

Shared micromobility and public transport Integration

A mode choice study using stated preference data

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Agenda

- Introduction
- Methodology
- Results
- Conclusions and future research

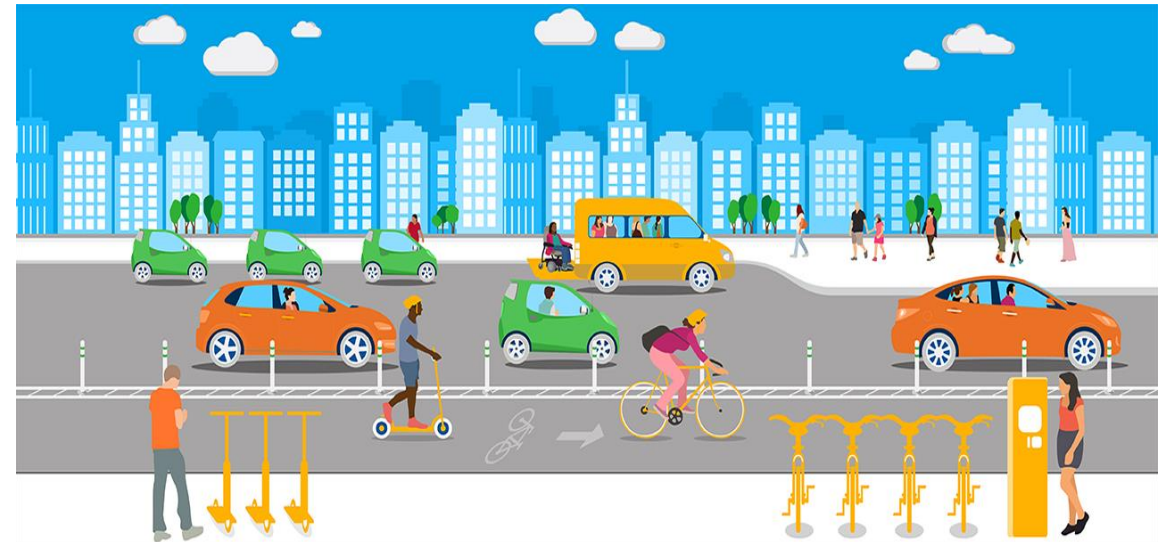
Introduction

Background

- Shared-mobility has emerged as an alternative transport in urban environments

"short-term access to shared vehicles according to the user's needs and convenience"

(Machado *et al.*, 2018)



Background

- Shared-mobility has emerged as an alternative transport option in urban environments
- Different modes, schemes and providers, some examples:

1. **Shared bicycle (dock-less)**
e.g. Donkey republic, mobike
2. **Shared bicycle (station-based)**
e.g. OV-fiets
3. **Shared e-bike (dock-less)**
e.g. Jump, vaimoo
4. **Shared moped (dock-less)**
e.g. Felyx, go sharing
5. **Shared standing scooter (dock-less)**
e.g. Lime, bird
6. **Shared car (dock-less)**
e.g. Greenwheels



Background

- Shared-mobility has emerged as an alternative transport option in urban environments
- Different modes, schemes and providers
- New mobility platforms and collaborations

Problem definition

New challenges for transport authorities and providers

- How to react to these new modes?
- Should there be collaboration between shared micromobility and public transport providers?
- How should collaborations look like?
- ...



Problem definition

New challenges for transport authorities and providers

How to react to these new modes?

Should there be collaboration between micromobility and public transport providers?

How should collaborations look like?

...

But first, it is important to:

- Understand the behaviour and preferences of travellers
- Understand the relationship(s) between public transport and shared micromobility



Methodology

Approach

Hypothetical scenario: Public transport and shared micromobility perfectly integrated in terms of payment, vehicle availability and trip planning

Stated choice experiment

Mode choice experiment in Rotterdam area



Discrete choice models

MNL and ML models

Scope

- Study developed under the case of Rotterdam
- Shared modes limited to
 - Shared bicycles and shared scooters (*standing scooters*)
 - Dock-less shared modes

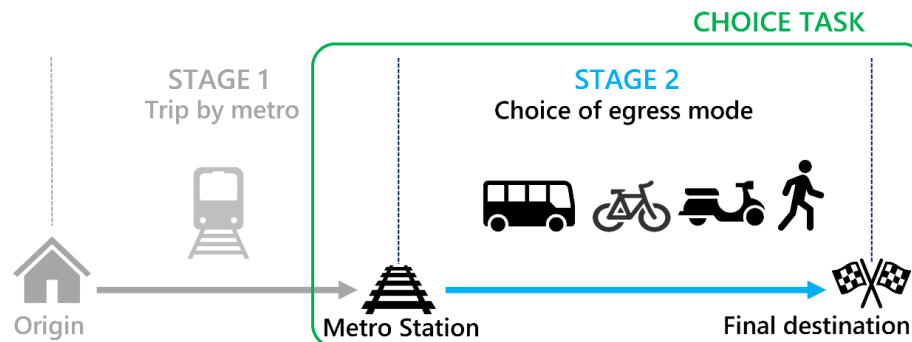


The experiment

- 9 different scenarios with two choice tasks each

The experiment

- 9 different scenarios with two choice tasks each
- Choice task A: Egress mode choice



A. Assume you made the following trip by metro

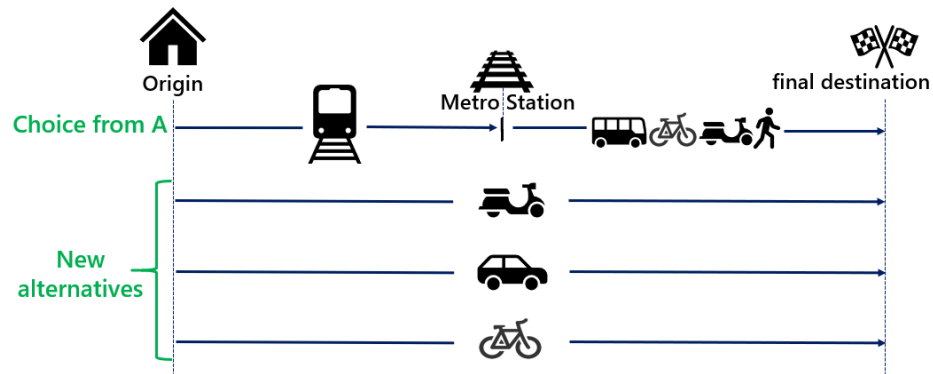
	Waiting	5 minutes
	In-Vehicle	10 minutes
	Cost	€ 2.40

Which of the following options would you choose to reach your destination from the metro station?

BUS / TRAM	WALKING	SHARED MOPED	SHARED BIKE
5 minutes	—	—	—
9 minutes	—	7 minutes	7 minutes
5 minutes	20 minutes	—	—
€ 1.20	—	€ 2.70	€ 2.20

The experiment

- 9 different scenarios with two choice tasks each
- Choice task A
- Choice task B



B. Now, let's consider the whole trip from your home to your final destination. Which of the following options would you choose?

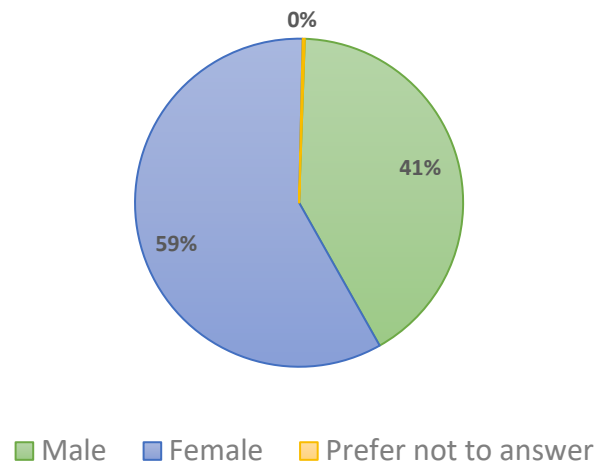
METRO AND SHARED MOPED	BIKE	SHARED MOPED	CAR
Search	Search	Search	Search
Walking	Walking	Walking	Walking
5 min	25 minutes	3 minutes	20 minutes
10 min		20 minutes	3 minutes
7 min			
Cost	Cost	Cost	Cost
€ 2.40	€ 4.00	€ 5.00	€ 0
€ 2.70			

The experiment

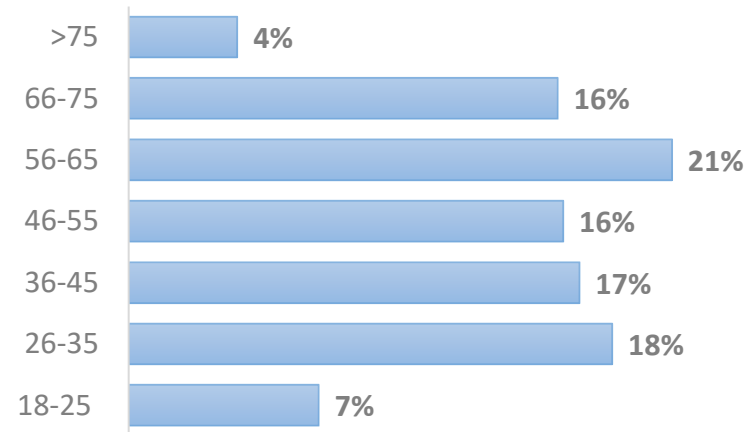
- 9 different scenarios with two choice tasks each
- Choice task A
- Choice task B
- In addition
 - Socio-demographic information
 - Vehicle ownership
 - Ability to drive vehicles (license and skills)
 - Familiarity and previous use of shared modes
 - Frequency of use of Public transport

Sample characteristics (487 respondents)

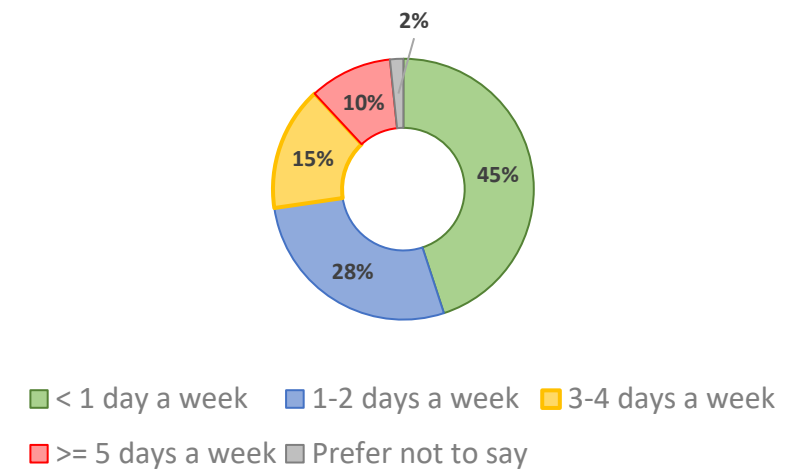
Gender



Age

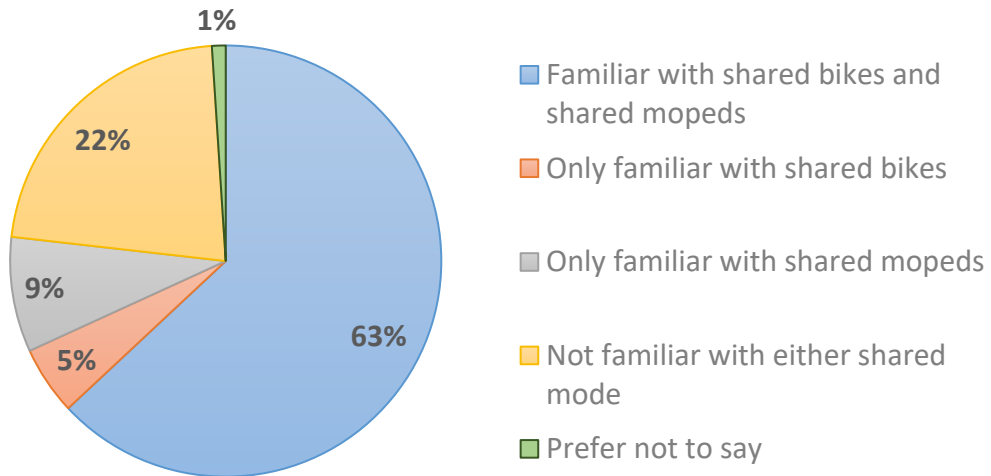


Use of public transport (before COVID-19)

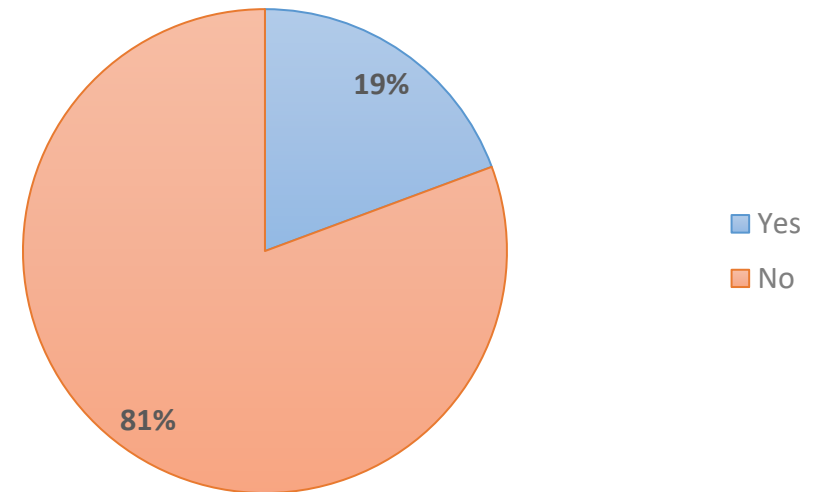


Sample characteristics

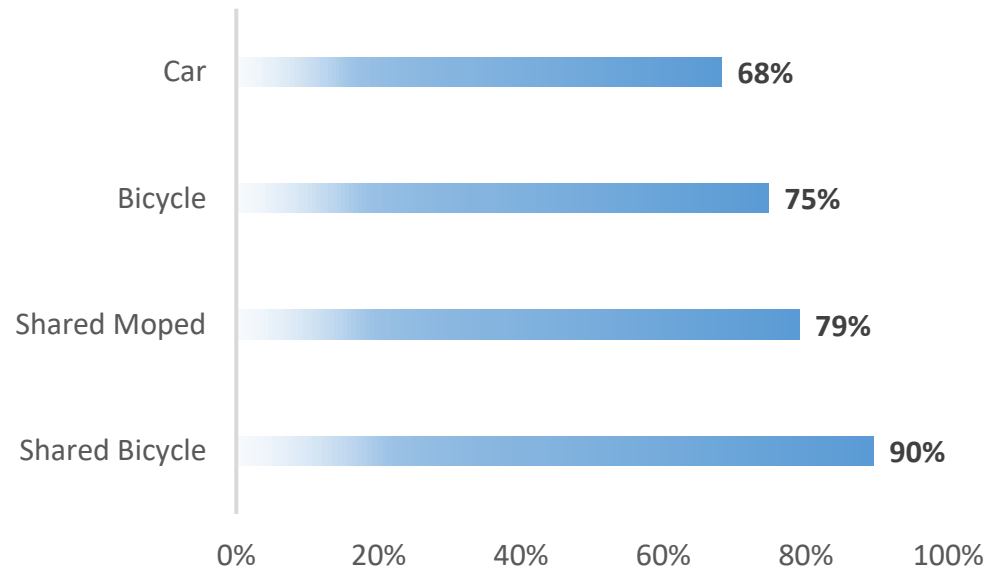
Familiarity with shared micromobility



Having used shared micromobility before

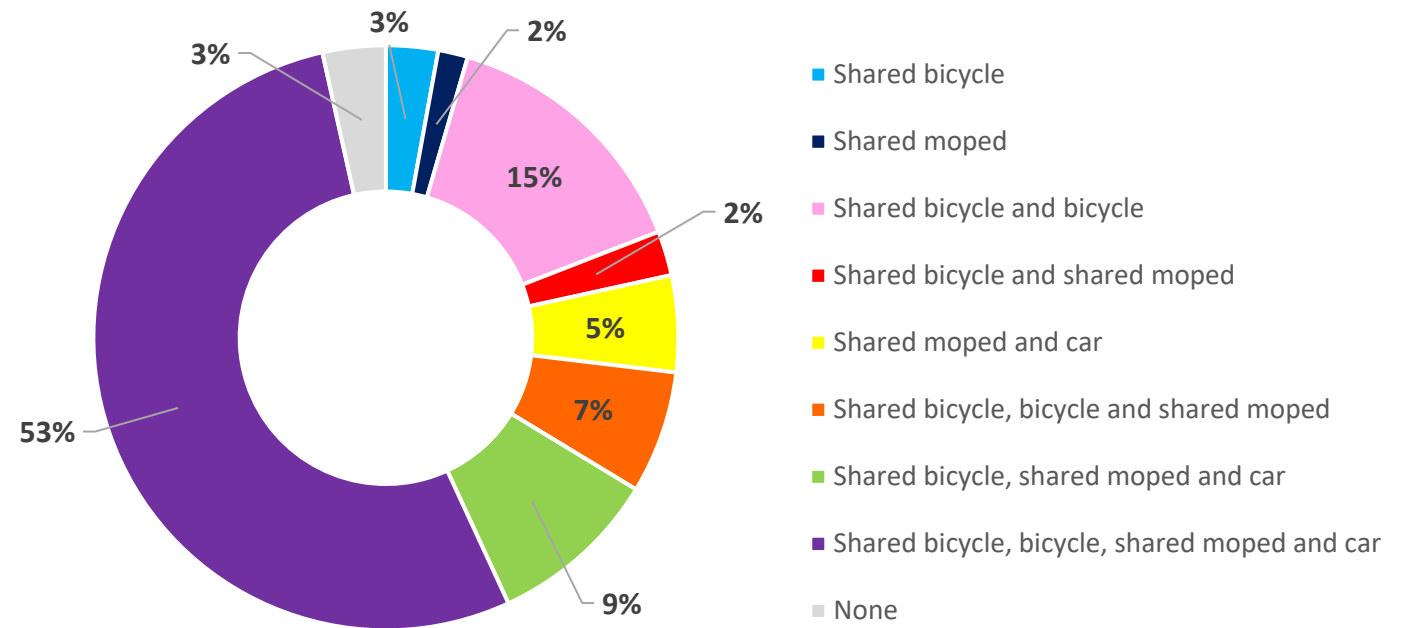
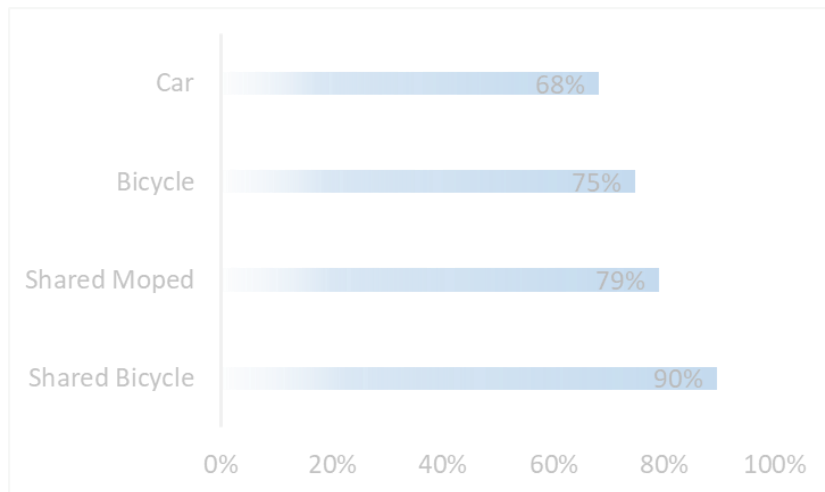


Availability of vehicles



Availability of modes in the sample

Availability of vehicles



Choice set composition

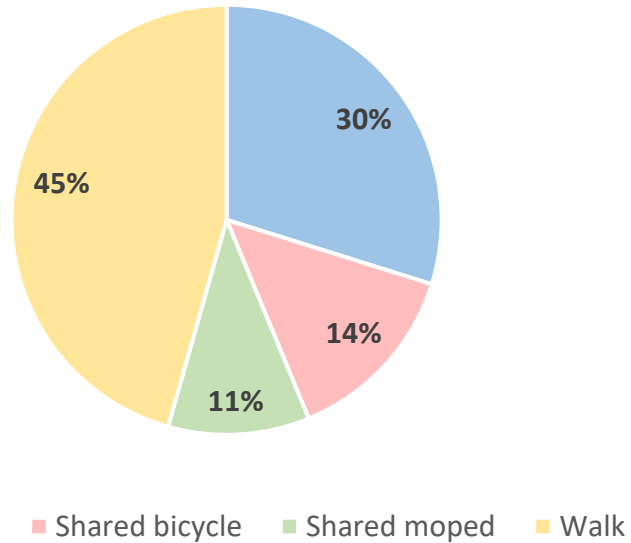
Modelling approach

- 7 independent transport modes (alternatives)
- Characteristics included: travel time, travel cost and based preference towards each mode
- Different model specifications
 - Base multinomial logit model (MNL)
 - Multinomial logit models with interaction effects
 - Mixed logit models (ML)

Results

Choice Overview

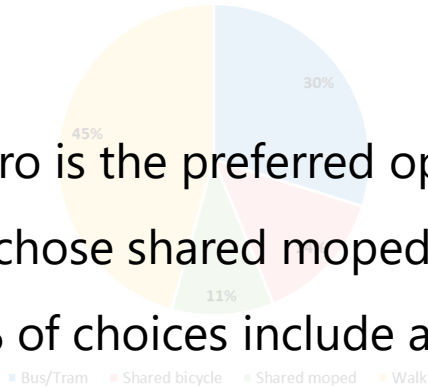
Egress mode choice



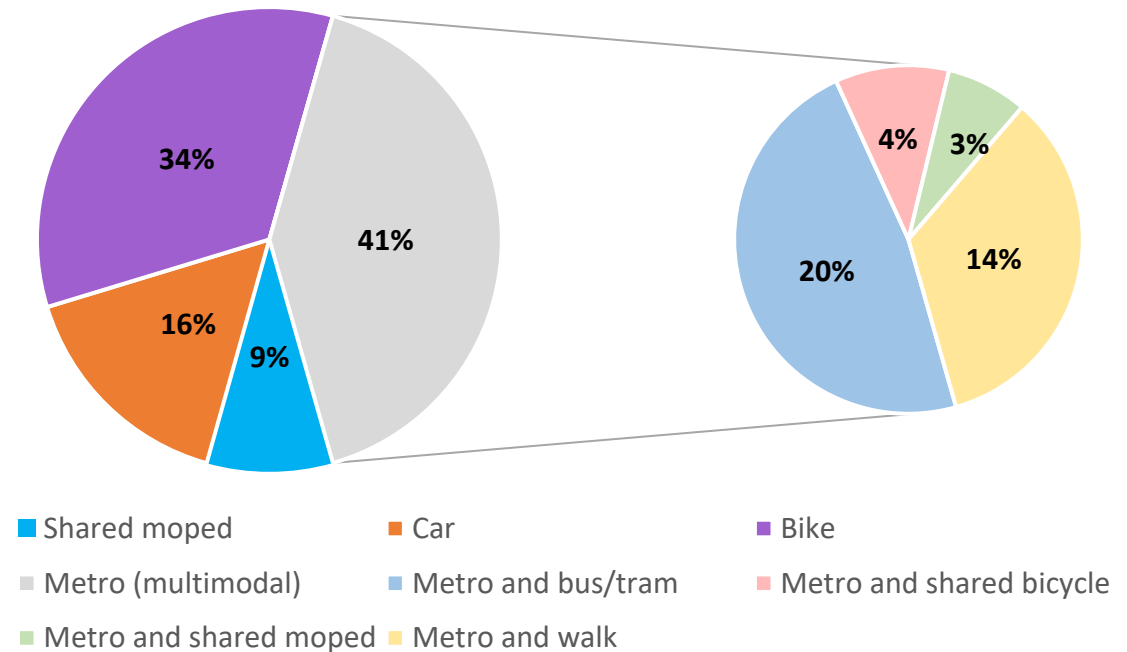
- 25% of choices were for shared micromobility
- Walk is the preferred option

Choice Overview

- Metro is the preferred option
- 9% chose shared moped for the whole trip
- 16% of choices include a shared mode

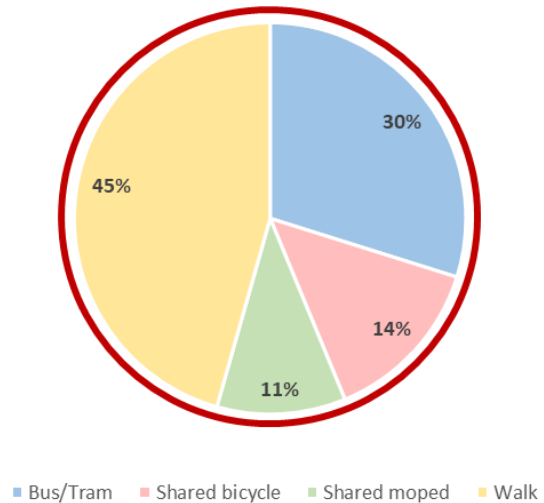


Complete mode choice

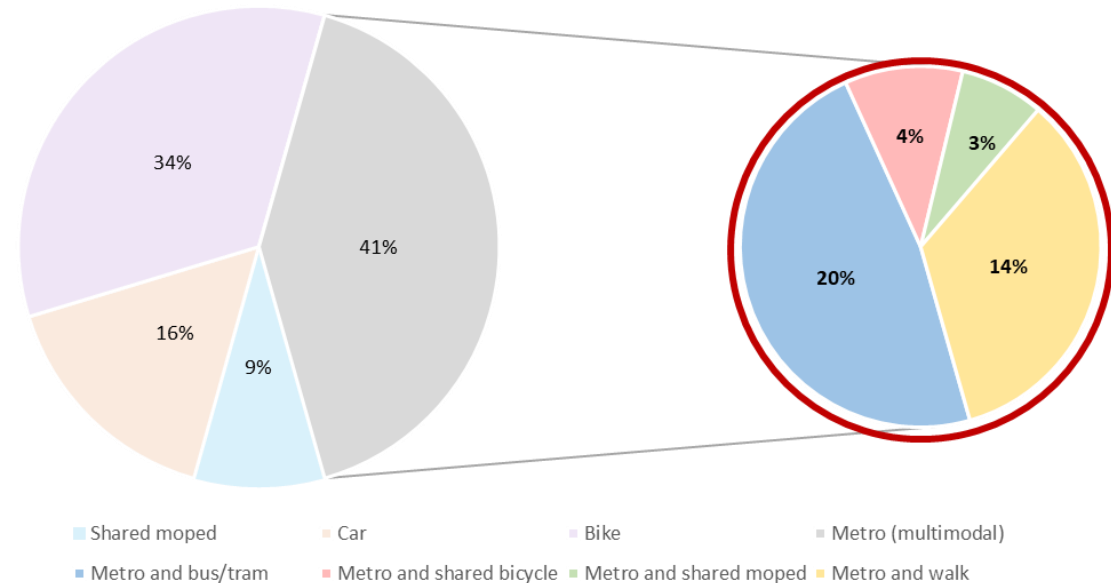


Choice Overview

Egress mode choice

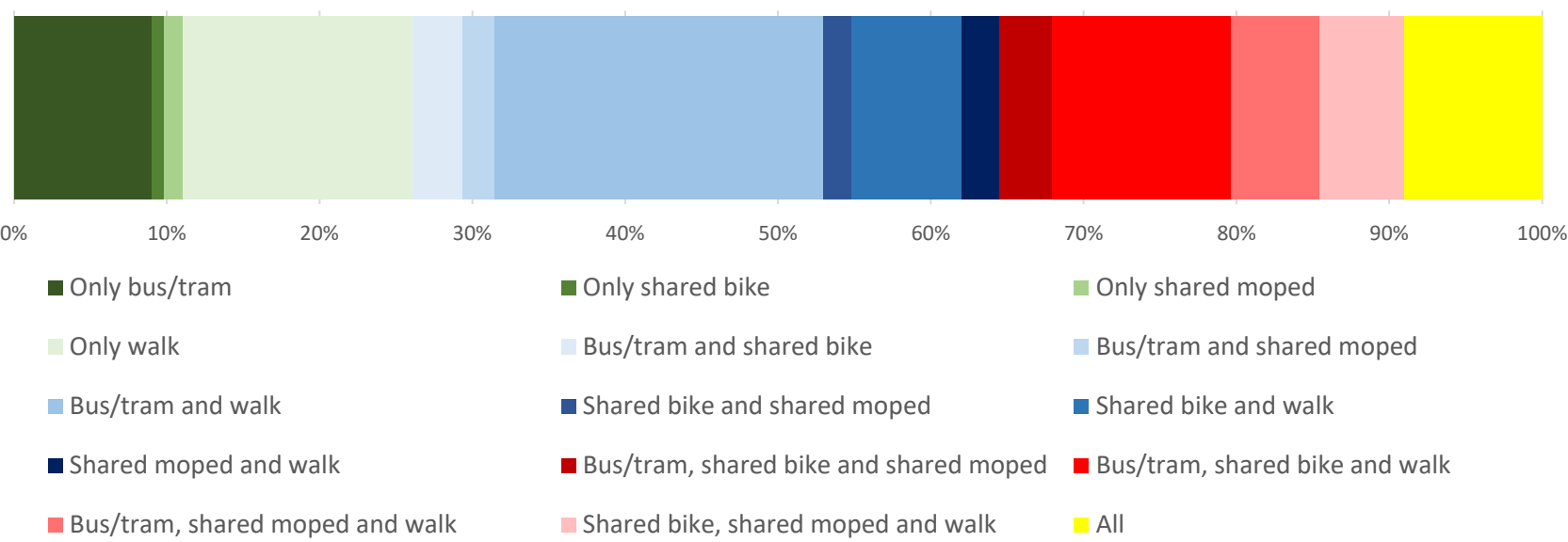


Complete mode choice



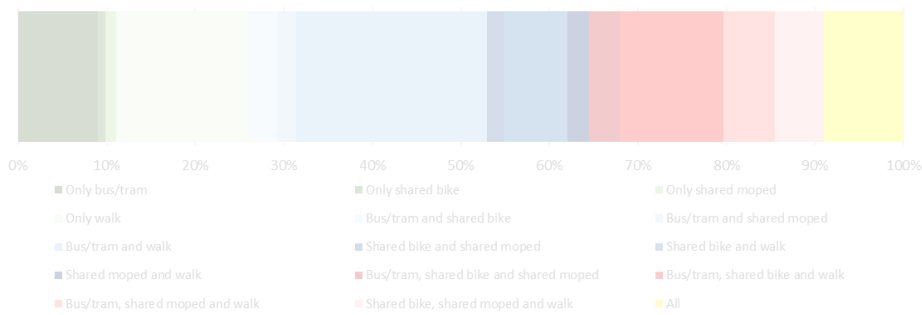
- Note that the distribution of egress modes changes within the choices for metro
- When metro is chosen → 17% of time the egress option is a shared mode (compared to 25% overall)

Portfolios of alternatives

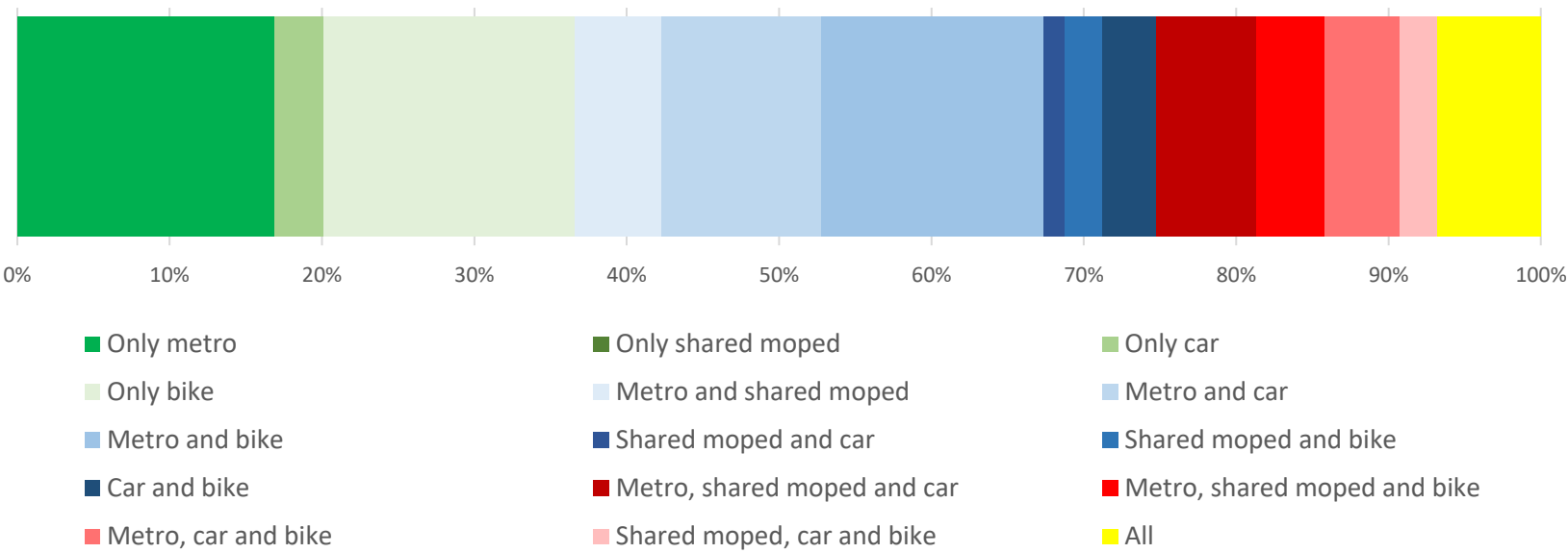


Egress mode choice

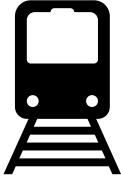








Portfolios of alternatives



Complete trip mode choice

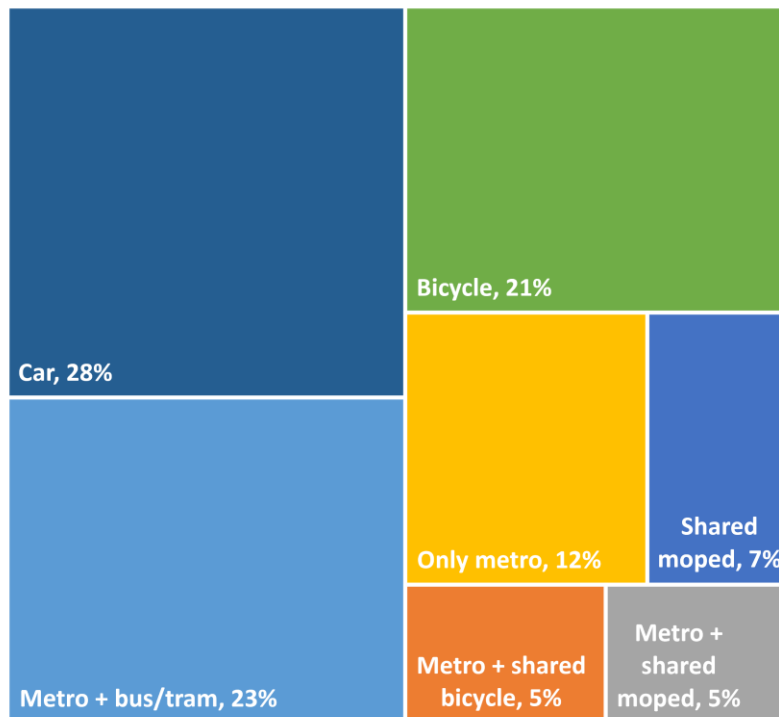


Discrete choice modelling

		Travel time	Travel cost
Main leg			
Egress leg	   		

Discrete choice modelling

If only base preference towards modes matter



Choice probabilities for all modes if travel time and travel cost are the same for all alternatives

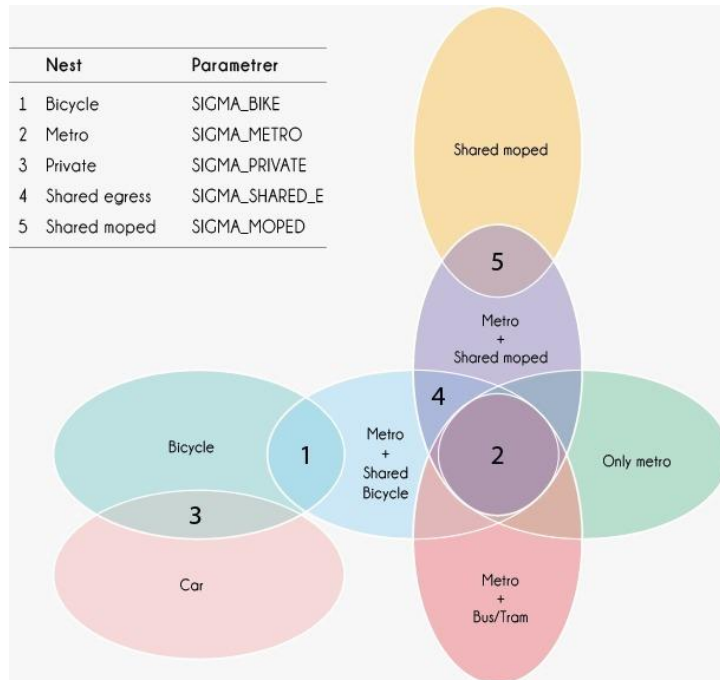
Discrete choice modelling

Interaction effects with sociodemographics

- Women seem to like shared bicycles and dislike shared scooters more than men
- Being familiar with shared micromobility and having use the modes before affect positively the perception towards these modes
- Age and frequency of public transport use seem to have important effects in perception towards shared micromobility
- Frequency of use of public transport affects positively the perception towards shared micromobility

Discrete choice modelling

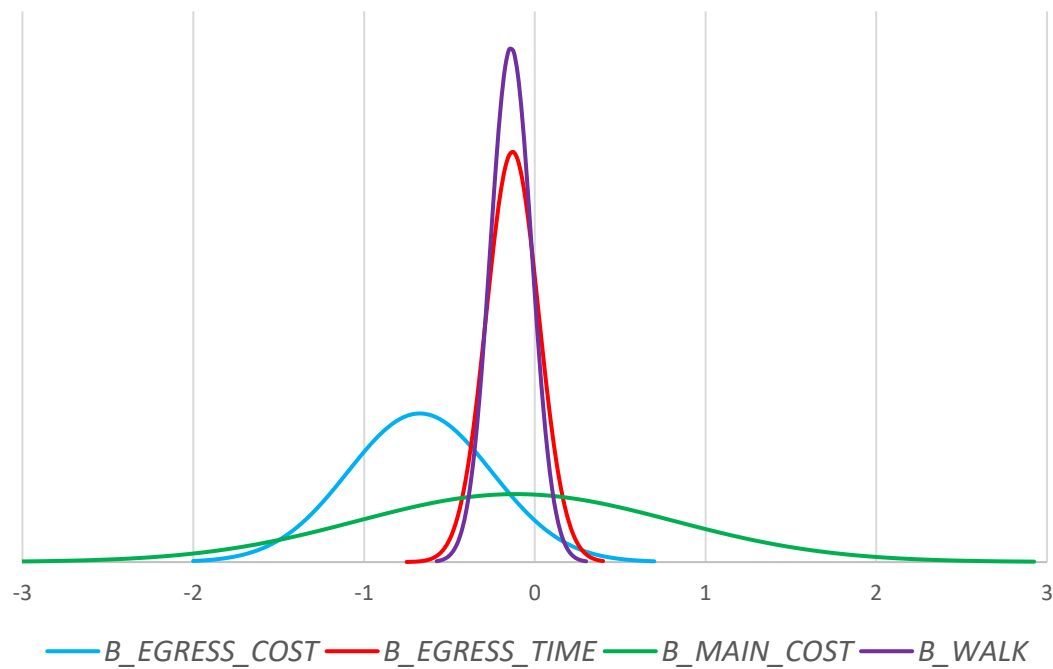
Correlation amongst alternatives *due to characteristics they have in common*



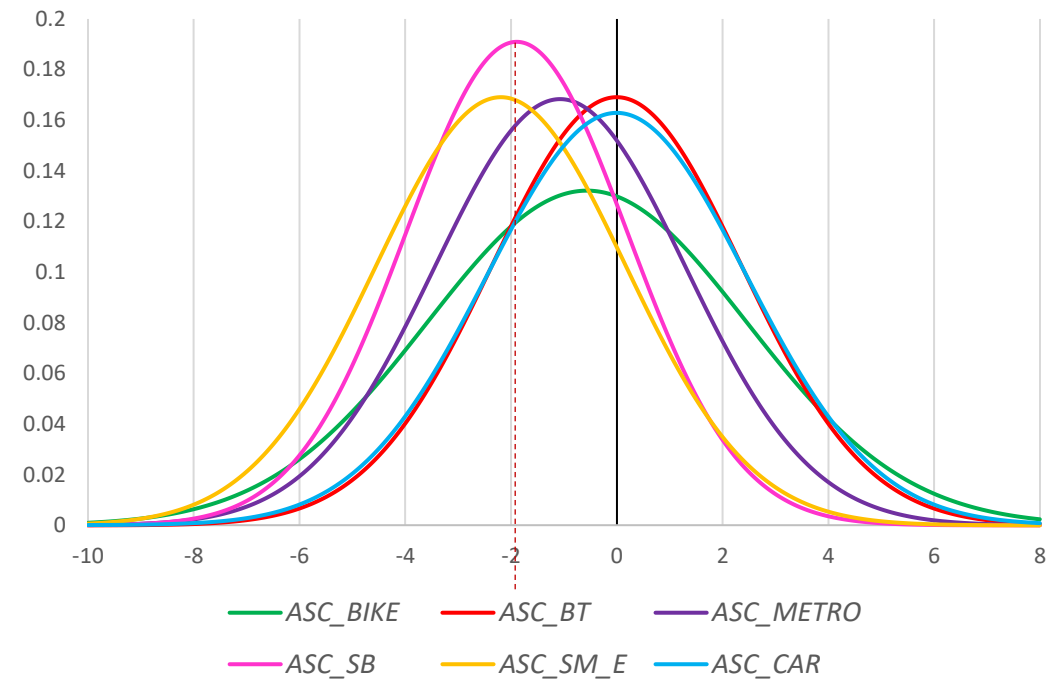
	Parameter
SIGMA_B	2.66
SIGMA_METRO	1.83
SIGMA_MOPED	2.22
SIGMA_PRIVATE	1.99
SIGMA_SHARED_E	1.43

Discrete choice modelling

Taste heterogeneity



Mode preference heterogeneity



Conclusions and future research



Conclusions

Considering the overview of choices:

- Shared modes seem to be appealing alternatives as egress modes for metro trips on a considerable amount of occasions.
- By becoming attractive alternatives for last-mile connections, shared modes can be argued to serve as a complement for metro, yet they would be expected to compete with other popular egress modes such as bus/tram for example.
- Shared mopeds are interesting alternative as an individual mode for long-distance trips

Conclusions

To positively influence the effects of integration with shared mobility through collaborations, public transport operators should focus on:

- Improving door to door experience in terms of time
- Finding pricing schemes that limit the demotivation caused by the egress part of the trip
- Encouraging travellers to try shared modes for the first time
- Targeting specific groups

Future research

- Effects of mode choice under integrated public transport and shared micromobility services, under a context in which public transport would not be a feasible option without the presence of shared modes.
- Effect of availability of shared modes in transit stations, which might help to grasp thresholds regarding for example quantity of vehicles that assure travellers that they will encounter available vehicles at their arrival at the station.