



Adoption of Ride-hailing in California and Impacts on the Use of Other Travel Modes

STEPS Symposium, December 7, 2017

Dr. Giovanni Circella

Director, 3 Revolutions Future Mobility Program

Institute of Transportation Studies, University of California, Davis

3 Revolutions Future Mobility Program

Research activities of the 3 Revolutions Future Mobility Program include:

- ***Data collection and analysis** of behavioral and attitudinal data on shared mobility, adoption of electric vehicles and of connected/automated vehicles;*
- ***Forecasting and simulation models** of the impacts on activity participation, travel patterns, vehicle ownership, and vehicle miles traveled;*
- ***Behavioral experiments** to understand the impacts of the adoption of new transportation technologies;*
- ***Policy analysis** and simulation of future transportation scenarios; and*
- ***Analysis of environmental, economic and equity impacts** of emerging transportation trends and evolving lifestyles.*

Panel Study of Emerging Transportation Trends

- Statewide study of emerging transportation trends in California
- Design of a detailed survey to collect information on several groups of variables
- First survey administered with an online opinion panel among Millennials (18-34) and Generation X (35-50) in fall 2015
- Quota sampling by geographic region and neighborhood type
- Part of a longitudinal study (with rotating panel)



UC DAVIS

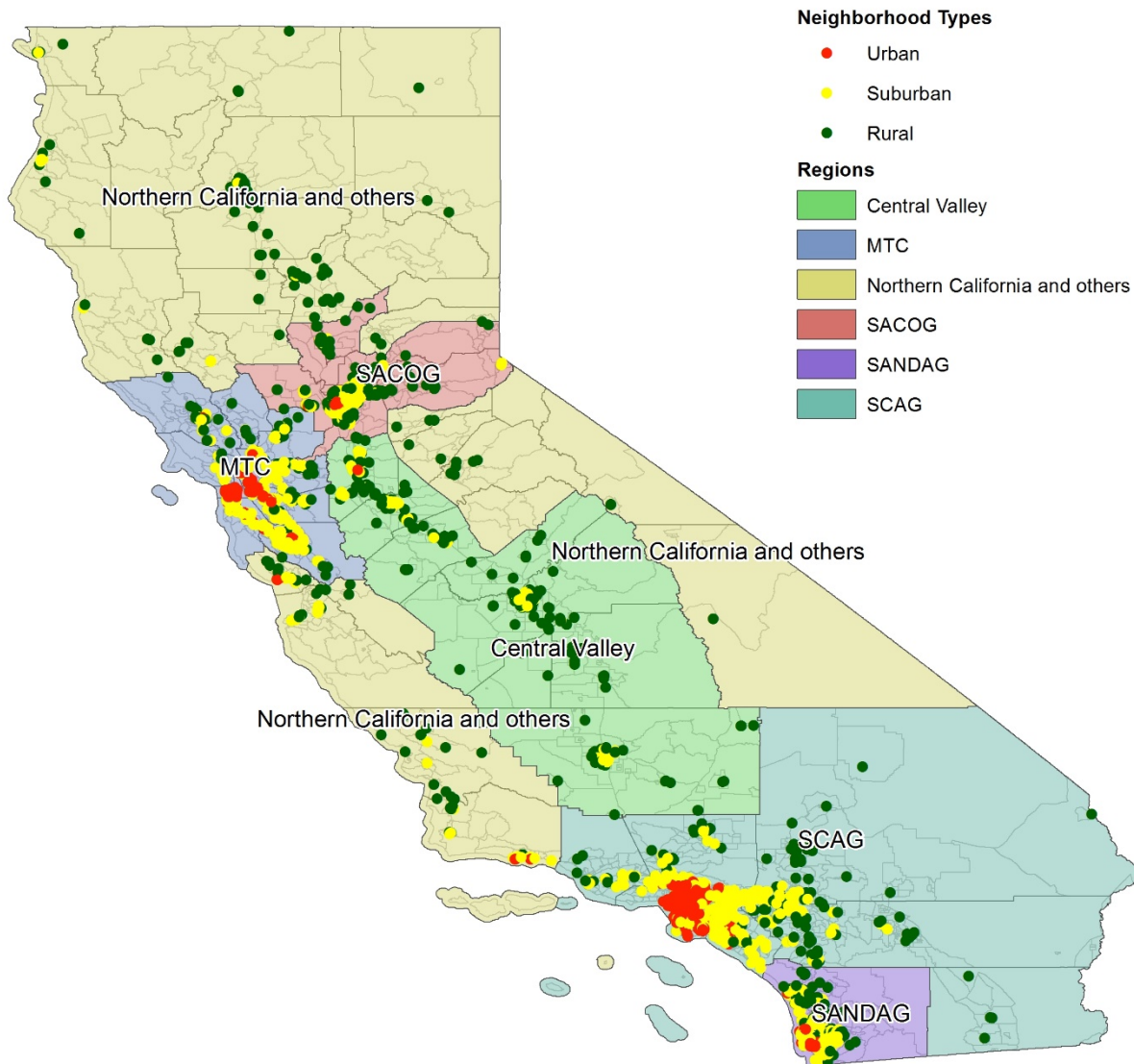
SUSTAINABLE TRANSPORTATION ENERGY PATHWAYS
An Institute of Transportation Studies Program

Panel Study of Emerging Transportation Trends

- Statewide study of emerging transportation trends in California
- Design of a detailed survey to collect information on several groups of variables
- First survey administered with an online opinion panel among Millennials (18-34) and Generation X (35-50) in fall 2015
- Quota sampling by geographic region and neighborhood type
- Part of a longitudinal study (with rotating panel)

- Susan Handy
- Pat Mokhtarian
- Lew Fulton
- Farzad Alemi
- Rosaria Berliner
- Kate Tiedeman
- Yongsung Lee
- Ali Etezady
- Grant Matson

The Dataset



All cases were geocoded based on residential location.

We integrated data from other sources, e.g. US Census, US EPA Smart Location Data, AllTransit, Walkscore.com, etc.

We classified the NH type as *urban*, *suburban* or *rural*, based on land use features at the census tract.

MILLENNIALS
DRIVE LESS BUT
DIFFERENCES IN
VMT LARGELY
EXPLAINED BY
STAGE IN LIFE

VMT

-15%

HIGHER
ADOPTION OF
RIDEHALING
AMONG WELL-
EDUCATED
URBAN
MILLENNIALS



MOST PEOPLE
COMMUTE BY CAR
IN CALIFORNIA.
STILL, MILLENNIALS
SLIGHTLY MORE
LIKELY TO ADOPT
OTHER MODES



MILLENNIALS WITH
CHILDREN USE
PUBLIC TRANSIT
MORE THAN
OLDER ADULTS
WITH CHILDREN.
SMARTPHONE USE
CORRELATED WITH
TRANSIT USE



INDEPENDENT
MILLENNIALS
CHOOSE MORE
CENTRAL,
ACCESSIBLE
LOCATIONS AND
ARE MORE
MULTIMODAL

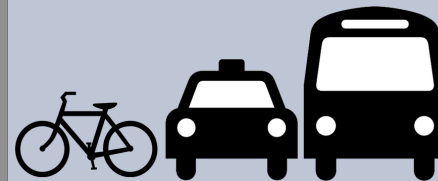


LATENT-CLASS
ANALYSIS
IDENTIFIES FIVE
WELL-DEFINED
GROUPS OF
TRAVELERS

HABITUAL DRIVERS:

84.7%

MANY UBER TRIPS
MADE BY
MILLENNIALS
REDUCE THE
AMOUNT OF
WALKING AND
CYCLING



HIGHER LEVEL OF
SATISFACTION
WITH TRAVEL
AMONG NON-
URBAN
MILLENNIALS,
THOSE THAT RIDE A
BIKE AND HAVE
ACCESS TO A CAR



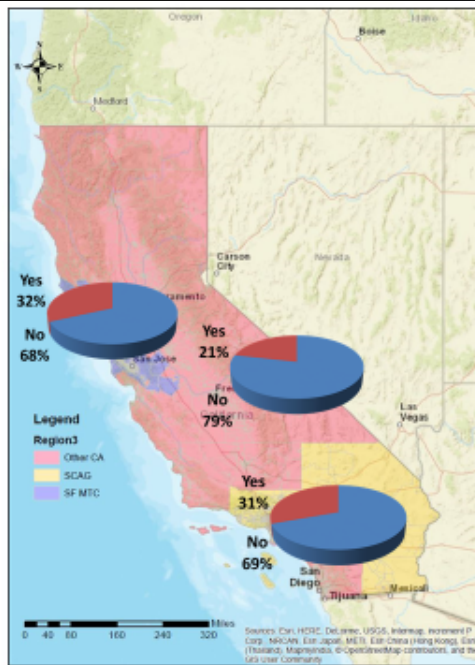
Research Question

How does the adoption of *shared mobility* affect other components of *travel behavior* and *vehicle ownership*?

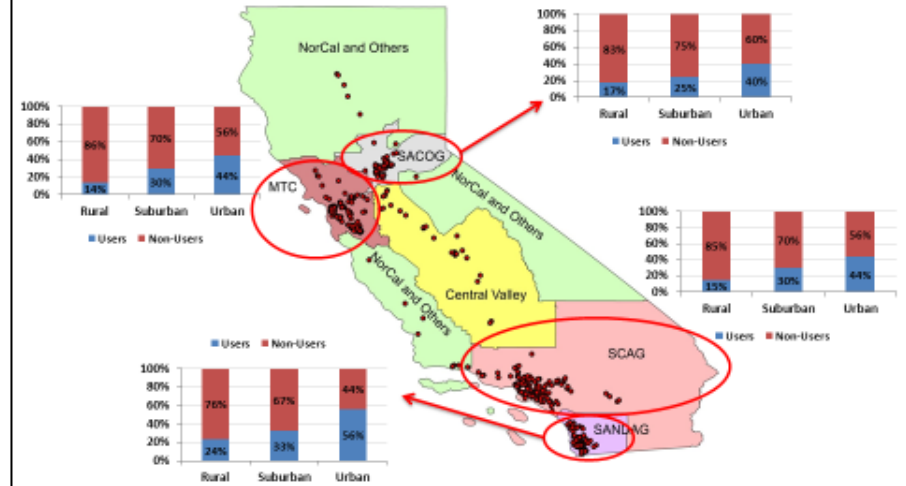


Interest in modeling the adoption of shared mobility and the use of other travel modes, controlling for personal attitudes, adoption of technology, household, individual and built environment characteristics.

Use of Uber/Lyft



Adoption of Ridehailing



Results: Adoption of Lyft/Uber

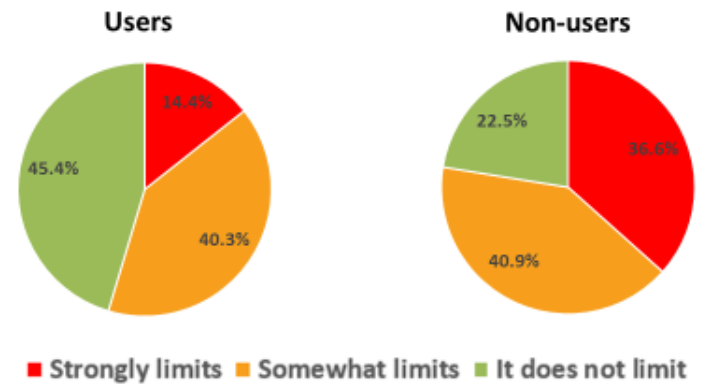
- **Age** and **income/education** have the largest effects among sociodemographics.
- **Car accessibility** and **land-use mix** positively affect the use of ridehailing.
- Familiarity with **ICT** and use of **other emerging transportation** services are associated with higher adoption.
- Individuals with stronger **variety-seeking**, **technology-embracing**, and **pro-environment** attitudes are more likely to use Uber/Lyft.



What Limits the Adoption of Shared Mobility?



Concerns about drivers



Attributes of Latent Classes



- Class Size: 37%
- Highest Adoption Rate (47%)
- Independent Millennials
- Not Married
- No Kids
- Work and Study
- City Dwellers



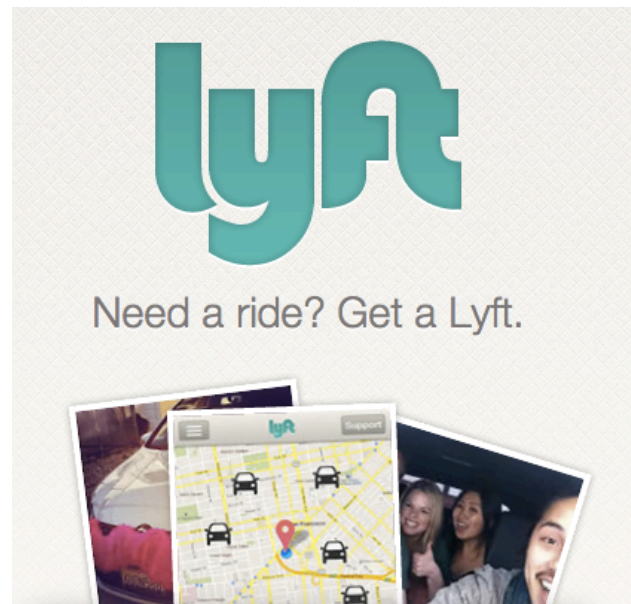
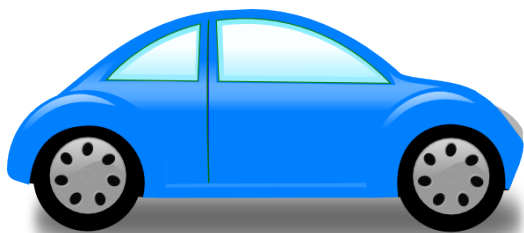
- Class Size: 33%
- Adoption rate: 27%
- Most Affluent
- Dependent Millennials and Older Gen Xers
- Work or Study
- Live with Kid(s)



- Class Size: 30%
- Lowest Adoption Rate (5%)
- Lowest Education
- Least Affluent
- Younger Gen Xers
- Not Work nor Study
- Rural Dwellers

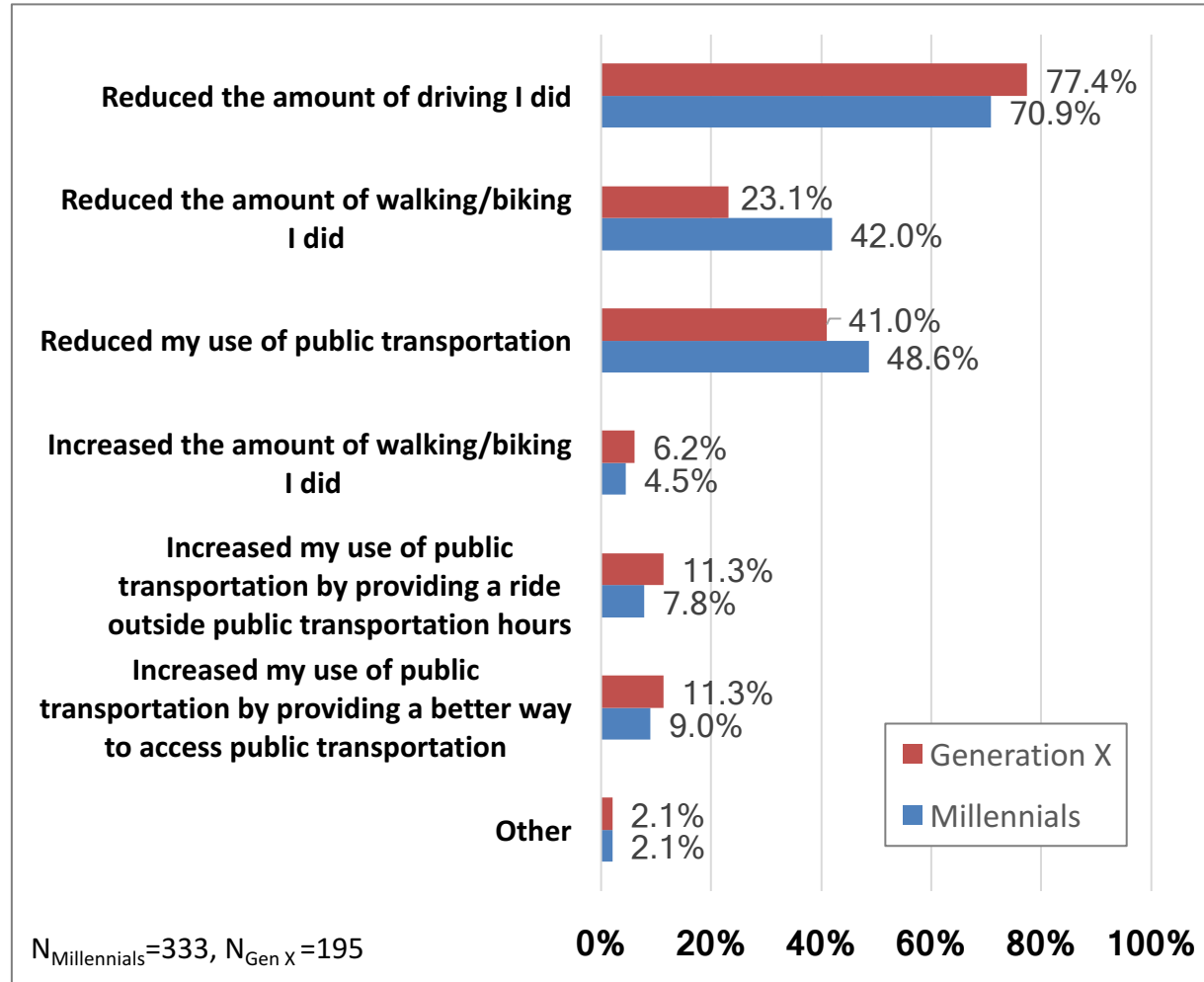
Research Question

What Replaces What?



Impacts on the Use of Other Travel Modes

Impact of last Lyft/Uber trip on the use of other means of transportation (by age group)



Impacts on the Use of Other Travel Modes (2)

Latent Class Analysis

Identification of different classes of behavioral changes

- Urban dwellers
- Walkable neighborhoods with good transit access
- Cost and time sensitive
- Least affluent
- Younger/independent Millennials
- Frequent commuters
- Multimodal travelers
- Most frequent users of Uber/Lyft

Class 1 (size=53%)



- Suburban Dwellers
- Car-oriented neighborhoods with poor transit access
- High number of vehicles per household drivers
- Frequent commuters
- Monomodal with high VMT
- Pro-suburban
- Materialistic/must own car
- Frequent air travelers
- Medium Uber/Lyft frequency

Class 2 (size=37%)



- Suburban Dwellers
- Low transit and walk accessibility
- Not cost and time sensitive
- Older Gen Xers
- Want to come back to urban area
- Non-frequent commuters
- Multimodal when possible
- Like biking
- Pro-environment
- Low frequency users

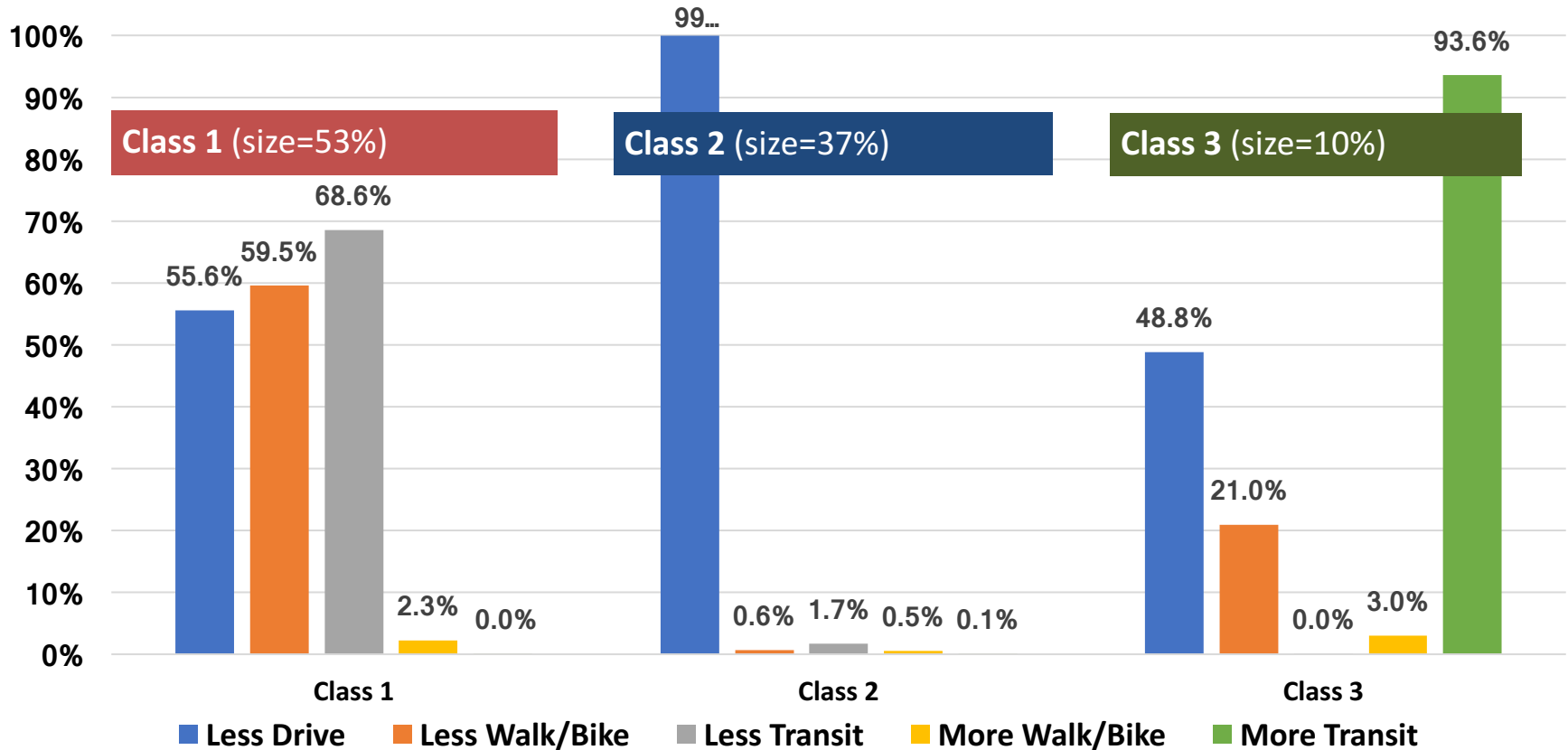
Class 3 (size=10%)



Impacts on the Use of Other Travel Modes (2)

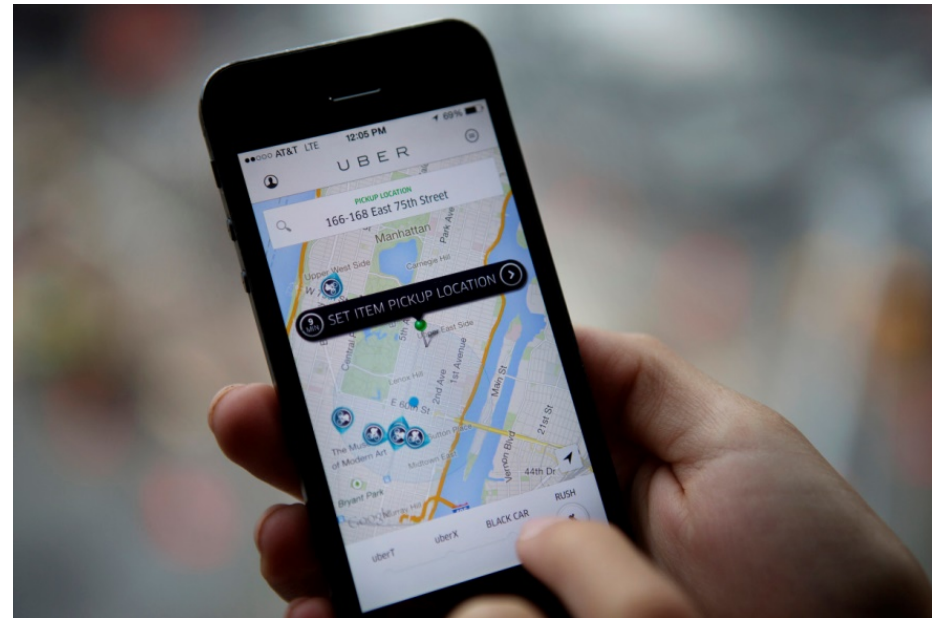
Latent Class Analysis

Identification of different classes of behavioral changes



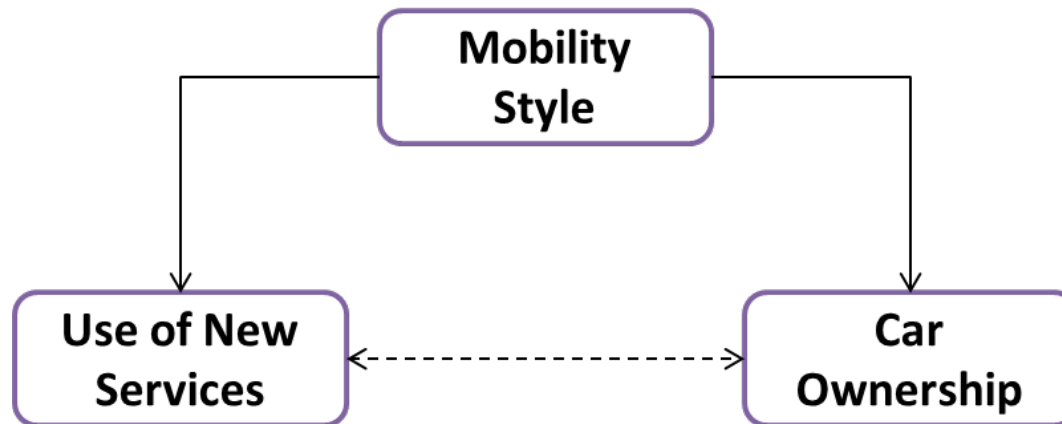
Research Question

Car Ownership vs. Shared Mobility?



Longitudinal Analysis of Vehicle Ownership Trends

How does the adoption of *shared mobility* affect other components of *travel behavior* and *vehicle ownership*?



Data from longitudinal component of panel study (2015-2018) will help disentangle the relationship with *vehicle ownership*...

Policy Implications and Research Needs

- Cost and personal-vehicle preference are limiting factors to the use of ridehailing → **Pooling is the answer!**
 - Pooling is the primary strategy to reduce prices and negative externalities.
 - It is a case where the public interest aligns with business interests.
 - Policymakers need better understanding of who might use pooling services and what incentives and policies could encourage them to do so.
 - More research is needed to determine price elasticity among different travelers.
- Single-passenger ridehailing tends to (a) substitute for driving, (b) replace the use of transit or active modes (especially among some groups), and (c) increases the attractiveness of living without a car:
 - Opportunities for demand-responsive services and microtransit.
 - Shared mobility can be integrated with public transit to provide better overall service, with lower economic and environmental costs.
 - More research is required to better understand the true nature and the causality links between the use of Uber/Lyft and the use of other modes.

Scientific Papers and Presentations

- Circella, G. F. Alemi, R. Berliner, K. Tiedeman, Y. Lee, L. Fulton, S. Handy and P. Mokhtarian “Multimodal Behavior of Millennials: Exploring Differences in Travel Choices Between Young Adults and Gen-Xers in California”, Presented at the Transportation Research Board 96th Annual Meeting, Washington DC, January 2017, *TRB Paper #17-06827*.
- Tiedeman, K., G. Circella, F. Alemi and R. Berliner “What Drives Millennials: Comparison of Vehicle Miles Traveled Between Millennials and Generation X in California”, Presented at the Transportation Research Board 96th Annual Meeting, Washington DC, January 2017, *TRB Paper #17-06044*.
- Berliner, R. and G. Circella “Californian Millennials Drive Smaller Cars: Estimating Vehicle Type Choice of Millennials”, Presented at the Transportation Research Board 96th Annual Meeting, Washington DC, January 2017, *TRB Paper #17-06744*.
- Alemi, F., G. Circella, S. Handy and P. Mokhtarian. Under review. “What Influences Travelers to Use Uber? Exploring the Factors Affecting the Adoption of On-Demand Ride Services”, Presented at the Transportation Research Board 96th Annual Meeting, Washington DC, January 2017, Paper No. 17-05630; Submitted to *Travel Behavior and Society* (2017).
- Alemi, F., G. Circella and S. Handy. Under review. “Exploring the Latent Constructs behind the Use of On-Demand Ride Services in California”. Submitted for publication in the *Journal of Choice Modelling*.
- Alemi, F., G. Circella, and D. Sperling. Forthcoming. “On-demand Ride Services in California: Investigating the Factors Affecting the Frequency of Use of Uber/Lyft”, To be presented at the Transportation Research Board 97th Annual Meeting, Washington DC, January 2018.
- Circella, G., F. Alemi and P. Mokhtarian. “Exploring the Impact of Shared Mobility on California Millennials and Older Adults’ Travel Patterns”, Presented at the 2017 International Choice Modeling Conference, Cape Town (South Africa), April 2017.

Papers presented at international conferences:

- Transportation Research Board 2017: 4 papers
- International Choice Modeling Conference 2017: 2 papers
- Association of Collegiate Schools of Planning 2017: 2 papers
- Transportation Research Board 2018: 6 papers

What Influences Travelers to Use
On-Demand Ride Services in California?

Farzad Alemi, Ph.D. Candidate
Institute of Transportation Studies
University of California, Davis
1715 Tilia Street
Davis, California 95616
Phone: 916-751-0050
faledi@ucdavis.edu

Giovanni Circella, Ph.D.
Institute of Transportation Studies
University of California, Davis,
School of Civil and Environmental
Engineering
Georgia Institute of Technology
1715 Tilia Street
Davis, California 95616
Phone: 530-554-0838
gcircella@ucdavis.edu

Susan Handy, Ph.D.
Department of Environmental Science
Institute of Transportation Studies
University of California, Davis
One Shields Avenue
Davis, California 95616
Phone: 530-752-5878
[shandy@ucdavis.edu](mailto:s handy@ucdavis.edu)

and

Patricia Mokhtarian, Ph.D.
School of Civil and Environmental
Engineering
Georgia Institute of Technology
790 Atlantic Drive
Atlanta, GA 30332
Phone: 404-385-1443
patmokh@gatech.edu

1 Exploring the Latent Construct
2
3 **Farzad Alemi, Ph.D. Candidate**
4 Institute of Transportation Studies
5 University of California, Davis
6 1715 Tilia Street
7 Davis, California 95616
8 Phone: 916-751-0050
9 faledi@ucdavis.edu
10
11 **Giovanni Circella, Ph.D.**
12 Institute of Transportation Studies
13 University of California, Davis,
14 School of Civil and Environmental
15 Georgia Institute of Technology
16 1715 Tilia Street
17 Davis, California 95616
18 Phone: 530-554-0838
19 gcircella@ucdavis.edu
20
21 and
22
23 **Susan Handy, Ph.D.**
24 Department of Environmental Science
25 Institute of Transportation Studies
26 University of California, Davis
27 One Shields Avenue
28 Davis, California 95616
29 Phone: 530-752-5878
30 shandy@ucdavis.edu
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46 Submitted to *Journal of Choice Models*

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

On-demand Ride Services in California:
Investigating the Factors Influencing
Adoption of On-Demand Ride Services in California

Farzad Alemi, Ph.D. Candidate (Corresponding author)
Institute of Transportation Studies
University of California, Davis
1715 Tilia Street
Davis, California 95616
Phone: 916-751-0050
faledi@ucdavis.edu

Giovanni Circella, Ph.D.
Institute of Transportation Studies
University of California, Davis,
School of Civil and Environmental Engineering
Georgia Institute of Technology
1715 Tilia Street
Davis, California 95616
Phone: 530-554-0838
gcircella@ucdavis.edu

and

Daniel Sperling, Ph.D.
Institute of Transportation Studies
University of California, Davis
1715 Tilia Street
Davis, California 95616
Phone: 530-752-7434
dsperling@ucdavis.edu

Submitted for presentation to the 97th Annual Meeting of the Transportation Research Board

Word count: 7550 (5550 words + 2000 figures and tables)

1 Adoption of Uber and Lyft, Factors Limiting and/or Encouraging Their Use and Impacts
2 on Other Travel Modes among Millennials and Gen Xers in California

3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

Farzad Alemi, Ph.D. Candidate (Corresponding author)
Institute of Transportation Studies
University of California, Davis
1715 Tilia Street
Davis, California 95616
Phone: 916-751-0050
faledi@ucdavis.edu

Giovanni Circella, Ph.D.
Institute of Transportation Studies
University of California, Davis,
School of Civil and Environmental Engineering
Georgia Institute of Technology
1715 Tilia Street
Davis, California 95616
Phone: 530-554-0838
gcircella@ucdavis.edu

and

Daniel Sperling, Ph.D.
Institute of Transportation Studies
University of California, Davis
1715 Tilia Street
Davis, California 95616
Phone: 530-752-7434
dsperling@ucdavis.edu

Submitted for presentation to the 97th Annual Meeting of the Transportation Research Board

Revision date: November 15, 2017

Word count: 5750 words + 6 Figures + 1 tables = 7500 words

THE ADOPTION OF SHARED MOBILITY IN CALIFORNIA AND ITS RELATIONSHIP WITH OTHER COMPONENTS OF TRAVEL BEHAVIOR

November
2017

A Research Report from the National Center
for Sustainable Transportation – **FINAL DRAFT**

Giovanni Circella, University of California, Davis

Farzad Alemi, University of California, Davis

Kate Tiedeman, University of California, Davis

Susan Handy, University of California, Davis

Patricia Mokhtarian, Georgia Institute of Technology

Lew Fulton, University of California, Davis



National Center
for Sustainable
Transportation

ITS UC DAVIS
INSTITUTE OF TRANSPORTATION STUDIES

Soon available at:

ncst.ucdavis.edu

Thank you for your attention!



For more information, please contact:

Dr. Giovanni CIRCELLA

Director, 3 Revolutions Future Mobility Program
Institute of Transportation Studies, University of California, Davis
gcircella@ucdavis.edu