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A choice experiment approach to analyzing preferences for Flood Risk Reduction; the case of the Gothenburg region

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Motivation and objective

Climate change -> increased flood risk

The Gothenburg region

- already flood prone
- flood risks are expected to increase more than the national average (precipitation 30%, water discharge 60% and sea level rise 80cm)

➢ Decreasing water quality and possible drinking water supply shortages.

➢ Increased property damage

➢ Increased traffic disturbances

For policy makers to make efficient investment decisions and prioritization knowledge about the general publics' valuation and preferences for flood risk reduction is needed.

This paper addresses this issue by conducting a choice experiment which elicits public preferences for reducing the negative effects of floods in relation to water quality, damaged property, and traffic disturbances, in the Gothenburg region.

Contribution

- This study will focus on the outcome of flood risk reduction rather than preferences for a specific policy program.
- This paper also includes information on personality traits; our personality influence the way we humans behave, and may thus affect our preferences for flood risks.

The questionnaire

- Three parts
- The first part includes questions about the respondents' knowledge and experience of floods, and attitude towards flood risk.
- The second part contains the choice experiment.
- The third part consists of questions regarding the respondent´s socioeconomic status, and personality.

The questionnaire

- Respondents were provided with information on the consequences of flood risk in the region today, and in the future (in 20 years' time)
- The respondents were informed that it is possible to reduce the negative consequences of floods, but it implies costs which can be financed through an annual fee paid for 10 years by all households in the region to the municipalities.
- The respondents were then presented with eight choice sets.

Choice set 1
Which of the following alternatives, A, B or C do you prefer? The alternatives describe a situation in 20 years' time. Alternative C describes a situation where no measures against floods are taken, and implies a larger flood risk than today. Choose one of the alternatives by ticking one of the boxes at the bottom of the table.

	Alternative A – measures taken	**Alternative B – Measures taken**	**Alternative C – No measures**
Water quality Number of days per year that the water from Göta river cannot be used for producing drinking water due to contamination.	100 days	100 days	200 days
Damaged property Number of flood damaged properties per year.	10 properties	100 properties	100 properties
Traffic disturbances Number of days per year with flooded, eroded or washed away roads and railways.	8 days	2 days	8 days
Fee SEK per year to be paid for 10 years.	500 SEK	100 SEK	0 kronor
My choice	[ ]	[ ]	[ ]

Data

- Online survey march 2015.
- Response rate 31%.
- Final sample 809 respondents.
- Respondents are on average older and more educated in comparison to the general population.

Model

- Random Parameter Logit (RPL) model
  - Can handle the modeling of a choice between more than two discrete alternatives
  - Allows unobserved factors to be random and follow any distribution.

- Latent Class model
  - Respondent's choice behavior depends on both observable attributes and latent heterogeneous attributes which are unobserved by the researcher.
  - Respondents are classified into a set of classes/groups which remain latent to the researcher. Within each class/group the preferences are homogenous

Results

Variables	RPL	LCM (Class utility function)		
		Group 1	Group 2	Group 3
Fee	-0.001(0.000)***	-0.002(0.000)***	-0.003(0.000)***	0.000(0.000)
Water quality high	1.558(0.116)***	1.307(0.183)***	0.8872(0.494)*	3.022(0.504)***
Water quality medium	0.969(0.092)***	0.889(0.150)***	0.288(0.419)	2.783(0.448)***
Property damage medium	0.250(0.102)**	0.176(0.163)	-0.129(0.471)	1.934(0.485)***
Property damage low	0.241(0.078)***	0.515(0.129)***	-0.183(0.340)	0.486(0.374)
Traffic disturbances low	-0.171(0.036)***	0.221(0.053)***	0.258(0.391)	0.196(0.096)**
Alternative specific constant	-0.677(0.079)***	-1.638(0.129)***	1.564(0.506)***	-3.352(1.268)***
Variables		LCM (Class membership function)		
		Group 1	Group 2	Group 3
Extraversion		-0.059(0.101)	0.444(0.209)**	_
Agreeableness		-0.419(0.130)***	0.555(0.218)**	_
Conscientiousness		0.118(0.123)	0.005(0.213)	_
Neuroticism		0.032(0.110)	0.298(0.217)	_
Openness		-0.112(0.097)	0.181(0.179)	_
Worried for climate change		-0.261(0.092)***	-0.589(0.158)***	_
Faith in the state		0.067(0.097)	-0.530(0.175)***	_
Woman		0.029(0.185)	-1.074(446)**	_
Can't pay but want to		0.269(0.075)***	-0.085(0.150)	_
Insurance cover – no need to invest		0.291(0.078)***	0.706(0.119)***	_
Latent class probability		0.519	0.084	0.397

Numbers in parentheses are standard errors. ***, **, * indicate significance level at 1 percent, 5 percent, and 10 percent.

Results

Table 5 Marginal willingness for flood risk attributes in SEK (euro in brackets)

Variables	RPL	LCM		
		Group 3	Group 1	Group 2
Water quality high	1262 (133)***	20289 (2135)	548 (58)***	179 (19)
Water quality medium	792 (83)***	18516 (1949)	371 (39)***	26 (3)
Property damage medium	203 (21)***	13174 (1386)	61 (6)	-87 (-9)
Property damage low	191 (20)**	3406 (358)	204 (21)***	-98 (-10)
Traffic disturbances low	140 (15)***	1404 (147)	96 (10)***	-10 (-1)

Numbers in parentheses are MWTP in euros. ***, **, * indicate significance level at 1 percent, 5 percent, and 10 percent

Conclusion

- Households are willing to pay to reduce flood risk in the Gothenburg region.
- Improvements in water quality is prioritized, in relation to property damage and traffic disturbances.
- The differences in valuation of reducing the negative effects of floods are explained by attitudes towards climate change, personality traits, faith in the state and individual, gender and objections to fees.

Policy implications

- Policy makers should further develop flood management policies and invest in flood risk reducing measures.
- They should prioritize addressing the issue of water quality.
- There are considerable heterogeneity in the valuation of reducing the negative effects of floods which imply that policy changes will affect households utility differently.