

Assessing Car Dependence: Development of a Comprehensive Survey Approach Based on the Concept of a Travel Skeleton

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Background

Motivation of the study

- Exploring the potential for any form of vehicle or service-related mobility products in urban contexts
- Understanding of the role of cars within society on an individual level (e.g., how dependent are people from their own car)
- Previous research has mainly focused on either objective or subjective dependence (see Lucas and Jones, 2009; Mattioli et al., 2016)



Investigating subjective and objective dimensions of car dependence on a individual level

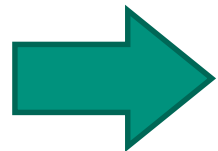
Research objectives

- How dependent are people from their own car in urban contexts?
- Which types of car dependence are prevalent in different cities?

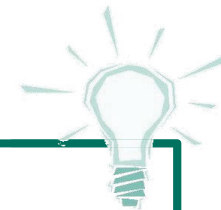
Background

Challenges in measuring car dependence

- To support **abstracted research topics such as car dependence** on an individual level an observation of travel behavior over a longer period is required
- Travel behavior is highly variable and cannot be measured intra-individually by considering only short periods of time
- Existing longitudinal surveys capture a longer period and allow for the identification of “typical” travel behavior, which determinate car ownership
- Trip diary surveys are expensive, increase the respondent burden of the participants, and need large sample size

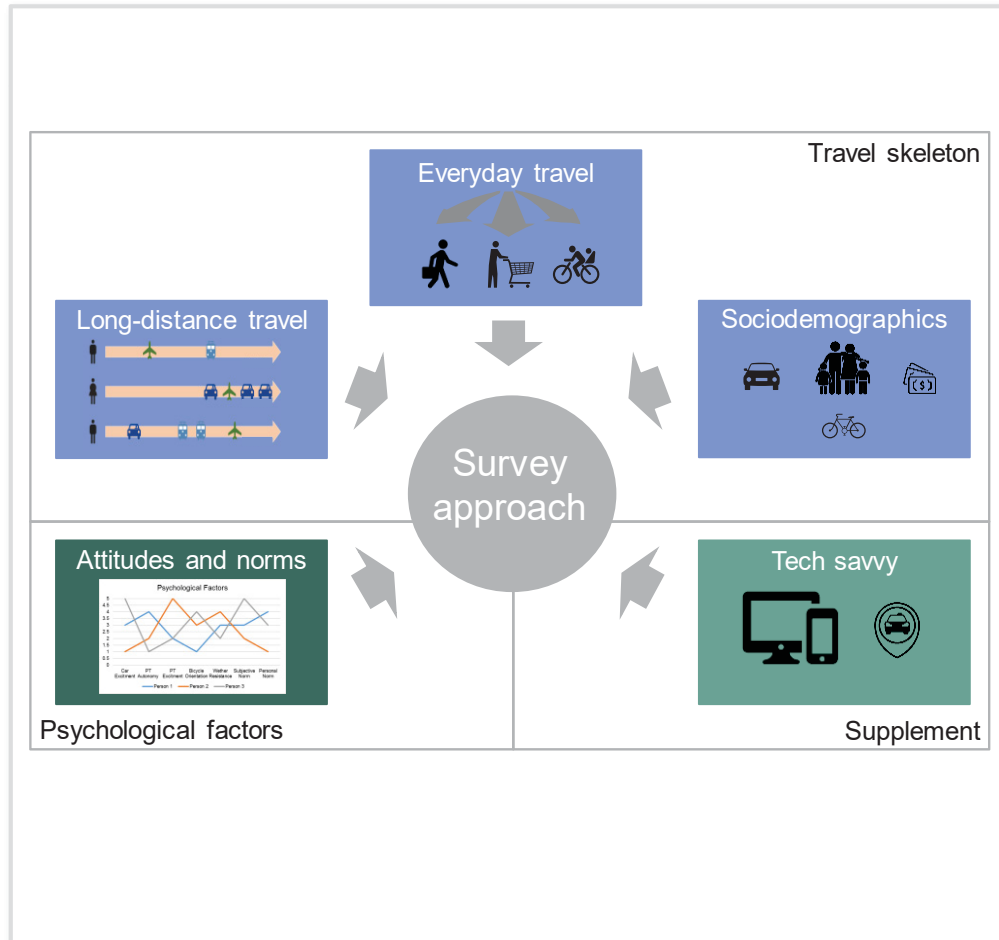


A cost-effective survey alternative, which focuses on typical elements of travel behavior and long-distance travels, is required



Survey approach

Concept of a travel skeleton



Travel skeleton

- Activities and mode choice in a 'typical' week (quasi-longitudinal)
- Using a 'typical' week to exclude random effects
- Five areas of life: work, leisure, chauffeuring, purchases and errands

Psychological factors

- Norms and attitudes towards modes (standardized item set with 27 items from Prof. Hunecke)

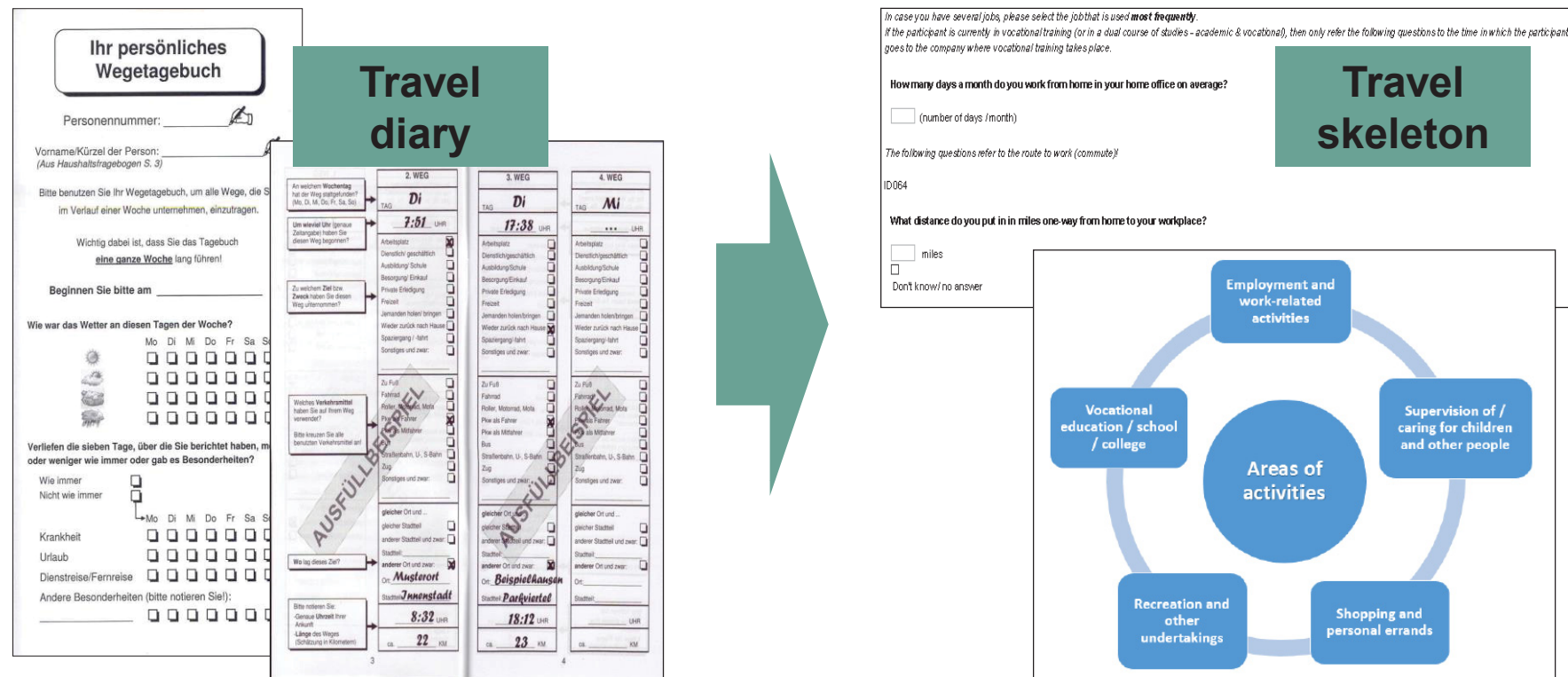
Tech savviness

- Smartphone usage, ODM usage

Survey approach

Capturing everyday travel

- Transformation of a travel diary into a travel skeleton (quasi-longitudinal)
- Respondents had to report their behavior in a typical week in order to capture their usual mobility pattern



Data collection

Study sample

- Standardized survey approach was conducted in Berlin (Germany), Shanghai (China) and San Francisco (U.S.)
- Representative survey in each city between October-2016 and January-2017
- Face-to-face interviews (CAPI) with a duration of approximately 40 minutes
- About 600 individuals from each city



Investigation of car dependence based on this survey



Calculating car dependence scores

Dimensions of car dependence

- Two dimensions are relevant for car owner:

1 “objective”



“Leading everyday life without a private car is difficult”



“Leading everyday life without a private car is easily possible”

2 “subjective”



“Driving a car means independency, security and privacy to me”



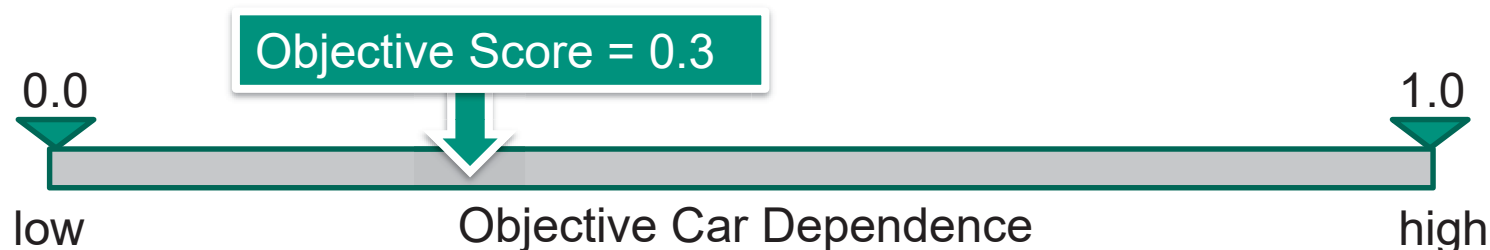
“Driving a car means no fun to me and I don't need a car at all”

Calculating car dependence scores

Objective dependence



- Scoring system based on the idea of a **value benefit analysis** and assessment of different criteria
 - realized travel behavior (e.g., daytrips)
 - determinants of mobility (e.g., chauffeuring of children)
 - mobility options (e.g., number of cars)
- Criteria are weighted based on their potential impact to objective car dependence



Calculating car dependence scores

Subjective dependence

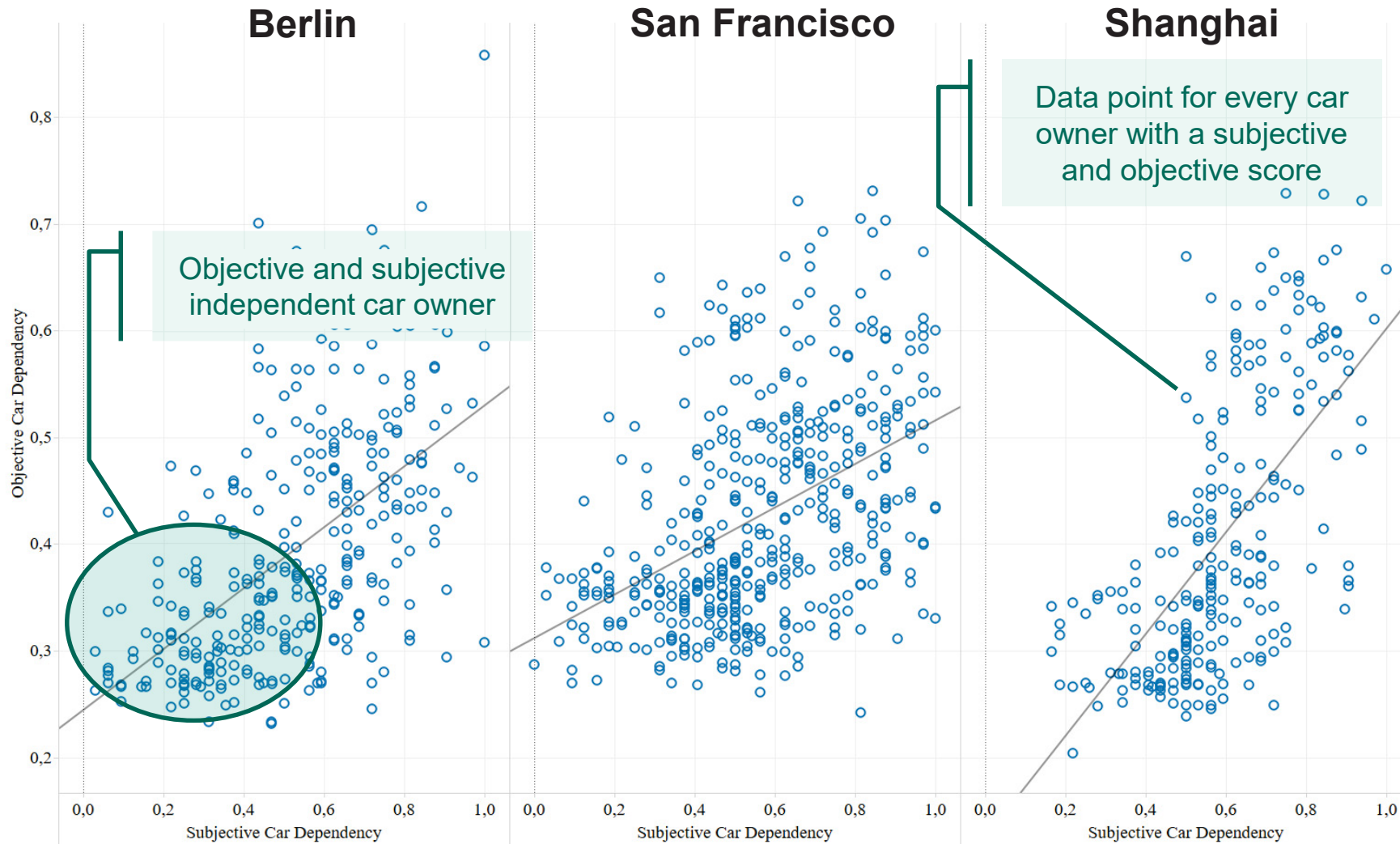


- Definition of the subjective score by preliminary assessments
 - Factor analysis with all 27 items → car-oriented factor
 - Ordered logit regression model to identify attitudes with a high influence on car usage
- Subjective score consists of attitudinal questions about *Car excitement* and *Public transit autonomy* (8 questions)
 - Car excitement: e.g., Driving a car means fun and passion to me
 - Public transit autonomy: e.g., I can structure my everyday life very well without a car



Results

Two-dimensional car dependence



Results

Types of car dependence

Car captives

Have to use their car for their everyday travel, but do not enjoy driving

Convinced car-users

Must use their car and enjoy driving as well (car dependent in both dimensions)

Car independent pragmatics

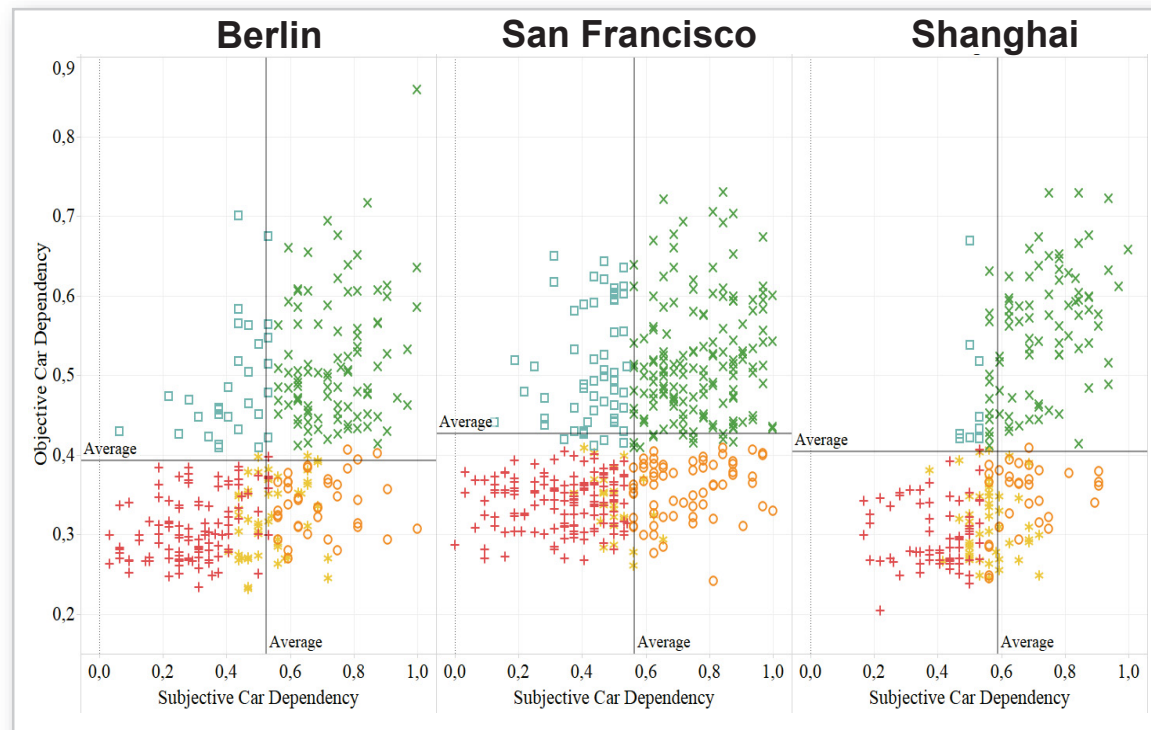
Handle their everyday life without their private car and do not enjoy driving (car independent in both dimensions)

Inhibited car enthusiasts

Enjoy driving a car but have no opportunity in their everyday travel to use it

Car affine pragmatics

Like to drive a car, but also use alternative modes of transportation



Results

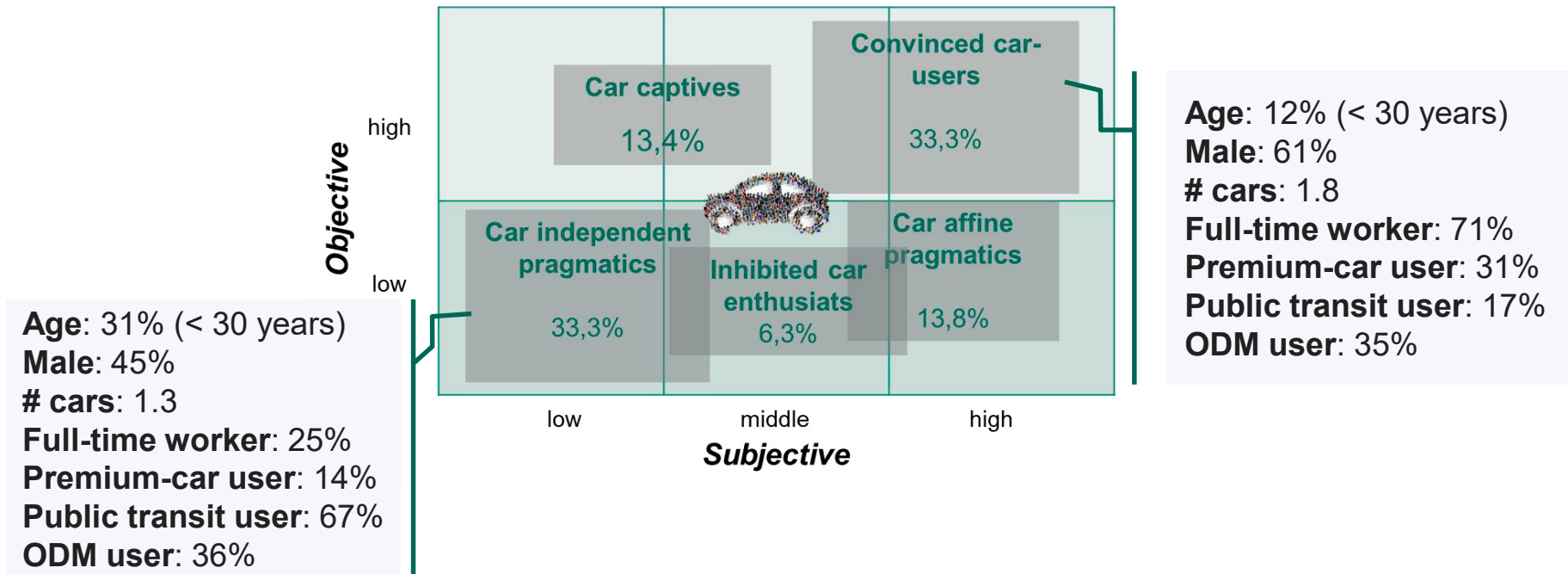
City comparison

	San Francisco	Berlin	Shanghai
<i>Car captives</i>	13,4%	9,1%	3,7%
<i>Convinced car-users</i>	33,3%	29,8%	34,2%
<i>Car independent pragmatics</i>	33,3%	33,7%	28,8%
<i>Inhibited car enthusiasts</i>	6,3%	15,5%	19,8%
<i>Car affine pragmatics</i>	13,8%	11,9%	13,6%

- Shanghai and Berlin show more similarity than in comparison with San Francisco
- Large group of **Car independent pragmatics** are observable in each city, which have a potential to give up their car
- Shanghai has also a large group of **Inhibited car enthusiasts**
- **Car captives** are mostly observable in San Francisco and they are rare in Shanghai

Results

Analyzing types in San Francisco



- **Car independent pragmatics** are younger and have less (premium) cars in their households; this group handle their life with public transit and on-demand mobility services
- **Convinced car users** are older and have more cars in their household

Conclusion & Further Research

Conclusion

- In all 3 cities persons with dissonances between subjective and objective dimensions are observable (e.g., **Car captives**)
- Even in urban areas with a good public transit are many **Convinced car users**



Investigation of car dependence showed the usefulness of the travel skeleton approach

Further research

- Implementing macro information about car dependence (e.g., public transit accessibility)
- Extension subjective car dependence by using questions about motives of car use (emotional, instrumental, symbolic)

Thank you for your attention!



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List of sources

Literature and pictures

Literature

- Mattioli, G., Anable, J., Vrotsou, K., 2016. Car dependent practices. Findings from a sequence pattern mining study of UK time use data. *Transportation Research Part A: Policy and Practice* 89, 56–72. 10.1016/j.tra.2016.04.010.
- Lucas, K., Jones, P., 2009. *The Car in British Society*, London.
- von Behren, S., Minster, C., Esch, J., Hunecke, M., Chlond, B. (2017). Assessing Car Dependence: Development of a Comprehensive Survey Approach Based on the Concept of a Travel Skeleton. In *International Steering Committee for Travel Survey Conferences (ISCTSC) (Ed.)*, 11th International Conference on Transport Survey Methods

Pictures

- <http://www.capoliticalreview.com/top-stories/san-franciscos-absurd-resistance-to-change/>
- <https://diepresse.com/home/wirtschaft/international/1457035/China-testet-Freihandelszone-in-Shanghai->
- <https://www.visitberlin.de/de>

BACKUP

■ Definition of ,typical‘ behavior

- frequent repetition of behavior
- frequently used modes or mode combinations for commuting, purchases, chauffeuring, leisure, errands