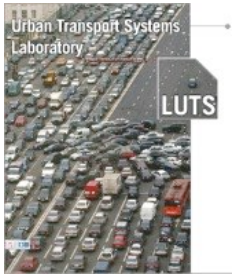

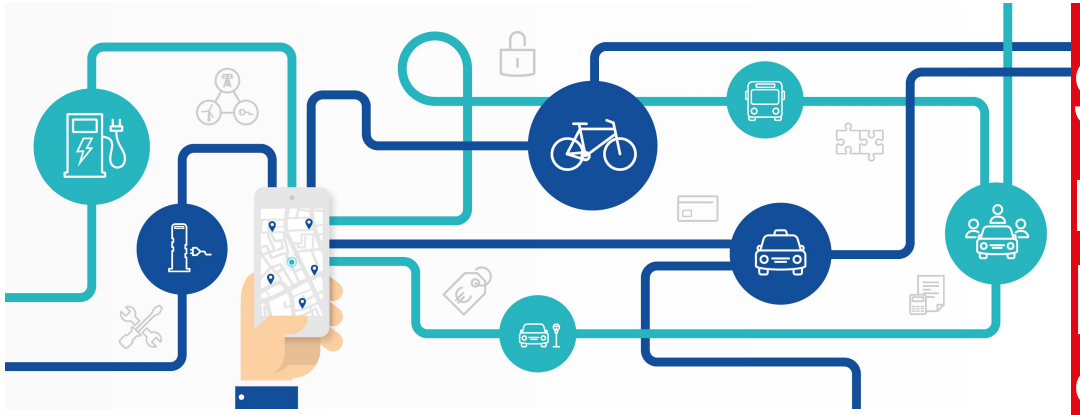

Shared mobility and Mobility as a Service

Nikolas Geroliminis and Caio Beojone

(thanks to Dr. Susan Shaheen for the survey slides)

School of Architecture, Environmental and Civil Engineering

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Shared economy

Paradigm change?

Access trumps ownership

New Models
Subscription & Membership vs. Ownership

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NETFLIX

taskrabbit

Why not in transportation?

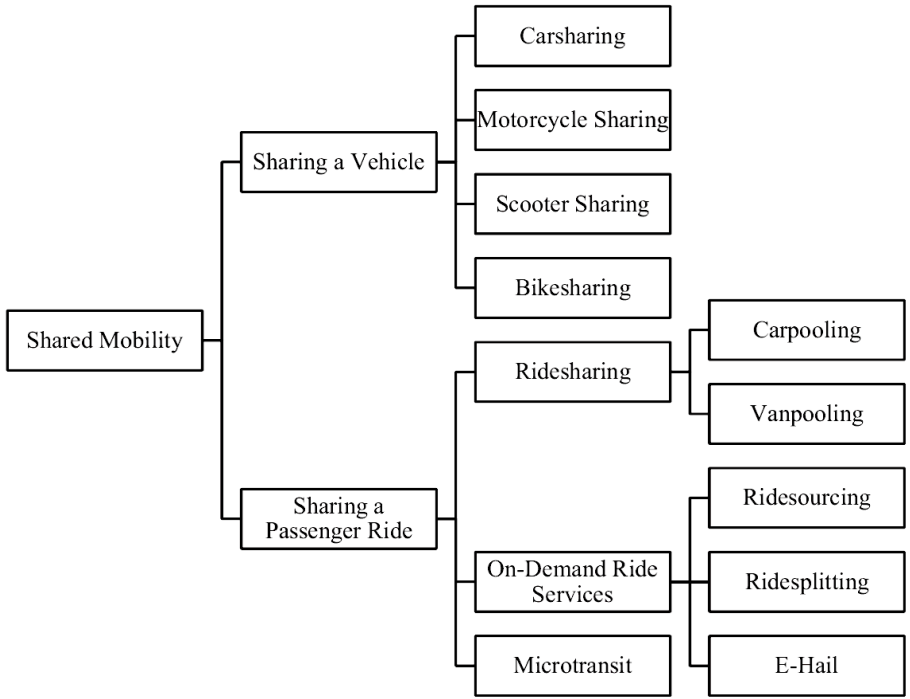

Fig. 1. Categories of shared mobility.
[Source: modified from Shaheen & Chan, 2016]

Vehicle-sharing systems

- Shared mobility service
  - Short periods of time
  - Easy registration
- Pay by the usage
  - By time
  - (By distance)
- Available outside business hours
- Vehicles distributed all over the area

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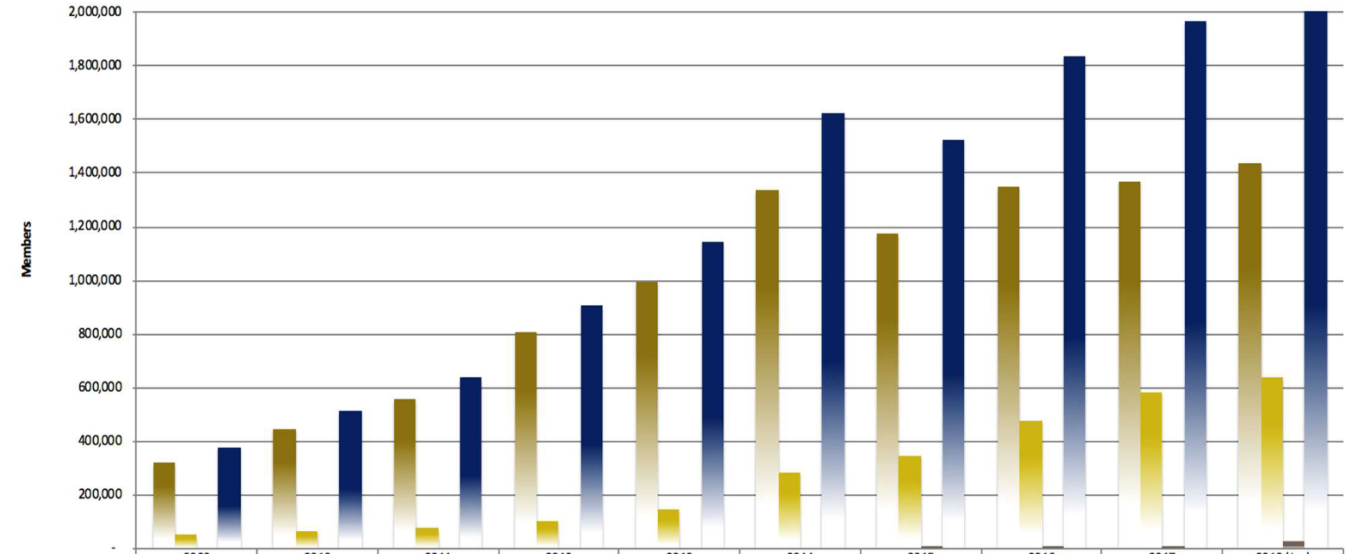
Vehicle-sharing systems

Car sharing Membership Growth: North America

Shaheen, 2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018 (Jan)
U.S. (n=21)	323,681	448,574	560,572	806,332	995,926	1,337,803	1,172,490	1,351,051	1,370,727	1,439,399
Canada (n=18)	53,916	67,526	78,856	101,502	147,794	281,675	344,403	477,528	582,528	642,472
Mexico (n=2)				750	2,654	6,174	9,639	9,275	11,295	28,240
North America (n=41)	377,597	516,100	639,428	908,584	1,146,374	1,625,652	1,526,532	1,837,854	1,964,550	2,110,111

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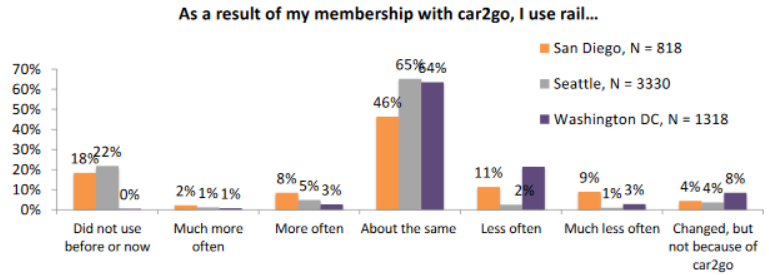
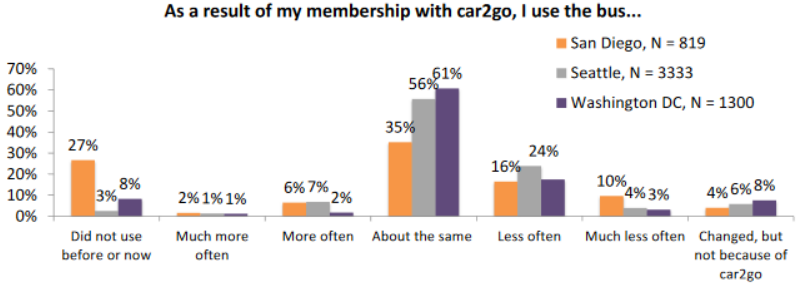
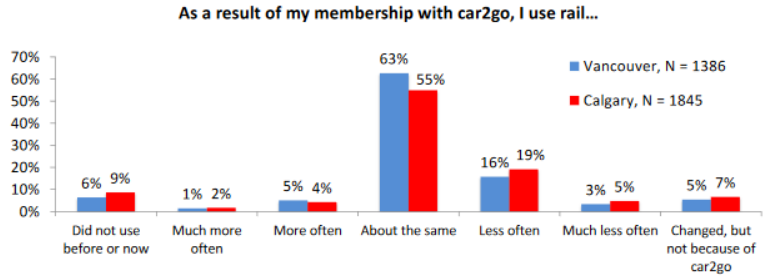
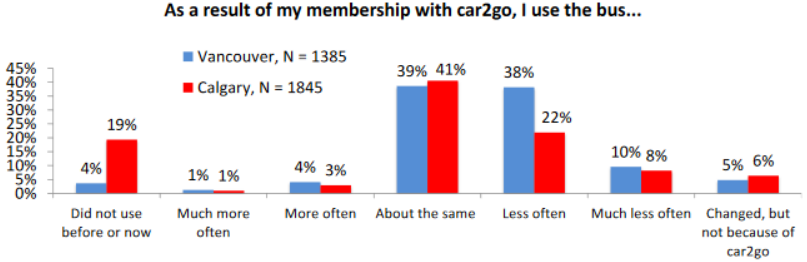
Impacts of car-sharing in public transit









Martin and Shaheen, 2016

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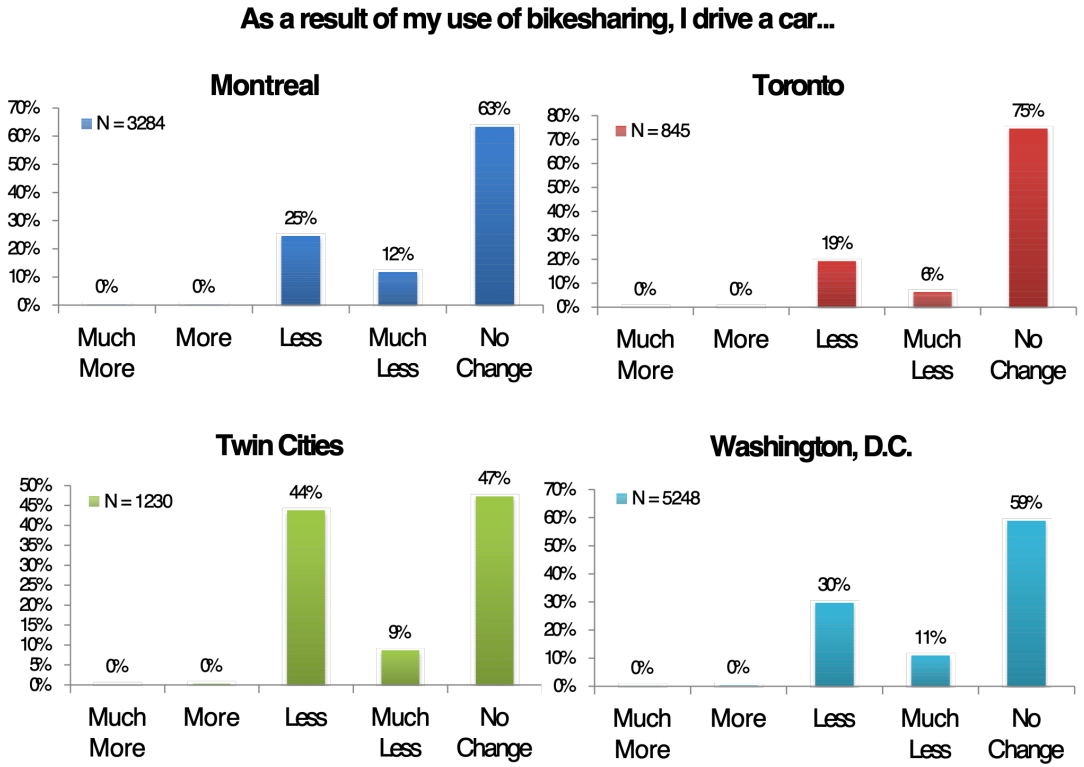
Impacts of bike-sharing



Shaheen et al., 2012

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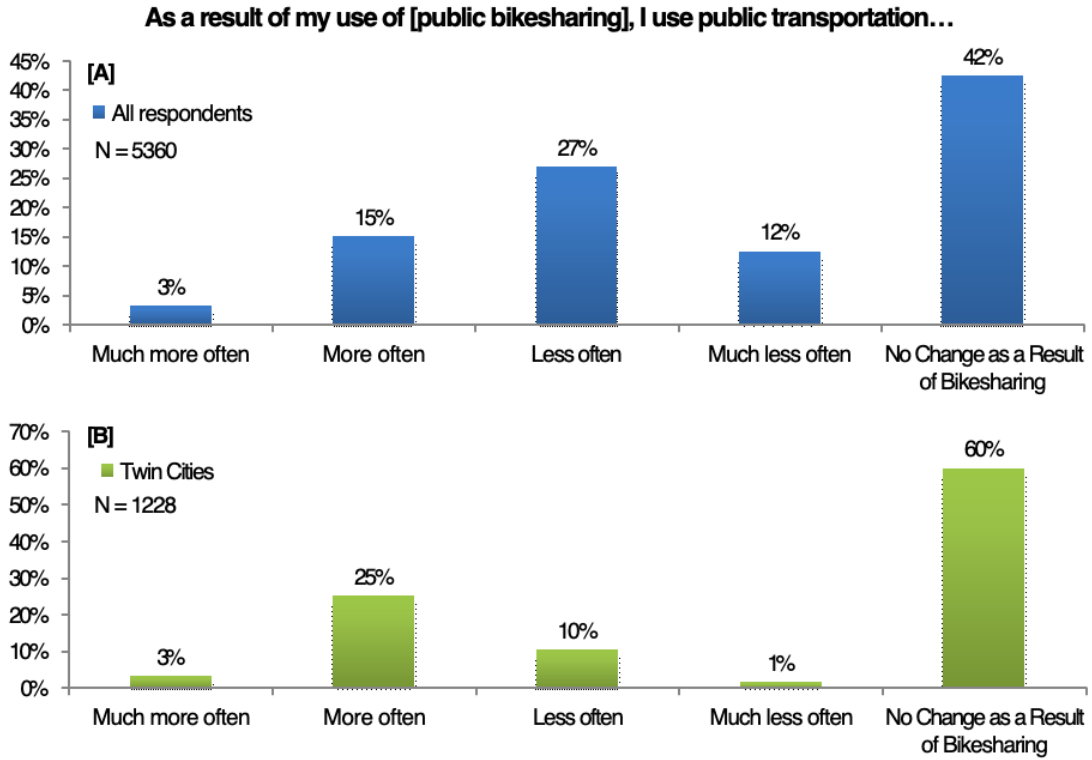
Impacts of bike-sharing

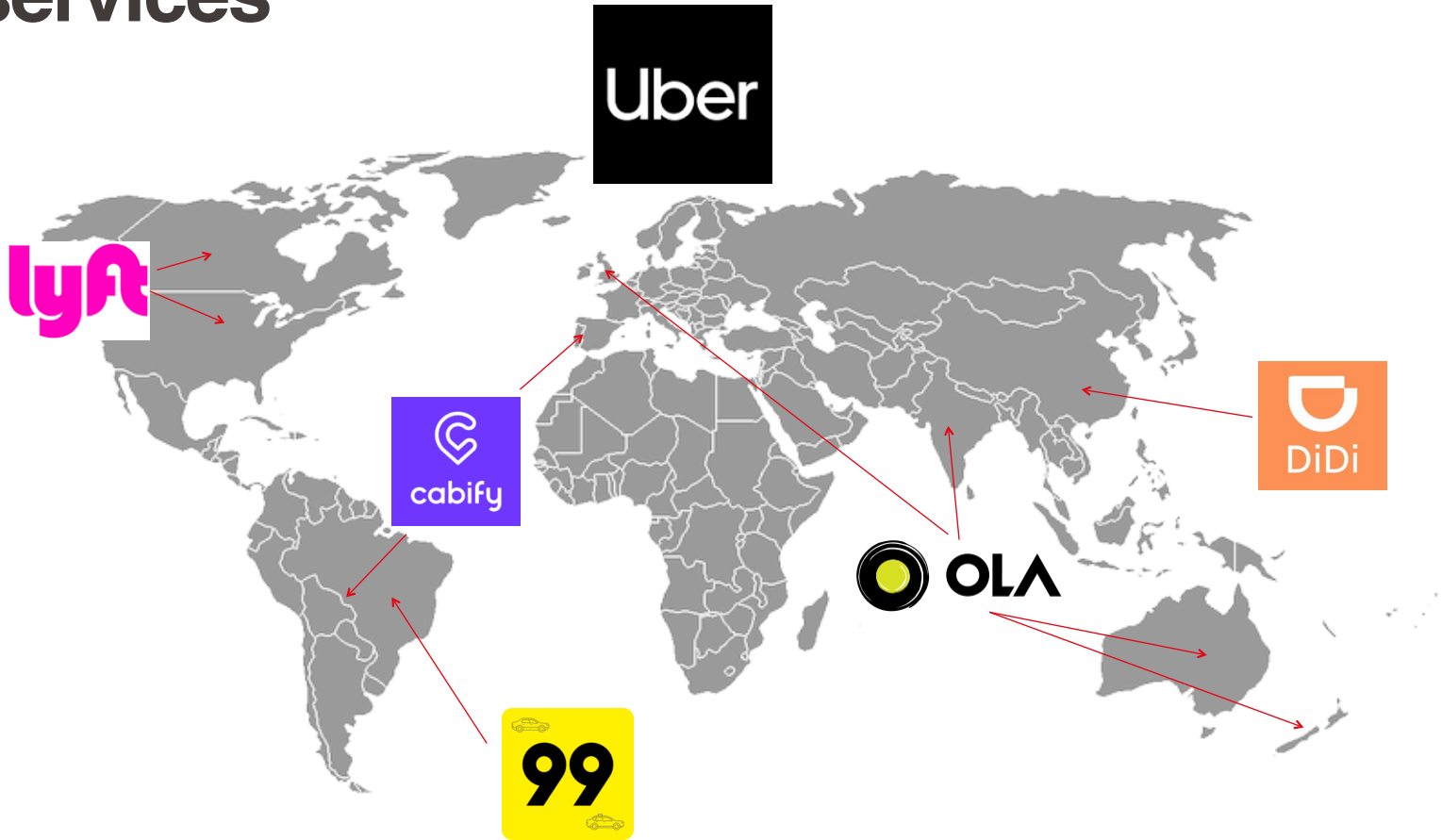


Shaheen et al., 2012

Passenger-sharing systems

- Scheduled
  - Carpooling like BlaBlaCar
  - Route-based services
    - Sheruts in Israel
    - Dolmush in Turkey
    - …
- On-demand
  - Uber
  - …

Some ride-sourcing services



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Competition of ride-sourcing with public transit

Ridesourcing survey responses to "How would you have made this trip if UberX/Lyft/Sidecar were not available?".

	All respondents	Do you have a car at home?	
		Yes	No
Taxi	39%	41%	35%
Transit (bus or rail)	33%	24%	43%
Walk	8%	9%	6%
Bike	2%	2%	3%
Drive my own car	6%	10%	0%
Get a ride with friend/family	1%	1%	2%
Other*	11%	12%	10%
n	*302*	*175*	*124*

Rayle et al. (2016)

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Rayle et al. (2016)

Challenges

- Expansion with concerns
- Regulations
- Pricing policy
- Favorable or unfavorable for traffic congestion?
- Replacement of traditional transportation modes
- Inducing latent demand

Challenges

- Objectives of companies:
  - More profit;
  - More demand;
  - More drivers;
  - Monopoly;
- Consequences:
  - More vehicles driving to pick-up passengers;
  - Lower waiting times;
  - Congestion;

Questions (practical)

- How to capture the effects of ride-sourcing services in urban congestion?
- Which mode interactions to consider?
- Which measurements should we take?
- How to mitigate the negative effects?

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Simulation study

- Shenzhen:
  - +10mi inhabitants
  - Immediately north of Hong Kong
  - Special economic zone (1979)
- Simulated network:
  - Centre of Shenzhen, China
  - 1858 nodes
  - 2013 links
  - Estimated MFD

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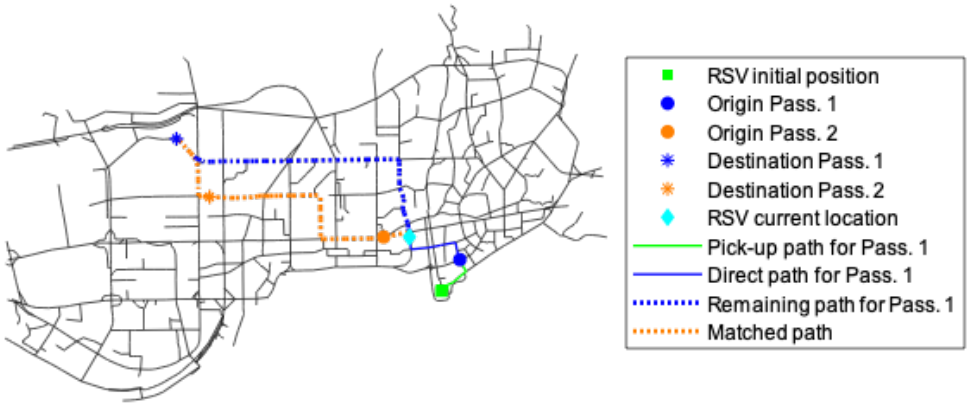
Simulation study

- Fleet size (1,000 to 7,000 vehicles)
- Willingness to share (0% to 90%)
- Idle drivers:
  - Move to hot-spots; or
  - Move to parking lots;



Simulation study

- Hot-spots and Parking lots;
  - Location: p-median;
  - Selection of depot:
    - ‘Color scheme’ and proximity

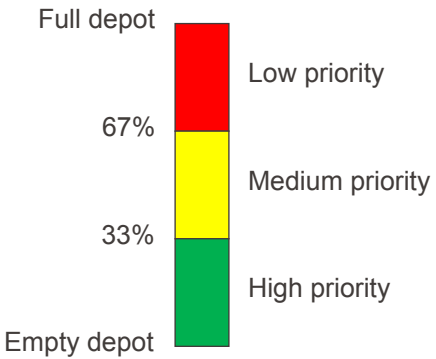


Figure 4. Color scheme for parking-lot selection.

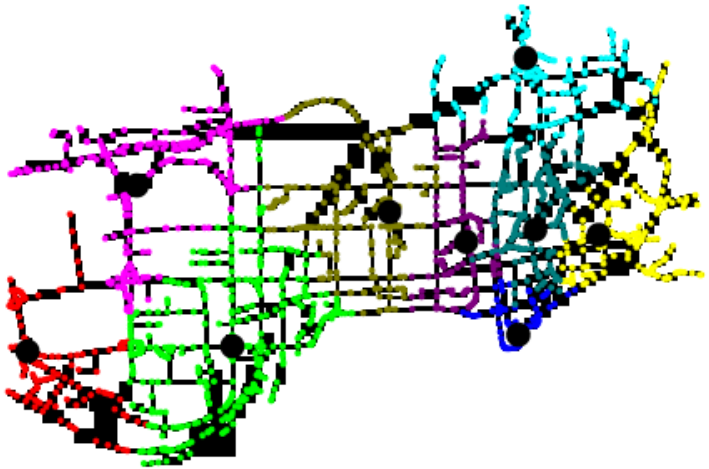
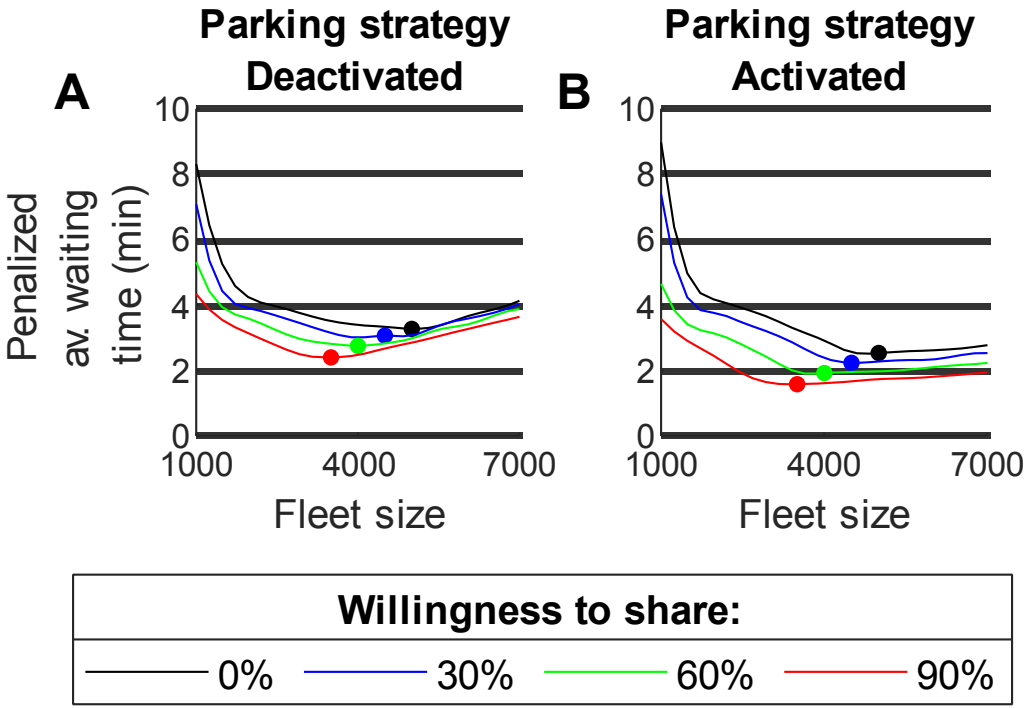


Figure 3. Locations of hot-spots (parking-lots) and closest intersections.

Effects of taking idle ride-sourcing vehicles from streets

- Waiting times:



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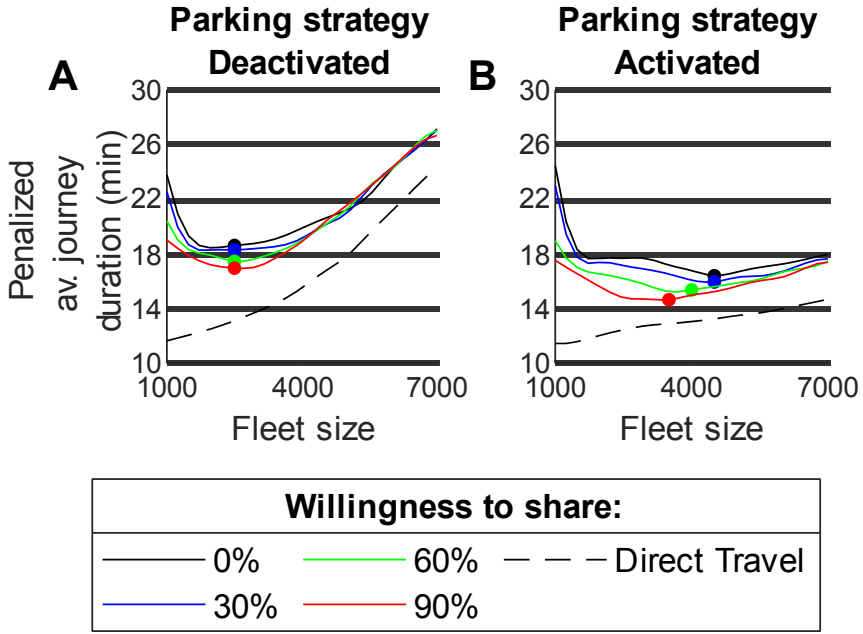
Effects of taking idle ride-sourcing vehicles from streets

- Trip duration (waiting times + travel times):



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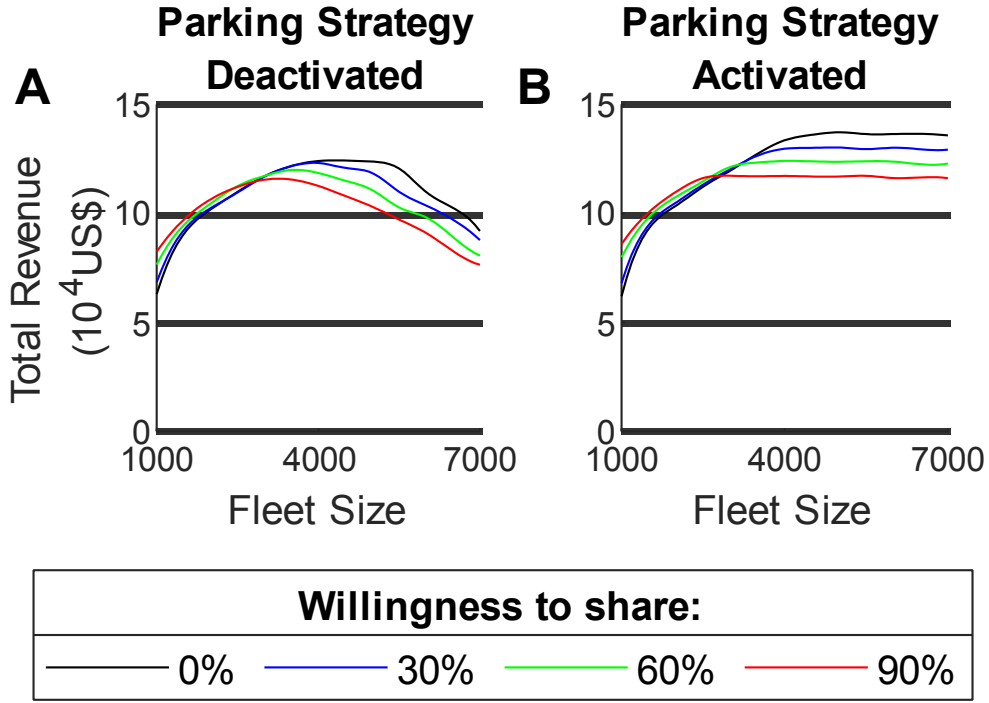
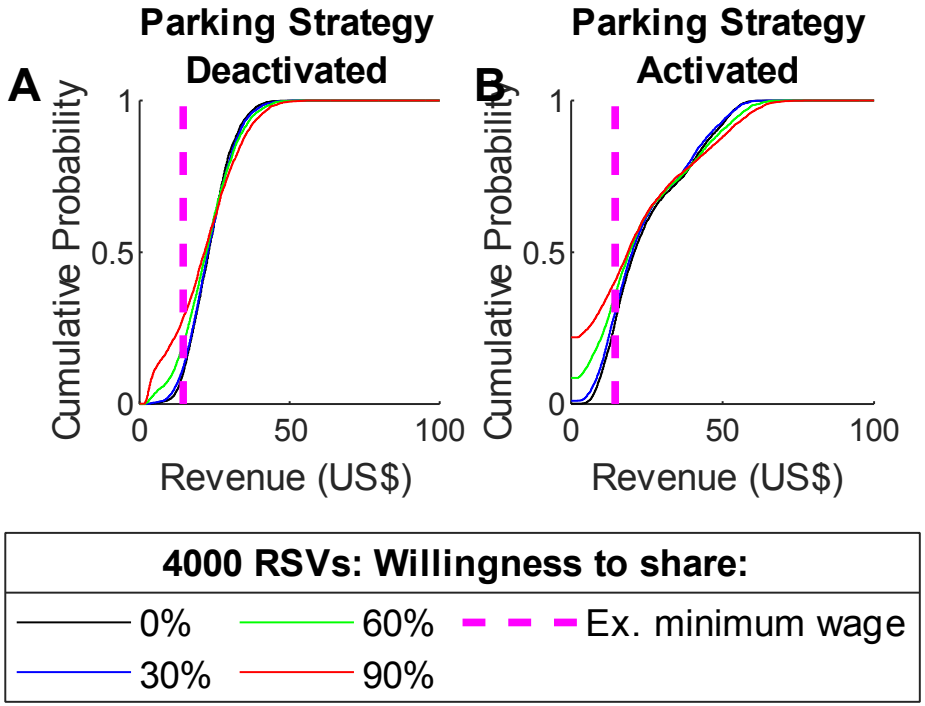
Results

- System's revenue:



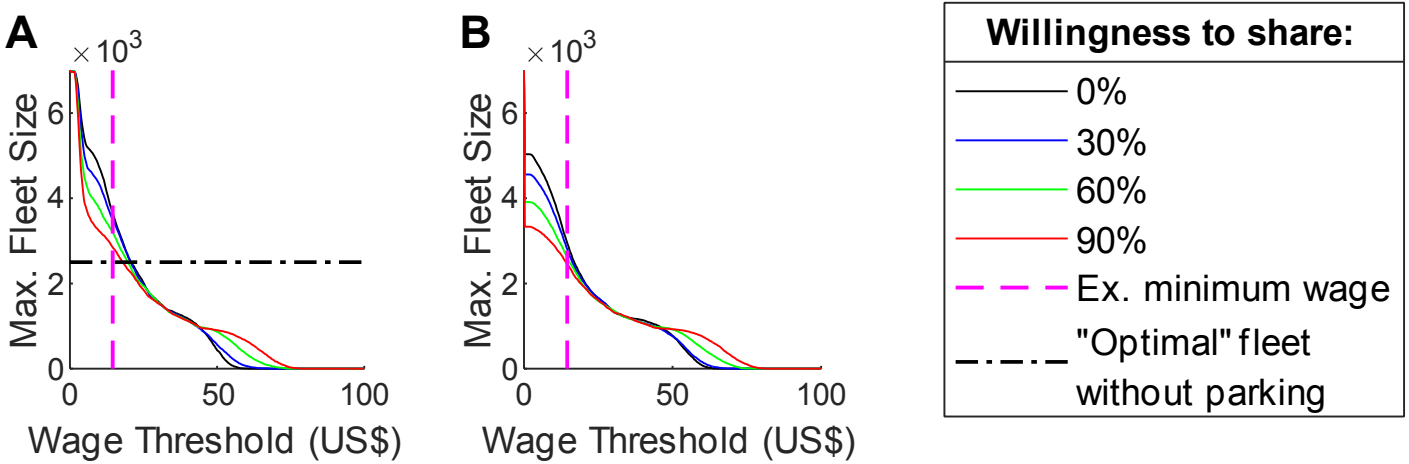
Results

- Drivers' revenue:



Results

- Active drivers:



Key Questions for Public Transportation

- When does shared mobility complement public transit and when does it compete?
  - How does it vary by mode & context?
- What factors influence complementarity vs. competition?
- How can shared mobility be used to enhance accessibility to areas without public transit service?
- How can shared mobility be used to improve efficiency and/or reduce service inefficiencies?
- How should public transportation respond to short-, mid-, and long-term changes? (e.g., shared mobility, AVs, SAVs, and other innovations)