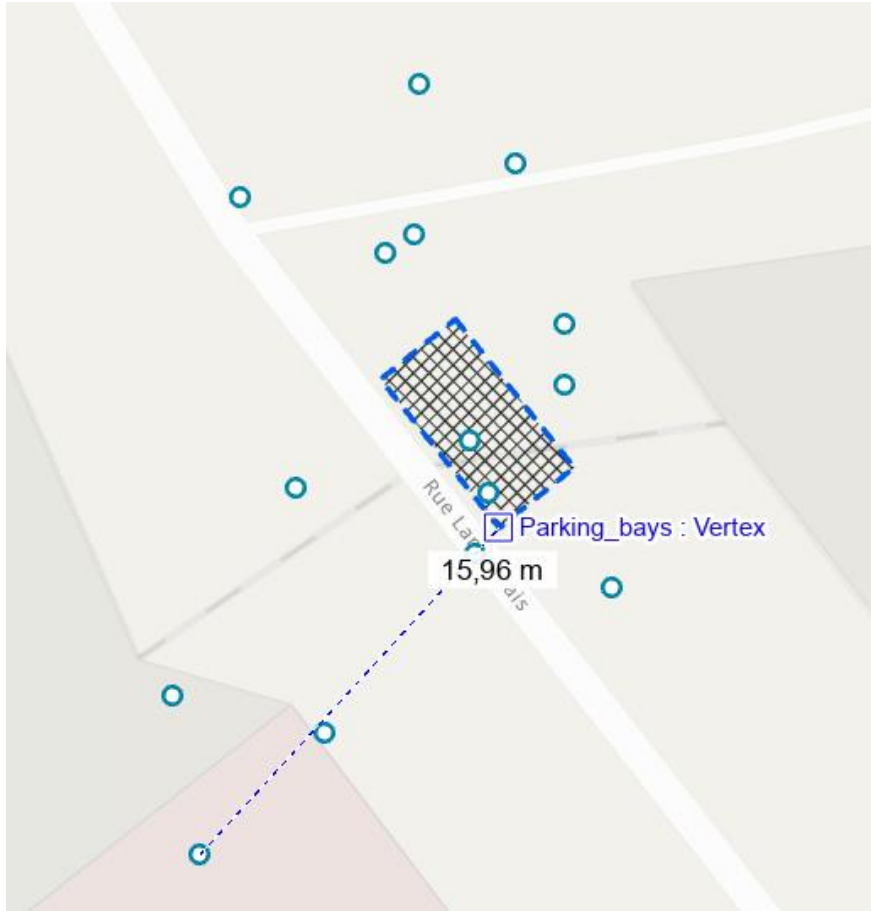
- H1: Dedicated parking zones reduce cluttering.

- We construct the following KPIs:

1. Euclidean distance between any vehicle and the closest parking bay.
   - ✓ Daily average.
   - ✓ Index with base 2019.

2. Demand for parking bays. Share of parking bays with at least one vehicle.
   - ✓ Different spatial tolerance.
   - ✓ Compare parked vs non-parked e-scooters.

Euclidean distance example



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Spatial tolerance example