# Consequences of vehicle automatization

## Aspects from a transportation science perspective

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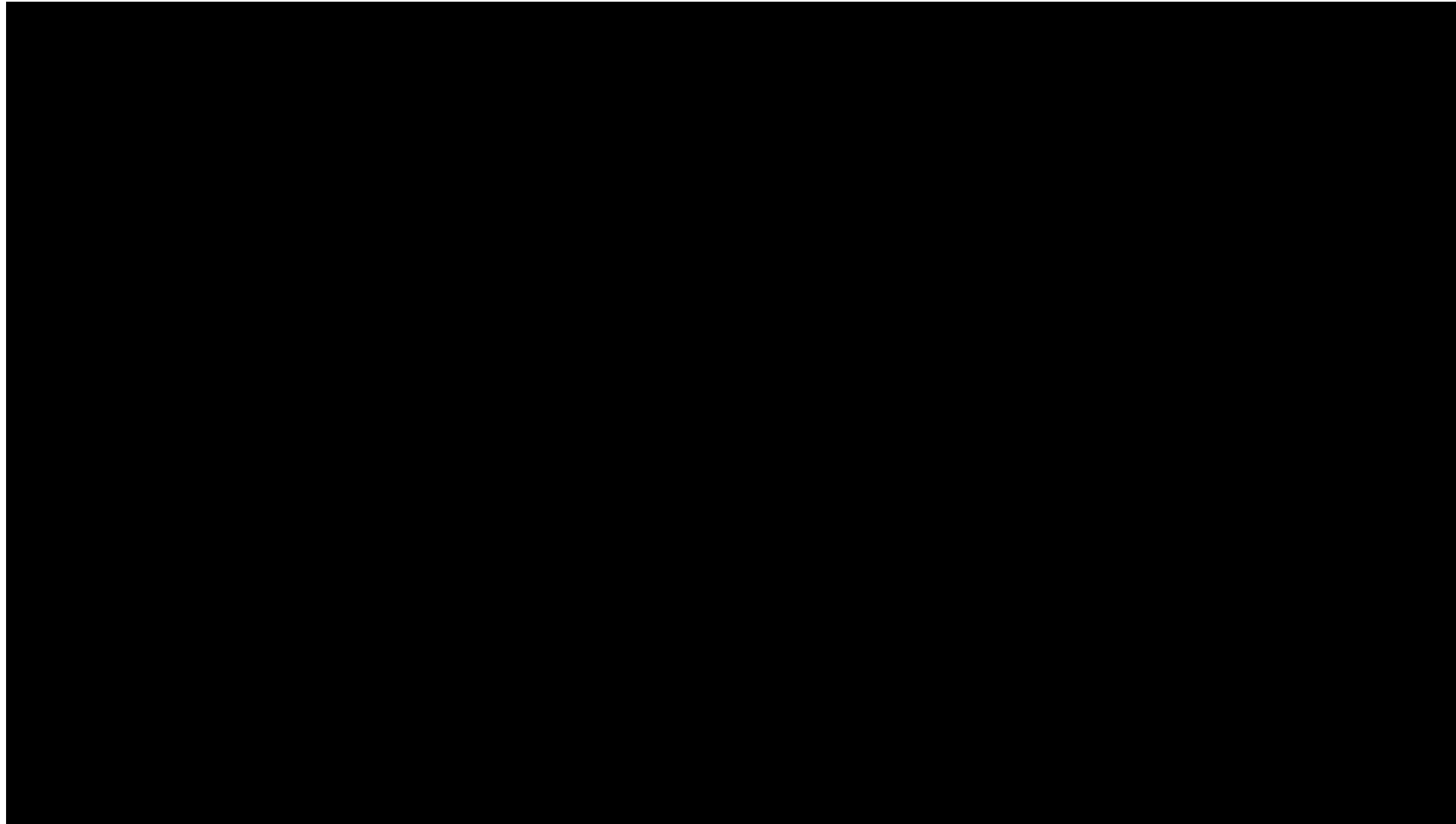
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Knowledge for Tomorrow

# City of tomorrow?

https://youtu.be/WmYsWYDQxuI

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# How does the video picture the city of tomorrow?

**More space for humans**
(less parking space needed, more efficient traffic flow)

**Less waiting times, smoother operations**
(synchronizing transport demand with supply)

**Safer, less noisy, and less polluting transport**
(smart traffic management, car2car communication)

How do we get there?
- Abandon private vehicles
- Install Shared Autonomous Vehicle services (SAV/AVoD/MaaS)

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# New SAV/AVoD/MaaS modes:
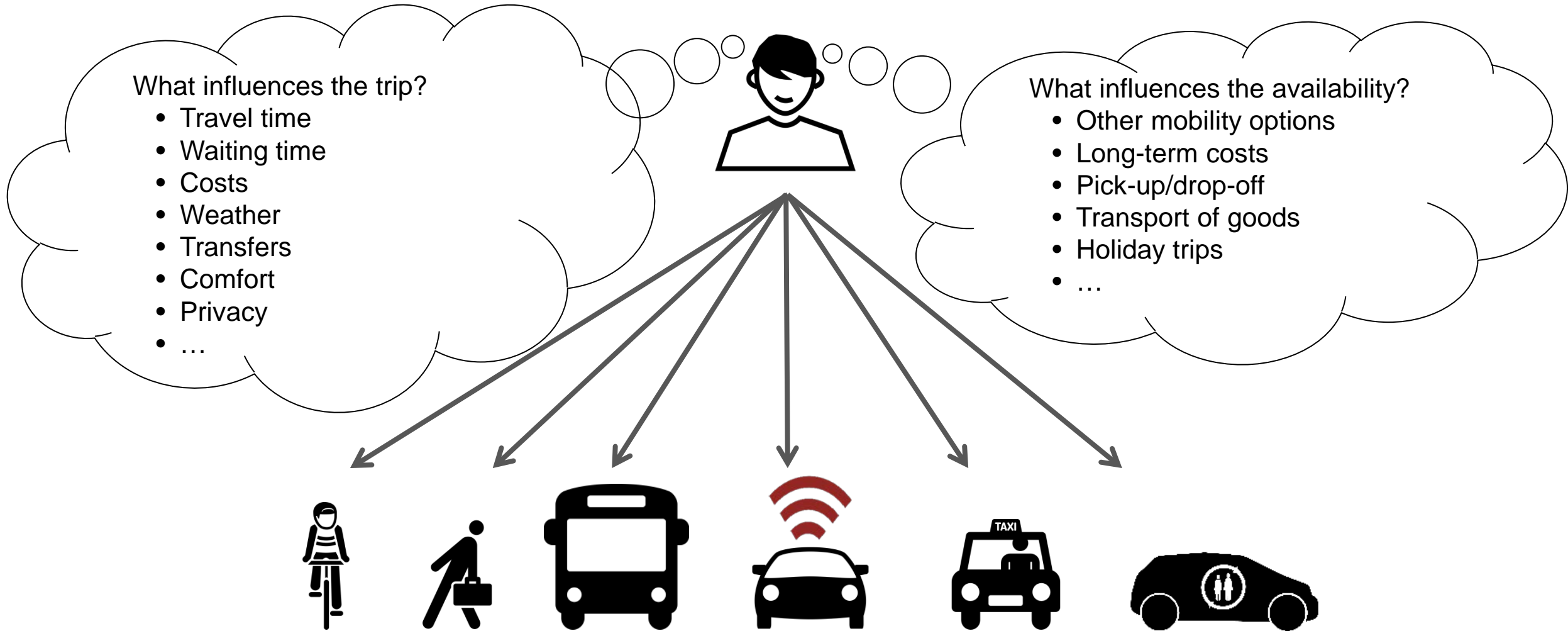# Autonomous Carsharing (ACS), Autonomous Ridesharing (ARS)



**Autonomous Carsharing**

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**Autonomous Ridesharing**

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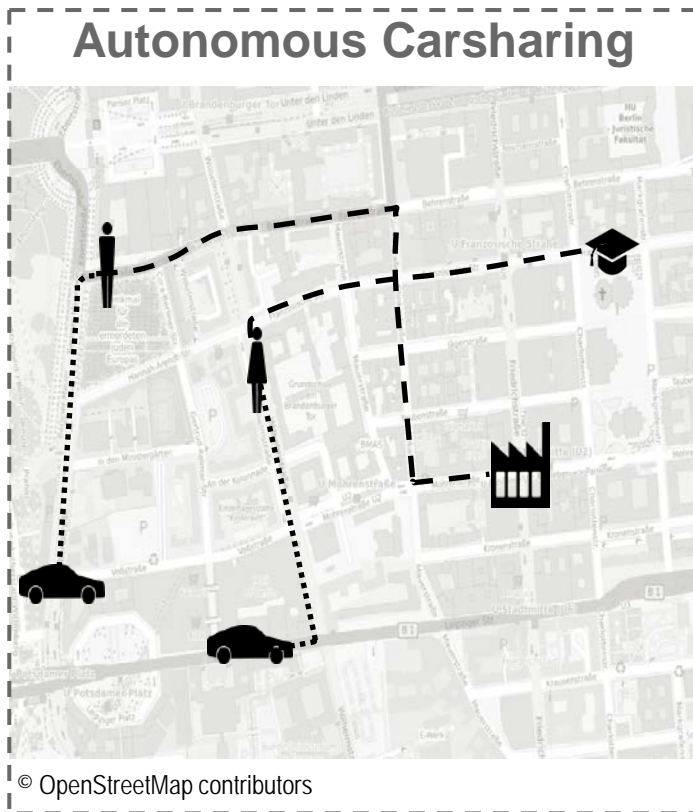
|  | ACS |
|---|---|
| Shared Vehicles | √ |
| Shared Rides | |
| Detours  possible | |
| Empty rides possible | √ |
| Splitting of ride costs | |
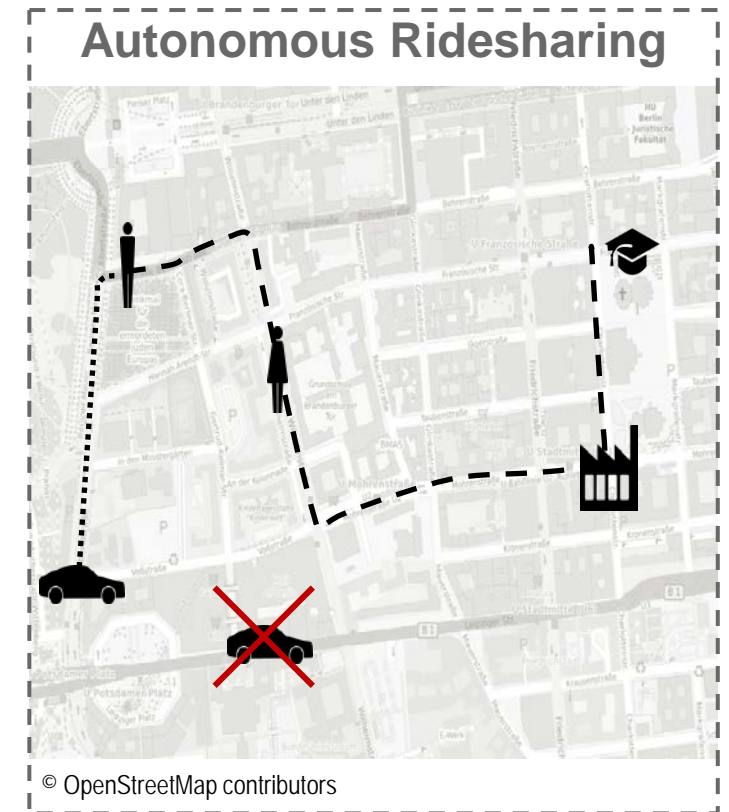
# Why do people have cars?

# Under which circumstances would they abandon them?

# The choice problem for trips and availability of mobility tools

What influences the trip?
- Travel time
- Waiting time
- Costs
- Weather
- Transfers
- Comfort
- Privacy
- …

What influences the availability?
- Other mobility options
- Long-term costs
- Pick-up/drop-off
- Transport of goods
- Holiday trips
- …

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# Expected effects through the automatization of private cars

Self-driving cars gradually enter the vehicle fleet

Mobility-impaired users become more mobile
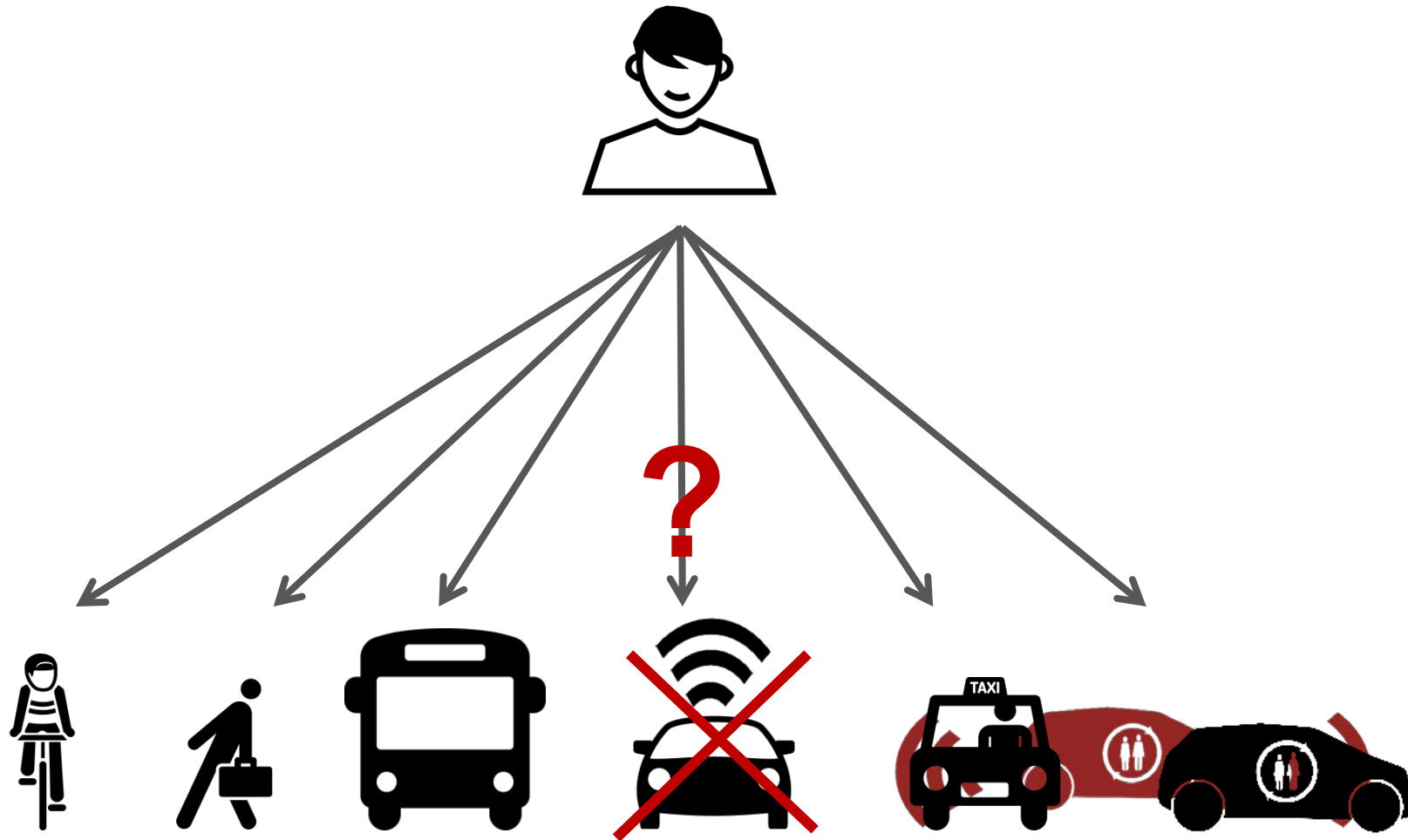
Parking is easier and faster

Travel time in a car can be used more productively

- Up to 20% AVs in the vehicle fleet by 2035

- Up to 10% increase in vehicle kilometers
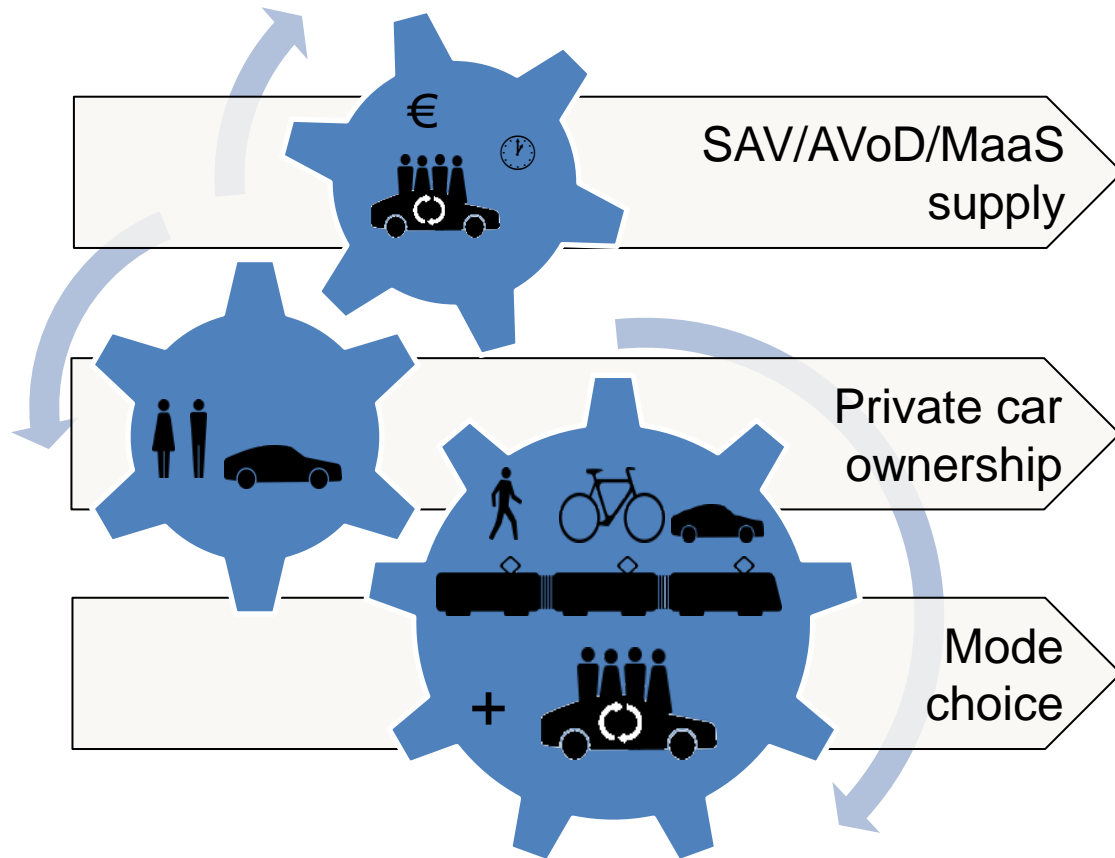
- Mode shift mainly from public transport

Source: Trommer et al. (2016), https://www.ifmo.de/publikationen.html?t=151

# Back to the choice problem



Icon made by Freepik from www.flaticon.com

# Expected effects through the automatization of fleets (SAV/AVoD/MaaS)



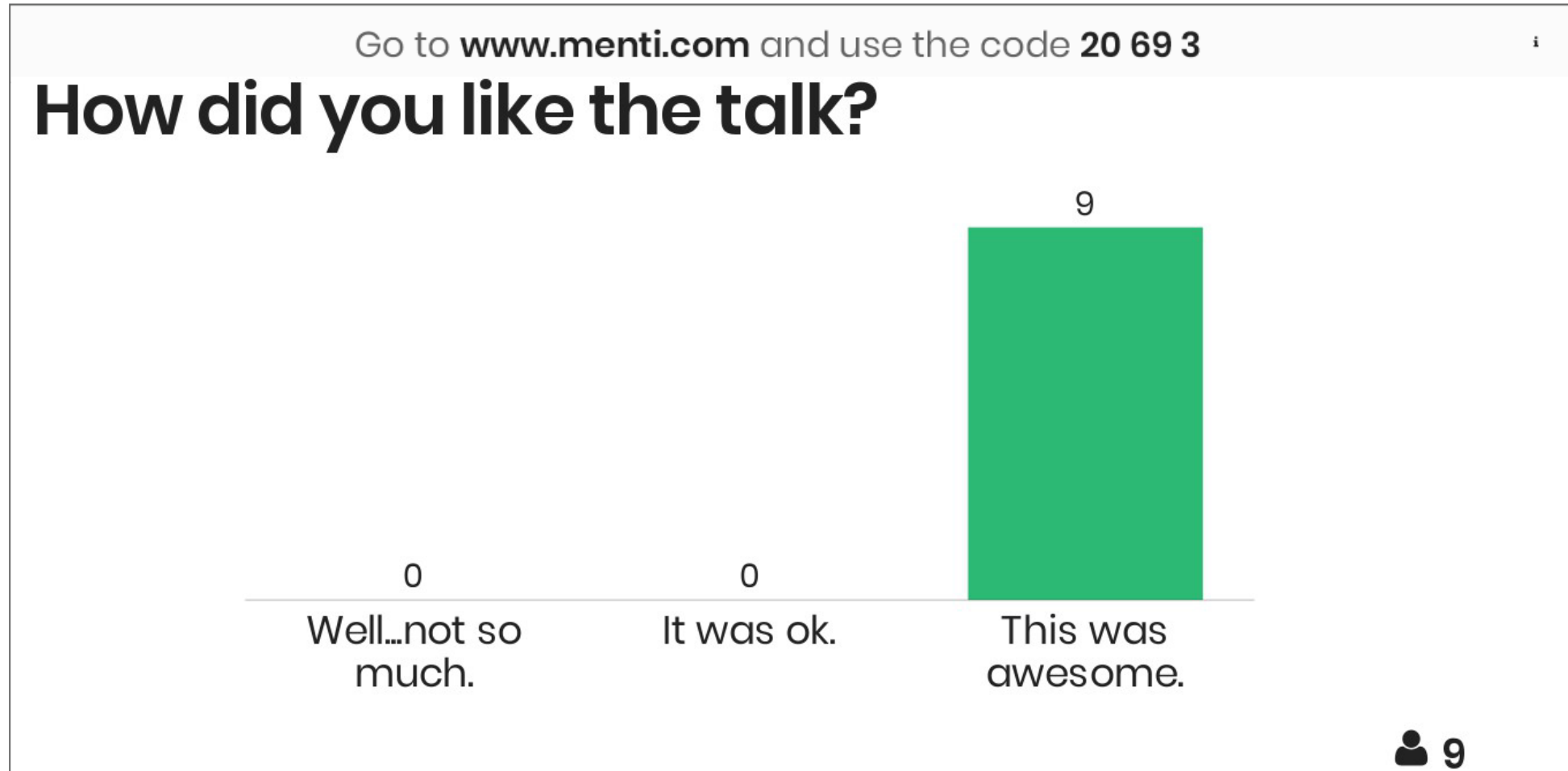SAV/AVoD/MaaS supply

Private car ownership

Mode choice

- Business cases for all regions in Germany

- Up to 15% market share

- Up to 10% increase in vehicle kilometers

- Mode shift from all other modes

Source: Trommer et al. (2016), https://www.ifmo.de/publikationen.html?t=151

The city of tomorrow without private cars is a utopia,
yet within reach.

Mode shifts are likely to increase traffic problems –
simulation models can assist.

Good regulatory framework is required –
strong administration and
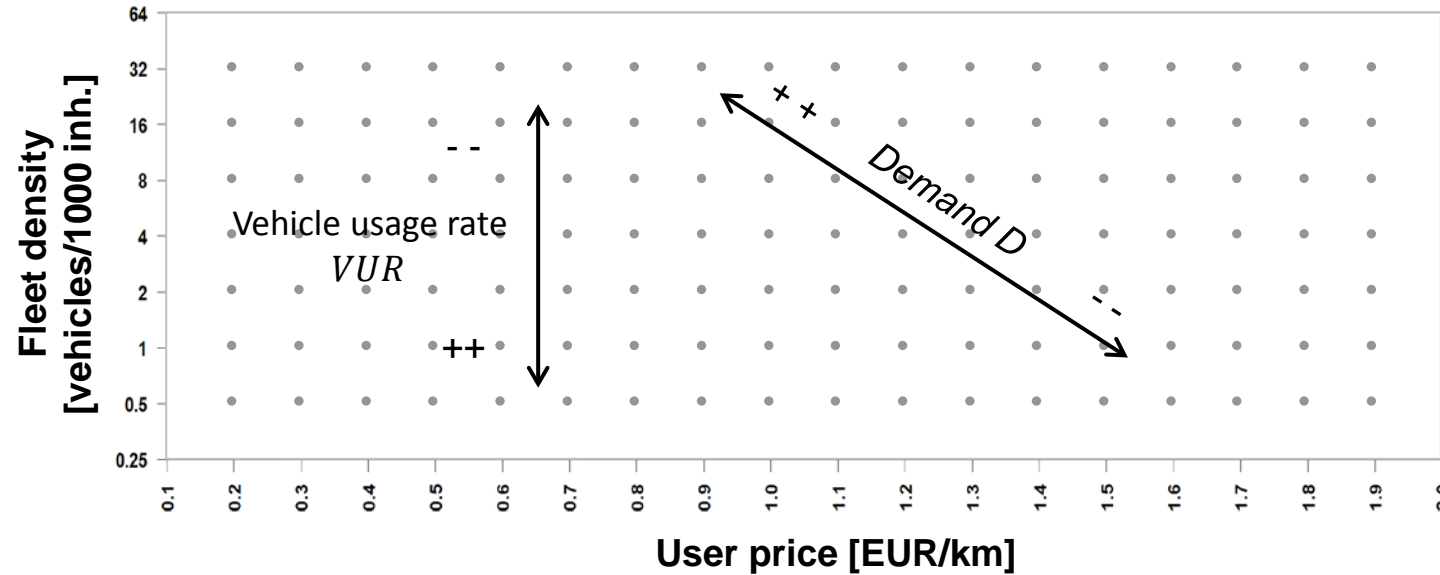important role of local transport providers.
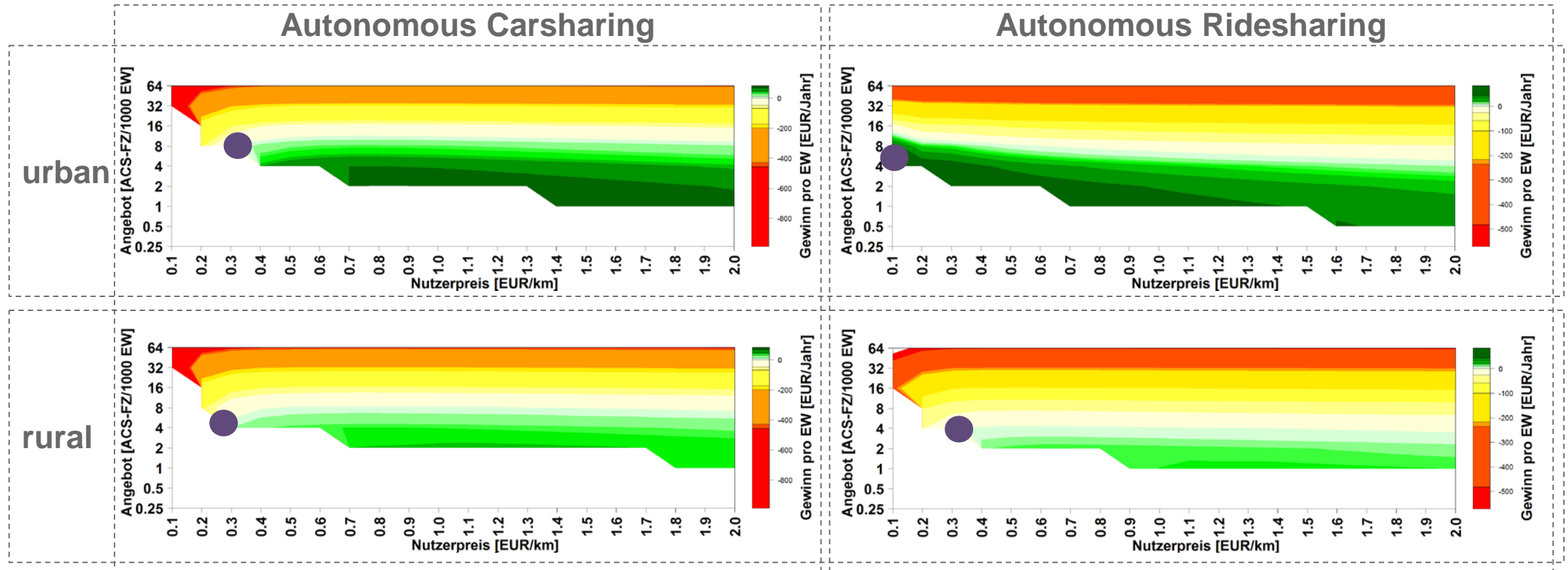
# Feedback

# Backup

# Business cases for SAV/AVoD/MaaS systems in Germany



- Simulating transport demand for Germany in 2035
- Allowing people to choose between all modes, including SAV/AVoD/MaaS systems
- Repeat this for various supply parameters

# Business cases for SAV/AVoD/MaaS systems in Germany



- Profit range larger in urban areas (still, positive business cases in all regions)
- Ridesharing has great potential in urban areas (user price comparable to public transport), potential in rural areas is limited (no bundling effect)

# Summary

- The city of tomorrow without private cars is a utopia, yet within reach.

- Understanding of transport demand and user's preferences (possibly leading to counter-intuitive (rebound) effects) is crucial – simulation models capturing mode choice effects can assist.

- However, a good regulatory framework is required:
  - Autonomous private cars will increase vehicle kilometers traveled and negative effects on society.
  - SAV/AVoD/MaaS systems have the potential to improve the situation, but only if they
    - Reduce VKT (e.g. forcing them to bundle trips)
    - Are installed in a way that supports and does not compete with public transport, bike, walk

- Managing the transition phase requires a strong collaboration between cities and potential operators.