

# Mode Choice Effects on Bike Sharing Systems

Matthias Kowald, Margarita Gutjar, Kai Röth, Christian Schiller and Till Dannewald  
Department of Architecture and Civil Engineering, RheinMain University of Applied Sciences, Wiesbaden (DE)

## Background

- Increasing number of bike-sharing systems (BSS)
- Lack of parameters for BSS-related attributes (e.g. price, travel time)
- BSS are not implemented in transport demand models
- No knowledge about the potential of BSS to reduce the use private motorized transport (PMT), e.g. vehicles



*Which mode-specific attributes affect the choice between BSS, PMT, and public transport (PT)?*

## Methods

### Data & Sample

#### Stated mode choices

- » Fieldwork: Sep 21 - Feb 22
- » Paper-and-pencil questionnaire
- » Respondents:
  - > 18 years and older
  - > owning a driver's license
  - > BSS-users and non-users
  - > living in the supply area of the transport association Rhine-Neckar (VRN)
- » Incentive: EUR 20

### Fieldwork

- **Recruiting**
  - » **BSS-users:** smartphone app
  - » **BSS-non-users:** telephone call
- **Collection of (semi-)RP data**
  - » **BSS-users:** BSS: last route by BS traced in a CATI, PMT: online routing provider, PT: online schedule
  - » **BSS-non-users:** aggregated figures; BSS: CATI survey, PMT & PT: secondary data (PMT, PT)
- **Variation of (semi-)RP data**
  - » by experimental design
- **Sending questionnaire**

### % Mode attributes

#### Bike-sharing system

- » access & egress time, travel time (tt)
- » travel costs
- » street type
- » street surface type

#### Private motorized transport

- » travel time (tt), incl. parking search
- » fuel costs & parking costs

#### Public transport

- » access & egress, travel time (tt)
- » travel costs
- » utilized capacity

→ 10 mode choice tasks

## Results

220 respondents, 2184 choices

### Multinomial Logit Model

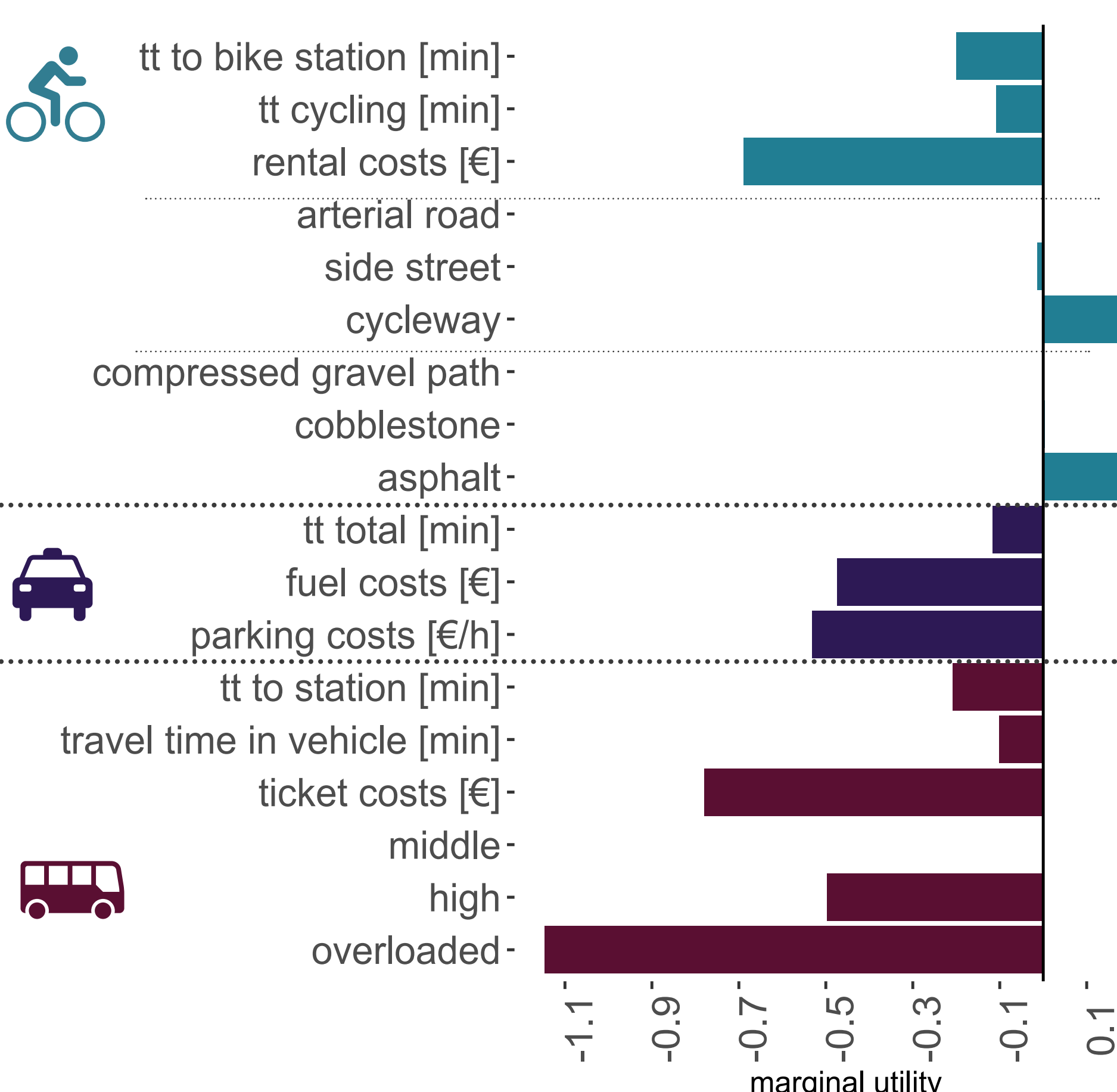


Fig. 1. Marginal utility for mode-specific attributes

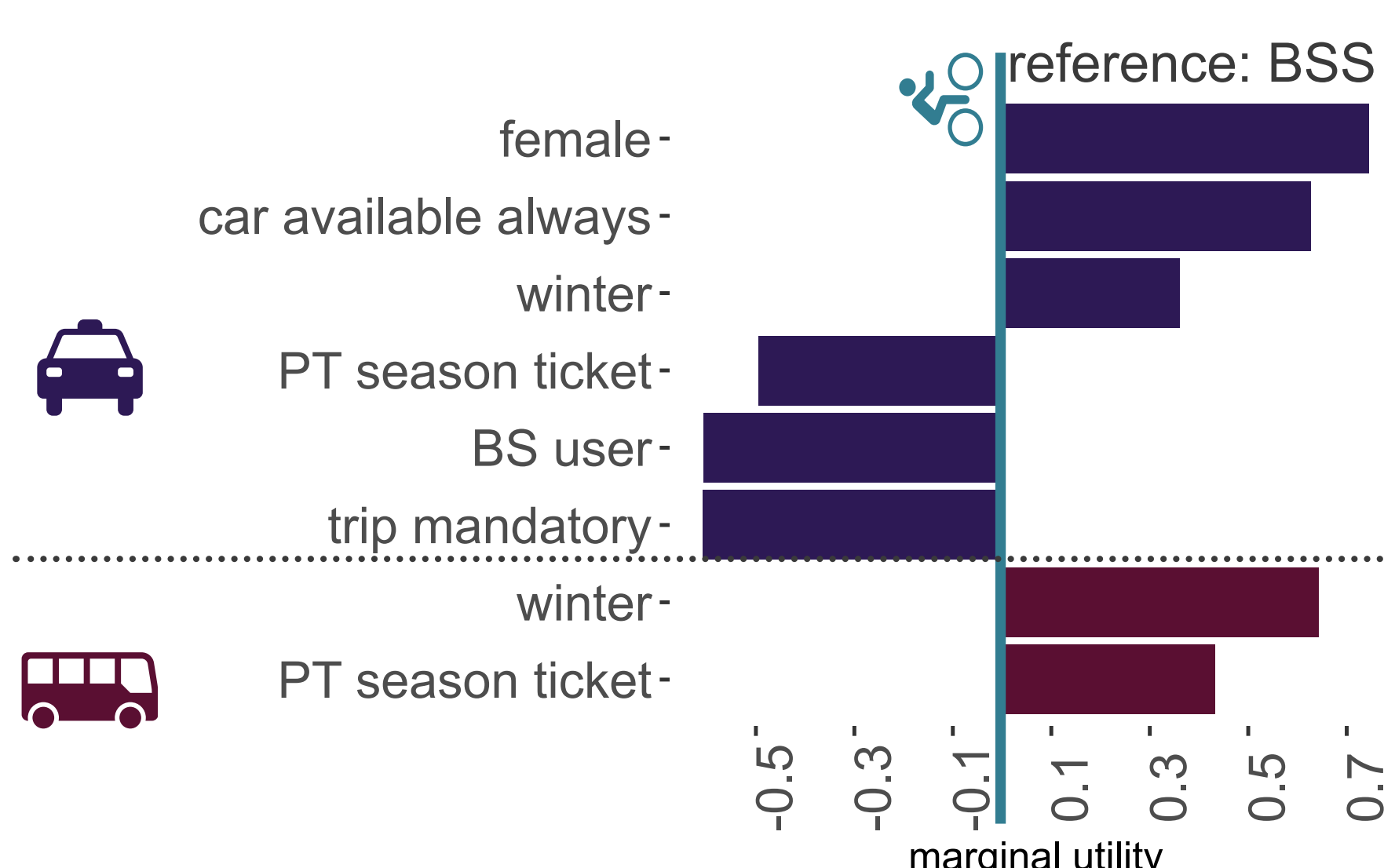


Fig. 2. Mode-specific marginal utility by demographics

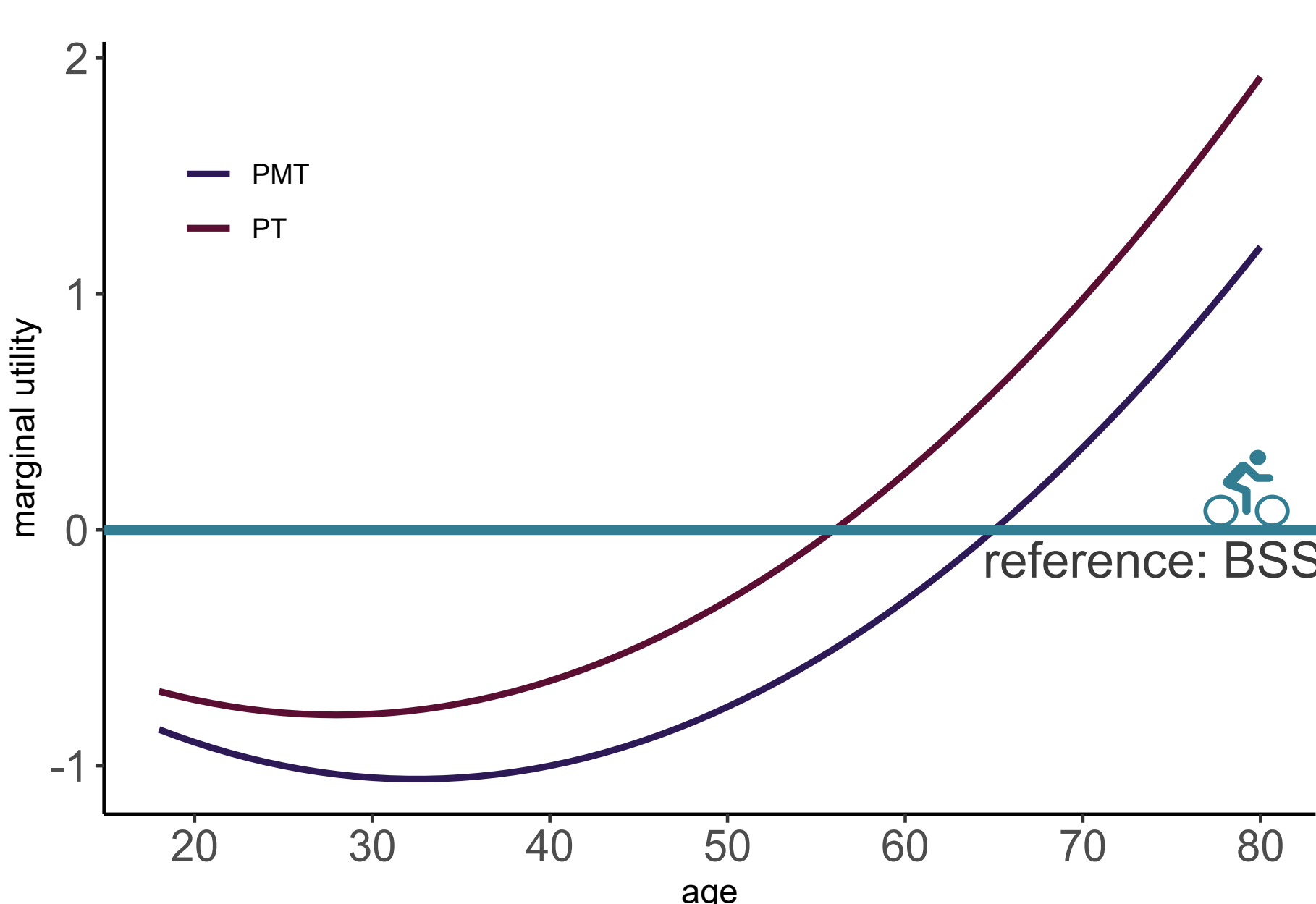


Fig. 3. Mode-specific marginal utility by age

### Mode-specific attributes:

- » **Negative effect for travel time**, even stronger for **access and egress time** for all modes (BS, PMT, and PT)
- » **Negative effects for costs**, while stronger for bike rental prices and PT tickets than for PMT fuel or parking costs
- » For BSS, **cycleway and asphalt** are most preferred
- » Higher **capacity utilization decreases the utility** of PT

### With reference to BSS:

- » **PMT:** is **more preferred** by females, if car available always, in winter, at age 64 and older; **less preferred** by BS-users, with PT season ticket, for mandatory trips, by people younger than 64
- » **PT:** is **more preferred** in winter, with PT season ticket, at age 55 & older; **less preferred** by people younger than 55

## Outlook

- » Estimating more sophisticated model
- » Implementing BSS-parameters into a regional transport demand model

### Acknowledgment

This project (HA-No. 1013/21-15) is funded by the state of Hessian and the House of Logistics (HOLM) within the program "Innovations in logistics and mobility" of the Hessian Ministry for Economic Affairs, Energy, Transport and Housing.

### Contacts

**Matthias Kowald**  
matthias.kowald@hs-rm.de  
Tel.: 0049 611 9495 1949

**Margarita Gutjar**  
margarita.gutjar@hs-rm.de  
Tel.: 0049 611 9495 1933

### Publication

Kowald, M.; Gutjar, M.; Röth, K.; Schiller, C.; Dannewald, T. (2022). Mode Choice Effects on Bike Sharing Systems. Appl. Sci., 12, 4391. <https://doi.org/10.3390/app12094391>

