ELICITING CONSEQUENTIALITY IN STATED PREFERENCE:

A DISCRETE CHOICE EXPERIMENT ON URBAN GREEN

Ewa Zawojska

University of Warsaw

Malte Welling

Institute for Ecological Economy Research

Julian Sagebiel

Technische Universität Berlin

ewa.zawojska@uw.edu.pl

Stated preference methods

- Provide estimates of economic value of non-market goods (e.g., clean air)
- Help determine the value of such goods to society (e.g., for benefit-cost analyses)
- Wide range of applications: transportation, health, environment, culture, etc.
- Value estimates derived from preferences stated in surveys
  - Typically large survey studies on representative samples of respondents
  - Preferences are often elicited through discrete choice experiments

Stated preference discrete choice experiment

Choice options: Policy scenarios

Attributes

	Option 1	Option 2	Current state
Street trees (per 100 meters of a street)	**5 trees**	**9 trees**	**5 trees**
Green spaces (% of the city area)	**25%**	**20%**	**20%**
Pedestrian and cycling greenways (% of the ways)	**60%**	**50%**	**40%**
Cost for you per year	**300 euro**	**100 euro**	**No cost**
Which option do you choose?	☐	☐	☐

Stated preference methods

- Many advantages:
  - Capture use and passive-use values of goods
  - Go beyond the scope of data on observed behavior
- 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 in stated preference surveys
  (Carson and Groves 2007; Carson et al. 2014; Vossler et al. 2012; Vossler and Holladay 2018)
- One of the conditions: The survey 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 (i.e., in actual consequences of the survey outcome)
- Difficulties in credibly assuring respondents about the consequentiality via scripts (e.g., Czajkowski et al. 2017; Lloyd-Smith et al. 2019)
- 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 elicit consequentiality perceptions?**
  - Guidance in this area is very limited

How are consequentiality perceptions elicited?

Typically…

- A 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; i.e., after a discrete choice experiment (the only exception: Lloyd-Smith et al. 2019)

Our focus here

Our research questions

Does it matter for self-reported consequentiality perceptions and for stated preferences:

- when the consequentiality question is asked (before versus after preference elicitation)? → **Location** — **Yes**
- whether the consequentiality question 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 (per 100 meters of a street)	**5 trees**	**9 trees**	**5 trees**
Green spaces (% of the city area)	**25%**	**20%**	**20%**
Near-natural green spaces (% of the city green spaces)	**30%**	**40%**	**20%**
Pedestrian and cycling greenways (% of the ways)	**60%**	**50%**	**40%**
Cost for you per year	**300 euro**	**100 euro**	**No cost**
Which option do you choose?	☐	☐	☐

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

How do the treatments address our research questions?

- Does the location of the consequentiality question matter?
  - A within-sample test:
    the question "before" vs "after" for Asked-Twice
  - A between-sample test:
    Asked-Once (only after) vs the question "before" for Asked-Twice
- Does the repetition of the consequentiality question matter?
  - A between-sample test:
    Asked-Once (only after) vs the question "after" for Asked-Twice

Econometric approach

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

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 Asked-Twice	0.166** (0.076)	0.689*** (0.129)	---
	---	---	0.514*** (0.128)
Male	0.195 (0.167)	0.153 (0.128)	
Age	-0.011* (0.006)	-0.008* (0.005)	
High-school diploma			0.359** (0.173)
University diploma	0.311 (0.220)		0.296* (0.169)
Frequent visitor of green spaces	0.426** (0.171)	0.302** (0.128)	0.291** (0.129)
Policy consequentiality script shown			
Payment inconsequentiality script shown			
Log of response time (in seconds)	0.135 (0.190)	0.313** (0.154)	
Number of observations	1,006	1,029	

Location

Repetition

within-sample test

between-sample test

Respondents asked twice state stronger consequentiality in the first question

Consequentiality is stronger when stated before preference elicitation

Consequentiality after preference elicitation is stronger if respondents are asked twice – Choice consistency?

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

- Mixed logit models in willingness-to-pay (WTP) space
- 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?

	Model 4	Model 5	Model 6
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	Before	After	After
Means			
Status quo (1)	-0.20 (0.04)***	-0.19 (0.03)***	-0.35 (0.03)***
Street trees (1)	0.07 (0.01)***	0.07 (0.01)***	0.05 (0.01)***
Green spaces (1)	1.82 (0.28)***	1.66 (0.22)***	0.62 (0.18)***
Near-natural green spaces (1)	0.91 (0.13)***	0.83 (0.11)***	0.81 (0.10)***
Greenways (1)	1.25 (0.14)***	1.21 (0.13)***	0.81 (0.10)***
A negative of *Cost* (1)	1.51 (0.12)***	1.55 (0.12)***	1.56 (0.11)***
Standard Deviations			
Interactions with *perceived consequentiality*			
Status quo (3)	-0.15 (0.03)***	-0.21 (0.06)***	-0.08 (0.02)***
Street trees (3)	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)
Green spaces (3)	0.22 (0.23)	0.78 (0.37)**	-0.19 (0.25)
Near-natural green spaces (3)	0.07 (0.13)	0.39 (0.12)***	-0.13 (0.11)
Greenways (3)	0.19 (0.13)	-0.00 (0.16)	0.08 (0.10)
A negative of *Cost* (3)	-0.11 (0.09)	-0.08 (0.09)	-0.07 (0.09)

- Perceived consequentiality mainly shifts respondents' preferences regarding *Status quo*
- When perceived consequentiality gets stronger, 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 4 – Model 5 = 0		**H_0: Model 4 – Model 6 = 0**		**H_0: Model 5 – Model 6 = 0**	
	Means	**Interactions (*perc. cons.*)**	**Means**	**Interactions (*perc. cons.*)**	**Means**	**Interactions (*perc. cons.*)**
Status quo	-0.003	0.057	0.155***	-0.073*	0.158***	-0.130**
Street trees	-0.003	-0.002	0.020**	0.012	0.023***	0.014
Green spaces	0.153	-0.559	1.199***	0.411	1.045***	0.971**
Near-natural green	0.085	-0.314*	0.099	0.201	0.015	0.515***
Greenways	0.04	0.196	0.437**	0.113	0.397**	-0.083

Notes: The numbers represent the exact value differences between the respective coefficients. The differences were calculated as indicated in the first line of the table.

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

	Model 4	Model 5	Model 6
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	Before	After	After

	H_0: Model 4 – Model 5 = 0		H_0: Model 4 – Model 6 = 0		H_0: Model 5 – Model 6 = 0	
	Means	**Interactions (*perc. cons.*)**	**Means**	**Interactions (*perc. cons.*)**	**Means**	**Interactions (*perc. cons.*)**
Status quo	-0.003	0.057				
Street trees	-0.003	-0.002				
Green spaces	0.153	-0.559				
Near-natural green	0.085	-0.314*				
Greenways	0.04	0.196				

- Models 4 and 5 use the same (Asked-Twice) sample
- A within-sample test of the location effect
- Barely any significant differences, which aligns with the expectation (the same respondents)

Notes: The numbers represent the exact value differences between the respective coefficients. The differences were calculated as indicated in the first line of the table.

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

	Model 4	Model 5	Model 6
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	Before	After	After

- A between-sample test of the location effect
- Mean WTP values differ for nearly all attributes
- On average, WTP values of respondents who faced the "before" consequentiality question are higher than WTP of respondents who did not

H_0: Model 4 – Model 6 = 0		H_0: Model 5 – Model 6 = 0	
Means	**Interactions (*perc. cons.*)**	**Means**	**Interactions (*perc. cons.*)**
0.155***	-0.073*	0.158***	-0.130**
0.020**	0.012	0.023***	0.014
1.199***	0.411	1.045***	0.971**
0.099	0.201	0.015	0.515***
0.437**	0.113	0.397**	-0.083

ferences between the respective coefficients. The differences were calculated as indicated in the first line of the table.

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

	Model 4	Model 5	Model 6
Sample	Asked-Twice	Asked-Twice	Asked-Once
Means interacted with	Before	After	After

- The repetition effect
- Significant differences in the means as in the earlier comparison (both comparisons employ the same samples of respondents)
- Some significant differences in the impact of consequentiality on WTP (interactions)
- With the repeated consequentiality question, WTP seems to increase with the strength of consequentiality perception
- With the single consequentiality question, WTP appears to decrease with the degree of consequentiality belief

H_0: Model 5 – Model 6 = 0	
Means	**Interactions (*perc. cons.*)**
0.158***	-0.130**
0.023***	0.014
1.045***	0.971**
0.015	0.515***
0.397**	-0.083

e coefficients. The differences

Conclusions

- The way how consequentiality perceptions are elicited seems to matter for both, self-reported 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 weaker 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
- This suggests caution in designing the consequentiality elicitation survey part
- The result may also point to the endogeneity of consequentiality statements

THANK YOU!

Ewa Zawojska

University of Warsaw

Malte Welling

Institute for Ecological Economy Research

Julian Sagebiel

Technische Universität Berlin

ewa.zawojska@uw.edu.pl