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#DisruptiveTransportation
TNCs & AVs

CAN'T STOP, WON'T STOP.

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FEHR PEERS
The Future Is Uncertain
The Future Is Uncertain

U.S. Dept of Transportation Forecasts of Future Driving vs. Reality

Vehicle-Miles Traveled (trillions)

C&P scenarios depicted based on linear growth; FHWA May 2014 forecast on compound growth.
* Based on "Cost to Maintain" scenario.
** Data through 2012 from FHWA Highway Statistics; 2013 data from FHWA Traffic Volume Trends
FHWA: Federal Highway Administration; C&P: Conditions & Performance report.
The Future is Already Here, Just Unevenly Distributed
The TNC markets has experienced astonishing growth
TNCs by the numbers – SF Snapshot

- 21% of American adults report using Uber or Lyft\(^1\)
- 70% of San Francisco residents have used a TNC service at least once, 40% use them at least once per month, and 20% use them at least once per week
- TNC use is higher among wealthier households, households in denser neighborhoods, and young adults
- Around 7% of all trips by Bay Area residents under age 35 are made by TNC; this number is higher for San Francisco residents.
- TNC use has doubled in San Francisco from 2015 to 2016, from around 2% of all trips to 4% of all trips. Based on modeled person trips from SF-CHAMP, this could represent around 150,000 average daily trips by TNC / 75,000 additional average daily TNC trips.
- Initial survey data suggest a substantial share of TNC trips may have shifted from transit

Clelow, RR & Mishra, Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States, UC Davis ITS 2017
In some instances, TNCs may be shifting people away from “non-auto” modes

- Mode shifts away from transit, walk, and bike
- Serving latent travel demand, but increasing VMT

<table>
<thead>
<tr>
<th></th>
<th>San Francisco</th>
<th>Denver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Shifts from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Transit</td>
<td>35 – 40 %</td>
<td>20 – 25 %</td>
</tr>
<tr>
<td>• Walk /Bike</td>
<td>10 %</td>
<td>10 – 15 %</td>
</tr>
<tr>
<td>• Taxi / Auto</td>
<td>50 – 55 %</td>
<td>60 – 70 %</td>
</tr>
<tr>
<td>Induced Trips</td>
<td>8 %</td>
<td>12 %</td>
</tr>
<tr>
<td>Added Vehicle Trips</td>
<td>~50 % (of TNC)</td>
<td></td>
</tr>
</tbody>
</table>
There may be a steep VMT downside to some TNC ridership

New vehicle and TNC trips generate VMT in both new and novel ways (and less productive):

- Induced trips i.e. trip that would not have occurred
- Conversion of a ped/bike/transit trip to vehicle trips
  - (to/from home to driving area)
  - (waiting for a request/cruising)
  - (the ‘pre-trip’, since the driver first needs to come to you)
  - (distant pickups or drop-offs due if sharing)

A doubling effect on VMT

Potential effects on Vision Zero, GHG goals
TNCs have been good for the ‘speculating about what’s going on with transit’ business

Metro Continues Steep Ridership Decline Amid Nationwide Trend Of Transit Losses

Uber and Lyft use at SFO increases six-fold in two years, BART loses ridership

SF may consider imposing fee on Uber, Lyft rides

Subway Ridership Declines in New York. Is Uber to Blame?

What Factors Are Causing Metro’s Declining Ridership? What Next?

BART’s Oakland Airport Connector losing money; Uber, Lyft to blame?

Lyft Shuttle is an experimental new Lyft Line feature that works like a bus route
Effect on Transit in NYC (Schaller)
Trend towards AVs replacing TNC drivers is clear, even if progress is disjointed.
Impacts are likely to become more pronounced as AVs replace TNC drivers.

<table>
<thead>
<tr>
<th></th>
<th>Cost per Mile</th>
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</thead>
<tbody>
<tr>
<td>Personal Vehicle (e.g. Camry)</td>
<td>$0.82/mi</td>
</tr>
<tr>
<td>TNC (e.g. Uber)</td>
<td>$0.86/mi</td>
</tr>
<tr>
<td>Automation Costs</td>
<td>$2.04/mi</td>
</tr>
<tr>
<td>Automation Savings</td>
<td>-$1.35/mi</td>
</tr>
<tr>
<td>Automated TNC</td>
<td>$0.17/mi</td>
</tr>
</tbody>
</table>

Doesn’t include cost of time.

Source: Rocky

- Automation Costs (e.g. hardware, fleet management)
- Driver Net Earnings
- TNC Revenue
- Ownership Costs (e.g. financing, insurance)
Land Use  
VMT/GHG  
Mobility Choices
The Question Is: Can We Model These Effects?
What We Did

- Tested nine regional models + two others
- Tested eight potential effects
- Two Cumulative Scenarios
AV Effects
Fehr & Peers Testing

• Tests
  1. Decrease access time
  2. Decrease parking costs
  3. Decrease vehicle operating costs
  4. Decrease impact of time lost driving
  5. Increase auto availability
  6. Increase freeway capacity
  7. Increase non-work trip-making
  8. Increase auto occupancy
What We Found
What We Found
What Can We Infer?

• Private sector incentivized to sell ‘miles of travel’.
• Increase in vehicle travel is likely to occur.
• Current bus transit service susceptible to largest shift.
• Current models do not account for TNC and AV effects.
• Regulations will matter.
So What:
Policy
A Role For Policy:
Encourage of and/or Subsidize Shared AV Use as Opposed to Owned
A Role For Policy: Investment in frequent, quality transit service in urban areas as well as cycling and pedestrian safety infrastructure in all areas
**A Role For Policy:** Determine if a cap on the number of lanes or areas available to AVs is appropriate.
A Role For Policy:
Consider whether separate facilities and/or whether road use pricing or priority schemes is appropriate.
A Role For Policy: Create additional opportunities for passenger and commercial loading
A Role For Policy: Prepare for the consequences of reduced sensitivity to in vehicle time
A Role For Policy: Prepare for what is now parking to become available as well as design any future urban parking facilities for eventual conversion.
What Next?

Continued Future Scenario Modeling

What would it take to offset the effects?

• Congestion pricing
• Improved headways, lower fares
• Vehicle occupancy minimums
• Expanded heavy rail systems
• Autonomous trucking
What Next?

Data Collection

Attributes
- 20 high activity sites
- 12 hour period (Friday)
- 2 video cameras
  - Records continuously
- 2 time lapse cameras
  - Provides ability to distinguish vehicle types
Travel demand profiles for transit and solo travel show the most effective roles of right-sized transit and TNC

| What Next? | Travel demand profiles for transit and solo travel show the most effective roles of right-sized transit and TNC |

<table>
<thead>
<tr>
<th>Backbone</th>
<th>Crowd-Sourced</th>
<th>Door-to-Door</th>
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</thead>
<tbody>
<tr>
<td>Rail</td>
<td>Hi Cap Bus, BRT</td>
<td>Coverage Bus</td>
</tr>
<tr>
<td>High density, limited linear corridors</td>
<td>High / Moderate demand density corridor trunks</td>
<td>Moderate demand corridors and branches</td>
</tr>
</tbody>
</table>

What Next?
What Next?

Quantify TNC and AV effect on:
status quo revenue models (gas tax, parking revenue, user fees, etc.)
land use, equity, parking demand, retail models, etc.