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How mode choice in an urban setting is influenced by environmentalism and variety seeking of decision-makers

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Motivation & Objectives

- Attitudes and perceptions play a major role in people's travel behaviour
- Measuring attitudes using psychometric scales and integrate them into choice models using the latent variables
- Several researchers already found that the attitude towards the environment influences mode choice
- We investigate also the role of variety seeking

Survey Design

- Paper and pen survey
- 222 respondents living in the canton of Zurich
- person and household characteristics
- 1-day travel diary (Tuesday, Wednesday or Thursday)
- 3 psychometric scales
  - Environmentalism
  - Variety seeking
  - Risk propensity

Questionnaire example - environmentalism

Einstellung zum Umweltschutz

	Trifft nicht zu				Trifft voll zu
Ich mache mir Sorgen um unsere Umwelt.	☐	☐	☐	☐	☐
Es ist eine gute Investition, Steuergelder für den ÖV einzusetzen.	☐	☐	☐	☐	☐
Fahrzeugabgase erhöhen die Gesundheitskosten.	☐	☐	☐	☐	☐
Damit die Menschen ihr Verhalten ändern, muss die Regierung mit gutem Beispiel vorangehen.	☐	☐	☐	☐	☐
Die potentiellen Gefahren des Treibhauseffektes werden in der öffentlichen Diskussion übertrieben dargestellt.	☐	☐	☐	☐	☐
Menschen, die sich nicht um Umweltschutz kümmern, drücken sich vor ihrer Verantwortung.	☐	☐	☐	☐	☐
Wir sollten Treibstoffpreise erhöhen um Staus und Luftverschmutzung zu reduzieren.	☐	☐	☐	☐	☐
Strengere Abgasnormen sollten eingeführt und durchgesetzt werden.	☐	☐	☐	☐	☐
Umweltschutz beginnt bei mir.	☐	☐	☐	☐	☐
Arbeitsplätze sind wichtiger als Umweltschutz.	☐	☐	☐	☐	☐
Umweltverschmutzung beeinträchtigt die Gesundheit.	☐	☐	☐	☐	☐
Umweltschutz kostet zu viel.	☐	☐	☐	☐	☐
Umweltschutz ist gut für die Wirtschaft.	☐	☐	☐	☐	☐

Topics covered by the psychometric scales

Environmentalism (25 questions)

General concern about the environment, awareness of consequences for myself, others and the biosphere, evaluation of measures for environmental protection

Variety seeking (28 questions)

In daily routine, shopping and eating, leasure activities, travelling

Risk propensity (49 questions)

Social, ethical, recreational, health/safety, financial and travel related risks

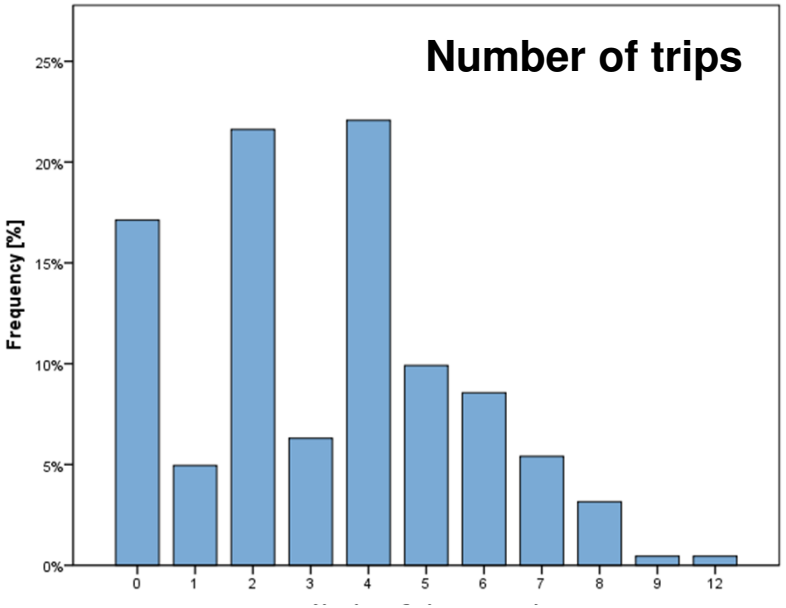
Socio-demographics of the respondents (1)

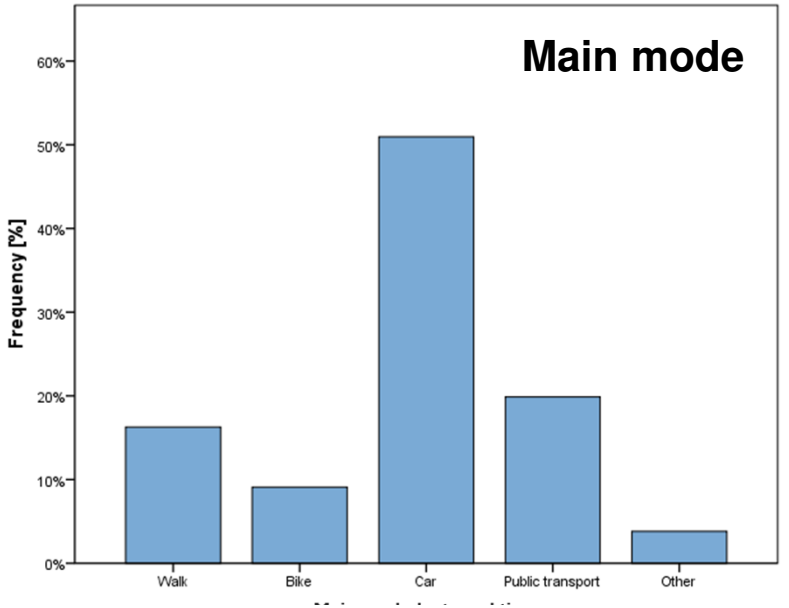
Attributes		**Survey [%]**	**MZ 2005 [%]**
Gender	Male	48.6	48.8
	Female	51.4	51.2
Age	< 25	0.0	20.3
	25-34	10.4	15.5
	35-44	19.4	18.3
	45-54	25.2	15.1
	55-64	27.5	13.5
	>= 65	16.7	17.2
Household income [CHF/month]	< 4‘000	6.3	11.1
	4‘000 - 8‘000	38.7	46.8
	8‘000 - 12‘000	23.9	21.5
	12‘000 - 16‘000	17.6	7.0
	>= 16‘000	10.8	4.1

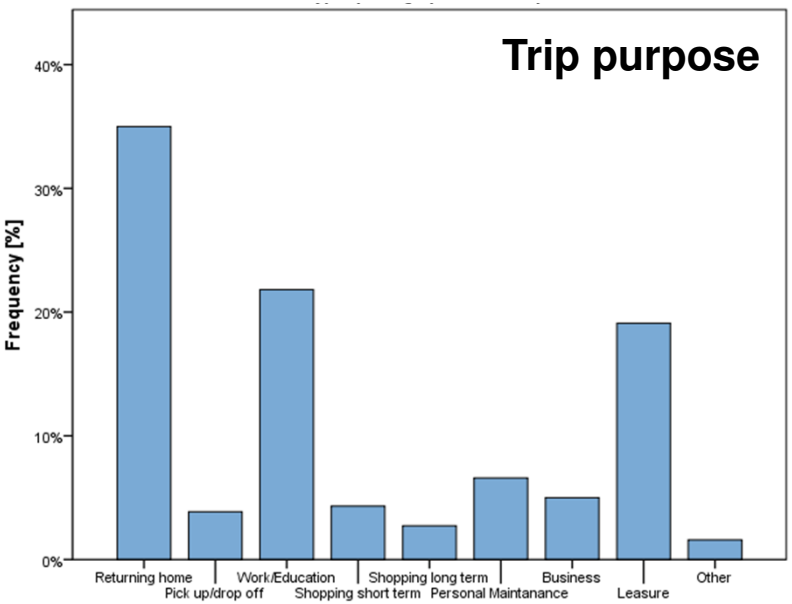
Socio-demographics of the respondents (2)

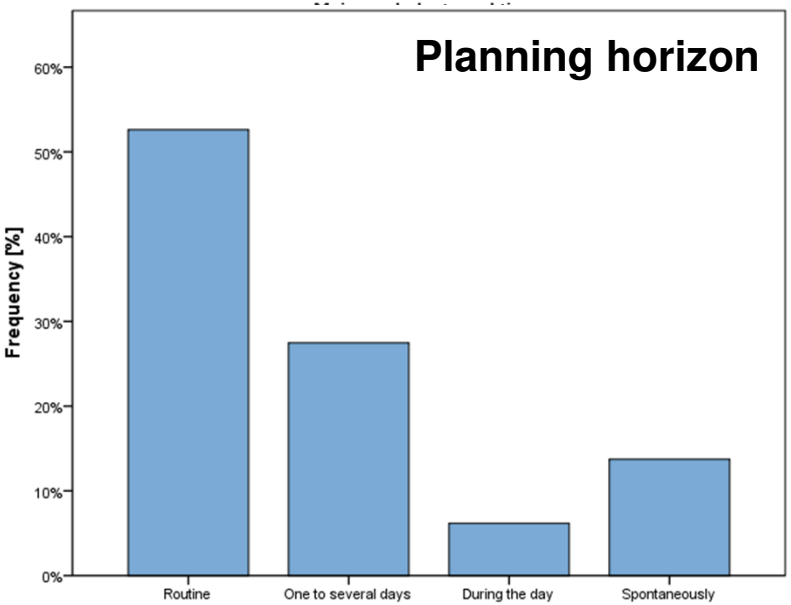
Attributes		**Survey [%]**	**MZ 2005 [%]**
Education	None	1.4	2.6
	Obligatory School	3.2	12.9
	Matur	5.4	7.0
	Apprentice	38.7	49.1
	Prof. diploma	10.8	9.7
	Uni of applied sc.	24.3	7.0
	University	16.2	11.7
Number of cars in household	0	21.6	18.8
	1	46.8	50.6
	2	25.2	25.1
	3	3.6	4.1
	>= 4	2.8	1.3
Bike available	Yes	86.0	70.6
	No	14.0	29.4

Diary analysis









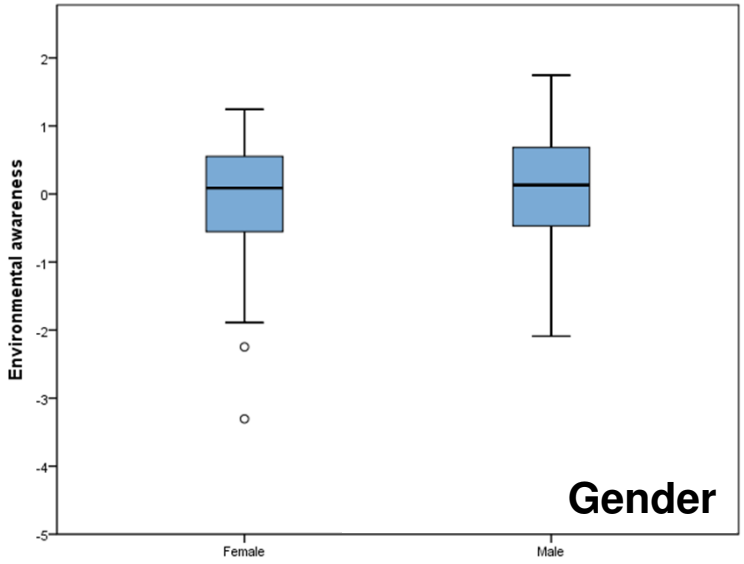
Factor analysis - Environmentalism

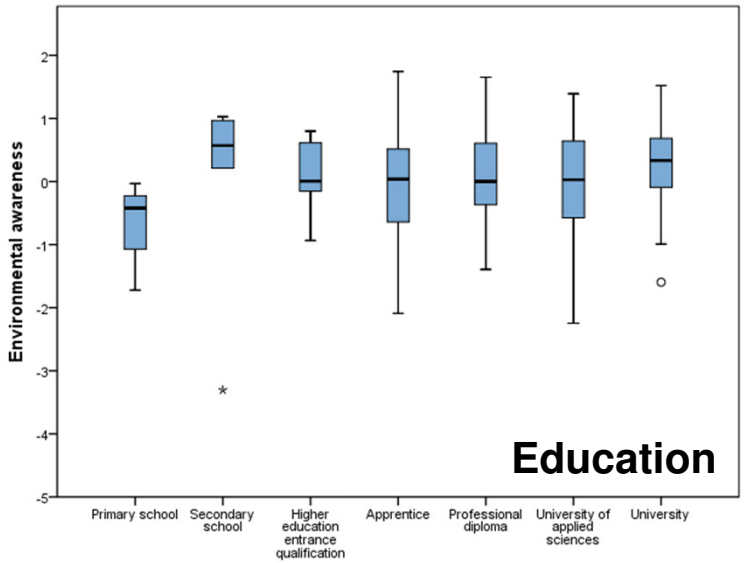
Question		F 1	F 2	F 3
E2	Too much attention is paid to environmental problems		**0.77**	
E3	Environmental problems are exaggerated		**0.72**	
E4	The attention for the greenhouse effect is exaggerated		**0.70**	
E6	Environmental pollution affects my health	**0.65**		
E7	Environmental problems have consequences for my life	**0.52**		
E9	Env. prob. are a risk for the future of my children	0.44		
E10	Saving threatened species is unnecessary luxury			-0.40
E11	We should care for our env. because we depend on it	0.50		
E12	Vehicle emissions increase the need for health care	**0.54**		
E13	A better environment starts with myself	0.48		
E15	Behav. change requires more env. friendly products			0.69
E16	Behav. change requires an example by the government			0.43
E18	Environmental protection costs too much		0.46	
E19	Environmental protection is good for the economy	0.42		
E20	Jobs are more important than the environment	-0.43		
E21	Stricter veh. smog control should be enforced	**0.54**		
E22	The price of gas should be raised to reduce pollution	**0.51**		
E24	There should be incentives for using electric vehicles			0.54
E25	Who causes environmental damage should pay to repair it	0.51		

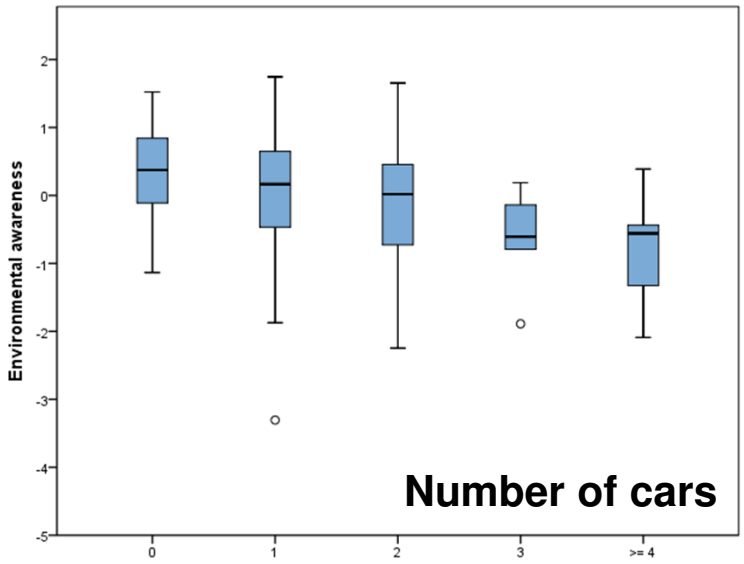
Factor analysis – Variety seeking

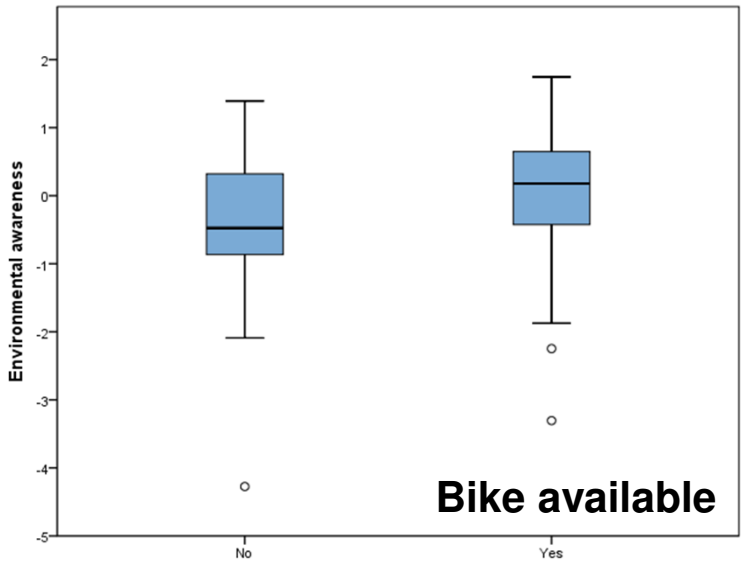
Question		F 1	F 2	F 3
V1	I like to experience novelty and change in my daily life			0.44
V2	I sometimes look for ways to change my daily routine		0.65	
V3	I like to have lots of activity around me	0.41		
V4	I prefer a clearly structured, repetitive daily schedule		**-0.49**	
V5	Rituals give me a feeling of control and security		**-0.44**	
V6	I love surprises			0.63
V8	Shops with exotic herbs and fragrances fascinate me	0.66		
V9	When eating out I like to try the most unusual items	0.41		
V15	I like to explore unknown towns or parts of my town	0.67		
V19	Cultures completely different from my own fascinate me	0.53		
V21	I always keep an open door for surprise visitors			0.41
V23	I like to explore new places	0.73		
V24	I like to try new routes to familiar destinations		**0.62**	
V25	I sometimes take a longer route to see something new		**0.48**	
V26	I like to drive around just for the fun of it		0.49	
V27	When commuting I always take the same route		**-0.46**	
V28	I like to meet new people while travelling by train			0.41

Socio-econ. profile - awareness for environmental issues

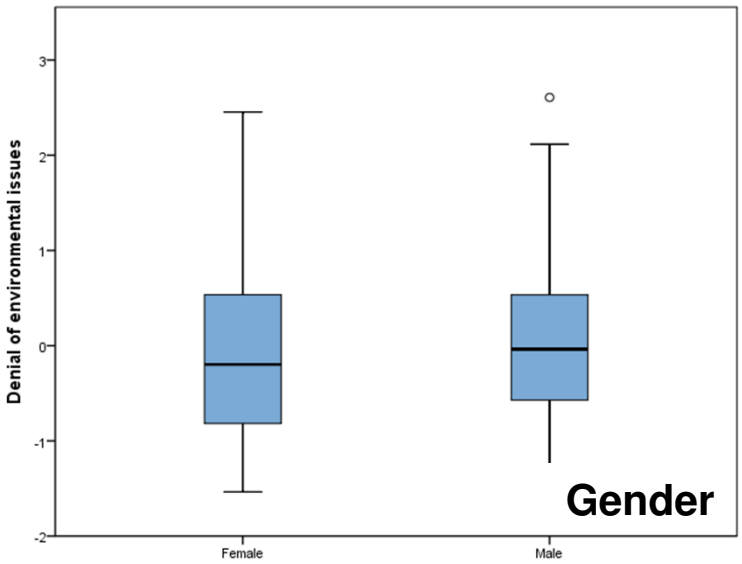


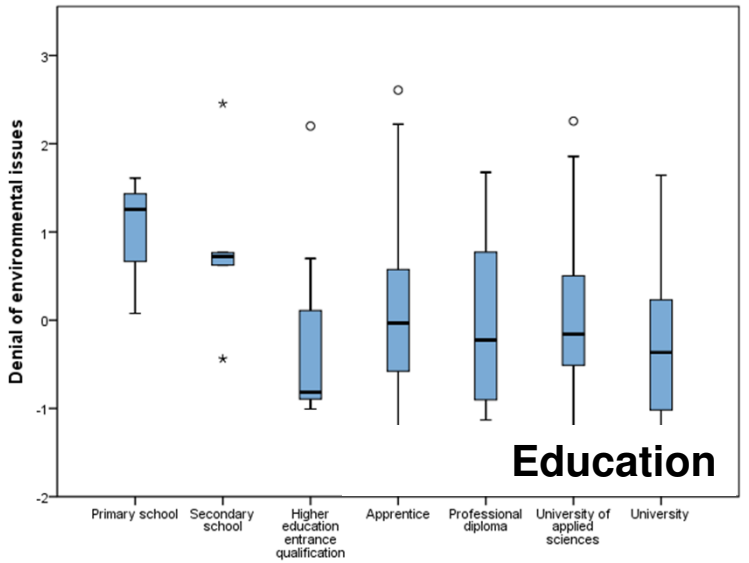


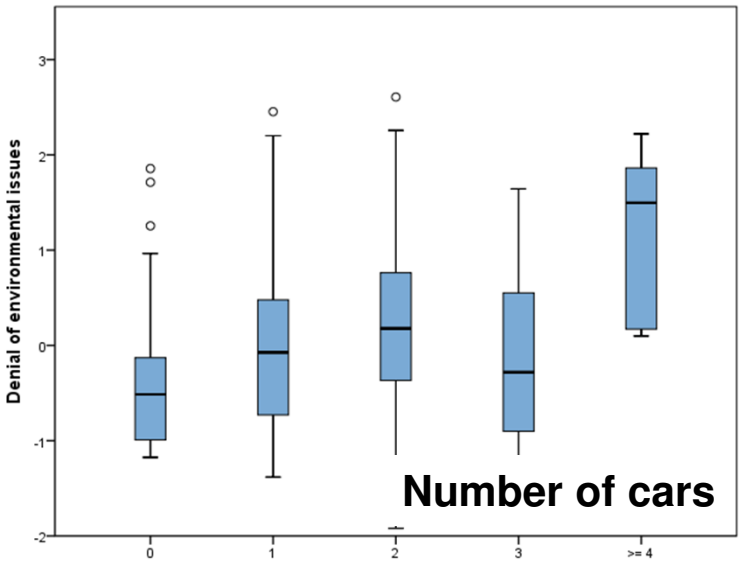


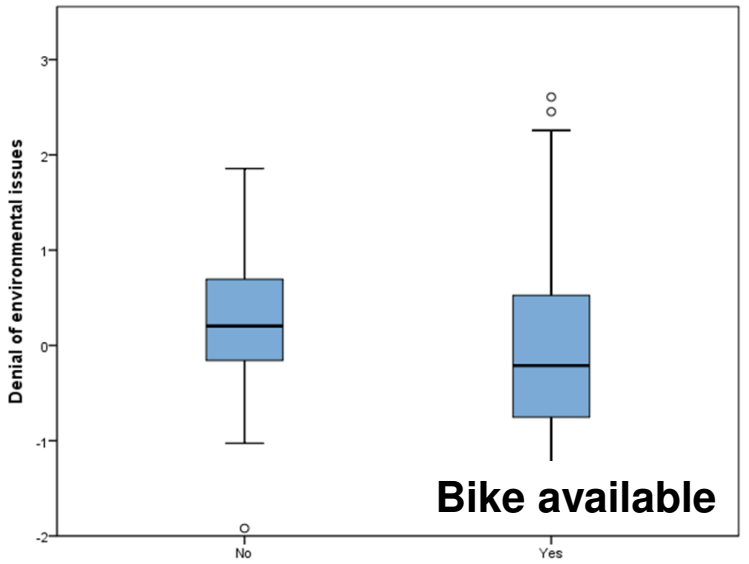


Socio-econ. profile - denial for environmental issues

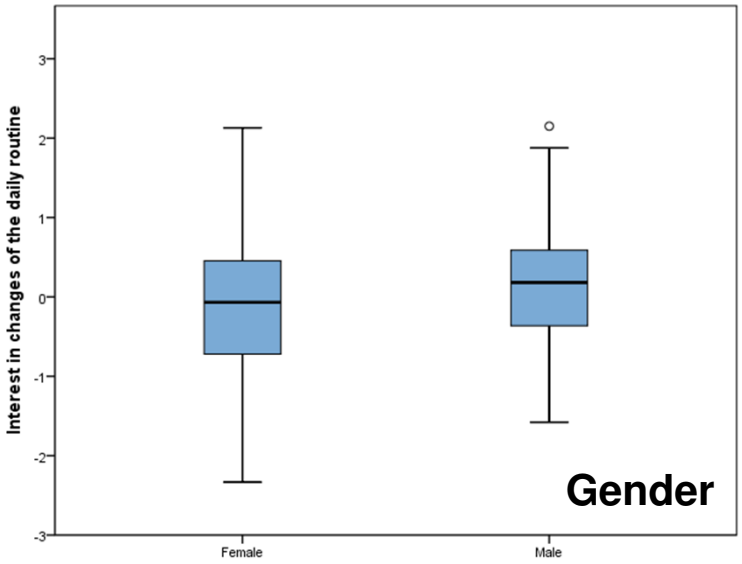


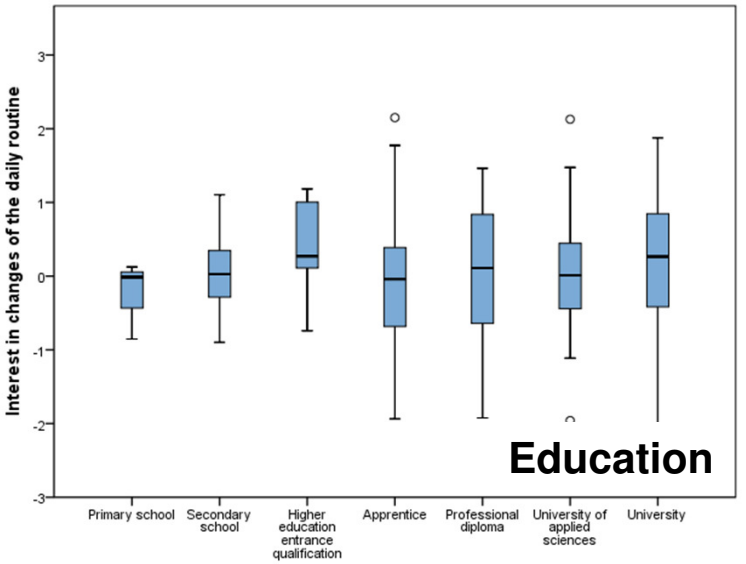


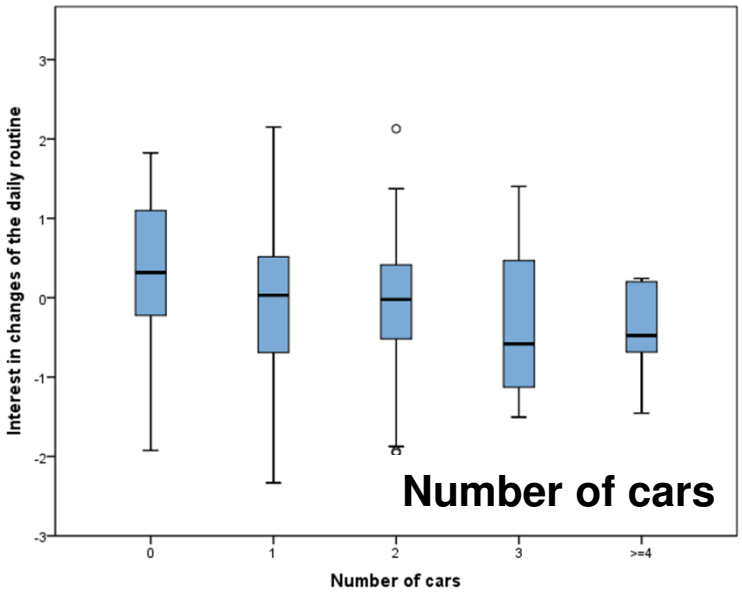


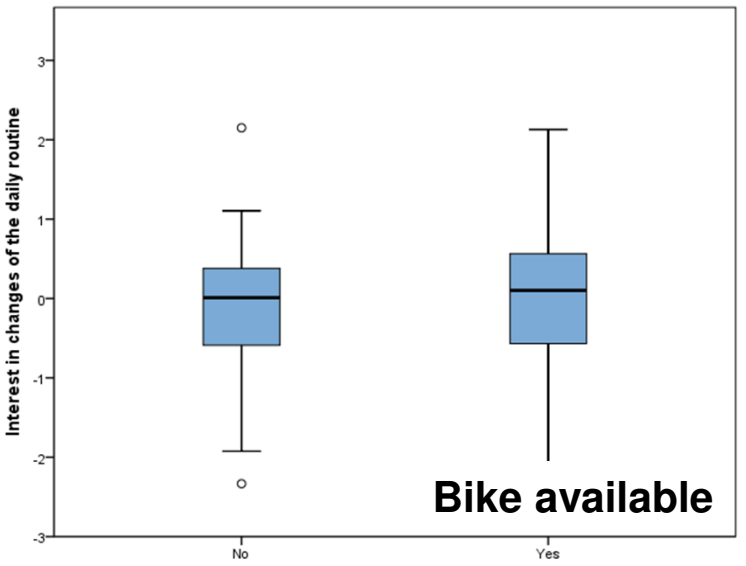


Socio-econ. profile – liking changes in daily routine









Model formulation

MNL base model

$$U_{in} = V_{in} + \varepsilon_{in} = f(\beta, X_{in}) + \varepsilon_{in}$$

Measurement model

$$I_j = a_j + \alpha_j Att + \upsilon_j$$

Structural model

$$Att = \overline{Att} + \sum_l \lambda_l * x_l + \omega$$

Modelling results - denial for environmental issues

Variable	Parameter	(t-test)
ASC_{Car}	5.63	(3.26)
β_{ttCar}	-4.48	(-4.18)
$\beta_{accttPT}$	-4.93	(-2.57)
$\beta_{systtPT}$	-1.00	(-0.91)
$\beta_{transfPT}$	-0.59	(-3.33)
$\beta_{planningHorizon}$	0.15	(2.16)
$\beta_{envAwareness}$	1.29	(3.44)
$\lambda_{ownsBike}$	0.33	(4.42)
$\lambda_{nofCars}$	-0.15	(-5.70)
Mean(EnvAwareness)	4.40	(58.76)
θ_{ω}	0.40	(10.31)
a_{E7}	-2.43	(-3.10)
a_{E12}	-4.19	(-4.85)
a_{E21}	-4.43	(-4.53)
a_{E22}	-5.67	(-4.94)
α_{E7}	1.42	(8.11)
α_{E12}	1.74	(9.01)
α_{E21}	1.84	(8.43)
α_{E22}	1.99	(7.76)
θ_{vE6}	-0.39	(-9.58)
θ_{vE21}	-0.22	(-4.18)
θ_{vE22}	0.11	(2.46)

Modelling results - denial for environmental issues

Variable	Parameter	(t-test)
ASC_{Car}	-1.34	(-2.76)
β_{ttCar}	-4.39	(-4.08)
$\beta_{accttPT}$	-4.98	(-2.70)
$\beta_{systtPT}$	-1.19	(-1.09)
$\beta_{transfPT}$	-0.56	(-3.20)
$\beta_{planningHorizon}$	0.32	(2.21)
$\beta_{envDeny}$	0.56	(3.55)
$\lambda_{nofCars}$	0.33	(7.78)
λ_{lowEdu}	1.15	(4.32)
Mean(EnvDeny)	4.40	(20.58)
θ_{ω}	0.40	(19.22)
a_{E3}	-0.12	(-0.89)
a_{E4}	0.17	(1.22)
α_{E3}	1.20	(18.69)
α_{E4}	1.15	(17.74)
θ_{vE2}	-0.51	(-9.99)
θ_{vE3}	-0.60	(-8.49)
θ_{vE4}	-0.30	(-6.46)

Modelling results – disliking changes in daily routine

Variable	Parameter	(t-test)
ASC_{Car}	-2.20	(-2.99)
β_{ttCar}	-4.84	(-4.40)
$\beta_{accttPT}$	-4.98	(-2.67)
$\beta_{systtPT}$	-1.57	(-1.46)
$\beta_{transfPT}$	-0.52	(-3.00)
$\beta_{planningHorizon}$	0.30	(2.15)
$\beta_{routine}$	0.77	(3.15)
$\lambda_{nofCars}$	0.15	(4.29)
Λ_{female}	0.31	(4.33)
Mean(Routine)	2.33	(28.10)
θ_{ω}	-0.58	(-9.70)
a_{V5}	0.58	(1.82)
a_{V24}	7.42	(13.67)
a_{V25}	6.28	(15.32)
a_{V27}	1.85	(5.27)
α_{V5}	0.95	(8.28)
α_{V24}	-1.61	(-8.09)
α_{V25}	-1.13	(-7.55)
α_{V27}	0.72	(5.65)
θ_{vV5}	-0.11	(-2.66)
θ_{vV24}	-0.11	(-1.77)
θ_{vV27}	0.19	(5.14)

Conclusions

- As expected, awareness of environmental problems increases the probability of choosing public transport while denial of environmental issues decreases it
- People searching for variety in their daily routine also have a stronger inclination towards public transport
- Short planning horizons, however, decrease public transport usage

Outlook

- Use scales in a bigger sample and with GPS diaries
- Combine different attitudes
- Investigate the influence of risk propensity
- Model the influence of these attitudes on car route choice and public transport connection choice