Impacts of Lyft and Uber on Transportation

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What to expect

- Motivation
- Research
- Preliminary Results
- Discussion
Disrupting Transportation

Many factors, including:

• Social networks
• Real-time information
• Mobile technology

Allow the creation and popularization of on-demand transportation services all over the world.
Evolving Transportation Services

- Bikesharing
- Carsharing
- Ridesharing
- Ridesourcing
- Taxi Hailing
- Microtransit
Sourcing of rides from a ‘for-fare’ driver pool accessible through an app-based platform.

Other names:
“Transportation Network Companies (TNCs)”,
“ride-hauling”, “ride-booking”, “ride-matching”,
“on-demand-rides”, “app-based rides”
Research

- RIDESOURCING

- CHANGES

- IMPACTS!
- EQUITY ISSUES
- TRAVEL BEHAVIOR
- MODE CHOICE. WHY?
Why is this Research Important?

Big Picture:
- Better understanding of ridesourcing to inform cities:
  - Policy Changes?
  - Infrastructure Changes?
  - Integration with other modes
- Better technology tools, apps and services
- Better travel demand models

With the goals of providing more efficient, sustainable, equitable & safer transportation systems
Literature Review

- Academic literature on ridesourcing is very limited.

- Researchers in San Francisco compared taxi and ridesourcing. Users tend to be younger, higher incomes and low car ownership (Rayle et al., 2015).

- FiveThirtyEight did a few articles on Uber using data thanks to a Freedom of Information Law request, showing that in NY Uber is taking rides away from taxis and covering a larger area of service.
Research Areas

Impacts of Ridesourcing (Uber/Lyft) on:

1. VMT and Parking Demand

2. Transportation Equity

3. Travel Behavior Changes
   - Mode Choice
   - Travel Demand Models
Section 1: VMT & Parking

- Vehicle Miles Traveled (VMT)
  - Increase or Decrease?
  - Induced Travel
  - Multimodality and Intermododality

- Parking Demand

Do the changes in VMT and Parking vary among geographical regions (urban vs. suburban, city size, density)? And mode share?
Section 2: Equity

Transportation Equity Issues
• Who is using ridesourcing?
• Demographics (e.g. age, income, education, ethnicity)
• Travel cost
• Waiting times
Section 2: Equity

Do waiting times vary among geographical areas with different demographics (e.g. age, income, ethnicity)?
Section 3: Travel Behavior & Mode Choice

What are the travel modes replaced by Lyft/Uber?
- Drive alone? Transit? A mix of modes?

Explanatory Variables for travel behavior changes
- Travel Attributes (e.g. trip purpose, time, parking)
- Characteristics of the Individual
- Modality Style (e.g. car-oriented, multimodal)
- Modality Resources (e.g. car ownership, transit pass)

How to take into account ridesourcing for travel demand models?
Mode Choice

**UNIVERSAL TRANSPORT SET**
Set of transportation options available for O-D trip

**INDIVIDUAL SUBSET (MODALITY STYLE)**
Set of transportation options considered by individual for O-D trip

**MODALITY RESOURCES:**
- Car Ownership
- Transit Pass
- Bike Ownership
- Membership for Carsharing or Ridesourcing

**Characteristics of the Individual and Household:**
- Gender, Age, Race, Income, Employment, Household Size, Marital Status, Parenthood Status

**Travel Attributes:**
- Travel Time
- Travel Cost

**Utility of travel mode**

**Choice of travel mode**

**OUTPUT 1**
Ridesourcing Intro

**INPUT**

**OUTPUT 2**

**OUTPUT 3**
Mode Choice

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**INPUT**
Ridesourcing Intro

**OUTPUT 1**

**INPUT**
Travel Attributes:
- Travel Time
- Travel Cost

**OUTPUT 2**

**OUTPUT 3**

Utility of travel mode

Choice of travel mode
Research Methods

- **Data**: A combination of travel attributes and revealed behavior data collected by Lyft/Uber drivers and the passengers.

- **Two components:**
  - Driver Data Collection
  - Passenger Interview

- **Goal**: Goal is to collect 1,000 travel samples.
Driver Data Collection

- Mileage and Times
  - Cruising/Waiting for a ride
  - From Request to Passenger Pick-up
  - Waiting for Passenger
  - Ride (with passenger)

- Money ($)
  - Driver Earnings
  - Passenger Paid
# Driver Data Collection

## DRIVER DATA COLLECTION

<table>
<thead>
<tr>
<th>Driver Name: ___________________________</th>
<th>Date: ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location at Log-in: ____________________</td>
<td>Time at Log-in: ___ am/pm</td>
</tr>
<tr>
<td>Location at Log-out: ____________________</td>
<td>Time at Log-out: ___ am/pm</td>
</tr>
<tr>
<td>End Location: __________________________</td>
<td>Time End Location: ___ am/pm</td>
</tr>
<tr>
<td>Log-in and Log-out for Lyft/Uber &amp; Daily $ Break-down (info from report)</td>
<td>Mileage: __________</td>
</tr>
<tr>
<td>Time in driver mode Lyft: ___</td>
<td>Lyft $: ___</td>
</tr>
<tr>
<td># Rides Accepted for Lyft: ___ &amp; Not Accepted: ___</td>
<td>Time in driver mode Uber: ___</td>
</tr>
<tr>
<td># Rides Accepted for Uber: ___ &amp; Not Accepted: ___</td>
<td>Uber $: ___</td>
</tr>
<tr>
<td>Reasons for not accepting: (Check all that apply)</td>
<td></td>
</tr>
<tr>
<td>□ App issues  □ Busy  □ On break  □ Pick up is too far  □ Forgot to log-out  □ Other: ____________</td>
<td></td>
</tr>
<tr>
<td>Collect: i) Driver Sheet, ii) Passenger survey, and iii) GPS tracking</td>
<td>* No need to collect text in blue</td>
</tr>
</tbody>
</table>

## DRIVER SHEET

<table>
<thead>
<tr>
<th>Ride # (shift): ___</th>
<th>Ride Request from: □ Lyft □ LyftLine □ UberX □ UberPool</th>
<th># Passengers: ___</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather: □ Clear □ Foggy □ Rainy □ Sunny □ Snowy □ Windy □ Other: __________</td>
<td>Temperature: ___</td>
<td></td>
</tr>
<tr>
<td>Driver Location at Request: __________________________</td>
<td>Cruising for a ride distance: ___ mi</td>
<td></td>
</tr>
<tr>
<td>Time at Request: ___ am/pm</td>
<td>Waiting/Cruising for a ride time: ___ mins (based on last ride)</td>
<td></td>
</tr>
<tr>
<td>Pick-up Location: __________________________</td>
<td>Lyft/Uber time &amp; dist: ___ mins ( ___ mi)</td>
<td></td>
</tr>
<tr>
<td>Arrival Time at Pick-up: ___ am/pm</td>
<td>Req to Arr time: ___ mins GoogleMaps time &amp; dist: ___ mins ( ___ mi)</td>
<td></td>
</tr>
<tr>
<td>Time when Ride Starts: ___ am/pm</td>
<td>Driver waiting time: ___ mins</td>
<td></td>
</tr>
<tr>
<td>Destination Location: __________________________</td>
<td>GoogleMaps time &amp; dist: ___ mins ( ___ mi)</td>
<td></td>
</tr>
<tr>
<td>Time when Ride Ends: ___ am/pm</td>
<td>Ride Time: ___ mins Lyft/Uber time &amp; dist: ___ mins ( ___ mi)</td>
<td></td>
</tr>
<tr>
<td>Parking Location: __________________________</td>
<td>Cruising to Park time &amp; dist: ___ mins ( ___ mi)</td>
<td></td>
</tr>
<tr>
<td>Prime Time (x): ___</td>
<td>Cost of Parking: $ ___</td>
<td></td>
</tr>
<tr>
<td>Total Paid by Passenger (inc. tip): $1.95+ ___ To Driver: ___+ tip: ___</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Money shown on App: $___</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Passenger Interview

Passenger fill-out survey while in the Lyft/Uber ride
   - Travel Behavior in general
   - Specific Trip
   - Demographics
Passenger Interview

http://www.surveygizmo.com/s3/2780782/2b261b1519b2
Preliminary & Expected Results

**Paper 1: Driving Efficiency**

- Mileage: Total Lyft/Uber driving miles (with and without passenger) vs. passenger miles
- Money Earned per hour and per mile
Preliminary & Expected Results

Mileage and Times

- Cruising/Waiting for ride (A-B)
- On-Route to Pick-up (B-C)
- Waiting for Passenger
- Ride (with passenger) (C-D)
Preliminary & Expected Results

Preliminary Data suggest:

- Total miles (including with passenger + cruising/waiting + on-route to pick up) per 100-passenger miles: 110-169 miles
- 59% to 90% efficiency in PMT/VMT
- Drivers earn $12-$26/hr before any gas, maintenance, or car expenses.
- $0.80-$1.30 per mile
Preliminary & Expected Results

**Paper 2: Comparison of Lyft/Uber vs. Driving**

- Travel times
- Travel cost
DOOR-TO-DOOR TRAVEL TIMES

(Walking + Driving + Cruising)

DRIVING

ORIGIN \( t_{d1} \) \( \rightarrow \) PARKING AT ORIGIN \( t_{d2} \) \( \rightarrow \) PARKING AT DESTINATION \( t_{d3} \) \( \rightarrow \) DESTINATION

RIDESOURCING

ORIGIN \( t_{r1} \) \( \rightarrow \) PICK UP AT ORIGIN \( t_{r2} \) \( \rightarrow \) DROP OFF AT DESTINATION
Travel Times: Google Maps, Driving & Ridesourcing
Preliminary & Expected Results

Preliminary Data suggest:

- An increase in VMT for individuals using ridesourcing (even when shifting from SOV)
- A decrease in Parking Demand
- Changes in VMT, Parking, and Equity differ from urban to suburban and mode choice availability.
- High percentage of trip purpose for ridesourcing is: Going out/social/recreational/entertainment
Preliminary & Expected Results

Preliminary Data suggest:

- Avoid Drinking and Driving, Value of Time, and Parking is very important
- Lyft/Uber is replacing a mix of modes (not just driving or just transit). Initially, mostly taxi.
- Short-trips vs. Long-trips
- Intermodality (mode-mixed) does not seem very significant
Preliminary & Expected Results

Four modality styles classes:

- **Car**: if most subsets only contain the car as the mode;
- **Multimodal with car**: if most subsets contain car and at least one more mode;
- **Multimodal without car**: if most subsets do not contain car as a mode;
- **Bi-style**: if the subsets are a mixed of the three previous classes.
Discussion

Source: AP photo/Eric Risberg
Discussion

Transportation equity issues

Source: Out Front Minnesota


Discussion

Safety

Vision Zero: “No loss of life is acceptable”

What is the role of Lyft/Uber and other transportation services including current/future autonomous and connected vehicles in safety and vision zero?
Transportation options ranked among city livability goals
(safety, sustainability, affordability, accessibility)

Transport Ecosystem

Concept: Tim Papandreou
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