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# *COnpeting and COnplementary MObility solutions in urban contexts (COCOMO)*

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# COmpeting and COmplementary MObility solutions in urban contexts (COCOMO)

- How **Shared Micro Mobilities** (SMM) are combined with existing travel modes within trips and longer term travel patterns and what implications this has for sustainability (VMT and greenhouse gas emissions);
- How SMM interact with existing forms of travel in public space and how this impacts on the attractiveness and accessibility of these modes;
- How travel implications of (see 1.), and access to SMM mobilities (see 2.) differ between geographical contexts and socio-economic groups, and what impacts this has on equity and inclusion.



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# COmpeting and COmplementary MObility solutions in urban contexts (COCOMO)



## **Data collection: Survey in Utrecht, Manchester, Malmö**

- Survey (June 2022): totally 1911 valid competes in three cities
- awareness and use frequency of different shared micro-mobility services, personal socio-demographics, access to different kinds of mobility instruments, and a series of statements on perceived transport disadvantage/adequacy, behaviour change resulting from SMM



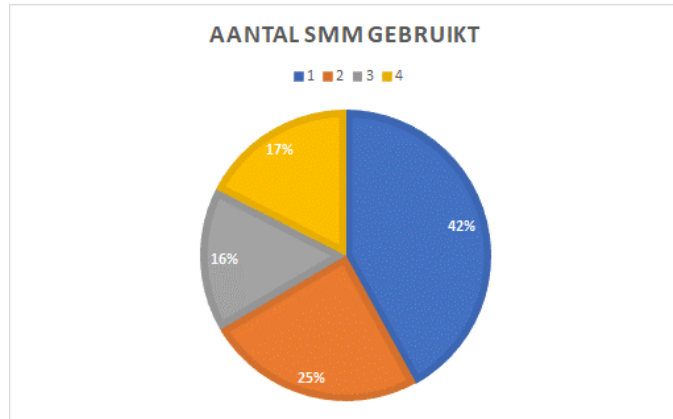
## Data collection: Survey in Utrecht, Manchester, Malmö

City	N	Users of <i>shared...</i>					SMM non-users
		Bike	E-bike	E-scooter (standing)	E-scooter (sitting)	E-cargo bike	
Manchester	540	225	200	201	—	—	271
Utrecht	354	129	100	—	81	55	185
Malmö	1017	195	—	290	—	—	651
Total	1911	549	300	491	81	55	1107





# Combining Shared Micro-mobilities in Utrecht



Combinations of Shared Micro-Mobility	
Bike & E-bike & E-Moped & Cargo-Bike	17,5%
Bike & E-bike	12,3%
Bike & E-bike & E-Moped	10,8%
E-bike & E-Moped	5,2%
Bike & E-bike & Cargo-Bike	4,7%
Bike & E-Moped	3,8%
Bike & Cargo-Bike	1,4%
E-Moped & Cargo-Bike	1,4%
E-bike & Cargo-Bike	0,5%
E-bike & E-Moped & Cargo-Bike	0,5%



# Multi modal patterns including Shared Micro-Mobilities

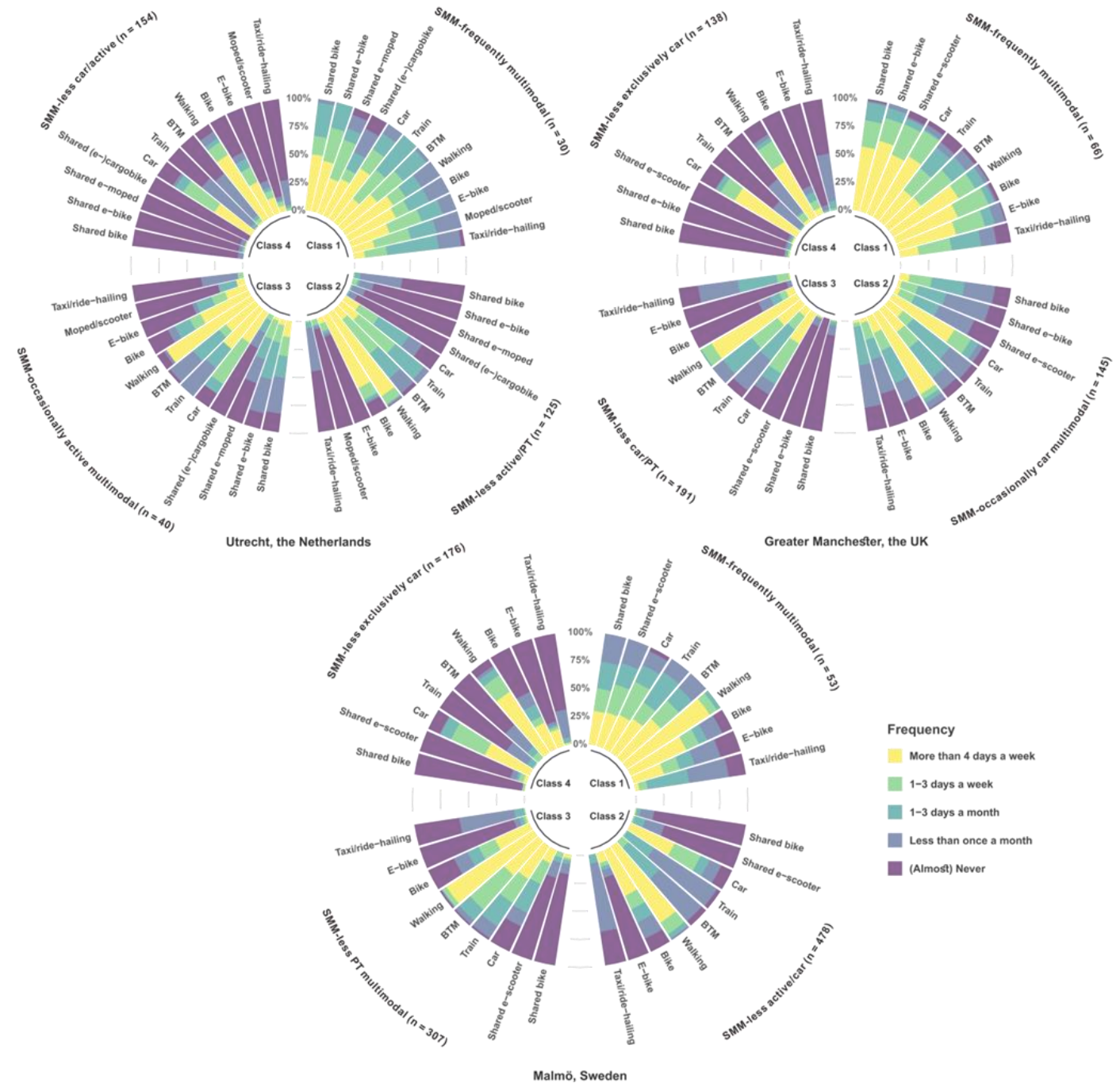
- Latent class cluster analysis based on use frequencies of
  - Shared bike
  - Shared e-bike
  - Shared e-moped
  - Shared e-cargo bike
  - Private car
  - Train
  - Bus/tram/metro
  - Private bike
  - Private E-bike
  - Walking
  - Private moped/scooter
  - Taxi/ride hailing





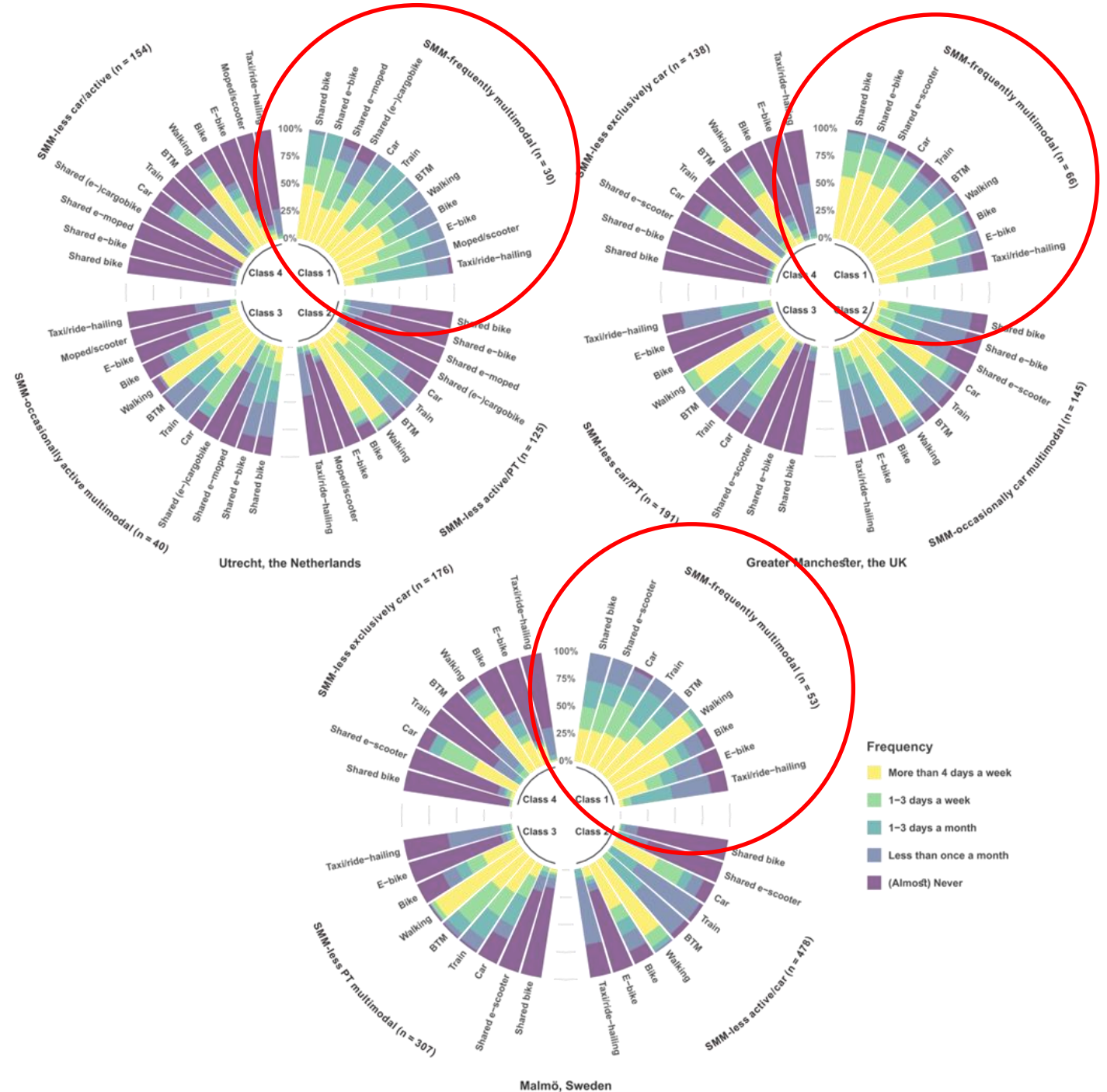
# Multi modal patterns including Shared Micro-Mobilities

- Work by Xingxing Fu – PhD candidate in Utrecht



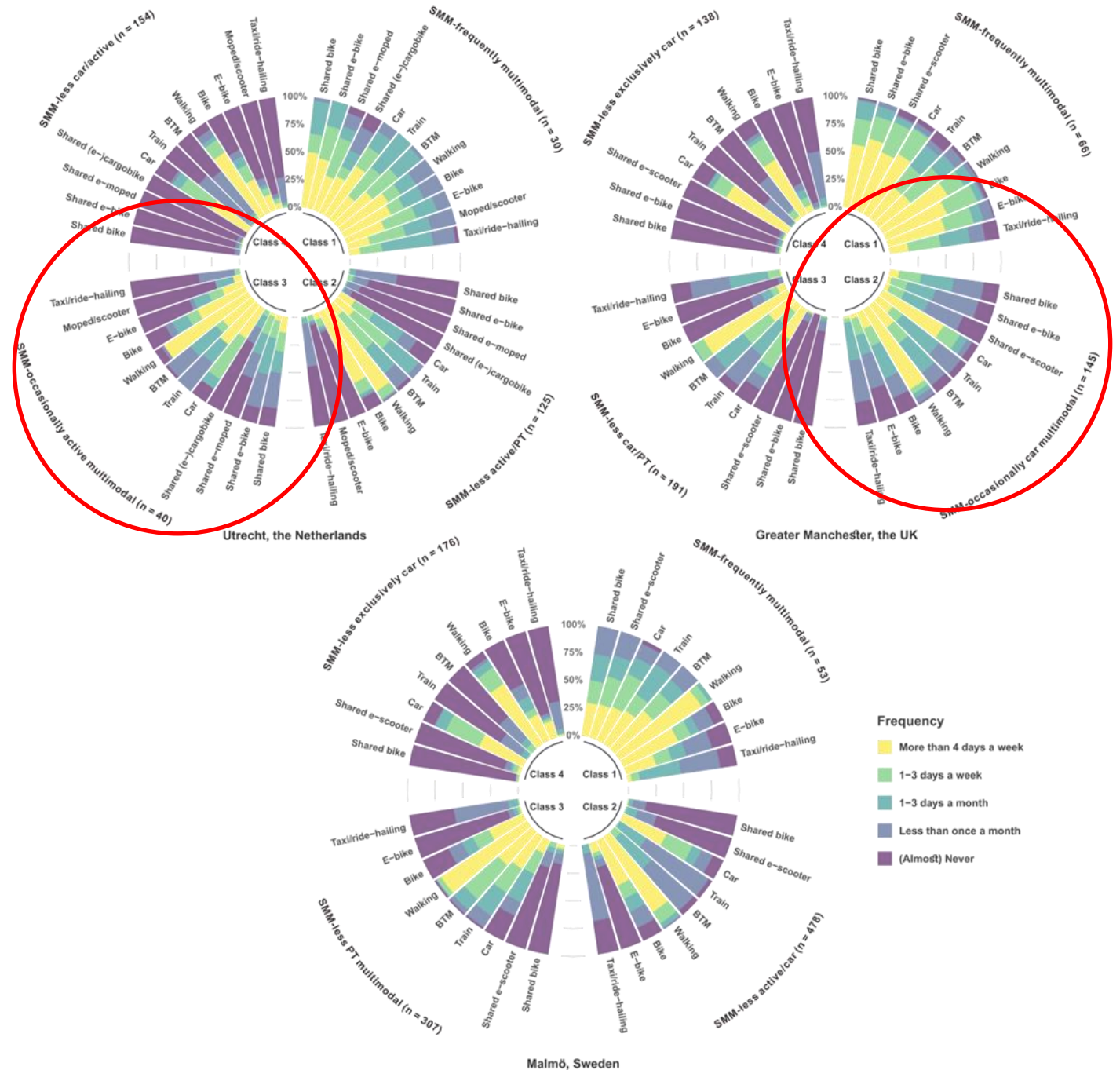
# Multi modal patterns including Shared Micro-Mobilities

- SMM-frequently multimodal group in each city:
- Utrecht 9% - male, <40, kids, employed, car, bike, PT card
- Manchester 12% - male, <30, med/high income, kids, employed, car, bike, PT card
- Malmö 5% - <40, med/high income, higher educated, employed, bike, PT card



# Multi modal patterns including Shared Micro-Mobilities

- SMM-occasional multimodal group in Utrecht and Manchester:
- **Utrecht 11%** – shared bike or e-bike + walking, own bike, PT, car
- male, <30, higher educated, student/part time, NO car, bike, PT card
- **Manchester 27%** – shared bike/e-bike/scooter + walking, car and a bit PT
- <30, med/high income, employed, sometimes car, bike, PT card



# Do SMM alleviate transport poverty/foster transport adequacy?

- Definition of transport poverty by Lucas et al. (2016):
- There is **no transport option available** that is suited to the **individual's physical condition and capabilities**.
- The existing transport options **do not reach destinations** where the individual can fulfil his/her daily activity needs. in order to maintain a reasonable quality of life.
- The necessary **weekly amount spent** on transport leaves the household with a residual income below the official poverty line.
- The individual needs to spend an excessive amount of **time** travelling, leading to time poverty or social isolation.
- The prevailing travel conditions are **dangerous, unsafe or unhealthy** for the individual.

# MobiMon transport adequacy scale (earlier work)

To what extent do you agree with the following statements? With the transportation options available to me...	Totally disagree			Totally agree	
	1	2	3	4	5
I am able to live my life as I want to	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There is always a transport option available to me at the times I need it	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can reach all my regular destinations and activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel safe while travelling to my regular destinations and activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can travel without negative consequences to my health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can travel in a way that is suited to my physical condition and abilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have to spend more money on necessary travel in a week than I can afford	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I spend much more time travelling than I'd like	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am concerned about road safety while travelling to my regular destinations and activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Other perceived accessibility/adequacy/poverty scales

	Delbosc & Currie (2010a)	Delbosc & Currie (2010b)	Lättman, Olsson & Friman (2018)	Singer & Martens (2023)	De Vos (2023)	Ettema, Geigenmüller, Van den Berg, Van Lierop (2023)
Availability of travel modes	•				•	•
Access to places	•					•
Spending too much time on travel	•			•		•
Having physical and mental skills	•				•	•
Feeling safe	•					•
Relying on others	•			•		
Cost of transport/spending too much	•			•		•
Difficulties/easy to engaging in activities		•	•			•
Foregoing activities		•		•		
Life as I want			•			•
Physical effort				•		
Comfort				•	•	
Motivation					•	



# Shared Micro-Mobilities (SMM) and Transport Adequacy

Table 1. Factor analysis result on perceived transport adequacy

Items	Mobility	Digital barrier	Accessibility	Travel cost	Healthy travel
There is always a transport option available to me at the times I need it	0.867				
I always have more than one transport options while travelling from home to my regular destinations & activities	0.857				
I can usually travel in a way that is suited to my physical condition & abilities	0.575		0.236		
I have difficulties using transport-related apps on smart phones		0.944			
I have difficulties getting information about available transport services		0.861			
I can easily reach my gym, team, place of worship, or (hobby) clubs in my ideal travel time			0.863		
I can easily reach healthcare facilities in my ideal travel time			0.846		
I can easily reach friends or relatives at their home in my ideal travel time			0.844		
I can easily reach the supermarket or local shopping areas in my ideal travel time			0.833		
I can easily reach my workplace (or place of education) in my ideal travel time			0.622		
I spend much more time travelling than I'd like				0.921	
I have to spend more money on necessary travel in a week than I can afford				0.781	
I feel tired or distressed while travelling to my regular destinations & activities				0.771	
I feel safe while travelling to my regular destinations & activities					0.936
I can travel without negative consequences to my health					0.795
<i>Cronbach's Alpha</i>	0.768	0.791	0.878	0.792	0.701



# Shared Micro-Mobilities (SMM) and Transport Adequacy

- Paper led by Xiaodong Guan
- Regression analyses
  - Dependent variables: transport adequacy factors (mobility, accessibility, travel costs, health & safety)
  - Explanatory variables: (frequent) use of SMM
  - Controlling for sociodemographics, location, vehicle access etc.
- Self reported effects of SMM use on accessibility and travel expenses

# Shared Micro-Mobilities (SMM) and Transport Adequacy

## Effect of SMM use on Transport Adequacy (regression models)

[illegible]

## Second study: Shared Micro-Mobilities (SMM) and Transport Adequacy

- Perceived change in accessibility and travel expenses

Variables	Degree of change	Utrecht (Netherlands)			Manchester (UK)			Malmö (Sweden)	
		Shared bike (N = 111)	Shared e-bike (N = 83)	Shared e-moped (N = 70)	Shared bike (N = 187)	Shared e-bike (N = 172)	Shared e-scooter (N = 166)	Shared bike (N = 162)	Shared e-scooter (N = 239)
<b>High-income group</b>		(N = 75)	(N = 58)	(N = 50)	(N = 118)	(N = 112)	(N = 102)	(N = 134)	(N = 200)
Perceived accessibility	Decreased	12.0%	10.3%	18.0%	21.2%	18.8%	17.6%	18.7%	17.0%
	No change	50.7%	56.9%	48.0%	42.4%	38.4%	42.2%	53.7%	51.0%
	Increased	37.3%	32.7%	34.0%	36.4%	42.9%	40.2%	27.6%	32.0%
Travel expense	Decreased	20.0%	17.2%	14.0%	39.0%	28.6%	29.4%	26.9%	16.0%
	No change	48.0%	46.6%	44.0%	37.3%	47.3%	47.1%	55.2%	60.0%
	Increased	32.0%	36.2%	40.0%	23.7%	24.1%	23.5%	17.9%	24.0%
<b>Low-income group</b>		(N = 36)	(N = 25)	(N = 20)	(N = 69)	(N = 60)	(N = 64)	(N = 28)	(N = 39)
Perceived accessibility	Decreased	5.6%	4.0%	10.0%	17.4%	25.0%	14.1%	21.4%	10.3%
	No change	38.9%	36.0%	45.0%	49.3%	36.7%	60.9%	42.9%	56.4%
	Increased	55.6%	60.0%	45.0%	33.3%	38.3%	25.0%	35.7%	33.3%
Travel expense	Decreased	25.0%	28.0%	10.0%	8.7%	38.3%	43.8%	39.3%	15.4%
	No change	44.4%	36.0%	50.0%	52.2%	40.0%	40.6%	46.4%	64.1%
	Increased	30.6%	36.0%	40.0%	39.1%	21.7%	15.6%	14.3%	20.5%

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	<i>No change</i>	44.4%	36.0%	50.0%	52.2%	40.0%	40.6%	46.4%	64.1%
	<i>Increased</i>	30.6%	36.0%	40.0%	39.1%	21.7%	15.6%	14.3%	20.5%

# Conclusions

- SMMs are combined with each other and with other travel modes, but to varying degrees by different segments
- SMM-rich travel patterns more displayed by younger, male, working, higher income travellers with a car, bike and PT card, but also occasional SMM patterns by no or low car groups
- SMM use leads to improved accessibility and mobility options but also higher costs, but different per SMM type and city. The effects seem to be stronger for low income travellers.



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