Shared mobility and ride sourcing: Status quo, regulation and outlook

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Do you use Uber?
Pool with students from UNAL, yesterday

(How often) do you use Uber?

- Rarely - once a month or less: 51%
- I never use it: 20%
- Frequently - Every day/couple of days: 14%
- Sometimes - once a week: 14%
- Uber?!?: 0%
Outline

Shared mobility and ride sourcing
- Definition and conceptualisation
- Current state

Case studies
- Market insights from case cities
- Paradigmatic cases

Outlook
- Market outlook
- Regulatory frameworks
Part I. Shared mobility and ride sourcing

Shared mobility and ride sourcing

• Definition and conceptualisation
• Current state

Case studies
• Market insights from case cities
• Paradigmatic cases

Outlook
• Market outlook
• Regulatory frameworks
Conceptualization of ‘shared mobility’

Shared Mobility

- Vehicle based
  - Carsharing
  - Motorcycle sharing
  - Scooter sharing
  - Bike sharing

- Ride based
  - Microtransit
  - On-demand Ride services
  - Ride sourcing
  - Ride splitting
  - E-Hail (Taxis)

Own, inspired by Shaheen & Chan 2016
## Overview of vehicle based shared mobility options

<table>
<thead>
<tr>
<th>Year</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>Carsharing 1.0</td>
<td>Early model of carsharing where vehicles are picked up and returned to the same location; typically through an hourly rental.</td>
</tr>
<tr>
<td></td>
<td>Station based</td>
<td></td>
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<tr>
<td></td>
<td>zipcar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carsharing 2.0</td>
<td>Second generation of carsharing where vehicles can be picked up and dropped off in different locations (possibly by zone vs. designated parking spots); typically charged by minute.</td>
</tr>
<tr>
<td></td>
<td>One-to-many</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DriveNow, CAR2GO, scoot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carsharing 3.0</td>
<td>Peer-to-peer sharing where individuals can rent out their personal vehicles to others when not in use.</td>
</tr>
<tr>
<td></td>
<td>P2P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>drivy, MAVEN</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Ride sourcing</td>
<td>Platform where individuals can hail and pay for a ride from a driver through an app, driver can be professional and work full or part-time.</td>
</tr>
<tr>
<td></td>
<td>lyft, DiDi, Uber</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>Ride pooling</td>
<td>Extension of ride-sourcing where individuals can be matched in real-time to share rides with others going on a similar route.</td>
</tr>
<tr>
<td></td>
<td>+/-splitting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>uberPOOL,LYFT LINE</td>
<td></td>
</tr>
</tbody>
</table>

Source: Based on Clewlow & Mishra, 2017
Transportation Network Companies (TNC)

- Companies like Uber, Lyft, Cabify, Didi Chuxing offering a variety of services around “selling rides”
- TNC has established as the official term describing companies offering the variety of services around “selling rides”
- TNC defined by the California Public Utility Commission (CPUC):

> “a company that uses an **online-enabled platform** to **connect passengers with drivers using their personal, non-commercial Vehicle**”

- Companies are considered start-ups due to their relatively young age, their IT background and their business strategies of fast expansion
- Lyft & Uber have announced an Initial Public Offering (IPO) for this year, meaning they will become companies listed on the stock market
How ride sourcing works

Supply
- Private, non-professional drivers
- Private, non-commercial vehicles

TNC

Demand
- Passenger Ride-request ("Door-to-Door")

Matching

Routing and pricing based on real-time data before the trip (pre-price prediction)

20 – 25% Commission of the price of the ride

Positioning using a GNSS (i.e. GPS)

<table>
<thead>
<tr>
<th>Countries where Uber operates</th>
<th>Didi Chuxing</th>
<th>Grab</th>
<th>Ola</th>
<th>Careem</th>
<th>YandexTaxi</th>
<th>Easy Taxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxify</td>
<td>Lyft</td>
<td>Gett</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Mashable.com, „Uber’s global rivals are teaming up, and here's who they are“, Retrieved 04.05.2018
https://mashable.com/2017/08/16/uber-global-rivals-didi/#hS5qSx9zsgqf
Growth of ride sourcing: Evidence from USA

- In New York City, ride sourcing takes over a significant share of taxi rides within short time
- Further evidence on impacts:
  - VMT increase: 3.5% citywide, 7% in Manhattan
  - Around 30% of cities’ inhabitants uses ride-sourcing
  - Takes share from all other modes, especially Bus (-6%) and Metro (-3%)
  - About 50% of all trips would not have been carried out, or carried out by NMT (Bike, Walk)

(Schaller 2017, 2018; Clelowl and Mishra 2017)

Figure: TNC and Taxi ridership in USA 1990 - 2018
Source: Schaller 2018
Part II. Case studies on the regulation

Shared mobility and ride sourcing
- Definition and Conceptualisation
- Current state

Case studies on regulation
- How do different global ride sourcing markets develop?
- Regulative approaches

Outlook
- Market outlook
- Regulatory frameworks
Get interactive: On-the-fly Pool

→ https://www.sli.do → #Z836

One word about uber...
One word about Uber

- easy
- fast
- modern
- costo
- comfortable
- available
- personal
- fun
- cheap
- illegal
- comodidad
- dor to service
- flexible
- Salvador
- secure
- better than taxi
Base of this research: Pre-analysis of 16 cities, 3 extensive case studies

Goal: Identify paradigmatic, leading ride sourcing markets in cities and assess their regulation strategies

<table>
<thead>
<tr>
<th>Europe</th>
<th>America</th>
<th>China</th>
<th>Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paris</td>
<td>Atlanta</td>
<td>Chongqing</td>
<td>Cape Town</td>
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<tr>
<td>Wien</td>
<td>Los Angeles</td>
<td>Hangzhou</td>
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<tr>
<td>London</td>
<td>San Francisco</td>
<td>Shanghai</td>
<td></td>
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<tr>
<td>Amsterdam</td>
<td>New York</td>
<td></td>
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<tr>
<td>Moscau</td>
<td>Vancouver</td>
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<tr>
<td></td>
<td>Bogotá</td>
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<tr>
<td></td>
<td>Mexiko-City</td>
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<td></td>
<td>São Paulo</td>
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## Subsequent qualitative Analysis

<table>
<thead>
<tr>
<th>Target group</th>
<th>Topics</th>
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<tbody>
<tr>
<td>Administration</td>
<td>- View on ride sourcing and other EMT</td>
</tr>
<tr>
<td></td>
<td>- Regulatory approach</td>
</tr>
<tr>
<td></td>
<td>- Intermodal integration</td>
</tr>
<tr>
<td>Service Providers (TNC)</td>
<td>- Service and supply</td>
</tr>
<tr>
<td></td>
<td>- Strategies and cooperations with PT</td>
</tr>
<tr>
<td>Academia, NGO</td>
<td>- Effects on the mobility</td>
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<tr>
<td></td>
<td>- Users and usage</td>
</tr>
<tr>
<td></td>
<td>- Outlook</td>
</tr>
</tbody>
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Results based on 15 expert interviews (+ additional background talks)
Key research finding: TNC are not profitable

“Uber is basically a bet of the tech-VCs on robo-taxis and that, whoever dominates this market when the technology is ready, will become market leader” – Researcher, USA

- Uber, Lyft have faced **high losses** ever since
- **Expansion** is the main goal
- TNCs try to **diversify** their **strategies** and products and develop new business models
  - Diversification of **vehicle types**: uberGreen, uberVan, uberAccess, …
  - **New services**: Food-delivery (uberEats), Parcel Delivery (uberDelivery) and more
  - **Selling data**
  - **Cooperation’s with car** manufactures for leasing contracts (monthly rate is absorbed with drivers’ ride revenues)
- Lyft announced its IPO early 2019
- Uber plans to follow later this year
Revenue and expenses from Uber and Lyft

- Uber Revenue
- Uber Expense
- Total Lyft revenue
- Total Lyft expense
Financial Results from Uber, year 2017 (unofficial)


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</thead>
<tbody>
<tr>
<td>Total passenger payments</td>
<td>685</td>
<td>2957</td>
<td>8900</td>
<td>20000</td>
<td>36900</td>
<td></td>
</tr>
<tr>
<td>Driver gross revenue</td>
<td>2462</td>
<td>6890</td>
<td>13550</td>
<td>29560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% pax fares retained by drivers</td>
<td>83%</td>
<td>77%</td>
<td>68%</td>
<td>80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uber Revenue</td>
<td>16</td>
<td>104</td>
<td>495</td>
<td>2010</td>
<td>6450</td>
<td>7340</td>
</tr>
<tr>
<td>Uber Expense</td>
<td>35</td>
<td>161</td>
<td>1060</td>
<td>3330</td>
<td>9650</td>
<td>11428</td>
</tr>
<tr>
<td>EBITDTAR margin</td>
<td>55%</td>
<td>114%</td>
<td>66%</td>
<td>50%</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td>EBITDAR contribution</td>
<td>-19</td>
<td>-57</td>
<td>-565</td>
<td>-1320</td>
<td>-3200</td>
<td>-4088</td>
</tr>
</tbody>
</table>

## Financial results from Lyft, based on IPO 2019 documents

<table>
<thead>
<tr>
<th>US$thousands</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Lyft revenue</td>
<td>343.298</td>
<td>1.059.881</td>
<td>2.156.616</td>
</tr>
<tr>
<td>Total Lyft expense</td>
<td>1.035.901</td>
<td>1.768.153</td>
<td>3.134.327</td>
</tr>
<tr>
<td>% expenses covered by revenue</td>
<td>33%</td>
<td>60%</td>
<td>69%</td>
</tr>
<tr>
<td>Lyft net income</td>
<td>- 682.794</td>
<td>-688.301</td>
<td>-911.335</td>
</tr>
<tr>
<td>Lyft net margin</td>
<td>-199%</td>
<td>-65%</td>
<td>-42%</td>
</tr>
</tbody>
</table>

San Francisco Bay Area: Starting point for the ride sourcing industry

- High density city
- Innovative environment regarding companies, users, policy makers
- Patchy public transport network
- 2018 more than 40,000 ride sourcing vehicles registered

Source: Own research

Photo: Google Earth
Mexiko City: First regulation in Latin America

- Latin America’s largest agglomeration
- (Relatively) advanced public transport network with 12 metro lines and BRT
- Ride sourcing considered to have high impact on the mobility in the city
- About 50,000 drivers registered for Uber (by Jan. 2018)

Source: Own research

Photo: Google Earth
San Francisco: Benchmark for the regulation of Transportation Network Companies (TNC)

„The city where you couldn’t get a cab.“ (Flores/TUT-Pol, 2016)

- Regulation starts 2013, shortly after Uber and Lyft started their services
- TNC are an official mode of transportation
- TNC: a company that uses an online-enabled platform to connect passengers with drivers using their personal, non-commercial Vehicle (California Public Utilities Commission 2013)
- Lyft starts aggressive market entrance, Uber responds and refines this system to expand globally

- Market entrance without permission
- Fast growth
- Generation of customer base
- Get users involved reg. regulation
- In any case: keep the service up!
- Lobbying politicians to get a loose regulation

Source: Flores/TUT-Pol 2016, own field research 2018
Mexico-City: Paradigmatic for Latin American cities

„The regulation was made to satisfy all, especially the existing lobby groups of taxistas and minibus-drivers, but also the upper middle class riders that got used to uber in short time.“ – Employee of a NGO

- Regulation of TNC since 2015, the first regulation in Latin America
- Uber follows a similar strategy to San Francisco
- Regulation:
  - TNC have been regulated to become quite expensive
  - They are an option for the upper middle-class
  - Market is a Duopol (uber & Cabify) – something very common in other cities

Source: Own research
Paris: VTC Regulation

„In Paris, Uber and co. are just one option amongst many. They mainly take ridership from Taxi, but also from public transport.“ Public servant from Paris

- TNCs are legal
- TNC are relatively similar to a taxi service in terms of service, slightly lower cost allow for a cheaper service
- Drivers and vehicles need to register as VTC („Vehicle Transport avec Chauffeur“)
- Quite strict requirements regarding drivers and vehicles
- Registration cost: 1000€ (vs. Taxi license that are ~200.000€)
- In future, taxi and VTC requirements will be harmonized
- TNC drivers in Paris are only professional drivers (certified, full-time workers)

Source: Own field research
### Regulation of TNC in case cities

<table>
<thead>
<tr>
<th></th>
<th>California</th>
<th>Paris</th>
<th>Mexiko</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulator</strong></td>
<td>State</td>
<td>National</td>
<td>City authority</td>
</tr>
<tr>
<td><strong>Status of drivers</strong></td>
<td>Private</td>
<td>Professional</td>
<td>Registered, private</td>
</tr>
<tr>
<td><strong>Vehicle registration</strong></td>
<td>Not public, but with TNC</td>
<td>Yes, as with authority</td>
<td>Yes, with authority</td>
</tr>
<tr>
<td><strong>Vehicles standards</strong></td>
<td>By TNC</td>
<td>Min. standard by regulation (size)</td>
<td>Min. price by regulation (~10,000 US$)</td>
</tr>
<tr>
<td><strong>Regulated tariff</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Data sharing</strong></td>
<td>Yes (but not being done)</td>
<td>No (in planning)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Mobility fund</strong></td>
<td>Yes, 1,5% of Revenue</td>
<td>No</td>
<td>Yes, 1,5% of Turnover</td>
</tr>
<tr>
<td><strong>Vehicle cap</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: Own field research
Intermediate Summary

• Ride sourcing has become a global market in short time
• Our case study research provides insights into different markets and regulatory frameworks and shows that TNCs can adopt quickly into different environments
• Ride sourcing is not profitable nowadays
• TNCs are involved in a deficitary expansion process with the goal to become market leader

• This brings up immediate questions
  a. How can this aggressive market expansion be explained with respect to the outlook for this business?
  b. How to deal with TNC from a perspective of the regulator?

• Aspect a) will be assessed now in the light of automation, assuming that TNC operate autonomous vehicle fleets on their own.
Part III. Outlook and attempt for explanation

Shared mobility and ride sourcing
- Definition and Conceptualisation
- Current state

Case studies
- Market insights from case cities
- Paradigmatic cases

Outlook
- Market outlook with automation
Prospects of TNC with automation

“„There is no pathway to profitability without automation.“ – Wissenschaftler USA

• If TNC are not profitable yet, automation may be the key
• How can we be explain this?

• Subsequently, an analytical model is presented to show the cost structures for a TNC that has an own fleet of autonomous carsharing vehicles (ACS)
Modelling the revenue structures of a TNC with automation

\[ RR = \frac{K(F, N)}{q_{\text{max}}} \]

\[ A = \frac{1}{2} \frac{N}{RR} = \frac{1}{2} \frac{N \cdot q_{\text{max}}}{K(F, N)} \]

\[ C = c \cdot K(F, N) + RR \cdot P_{\text{veh}} + M(A) \cdot K(F, N) \]

RR: replacement rate of vehicles on a yearly base
A: Average age of the fleet
C: Cost structure of TNC
F: fare per kilometer
N: no. of vehicles
K(F,N) yearly demand for km, function of F and N
q_{\text{max}}: max vehicle km
M(A): maintenance cost per km
c: operational cost of vehicle per km
P_{\text{veh}}: purchase price of new vehicle minus residual price of used vehicle arriving a q_{\text{max}}
Determining Average and Marginal Cost

\[ C = c \cdot K(F, N) + \frac{K(F, N)}{q_{\text{max}}} \cdot P_{\text{veh}} + M(A) \cdot K(F, N) \]

with \( \frac{\partial M(A)}{\partial A} > 0 \)

1. Average (AC) and marginal cost (MC) do not depend on the amount of driven kilometers: \( c \) is independent from \( K(F,N) \)

2. MC will always be smaller than AC
Summarizing the model findings

1. AC/MC not depended on driven kilometers:
   • Different then current situation, where operational costs depend on the availability of drivers, and therefore they increase as the demand for kilometers increases (increasing wages is required to keep drivers working or, eventually, to recruit more drivers).

2. Marginal cost are always below average Cost: Natural monopoly
   • The leading company will experience lower costs than the competition
   • Delivers an explanation why it is fundamental for ride sourcing companies to secure a leading position in the market before the advent of autonomous vehicles and the consequent change in the costs structures as well as the collision with car sharing companies.

3. Further findings (Algebra can be seen in Goletz&Bahamonde-Birke (2019))
   • TNC-ACS operators will maximize their profit, not the welfare – N of vehicles may be to high, or too low
   • With decreasing marginal cost, operators will have heavy incentives for frequent users
   • Equal access to the service will not hold: Power users will get better conditions then others
Summary

Shared mobility and ride sourcing
- Ride sourcing has established worldwide in short time
- It takes share from all modes

Case studies
- TNC adopt quickly to various conditions
- They do not make any profit!
- TNC seek to expand quickly, bearing little capital cost

Outlook
- With automation, TNCs can become profitable and monopolists
- Hence, regulation is a must
- Further questions arise: What will other transport actors do? What are possible cooperation partners?
Literature


- Goletz & Bahamonde-Birke (2019): The ride-sourcing Industry: Status Quo and Outlook, to be presented at WCTRS Conference 2019


Thank you!