Shared Mobility: Developments and Impacts

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Shared Mobility Ecosystem

Carsharing
- Roundtrip
- One-Way
- Personal Vehicle Sharing (PVS)
  - P2P Carsharing
  - Hybrid P2P-Traditional Carsharing Model
  - P2P Marketplace
  - Fractional Ownership

Scooter Sharing

Bikesharing
- Public Bikesharing
- Closed Campus Bikesharing
- P2P Bikesharing

Alternative Transit Services
- Shuttles
- Microtransit

Ridesharing
- Carpooling
- Vanpooling

On-Demand Ride Services
- Ridesourcing/TNCs
- Ridesplitting
- e-Hail

Courier Network Services (CNSs)
- P2P Delivery Services
- Paired On-Demand Passenger Ride and Courier Services
Growth of Worldwide Carsharing

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</thead>
<tbody>
<tr>
<td>Members</td>
<td>346,610</td>
<td>670,822</td>
<td>1,163,405</td>
<td>1,788,027</td>
<td>4,842,616</td>
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<tr>
<td>Vehicles</td>
<td>11,501</td>
<td>19,403</td>
<td>31,967</td>
<td>43,554</td>
<td>104,125</td>
</tr>
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Shaheen and Cohen, 2015
World Carsharing Growth Rates

<table>
<thead>
<tr>
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<th>2006-08</th>
<th>2008-10</th>
<th>2010-12</th>
<th>2012-14</th>
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<tbody>
<tr>
<td>Members</td>
<td>39%</td>
<td>32%</td>
<td>24%</td>
<td>64%</td>
</tr>
<tr>
<td>Vehicles</td>
<td>30%</td>
<td>28%</td>
<td>17%</td>
<td>55%</td>
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Shaheen and Cohen, 2015
CARSHARING IMPACTS

1 carsharing vehicle replaces 9-13 vehicles

- 25% sold a vehicle
- 25% postponed a vehicle purchase

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<tr>
<th>Metric</th>
<th>Description</th>
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<tbody>
<tr>
<td>↓ 0.58 - 0.84 metric tons</td>
<td>Reduction of GHG emissions per year for one household (mean observed and full impact)</td>
</tr>
<tr>
<td>↓ 34% - 41%</td>
<td>Reduction of GHG emissions per year for one household (mean observed and full impact)</td>
</tr>
<tr>
<td>↓ 27% - 43%</td>
<td>Reduction of VMT per year, considering vehicles sold and purchases postponed</td>
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</tbody>
</table>

More carsharing users increased their overall public transit and non-motorized modal use (including bus, rail, walking, bicycling, and carpooling) than decreased it.
- For every 5 members that use rail less, 4 use it more.
- For every 10 members that ride the bus less, 9 ride more.

$154 - $435 Monthly household savings per US member after joining carsharing

Martin and Shaheen, 2010, 2011
Shaheen et al., 2009
Member Vehicle Ratio
United States

Member Vehicle Ratio
Canada
Worldwide and U.S. Bikesharing: October 2015

Worldwide: **980 cities** with IT-based operating systems

- **1,258,500 bikes**
- **940,850 bikes** in China (and 390 cities)
- **9,300 electric bicycles**

U.S.: **87 cities** with IT-based systems (61 programs)

- **30,750 bikes**
- **3,200 stations**

Source: The Bike-sharing Blog, Russell Meddin, 2015
Count of Worldwide Cities with Bikesharing

Source: The Bikesharing Blog, Russell Meddin, 2015
Allocation of Bikesharing Bicycles Worldwide (2014)

- China, 80%
- France, 5%
- Spain, 3%
- United States, 2%
- Germany, 1%
- Rest of World, 9%

Source: The Bikesharing Blog, Russell Meddin, 2015
Bikesharing Impacts on Behavior

- Bikesharing alters travel behavior.
- Not surprisingly, everyone who uses bikesharing, *bicycles more* as a result.
- Everyone who uses bikesharing *drives less* as a result.
- Not as straightforward is the impact of bikesharing on:
  - Walking
  - Bus usage
  - Public transit
- Impacts differ based on urban geography

*Source: Elliot Martin*
Impact on Walking

As a result of my use of bikesharing, I walk...

Shaheen et al., 2014
Impact on Bus Use

As a result of my use of bikesharing, I use the bus...

Minneapolis Saint-Paul, N = 618
Salt Lake City, N = 72

- Much more often: 2%, 14%, 15%
- More often: 0%, 8%, 1%
- Less often: 3%, 3%, 4%
- Much less often: 46%, 57%, 17%
- About the same: 17%, 29%, 4%
- Did not ride the bus before/after: 4%, 1%
- Changed bus use, not due to bikesharing:

Montreal, N = 1091
Toronto, N = 1005

- Much more often: 1%, 5%, 3%
- More often: 0%, 3%, 5%
- Less often: 24%, 15%, 21%
- Much less often: 21%, 15%, 24%
- About the same: 35%, 35%, 24%
- Did not ride the bus before/after: 13%, 20%, 13%
- Changed bus use, not due to bikesharing:

Mexico City, N = 3330

- Much more often: 5%
- More often: 15%
- Less often: 22%
- Much less often: 12%
- About the same: 36%
- Did not ride the bus before/after: 8%
- Changed bus use, not due to bikesharing:
Impact on Rail Use

As a result of my use of bikesharing, I use urban rail...

Shaheen et al., 2014
Martin and Shaheen, 2014
Bikesharing and Bicycle Safety

- Natural safety concerns arise from:
  - Lack of helmet use
  - Presence of less experienced riders
  - More bicyclists on the road

- Study explored key questions
  - What are the safety statistics pertaining to bikesharing?
  - Does bikesharing improve bicycle safety of everyone by providing a “Safety in Numbers” benefit?
  - What are the safety factors related to bikesharing?
Number of Bikesharing Trips in Capital Bikeshare

- 2011: 1,243,103
- 2012: 2,049,576
- 2013: 2,584,945
- Total: 5,877,624

Number of Vehicle Involved Collisions for Capital Bikeshare

- 2011: 13
- 2012: 25
- 2013: 16
- Total: 54

Capital Bikeshare Vehicle-Involved Collision Rate
Collisions per 100,000,000 Bikesharing Trips

- Benchmark injury rate

- 2011: 1,046
- 2012: 1,220
- 2013: 619
- Total: 919
Bikesharing Fatalities

• Since 2013 to Present:
  • London = 4
  • Madrid = 1
  • Canada and Mexico = 6
    • Paris = 12
  • United States = 0

Source: Russell Meddin, 2016
Traditional Ridesharing

- Grouping of travelers into common trips by private auto/van (e.g., carpooling and vanpooling)

- Historically, differs from ridesourcing in financial motivation and trip origin/destination

- 662 ridematching services in the U.S. and Canada (24 span both countries)
  - 612 programs offer carpooling
  - 153 programs offer vanpooling
  - 127 programs offered carpooling and vanpooling

Chan and Shaheen, 2011
For-Hire Vehicle Access Models

**Ridesourcing/TNCs:** Service that allows passengers to connect with and pay drivers who use their personal vehicles for trips facilitated through a mobile application.

**Street Hail:**
Hailed with a raised hand or by standing at a taxi stand or specified loading zone.

**E-Hail:**
Hailed by dispatching a for-hire driver using a smartphone application.
Some Ridesourcing/E-Hail: Market Trends

- Lyft: 150 cities; over 100,000 drivers (2015)
- Uber: 62 countries; 365 U.S. cities (2015); over 162,000 drivers in U.S. (early 2015)
- Flywheel: 6 cities, over 5,000 drivers
- Curb: 60 cities; 35,000 cabs

Said, 2015; Miller, 2015; Bloomberg, 2015; Uber, 2015; Townsend, 2015
• Ridesourcing impacts are currently a subject of intensive study.

• Study underway of the GHG and vehicle impacts of Uber and Lyft in the United States.

• The operations of Ridesourcing likely increase driving, relative to carsharing, but it also brings scale and access of shared mobility to a wider region than carsharing has.
Shared Mobility: Impacts

- Historically used by:
  - Younger
  - Well educated
  - Upwardly mobile
  - Caucasian individuals
  - Living in urban areas

- How to scale this to other populations & land uses (accessibility, paratransit)?

- More research needed on mobility ecosystem and collective impacts

- Data critical to understanding innovative services

Shaheen, 2015
Impacts Summary

• Shared mobility is **evolving rapidly** and has been shown to **impact travel** where it operates.

• While some systems have been found to **reduce emissions**, shared mobility cuts both ways.

• It is a **mode substitution** in some environments.

• In other environments, it enables reduced dependence on the personal automobile, resulting in **substantive declines in driving**.

• As shared-use mobility **evolves and expands into new regions**, the nature of impact is likely to change.
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Industry Summary

- Growing ecosystem of services in mobility + sharing economy

- Carsharing used by 1.2 million people in the U.S.

- Bikesharing: 87 cities in the U.S. 30,750 bikes and 3,200 stations as of October 2015

- Ridesharing: ~662 vanpool/carpool services in U.S. and Canada

- Ridesourcing/TNCs and e-hail growing in the U.S.

- Shared mobility services: more understanding needed

Shaheen, 2015