

Information, consequentiality and credibility in stated preferences

A choice experiment on climate adaptation

EAERE 2020

25-06-2020

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Information in stated preferences



- In stated preference surveys, respondents are usually provided information about the scenario and the good to be valued before preference elicitation
- Type and amount of information provided matters for the validity of value estimates

(Mitchell and Carson, 1989; Blomquist and Whitehead, 1998; Johnston et al., 2017)

- Extensive research on effects of information scripts:
 - Many find information scripts matter for value estimates. Additional information often increases willingness to pay.

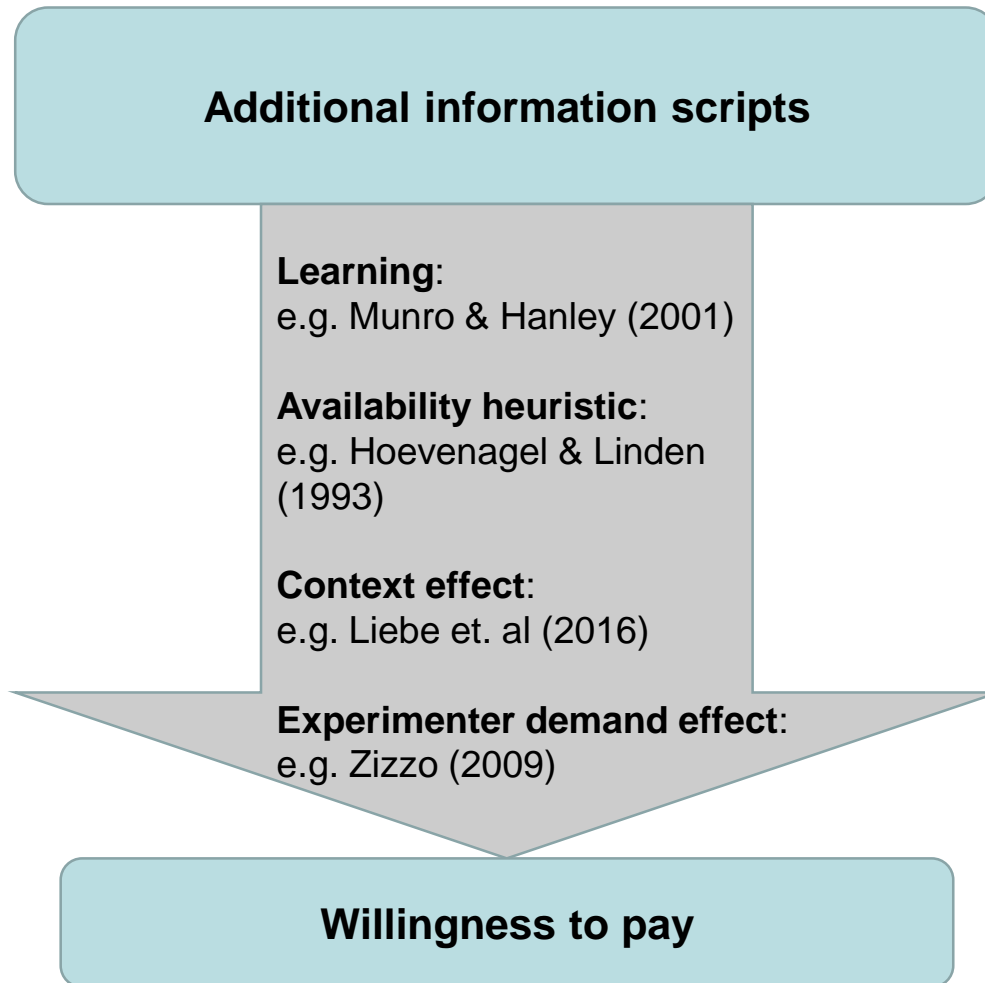
(Munro and Hanley, 2001; Bateman and Mawby, 2004; Czajkowski et al., 2016)

- But some report mixed findings

(Hoevenagel and Linden, 1993; MacMillan et al., 2006; Needham et al., 2018)

→ Better understanding of the mechanisms of information effects can deliver important insights for stated preference practitioners

Information, consequentiality, credibility

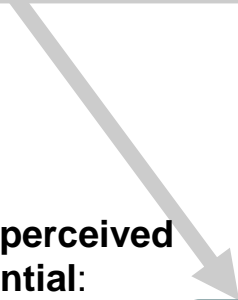


Information, consequentiality, credibility



Perceived consequentiality:

Does the survey outcome influence the decision of policy makers?

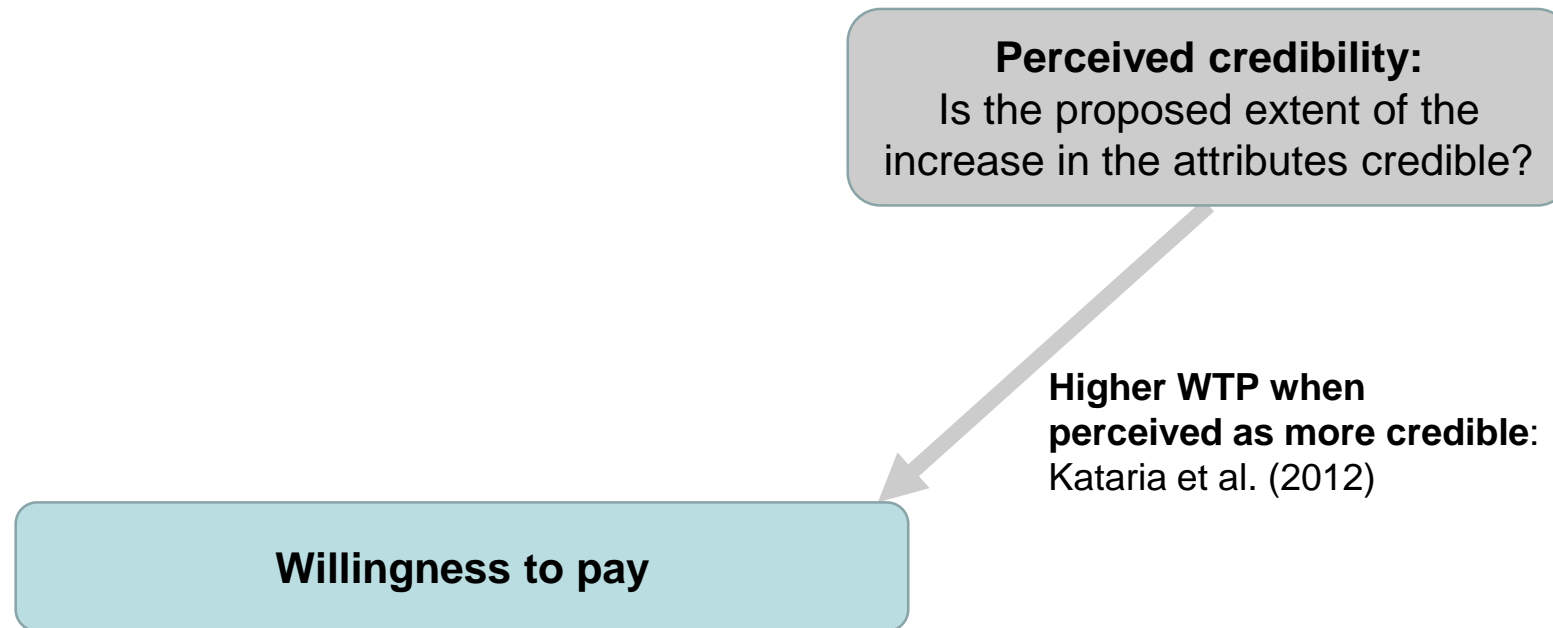


Higher WTP when perceived as more consequential:

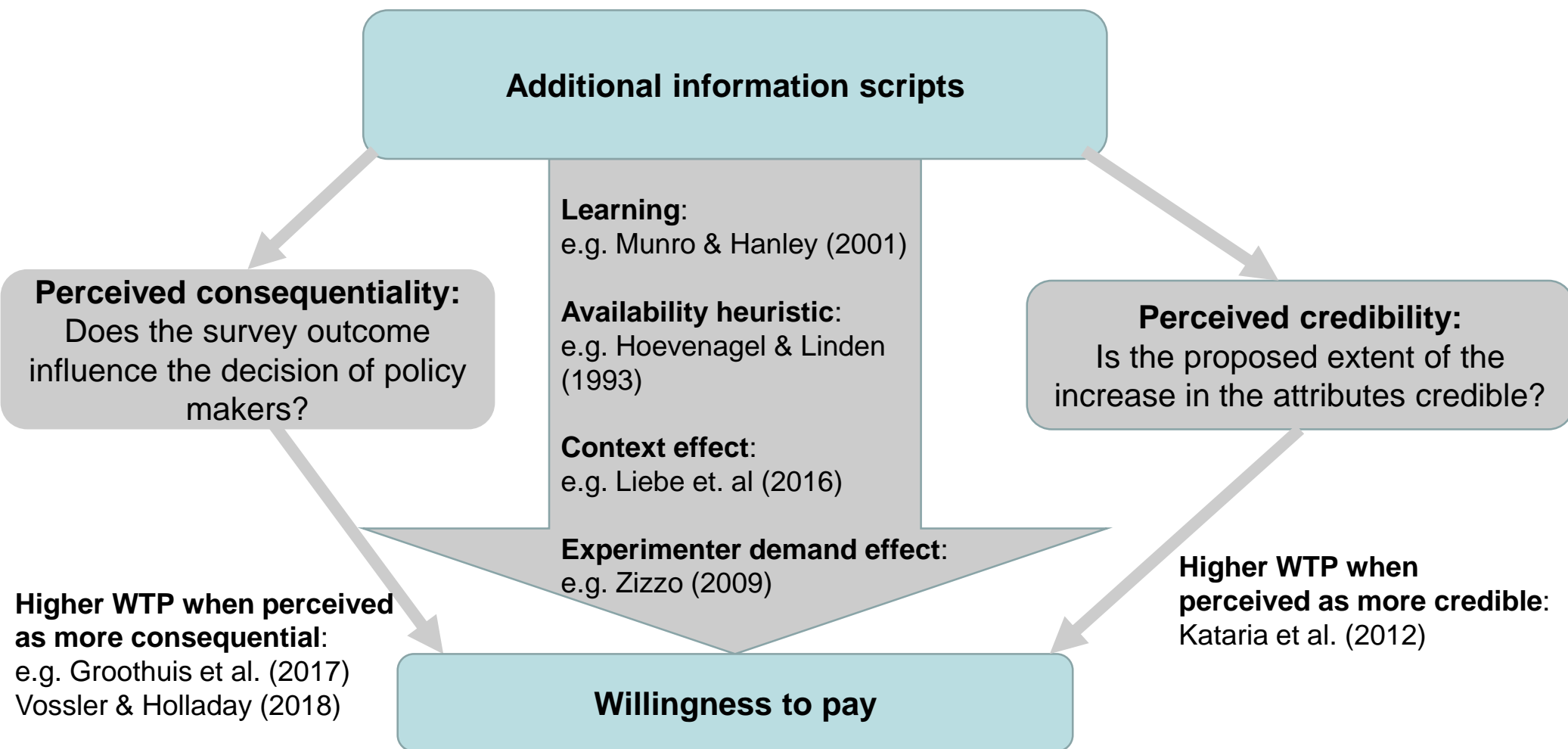
e.g. Grootuis et al. (2017)
Vossler & Holladay (2018)

Willingness to pay

Information, consequentiality, credibility



Research question





Research question

**Can shifts in the perceptions explain part of information effects?
To examine this, we address these questions:**

Additional information scripts

Perceived consequentiality:
Does the survey outcome influence the decision of policy makers?

Learning:
e.g. Munro & Hanley (2001)

Availability heuristic:
e.g. Hovevenagel & Linden (1993)

Context effect:
e.g. Liebe et. al (2016)

Perceived credibility:
Is the proposed extent of the increase in the attributes credible?

Experimenter demand effect:
e.g. Zizzo (2009)

Higher WTP when perceived as more consequential:
e.g. Grootuis et al. (2017)
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Higher WTP when perceived as more credible:
Kataria et al. (2012)

Willingness to pay



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Willingness to pay



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**Can shifts in the perceptions explain part of information effects?
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(1) Does the additional information script affect stated preferences?

(2) Does the additional information script affect perceptions?

(3) Do stated preferences vary with perceptions?

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Willingness to pay

Case study



- The city of Bremen adopted a climate adaptation strategy that contains urban green measures for climate adaptation: street trees, green spaces, green roofs
- Choice experiment with the urban green adaptation measures as attributes
- April – May 2019
- Computer-Assisted Web Interviews
- Sample: 1,178 residents of Bremen and surroundings



Study design: choice tasks

9 choice tasks per respondent:

	Combination A	Combination B	Current state
Street trees	+ 1 tree per 100 meters of a street	+ 2 trees per 100 meters of a street	As today
Green areas	+ 1% of the city area is green spaces	As today	As today
Extensive green roofs	+ 5 out of 100 roofs are extensive green roofs	+ 10 out of 100 roofs are extensive green roofs	As today
Intensive green roofs	As today	+ 2 out of 100 roofs are intensive green roofs	As today
Cost for you per year	€20	€5	€0
Which option do you choose?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: The tasks were originally displayed in German.



Study design: treatment

All respondents were provided with information about the attributes and their benefits.

Half of respondents were provided an additional information script:

No Script sample

X

The first part of this survey focuses on possible urban green measures for the city of Bremen.

Script sample

The Senate of Bremen adopted the climate change adaptation strategy for Bremen in April 2018. The strategy document explains the consequences of climate change for the city of Bremen. Strong rain, river and storm floods will become more likely. The strategy document predicts a rising risk of flooding with property damages, such as flooded basements and underground garages. Also heat waves will become more likely according to the strategy document. These can reduce your productivity and strain your cardiovascular system.

The climate change adaptation strategy mentions several measures which the city of Bremen could apply. The first part of this survey focuses on some of these measures.

Study design: elicitation of perceptions



Two consequentiality perception indicators:

Policy consequentiality: “To what degree do you believe that your responses will affect which measures will be implemented in the city of Bremen?”

Payment consequentiality: “To what degree do you believe that your responses will affect whether you will have to pay the additional cost if the measures are implemented?”

Six-point Likert scale “I strongly believe” – “I do not believe at all” and “I do not know”

Four credibility perception indicators:

For each of the four non-cost attributes: “How likely do you think it is that the proposed extent of the changes can actually be realized?”

Six-point Likert scale “very likely” – “very unlikely” and “I do not know”

Econometric approach



Model I: Mixed Logit in willingness to pay space

- Script interactions with the mean preference parameters

(1) Does the additional information script affect stated preferences?

Model II: Hybrid Mixed Logit in willingness to pay space

Measurement equations: Ordered Probit

Latent Variable 1 as explanatory variable for credibility indicators

LV 2 as explanatory variable for consequentiality indicators

Structural equations: Linear regression

Information script as explanatory variable for both latent variables

(2) Does the additional information script affect perceptions?

Choice model: Mixed Logit in willingness to pay space

Latent variable interactions with mean preference parameters

(3) Do stated preferences vary with perceptions?

Script interactions with the mean preference parameters

→ Comparison between Model I & Model II

(4) Can part of the information effect be assigned to shifts in perceptions?

Results



	Model I: Mixed Logit WTP space	Model II: Hybrid Mixed Logit WTP space
LL at convergence	-7854	-17256
LL at constants only	-11442	-21410
McFadden's pseudo-R²	0.314	0.194
Ben-Akiva-Lerman's pseudo-R²	0.495	0.494
AIC/n	1.488	3.270
BIC/n	1.511	3.323
Observations	10602	10602
Respondents	1178	1178
parameters	33	77

Estimation method for both models: simulated maximum likelihood with 10,000 Sobol draws



Results: information effect on preferences

Model I: Mixed Logit in WTP space

	Mean WTP	Standard Deviations	script interaction for means
Street trees (+1 per 100 meter street)	29.12 (2.42) ***	47.82 (2.47) ***	7.47 (3.12) **
Extensive green roofs (+1 of 100 roofs)	1.74 (0.42) ***	3.96 (0.44) ***	0.78 (0.48)
Intensive green roofs (+1 of 100 roofs)	11.64 (1.95) ***	22.58 (2.12) ***	4.51 (2.30) *
Green space (+ 1 % of city area)	23.35 (2.88) ***	52.17 (2.88) ***	6.57 (3.71) *
Status quo	- 20.28 (1.03) ***	23.64 (1.16) ***	- 7.48 (1.12) ***
- Cost (1000 EUR)	3.00 (0.06) ***	1.10 (0.07) ***	- 0.10 (0.07)

***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Standard errors are given in brackets.

(1) Does an additional information script affect stated preferences?

- In the script sample, WTP for attributes is larger and disutility from the status quo higher
- But only for status quo the effect is strongly significant



Results: information effect on perceptions

Model II: Hybrid mixed logit – Structural equations

Dependent variable	LV 1 credibility	LV 2 consequentiality
Information script	- 0.084 (0.035) **	- 0.041 (0.040)

(2) Does an additional information script affect perceptions?

- The information script strengthens perceived credibility significantly
- The information script does not strengthen perceived consequentiality significantly

***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Standard errors are given in brackets.

```
Measurement equation for: Cred_Tree (Ordered Probit)
var.      coef.    st.err.  p-value
LV 1      -0.4730***  0.0436   0.0000
Cutoff 1  -2.0319***  0.0951   0.0000
Cutoff 2  -0.7296***  0.0282   0.0000
Cutoff 3  -0.2895***  0.0367   0.0000
Cutoff 4   1.3043***  0.0408   0.0000
```

```
Measurement equation for: Cred_Area (Ordered Probit)
var.      coef.    st.err.  p-value
LV 1      -0.4098***  0.0435   0.0000
Cutoff 1  -1.6223***  0.0673   0.0000
Cutoff 2  -0.5996***  0.0526   0.0000
Cutoff 3  -0.0004     0.0509   0.9934
Cutoff 4   1.5490***  0.1176   0.0000
```

```
Measurement equation for: Cred_Ext (Ordered Probit)
var.      coef.    st.err.  p-value
LV 1      -1.4143***  0.1342   0.0000
Cutoff 1  -1.7087***  0.1207   0.0000
Cutoff 2   0.3496***  0.0497   0.0000
Cutoff 3   1.5170***  0.0519   0.0000
Cutoff 4   3.2065***  0.1334   0.0000
```

```
Measurement equation for: Cred_Int (Ordered Probit)
var.      coef.    st.err.  p-value
LV 1      -1.4032***  0.1252   0.0000
Cutoff 1  -2.3247***  0.1529   0.0000
Cutoff 2  -0.2215***  0.0471   0.0000
Cutoff 3   0.8418***  0.1113   0.0000
Cutoff 4   2.6955***  0.1102   0.0000
```

```
Measurement equation for: Cons_pol (Ordered Probit)
var.      coef.    st.err.  p-value
LV 2      -0.7941***  0.1264   0.0000
Cutoff 1  -1.4179***  0.1067   0.0000
Cutoff 2   0.1966     0.1633   0.2286
Cutoff 3   0.9703***  0.2401   0.0001
Cutoff 4   2.3053***  0.3610   0.0000
```

```
Measurement equation for: Cons_pay (Ordered Probit)
var.      coef.    st.err.  p-value
LV 2      -1.1385***  0.2462   0.0000
Cutoff 1  -2.0029***  0.2551   0.0000
Cutoff 2  -0.4287***  0.0558   0.0000
Cutoff 3   0.3318***  0.0559   0.0000
Cutoff 4   1.8067***  0.0672   0.0000
```



Results: role of perceptions for preferences

Model II: Hybrid Mixed Logit in WTP space

	Mean WTP	Standard Deviations	LV 1 interaction for means	LV 2 interaction for means
Street trees (+1 per 100 meter street)	28.57 (2.85) ***	45.96 (2.51) ***	- 8.55 (2.03) ***	- 10.05 (2.32) ***
Extensive green roofs (+1 of 100 roofs)	1.82 (0.44) ***	3.74 (0.44) ***	- 1.07 (0.30) ***	- 0.85 (0.34) ***
Intensive green roofs (+1 of 100 roofs)	11.89 (2.19) ***	23.24 (2.62) ***	- 4.40 (1.68) ***	- 4.79 (1.77) ***
Green space (+ 1 % of city area)	23.82 (3.19) ***	50.02 (2.55) ***	- 10.35 (2.44) ***	- 10.05 (2.32) ***
Status quo	- 20.14 (1.15) ***	21.48 (1.21) ***	6.24 (0.82) ***	6.55 (0.86) ***
- Cost (1000 EUR)	2.99 (0.06) ***	1.07 (0.08) ***	0.10 (0.04) **	0.22 (0.05) ***

(3) Do stated preferences vary with perceptions?

Strong credibility and consequentiality perceptions are associated with larger WTP for attributes and higher disutility from the status quo



Results: assessing the perceptions pathway

	<u>Model I</u>		<u>Model II</u>	
	Mixed Logit in WTP space		Hybrid Mixed Logit in WTP Space	
	Mean WTP	script interaction for means	Mean WTP	script interaction for means
Street trees (+1 per 100 meter street)	29.12 (2.42) ***	7.47 (3.12) **	28.57 (2.85) ***	6.43 (3.56) *
Extensive green roofs (+1 of 100 roofs)	1.74 (0.42) ***	0.78 (0.48)	1.82 (0.44) ***	0.56 (0.53)
Intensive green roofs (+1 of 100 roofs)	11.64 (1.95) ***	4.51 (2.30) *	11.89 (2.19) ***	3.67 (2.66)
Green space (+ 1 % of city area)	23.35 (2.88) ***	6.57 (3.71) *	23.82 (3.19) ***	5.41 (4.02)
Status quo	- 20.28 (1.03) ***	-7.48 (1.12) € ***	- 20.14 (1.15) ***	- 6.32 (1.44) ***
- Cost (1000 EUR)	3.00 (0.06) ***	-0.10 (0.07)	2.99 (0.06) ***	- 0.09 (0.08)

(4) Can part of the information effect be assigned to shifts in perceptions?

- Script coefficient is smaller when accounting for perceptions in Model II for all attributes and SQ, but difference is small and not statistically significant
- Robust difference between Script and No script sample remains at least for status quo



Results: summary

- Information effect is present: larger disutility from status quo, larger WTP for (at least some) attributes
- Our information script does not significantly affect perceived consequentiality
 - Not very surprising: even with targeted consequentiality scripts mixed findings about effect on consequentiality statements
- We can not confirm a credibility perceptions pathway in information effects, but find some indications for a small role:
 - Information script strengthens credibility perceptions
 - Credibility perceptions affect preferences
 - Accounting for perceptions might weakly decrease information effect

Discussion



- More differentiated or extreme versions of script might give additional insight
 - Size of information effects can depend on factors like style of the information script and how extreme the script is
 - these could also influence the mechanism of information effects
- Endogeneity of perceptions as explanatory variables: Hybrid mixed logit model controls for measurement error, but not reverse causality or omitted variables
- We used one latent variable for credibility perceptions and one for consequentiality perceptions: Previous research suggests two separate ones for policy and payment consequentiality. In our models, second LV for consequentiality seemed not to capture anything more.

Thank you.

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