ELICITING CONSEQUENTIALITY IN STATED PREFERENCE SURVEYS:

AN APPLICATION TO URBAN GREEN

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Stated preference methods

- Widely used to measure the value of non-market goods, especially public goods
- In transportation, marketing, health, culture, environmental economics, …
- Based on surveys
- Many advantages:
  - Capture use and passive-use values
  - Go beyond the scope of the existing data
- But also important disadvantages:
  - Not based on market behavior
  - Might be viewed as not related to direct consequences
  - Incentive properties insufficiently understood

Do stated preferences represent well true preferences?

A necessary condition: Consequentiality

- Literature defines conditions for truthful preference disclosure
  (Carson and Groves 2007; Carson et al. 2014; Vossler et al. 2012; Vossler and Holladay 2018)
- One of the conditions: The survey is or is viewed as consequential
- "a survey's results are seen by the agent as potentially influencing an agency's actions and the agent cares about the outcomes of those actions"
  (Carson and Groves 2007)

Controlling for consequentiality in surveys

- **Communicated consequentiality** – researchers communicate in the script (potential) consequences of the survey outcome
- **Perceived consequentiality** – respondents are directly asked about their belief in the survey consequentiality (actual consequences of the survey outcome)
- Difficulties in credibly assuring respondents about the consequentiality via scripts →
- Keeping consequentiality vague on purpose (e.g., when the presented project is preliminary and policy-makers prefer not to make definite statements)
- The need for elicitation of consequentiality perceptions
- How to correctly elicit consequentiality perceptions?

Can consequentiality perceptions be induced with a survey script?

They cannot

Lloyd-Smith et al. (forthcoming)

They rather cannot

Czajkowski et al. (2017)

They somewhat can

Andor et al. (2017)

Receiving the consequentiality script made respondents more likely to declare definite certainty about their willingness-to-pay statements

They can

Oehlmann and Meyerhoff (2017)

Respondents were more likely to view the survey as at least somewhat consequential when the consequentiality script was provided

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- Keeping consequentiality vague on purpose (e.g., when the presented project is preliminary and policy-makers prefer not to make definite statements)
- The need for elicitation of consequentiality perceptions
- **How to correctly elicit consequentiality perceptions?**
  - Guidance in this area is very limited

How are consequentiality perceptions elicited?

Typically…

- A single general question: To what extent do you believe that the survey outcome will affect the decision of public authorities?
- Response format – a discrete (Likert) scale, from two to several levels
- Location of the consequentiality elicitation – after preference elicitation (the only exception – Lloyd-Smith et al. forthcoming)

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Our focus here

Our research questions

Does it matter for stated consequentiality perceptions
and for stated preferences:

- where the consequentiality elicitation is placed (before versus after preference elicitation)? → Location **Yes**
- whether the consequentiality elicitation is repeated or not (asked before and after preference elicitation versus asked only after)? → Repetition **Yes**

Research design

- A city-wide policy project of the extension of urban green
- Four German cities:
  Augsburg (559), Karlsruhe (479), Leipzig (1,130) and Nuremberg (638)
- Computer-Assisted Web Interviews (CAWI)
- 9 choice tasks per respondent
- July and November 2018

	Option 1	Option 2	Current state
Street trees	**5 trees** per 100 meters of a street	**9 trees** per 100 meters of a street	**5 trees** per 100 meters of a street
Green areas	**25%** of the city area is green spaces	**20%** of the city area is green spaces	**20%** of the city area is green spaces
Near-natural green areas	**30%** of the green areas is near-natural	**40%** of the green areas is near-natural	**20%** of the green areas is near-natural
Pedestrian and cycling greenways	**60%** of the ways are greenways	**50%** of the ways are greenways	**40%** of the ways are greenways
Cost for you per year	**€300**	**€100**	**No cost**
Which option do you choose?	☐	☐	☐

Note: The tasks were originally displayed in German. Here a translation is provided.

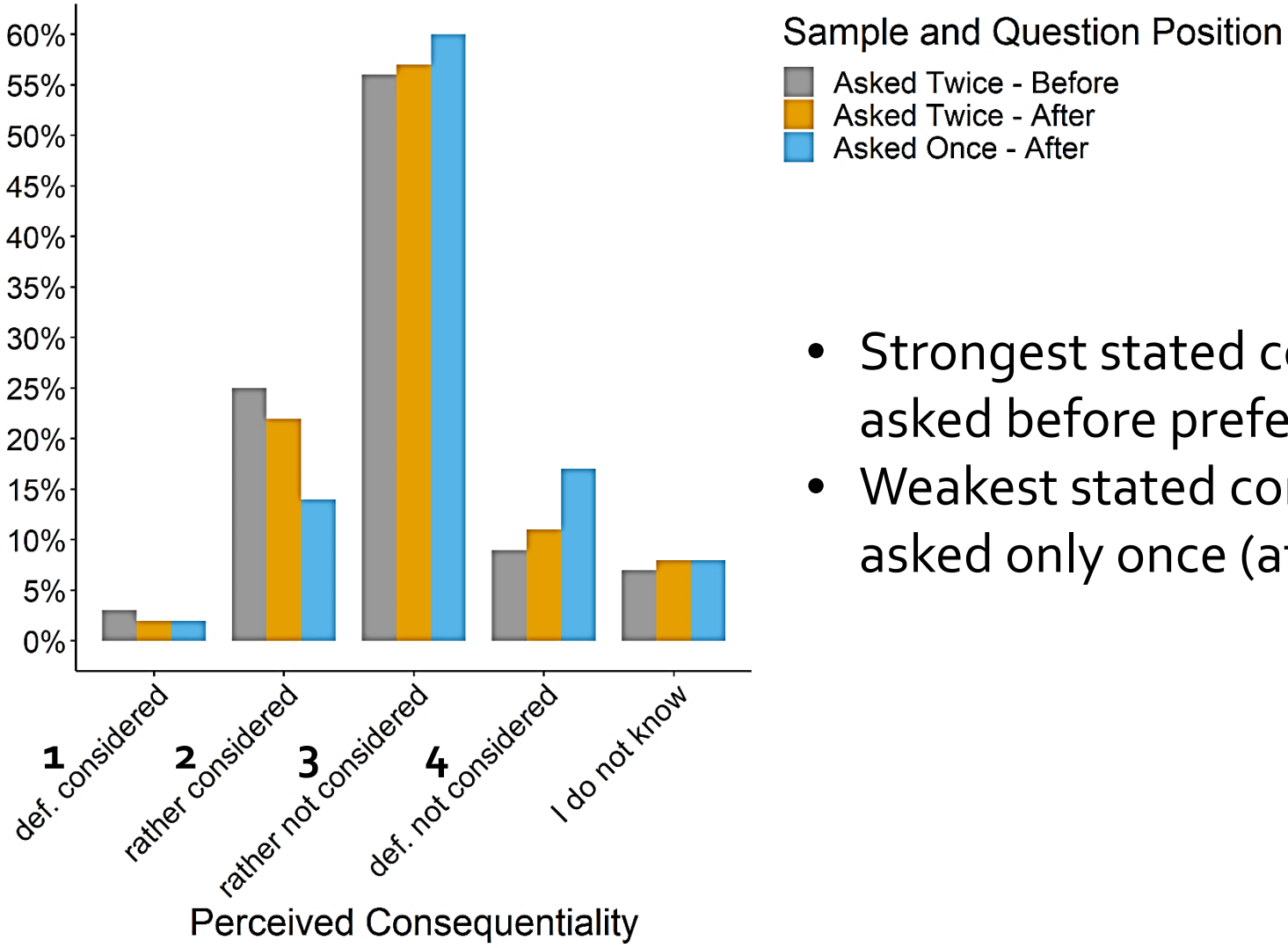
Research design – consequentiality elicitation

- "To what degree do you believe that your responses will be taken into account in policy and administration?"
- A Likert response scale: "definitely considered", "rather considered", "rather not considered", "definitely not considered" and "I do not know"
- Two treatments:
  - **Asked-Once** – the consequentiality question asked right after the preference elicitation
  - **Asked-Twice** – the consequentiality question asked before and after the preference elicitation
    - Respondents were not informed that they would be asked twice

Econometric approach

- How is stated consequentiality affected by the way the perceptions are elicited?
  $\rightarrow$ Ordered logit models
- Does the effect of consequentiality perceptions on stated preferences differ depending on the way the perceptions are elicited?
  $\rightarrow$ Mixed logit models in willingness-to-pay space
- Perceived consequentiality coded as a variable with four levels:
  - 1 – the strongest perceived consequentiality ("definitely considered")
  - 4 – the weakest perceived consequentiality ("definitely not considered")
  - "I do not know" consequentiality statements are omitted in modelling

Consequentiality perceptions



- Strongest stated consequentiality when asked before preference elicitation
- Weakest stated consequentiality when asked only once (after preference elicitation)

Is stated consequentiality affected by the perception elicitation?

Ordered logit models

Is stated consequentiality affected by the perception elicitation?

	Model 1	Model 2	Model 3
Dependent variable	Responses to both consequentiality questions	Responses to the consequentiality question asked as first	Responses to the consequentiality question asked after preference elicitation
Sample	Asked-Twice	All	All
Before	-0.246*** (0.049)	---	---
Asked-Twice	---	-0.764*** (0.082)	-0.493*** (0.081)
Male	0.055 (0.104)	0.029 (0.080)	
Age	0.003 (0.003)	.002 (0.003)	
Secondary or elementary			0.126 (0.270)
High-school			-0.163 (0.268)
University	-0.442 (0.398)	-0.270 (0.258)	-0.228 (0.267)
Augsburg Online			
Augsburg Postal			
Karlsruhe Online			
Karlsruhe Postal			
Leipzig	0.178 (0.133)	0.129 (0.105)	
Number of observations	2,514	2,600	2,580

Notes: ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Standard errors are given in brackets (for Model 1 clustered by respondents).

Location

Repetition

within-sample test

between-sample test

Respondents asked twice state stronger consequentiality in the first question

Consequentiality is stronger when stated before choice tasks

Consequentiality after choice tasks is stronger if respondents are asked twice
– Choice consistency?

Is stated consequentiality affected by the perception elicitation?

	Model 1	Model 2	Model 3
Dependent variable	Responses to both consequentiality questions	Responses to the consequentiality question asked as first	Responses to the consequentiality question asked after preference elicitation
Sample	Asked-Twice	All	All
Before	-0.246*** (0.049)	---	---
Asked-Twice	---	-0.764*** (0.082)	-0.493*** (0.081)
Male	0.055 (0.104)	-0.029 (0.080)	0.080 (0.081)
Age	0.003 (0.003)	0.002 (0.003)	0.003 (0.003)
Secondary or elementary	-0.061 (0		270)
High-school	-0.382 (0		268)
University	-0.442 (0		267)
Augsburg Online	0.084 (0.178)	0.016 (0.142)	0.128 (0.143)
Augsburg Postal	-0.515*** (0.196)	-0.526*** (0.160)	-0.496*** (0.160)
Karlsruhe Online	-0.101 (0.190)	-0.285** (0.141)	-0.222 (0.144)
Karlsruhe Postal	-0.550** (0.219)	-0.568*** (0.196)	-0.677*** (0.196)
Leipzig	0.178 (0.133)	0.129 (0.105)	0.106 (0.106)
Number of observations	2,514	2,600	2,580

Notes: ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Standard errors are given in brackets (for Model 1 clustered by respondents).

Recruitment via postcards strengthens the perceived consequentiality – Self-selection?

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

- Mixed logit models in willingness-to-pay (WTP) space; separately for each city
- Non-monetary preference parameters from a normal distribution, the cost preference parameter from a lognormal distribution
- Perceived consequentiality used as a continuous variable, normalized to have zero mean and unit standard deviation
- Mean preference parameters interacted with perceived consequentiality
- 3 models – interactions with consequentiality stated:
  - before choice tasks by the asked-twice sample
  - after choice tasks by the asked-twice sample
  - after choice tasks by the asked-once sample

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

Here, for Leipzig only

	Model I	Model II	Model III
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	*Before*	*After*	*After*
Means			
Status quo (1)	-0.11 (0.03)***	-0.01 (0.03)	-0.30 (0.03)***
Street trees (1)	0.07 (0.01)***	0.07 (0.01)***	0.04 (0.01)***
Green areas (1)	1.79 (0.29)***	1.58 (0.27)***	0.58 (0.23)**
Near-natural green (1)	0.84 (0.14)***	0.81 (0.12)***	0.86 (0.10)***
Greenways (1)	1.27 (0.11)***	1.19 (0.12)***	0.76 (0.10)***
A negative of *Cost* (1)	1.57 (0.15)***	1.43 (0.10)***	1.58 (0.12)***
Standard Deviations			
Interactions with *perceived consequentiality*			
Status quo (3)	0.20 (0.02)***	0.08 (0.03)**	0.21 (0.03)***
Street trees (3)	0.00 (0.01)	-0.01 (0.01)	0.00 (0.01)
Green areas (3)	-0.13 (0.20)	-0.78 (0.28)***	0.34 (0.21)*
Near-natural green (3)	-0.08 (0.12)	-0.27 (0.13)**	0.24 (0.12)**
Greenways (3)	-0.16 (0.10)	0.09 (0.12)	-0.08 (0.10)
A negative of *Cost* (3)	0.10 (0.09)	0.11 (0.08)	0.02 (0.09)

- Perceived consequentiality mainly shifts respondents' preferences regarding *Status quo*
- When perceived consequentiality gets stronger, the disutility from the current state intensifies

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

- To answer this, we formally test for statistical differences in the coefficients on the means and the interaction terms across the three models using z-tests

	H_0: Model I – Model II = 0				H_0: Model I – Model III = 0				H_0: Model II – Model III = 0			
	Means		Interactions (*perc. cons.*)		Means		Interactions (*perc. cons.*)		Means		Interactions (*perc. cons.*)	
Status quo	-0.095	**	0.119	***	0.196	***	-0.015		0.291	***	-0.135	***
Street trees	0.002		0.012		0.026	***	-0.002		0.025	***	-0.014	
Green areas	0.206		0.647	*	1.201	***	-0.473	*	0.995	***	-1.120	***
Near-natural green	0.031		0.188		-0.018		-0.322	*	-0.048		-0.511	***
Greenways	0.084		-0.244		0.510	***	-0.081		0.426	***	0.163	

Notes: The numbers inform on values of the differences between respective coefficients. The differences were calculated as indicated in the first row of the table.

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

	Model I	Model II	Model III
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	*Before*	*After*	*After*

	H_0: Model I – Model II = 0			
	Means		Interactions (*perc. cons.*)	
Status quo	-0.095	**	0.119	***
Street trees	0.002		0.012	
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Near-natural green	0.031		0.188	
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Notes: The numbers inform on values of the differences between respective coefficients. The differences were calculated as indicated in the first row of the table.

- A within-sample test – Models I and II use the same (Asked-Twice) sample
- Except for *Status quo*, no significant differences, which aligns with the expectation (the same respondents)
- Weaker effect of consequentiality on *Status quo* preferences when stated after choice tasks

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

- A between-sample test
- Mean WTP values differ for nearly all attributes
- On average, WTP of respondents who faced the consequentiality elicitation before choice tasks are higher than WTP of respondents who did not
- Consequentiality elicitation before preference elicitation positively influences WTP

	Model II				Model III			
	Asked-Twice				Asked-Once			
	After				*After*			
	H_0: Model I – Model III = 0				H_0: Model II – Model III = 0			
	Means		Interactions (*perc. cons.*)		Means		Interactions (*perc. cons.*)	
Attribute 1	0.196	***	-0.015		0.291	***	-0.135	***
Attribute 2	0.026	***	-0.002		0.025	***	-0.014	
Attribute 3	1.201	***	-0.473	*	0.995	***	-1.120	***
Attribute 4	-0.018		-0.322	*	-0.048		-0.511	***
Attribute 5	0.510	***	-0.081		0.426	***	0.163	

Notes: The numbers inform on values of the differences between respective coefficients. The differences were calculated as indicated in the first row of the table.

Does the effect of consequentiality perceptions on stated preferences differ depending on the perception elicitation?

	Model I	Model II	Model III
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	*Before*	*After*	*After*

- The effect of a repeated consequentiality statement
- Significant differences as in column 2 (both comparisons employ the same samples of respondents)
- Some significant differences in the impact of perceived consequentiality on WTP (interactions)
- With the repeated consequentiality elicitation, WTP seems to increase with the strength of consequentiality perception
- With the single consequentiality elicitation, WTP appears to decrease with the degree of consequentiality belief

H_0: Model II – Model III = 0			
Means		Interactions (*perc. cons.*)	
0.291	***	-0.135	***
0.025	***	-0.014	
0.995	***	-1.120	***
-0.048		-0.511	***
0.426	***	0.163	

icients. The differences were

Conclusions

- The way how consequentiality perceptions are elicited seems to matter for both, stated consequentiality and stated preferences
  - "How" = here, the location and the repetition of consequentiality elicitation
- Eliciting consequentiality perceptions after preference elicitation generates more conservative value measures and consequentiality statements
- Important practical implications
- Willingness-to-pay values are recently increasingly corrected by consequentiality perceptions
- Our findings show that these corrections might be sensitive to the way perceived consequentiality data is collected
- Our evidence suggests caution in designing the consequentiality elicitation
- The result may point to endogeneity of consequentiality statements

THANK YOU!

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