

## Preferred citation style

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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

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- 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

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- 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

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## Einstellung zum Umweltschutz

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

## Topics covered by the psychometric scales

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### **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, leisure activities, travelling

### **Risk propensity** (49 questions)

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

## Socio-demographics of the respondents (1)

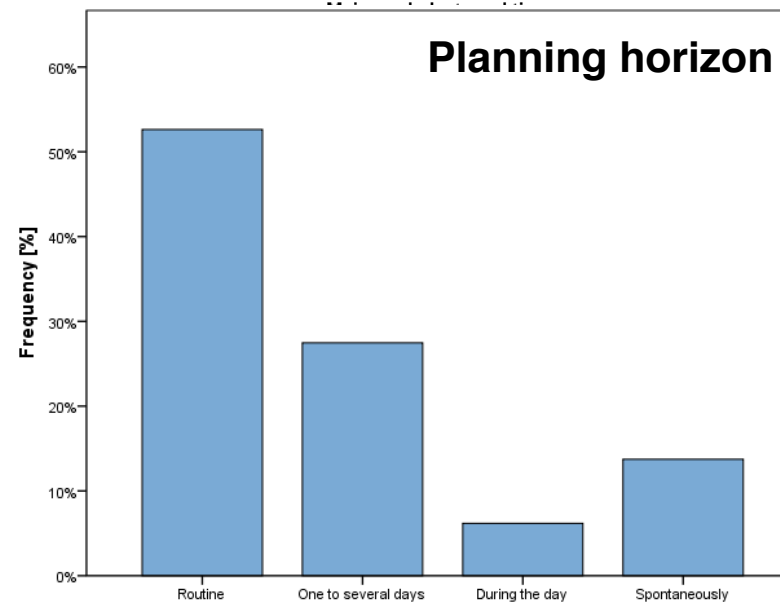
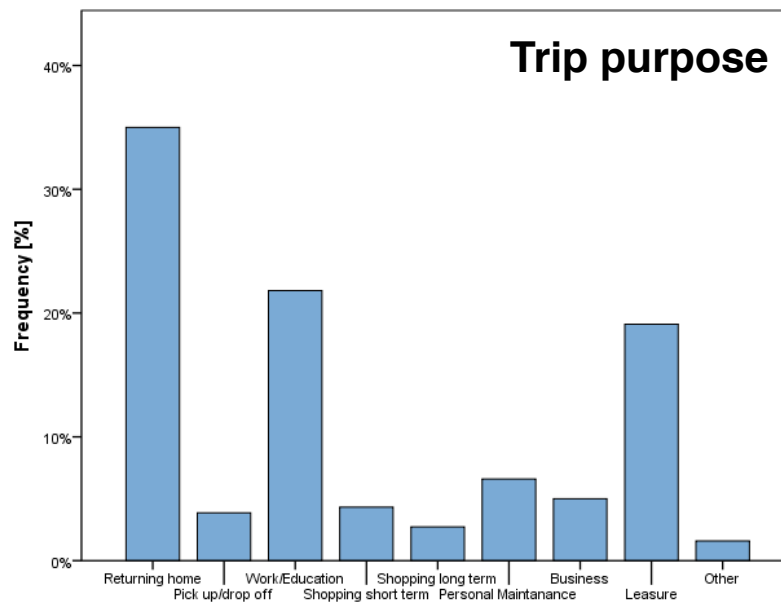
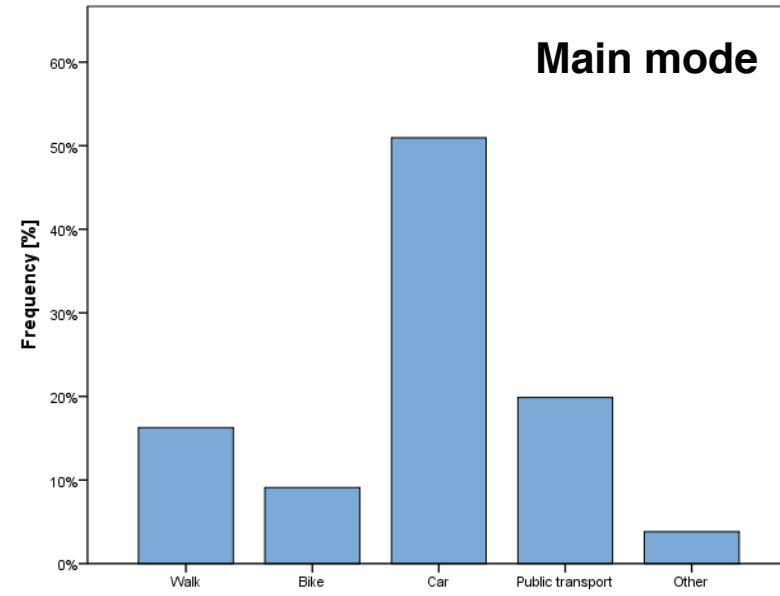
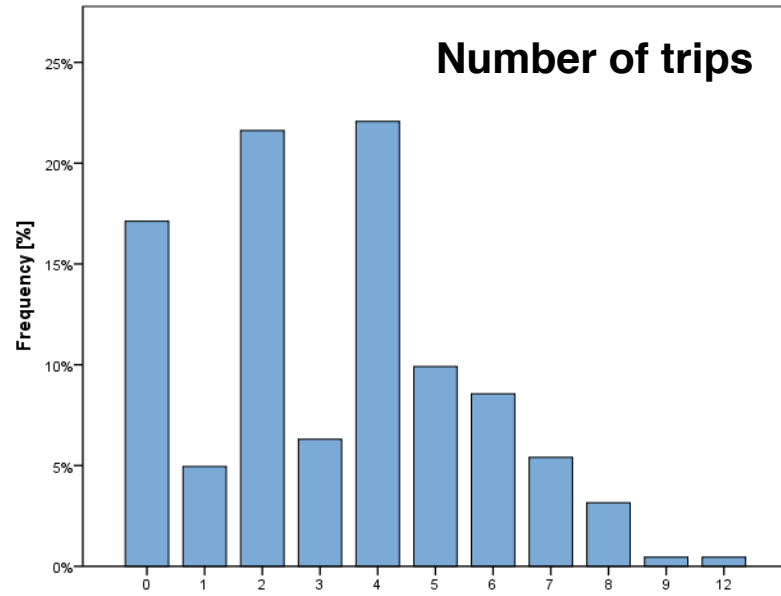
<b>Attributes</b>		<b>Survey [%]</b>	<b>MZ 2005 [%]</b>
Gender	Male	48.6	48.8
	Female	51.4	51.2
Age	< 25	0.0	20.3
	25-34	10.4	15.5
	35-44	19.4	18.3
	45-54	25.2	15.1
	55-64	27.5	13.5
	>= 65	16.7	17.2
Household income [CHF/month]	< 4'000	6.3	11.1
	4'000 - 8'000	38.7	46.8
	8'000 - 12'000	23.9	21.5
	12'000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

## Socio-demographics of the respondents (2)

<b>Attributes</b>		<b>Survey [%]</b>	<b>MZ 2005 [%]</b>
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



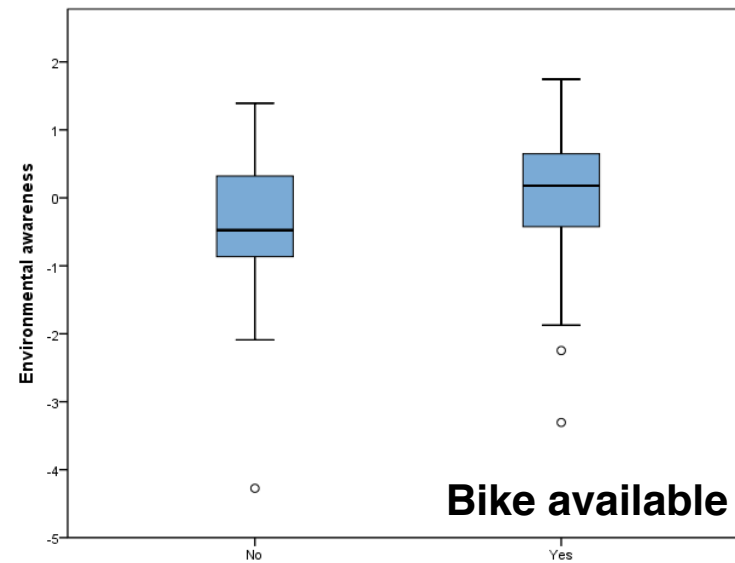
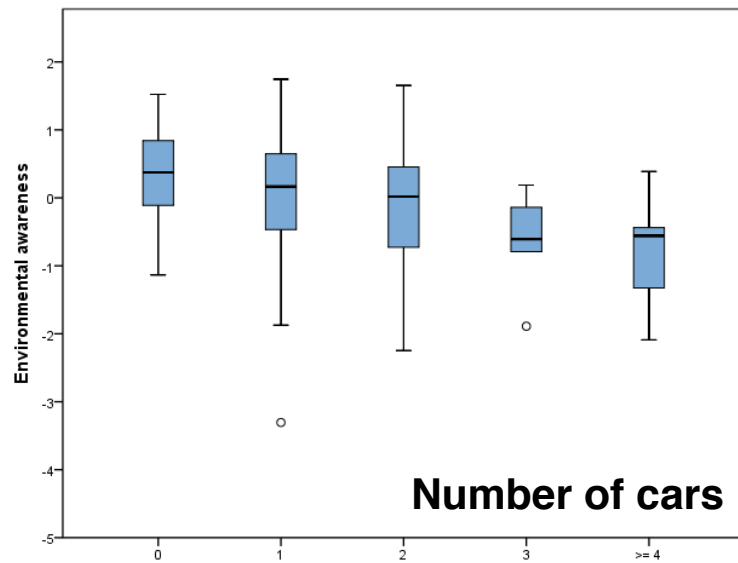
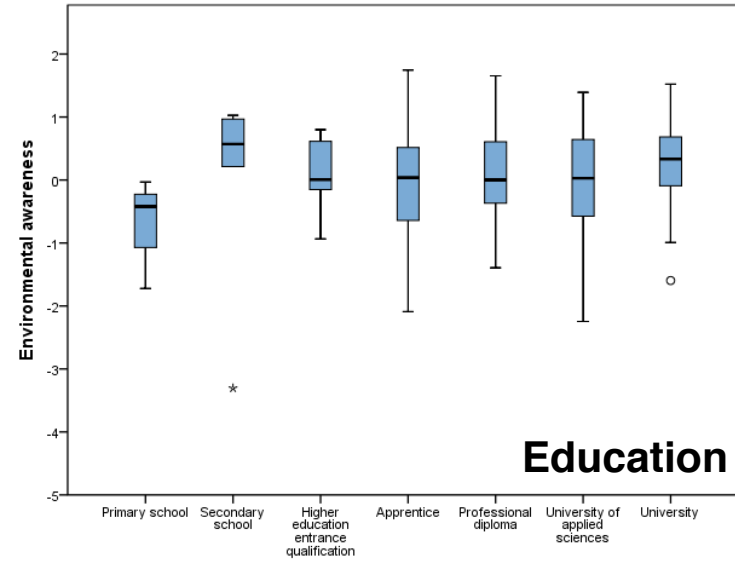
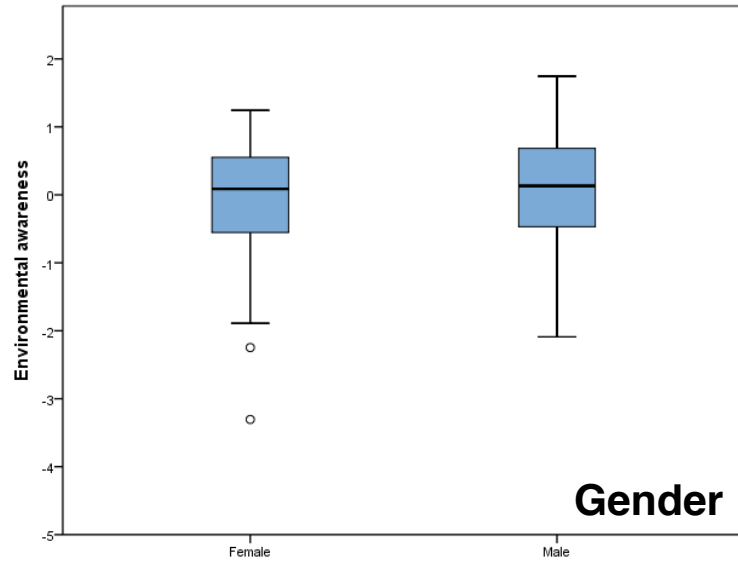
## Factor analysis - Environmentalism

Question	F 1	F 2	F 3
E2		<b>0.77</b>	
E3		<b>0.72</b>	
E4		<b>0.70</b>	
E6	<b>0.65</b>		
E7	<b>0.52</b>		
E9	0.44		
E10			-0.40
E11	0.50		
E12	<b>0.54</b>		
E13	0.48		
E15			0.69
E16			0.43
E18		0.46	
E19	0.42		
E20	-0.43		
E21	<b>0.54</b>		
E22	<b>0.51</b>		
E24			0.54
E25	0.51		

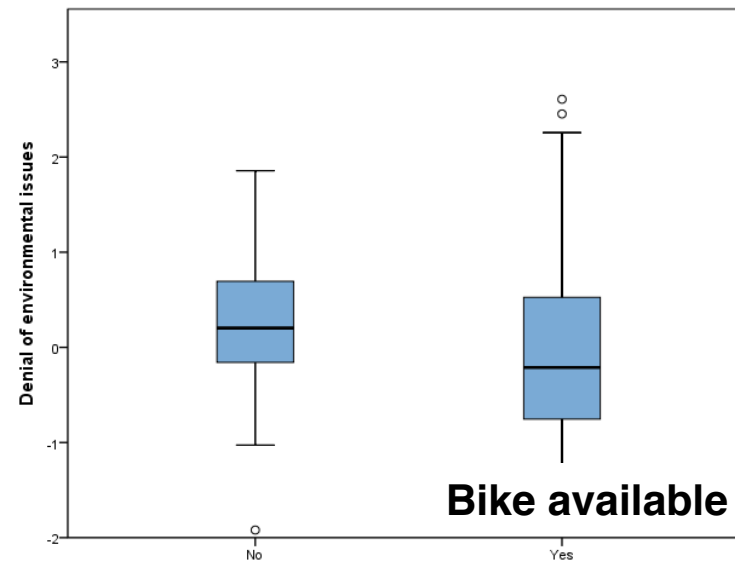
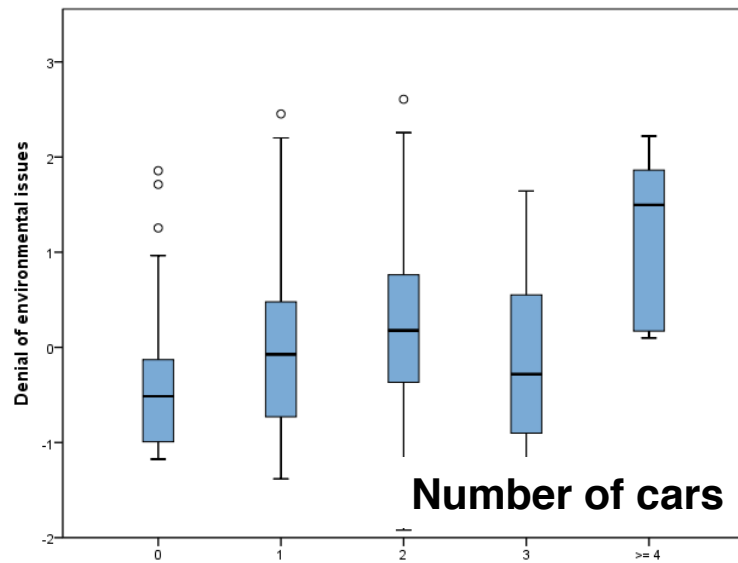
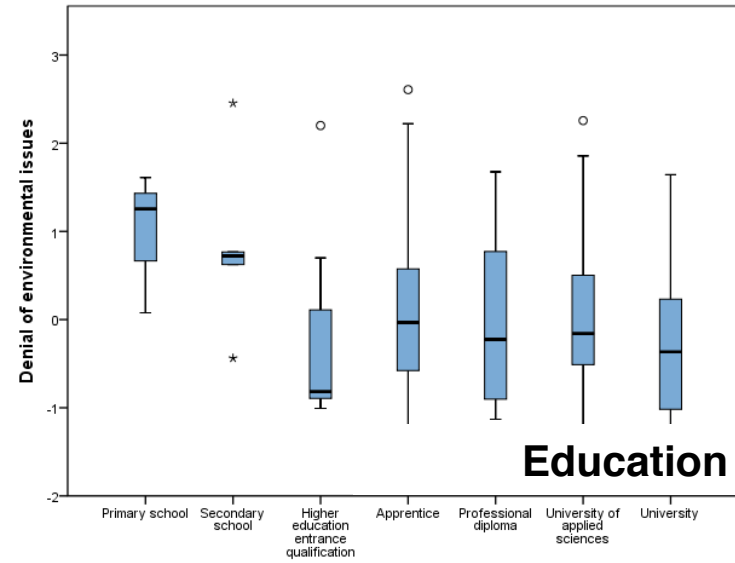
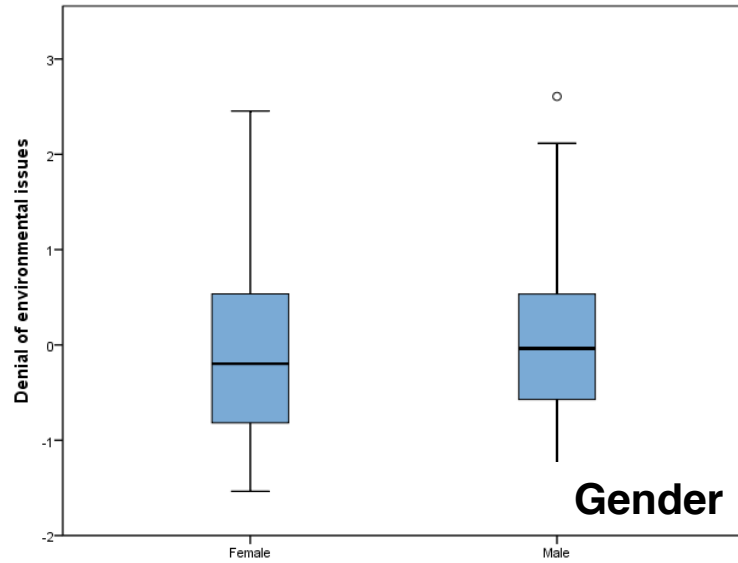
## Factor analysis – Variety seeking

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		<b>-0.49</b>	
V5 Rituals give me a feeling of control and security		<b>-0.44</b>	
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 placest	0.73		
V24 I like to try new routes to familiar destinations		<b>0.62</b>	
V25 I sometimes take a longer route to see something new		<b>0.48</b>	
V26 I like to drive around just for the fun of it		0.49	
V27 When commuting I always take the same route		<b>-0.46</b>	
V28 I like to meet new people while travelling by train			0.41

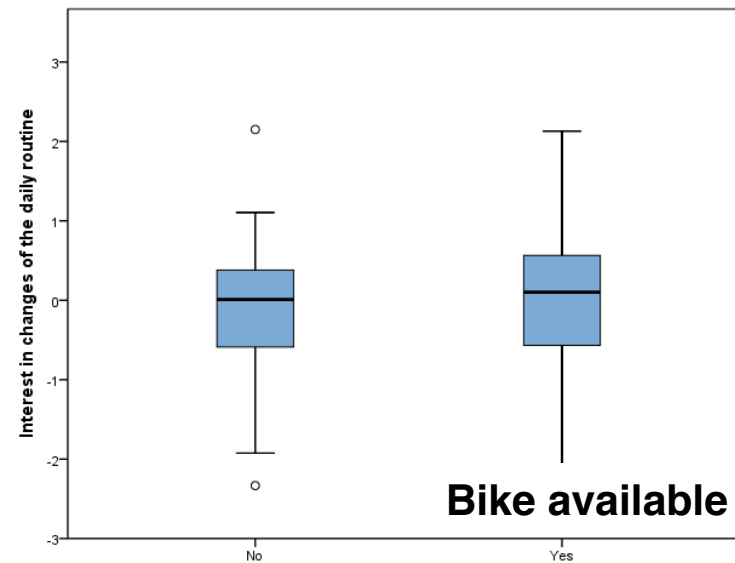
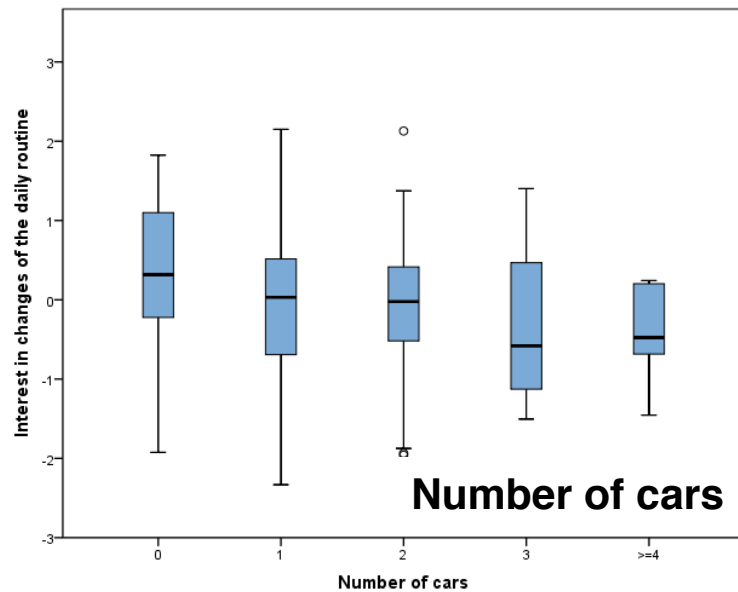
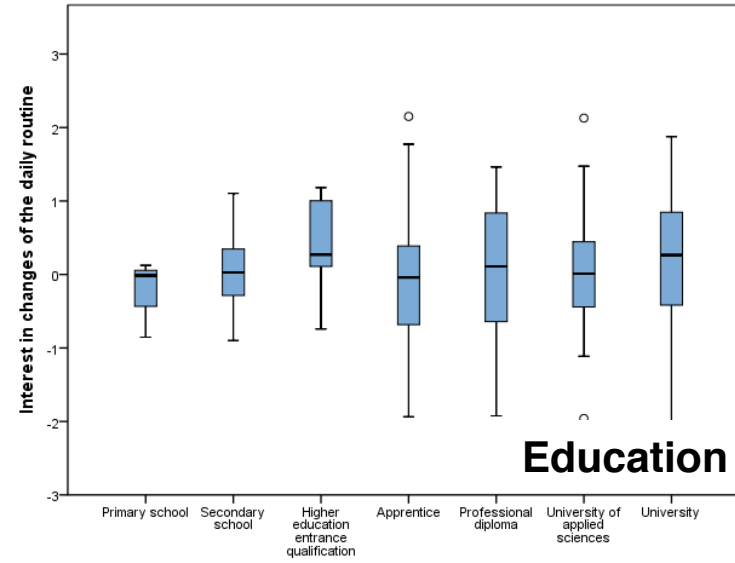
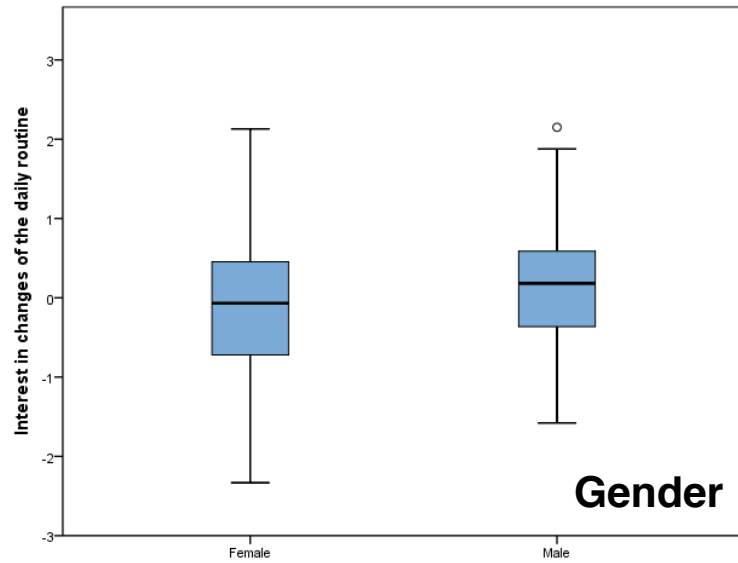
# Socio-econ. profile - awareness for environmental issues



# Socio-econ. profile - denial for environmental issues



# Socio-econ. profile – liking changes in daily routine



## Model formulation

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MNL base model

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

Measurement model

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

Structural model

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

## Modelling results - denial for environmental issues

<b>Variable</b>	<b>Parameter</b>	<b>(t-test)</b>
$ASC_{Car}$	5.63	(3.26)
$\beta_{ttCar}$	-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)
$\theta_{\omega}$	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)
$\alpha_{E7}$	1.42	(8.11)
$\alpha_{E12}$	1.74	(9.01)
$\alpha_{E21}$	1.84	(8.43)
$\alpha_{E22}$	1.99	(7.76)
$\theta_{vE6}$	-0.39	(-9.58)
$\theta_{vE21}$	-0.22	(-4.18)
$\theta_{vE22}$	0.11	(2.46)



# Modelling results - denial for environmental issues

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Variable	Parameter	(t-test)
$ASC_{Car}$	-1.34	(-2.76)
$\beta_{ttCar}$	-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)
$\lambda_{lowEdu}$	-0.15	(4.32)
Mean(EnvDeny)	4.40	(20.58)
$\theta_{\omega}$	0.40	(19.22)
$a_{E3}$	-0.12	(-0.89)
$a_{E4}$	0.17	(1.22)
$\alpha_{E3}$	1.20	(18.69)
$\alpha_{E4}$	1.15	(17.74)
$\theta_{vE2}$	-0.51	(-9.99)
$\theta_{vE3}$	-0.60	(-8.49)
$\theta_{vE4}$	-0.30	(-6.46)

## Modelling results - liking changes in daily routine

<b>Variable</b>	<b>Parameter</b>	<b>(t-test)</b>
$ASC_{Car}$	-2.20	(-2.99)
$\beta_{ttCar}$	-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)
$\lambda_{female}$	0.31	(4.33)
Mean(Routine)	2.33	(28.10)
$\theta_{\omega}$	-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)
$\alpha_{V5}$	0.95	(8.28)
$\alpha_{V24}$	-1.61	(-8.09)
$\alpha_{V25}$	-1.13	(-7.55)
$\alpha_{V27}$	0.72	(5.65)
$\theta_{VV5}$	-0.11	(-2.66)
$\theta_{VV24}$	-0.11	(-1.77)
$\theta_{VV27}$	0.19	(5.14)

## Conclusions

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- 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

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- 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