

CONSEQUENTIALITY IN STATED PREFERENCE

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HOW TO DISCOVER THE TRUE VALUE OF NON-MARKET PUBLIC GOODS?

Consequentiality in stated preference

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Non-market public goods

- Goods not bought / not sold in the market
- Examples:
 - Clean air
 - Hiking trails in a national park
 - Marine biodiversity
- No market price → No indication of the value of the good
- What for may we need the value of such goods?
 - Estimation of benefits from public policy projects
 - Necessary for cost-benefit analyses
 - Measurement of losses from natural damages needed in litigation processes (e.g., BP oil spill)
- Many applications: transportation, health, culture, environmental economics, ...

How to discover the value of non-market public goods?

Revealed preference methods

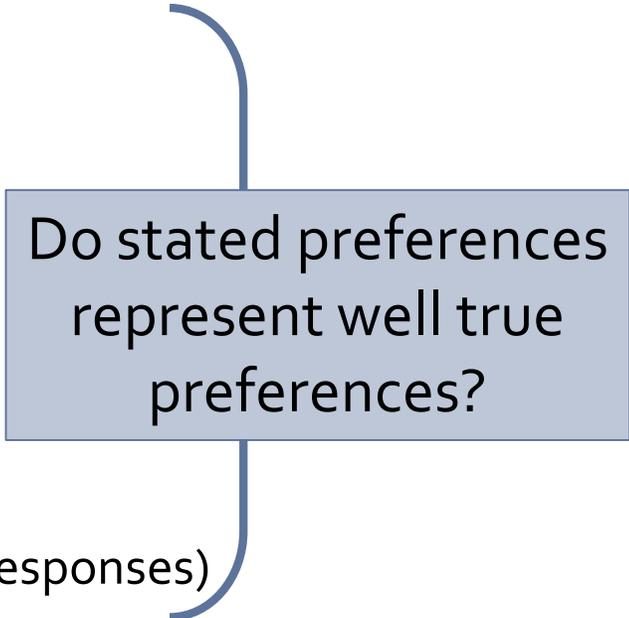
→ use information on actual behavior
(e.g., visits to a recreational site)

Stated preference methods

→ use surveys specifically designed to elicit information about preferences

Stated preference methods

- Advantages:
 - + Capture use and passive-use values (e.g., existence value)
 - + Go beyond the scope of the existing data
 - + Provide relatively clean identification of policy effects
- Disadvantages:
 - Not based on market behavior
 - Might be viewed as not related to direct consequences
 - Financial and policy consequences
 - Hypothetical policy scenarios
 - Lack of economic incentives to disclose preferences truthfully
 - Incentive properties insufficiently understood
 - Strategic responding
 - Behavioral “anomalies” (e.g., attribute non-attendance, protest responses)



Do stated preferences represent well true preferences?

How to discover **true** value of the goods?

Make surveys incentive compatible

Incentive compatibility = Revealing true preferences is a respondent's best strategy

Necessary conditions for incentive compatibility (Carson and Groves 2007):

1. The survey is (perceived as) **consequential**:
Respondents believe their responses will affect the final decision.
2. The authority can enforce the payment
(coercive payment; e.g., a tax).
3. The survey involves a yes-no answer on a single project.

Further advancements:

- A sequence of questions
(Vossler et al. 2012)
- An open-ended format
(Vossler and Holladay 2018)

Consequentiality – definition

- “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”

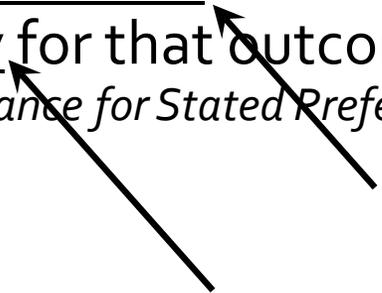
(Carson and Groves 2007)

- “an individual faces or perceives a nonzero probability that their responses will influence decisions related to the outcome in question and they will be required to pay for that outcome”

(*Contemporary Guidance for Stated Preference Studies*, Johnston et al. 2017)

policy consequentiality

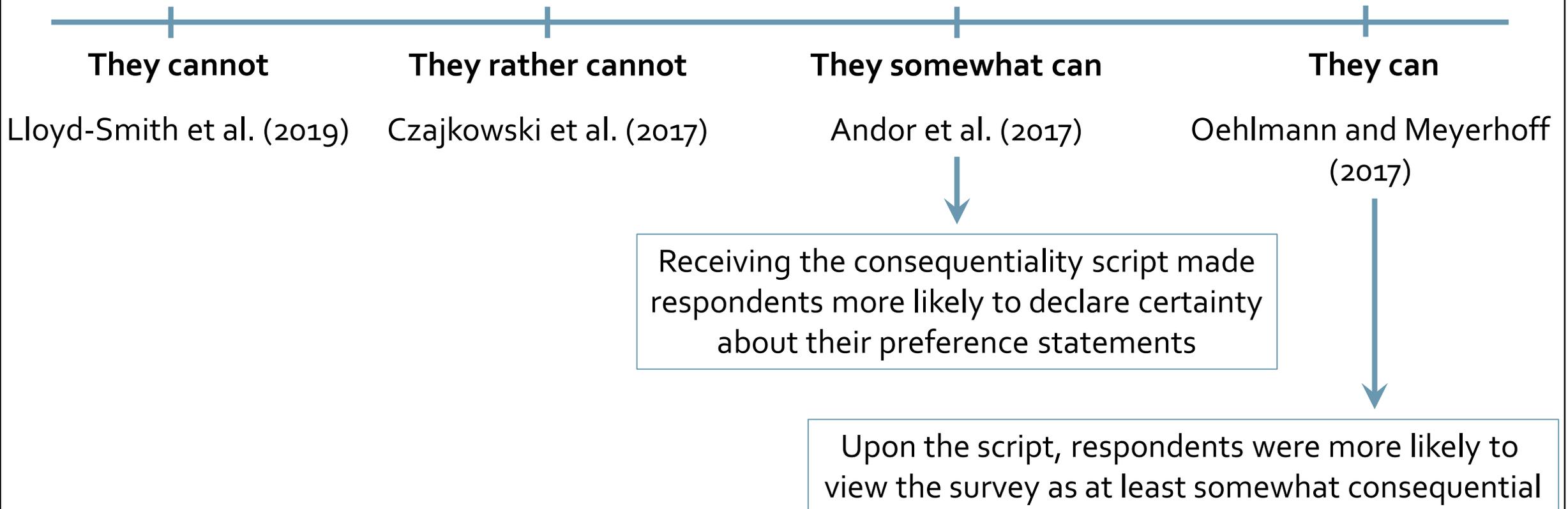
payment consequentiality



Controlling consequentiality in surveys

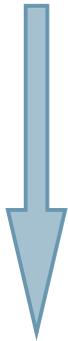
- **Communicated consequentiality** – researchers communicate in the script (potential) consequences of the survey outcome
- **Perceived consequentiality** – respondents are directly asked about their belief in the survey consequentiality
- Difficulties in credibly assuring respondents about consequentiality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

Can consequentiality perceptions be induced with a survey script?



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 - **How to correctly elicit consequentiality perceptions?**
 - **How to take them into account in preference modelling?**

Very limited guidance
in this area

How are consequentiality perceptions elicited?

- A single general question: To what extent do you believe the survey outcome will affect the decision of public authorities?
- Questions differentiating between policy and payment consequentiality:
 - If the authorities go forward with the plan, do you think your and other households will have to pay for it?
 - To what degree do you believe the survey outcome will affect whether the project is conducted?
- Response scale – typically a Likert scale, from two to several levels
- Located after preference elicitation
(the only exception: Lloyd-Smith et al. 2019)

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- Is any of the approaches better?
 - Limited evidence
 - First field survey study with policy and payment cons.
 - Zawojka, Bartczak and Czajkowski (2019)

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 - If the authorities go forward with the plan, do you think your and other households will have to pay for it?
 - To what degree do you believe the survey outcome will affect whether the project is conducted?
 - Response scale – typically 5-point Likert scale
 - Located after preference elicitation (the only exception: Llorente-Vega et al., 2014)
- Distinctive effects of policy and payment consequentiality
 - Policy consequentiality lowers sensitivity to the project cost, while payment consequentiality increases it
 - Thus, they respectively increase and decrease willingness-to-pay for the project

How to include stated perceptions in preference modelling?

- Endogeneity concerns: Self-reports on consequentiality are likely driven by similar (unobservable) factors as stated preferences
- Limited and mixed empirical evidence on endogeneity
- Studies suggesting endogeneity:
 - Herriges et al. (2010)
 - Groothuis et al. (2017) – unobserved factors strengthen the consequentiality and decrease the likelihood of being for the program
 - Lloyd-Smith et al. (2019) – without endogeneity control, perceived consequentiality affects stated preferences, but the effect disappears with endogeneity control
- No significant problem of endogeneity: Vossler et al. (2012), Interis and Petrolia (2014) (both use socio-demographics as instruments)
- None of these studies considers separately policy and payment consequentiality

Börger, Abate, Aanesen and Zawojkska (2019) Working paper

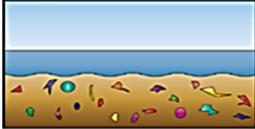
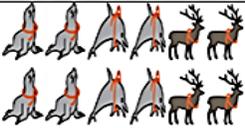
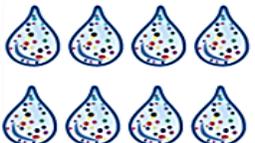
Our research questions:

Are self-reports on policy and payment consequentiality endogenous to stated preferences?

Do the self-reports depend on the preference question attributes (the project cost)?

Data

- A contingent valuation survey on marine plastics pollution in the Norwegian Arctic
- Norwegian households
- Online, June 2018
- 552 usable questionnaires
- An initiative to reduce the impacts of marine plastic litter around Svalbard

Impacts of marine plastic litter around Svalbard	Current situation	With the initiative
Impact on beaches		
	100 grams of plastics per meter square of beach	10 grams of plastics per meter square of beach
Impact on mammals		
	60 seals, reindeer, or porpoises get entangled in nets and ropes	10 seals, reindeer, or porpoises get entangled in nets and ropes
Impact on birds		
	90% of seabirds have pieces of plastic in the stomachs	10% of seabirds have pieces of plastic in the stomachs
Impact on microplastics		
	90% of water samples contain microplastics	10% of water samples contain microplastics

Data

Considering the anticipated results of the initiative outlined above, would you vote for this initiative if the initiative would cost your household an annual tax of NOK ____ for the next ten years?

- Yes, I would vote for the initiative if it costs my household NOK ____ per year.
- No, I would not vote for the initiative if it costs my household NOK ____ per year.

- Randomly assigned tax: 500; 1,500; 2,700; 4,400; 7,000 Norwegian Kroner

Data

- Consequentiality measures – two Likert-scale statements
- The scale – from Strongly Disagree (SD) to Strongly Agree (SA)
- Policy consequentiality – “My responses to this survey will have an influence on whether this initiative is implemented”
- Payment consequentiality – “If the government carries out this initiative, I believe that I will be charged the tax of NOK _____”
- Spearman’s rank order correlation of 0.214

	Policy cons.					Total		
	1 (SD)	2 (D)	3 (N)	4 (A)	5 (SA)			
	1 (SD)	4	4	3	2	0	13	2%
	2 (D)	11	17	25	14	3	70	13%
Payment cons.	3 (N)	18	44	150	41	5	258	47%
	4 (A)	7	24	67	66	4	168	30%
	5 (SA)	5	7	13	12	6	43	8%
	Total	45	96	258	135	18	552	
		8%	17%	47%	24%	3%		

Methodology

- Separate analysis for policy consequentiality and for payment consequentiality
- Drivers of consequentiality – binary and ordered probit models
(for robustness check, shown in the paper only)
- Endogeneity of consequentiality – bivariate probit models
(a two-stage instrumental variable approach)

Methodology

Bivariate probit models

- y_1^* – unobservable consequentiality beliefs (e.g., policy cons.)
- y_2^* – unobservable willingness-to-pay for the proposed initiative
- For each, zero-one coded indicators, y_1 and y_2 , are observed:
 - y_2 – a yes-no vote on the initiative (0 – no, 1 – yes)
 - y_1 – a recoded consequentiality statement (0 – strongly disagree or disagree, 1 – else)

$$y_1 = \begin{cases} 1 & \text{if } y_1^* > 0 \\ 0 & \text{otherwise} \end{cases}$$
$$y_2 = \begin{cases} 1 & \text{if } y_2^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$\text{First stage: } y_1^* = \beta_1' \mathbf{x}_1 + \gamma z + \epsilon_1$$

$$\text{Second stage: } y_2^* = \beta_2' \mathbf{x}_2 + \delta y_1 + \epsilon_2$$

- \mathbf{x}_1 and \mathbf{x}_2 – vectors of exogenous variables
- Instrument z – uncorrelated with y_2 (preference) but correlated with y_1 (consequentiality)
- Maximum likelihood method

Methodology

Bivariate probit models

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Correlation between the error terms, $\rho = \text{Cor}(\epsilon_1, \epsilon_2)$
If $\rho = 0$, no endogeneity and parameters can be estimated consistently in separate models

Explanatory variables

Variable	Explanation	Measurement / Unit	Mean	Std. dev.
Tax (cost)	Randomly assigned tax amount	NOK 1,000	3.21	2.30
Male	Sex	1 = male, 0 = female	0.51	0.50
Age	Age	Years	44	17.21
University	University degree	1 = yes, 0 = no	0.62	0.49
Visited	Visited or lived in Svalbard	1 = yes, 0 = no	0.13	0.34
Informed	How informed a respondent feels about "marine plastic litter"	From 1 = not at all to 5 = extremely	2.88	0.85
Dirtiness	Respondent's perception of dirtiness of Svalbard shores	From 1 = very clean to 5 = very dirty	3.86	0.78

Results: Bivariate probit for payment cons.

	First stage: Payment cons.		Second stage: Yes-No vote	
	Coeff.	St. Err.	Coeff.	St. Err.
Tax (cost)	-0.088***	(0.028)	-0.138***	(0.037)
Male	-0.216*	(0.110)	-0.112	(0.120)
Age				
University				
Visited				
Informed				
Dirtiness				
Payment cons.			1.579**	(0.619)
Ineffective (IV)	-0.739***	(0.247)		
Constant	1.743***	(0.466)	-2.327***	(0.648)
$\rho = Cor(\epsilon_1, \epsilon_2)$			-0.490	(0.384)
Log-likelihood			-519	
BIC			1,158	

- Instrument – uncorrelated with preferences but correlated with consequentiality
- Agreement with the statement: “I do not think measures in Norway alone will do much about marine plastic in Svalbard”
- Zero-one coded

Results: Bivariate probit for payment cons.

	First stage: Payment cons.		Second stage: Yes-No vote	
	Coeff.	St. Err.	Coeff.	St. Err.
Tax (cost)	-0.088***	(0.028)	-0.138***	(0.037)
Male	-0.246*	(0.140)	-0.143	(0.129)
Age	-0.001	(0.004)	0.001	(0.003)
University	0.044	(0.144)	0.114	(0.123)
Visited	0.055	(0.214)	0.242	(0.177)
Informed	0.124	(0.084)	0.310***	(0.079)
Dirtiness	0.007	(0.087)	0.229***	(0.079)
Payment cons.			1.579**	(0.619)
Ineffective (IV)	-0.739***	(0.247)		
Constant	1.743***	(0.466)	-2.327***	(0.648)
$\rho = Cor(\epsilon_1, \epsilon_2)$			-0.490	(0.384)
Log-likelihood			-519	No endogeneity
BIC			1,158	

Results: Bivariate probit for policy cons.

	First stage: Policy cons.		Second stage: Yes-No vote	
	Coeff.	St. Err.	Coeff.	St. Err.
Tax (cost)	0.058**	(0.026)	-0.181***	(0.026)
Male	-0.026	Main difference	-0.193*	(0.117)
Age	0.003	(0.004)	-0.001	(0.003)
University	0.060	(0.125)	0.100	(0.117)
Visited	-0.034	(0.175)	0.208	(0.171)
Informed	0.053	(0.071)	0.292***	(0.077)
Dirtiness	0.202***	(0.076)	0.117	(0.084)
Policy cons.			1.386***	(0.365)
Ineffective (IV)	-0.626***	(0.178)		
Constant	-0.040	(0.403)	-1.338***	(0.383)
$\rho = Cor(\epsilon_1, \epsilon_2)$			-0.677*	(0.230)
Log-likelihood			-609	Some endogeneity
BIC			1,338	

Divergent effects of a tax

on payment and policy consequentiality

- For higher tax amounts:
 - Stronger policy consequentiality – more likely that responses will affect the decision whether to implement the initiative
 - Weaker payment consequentiality – less likely that the tax will be imposed
-
- Groothuis et al. (2017) suggest a negative relationship:
 - higher tax amounts make respondents perceive the vote threshold less likely to be met, and so the chances to influence policy are reduced
 - Possible explanations of the positive effect:
 - The tax amount seen as a 'lever' to affect the implementation decision: The higher the tax, the more weight of the referendum outcome
 - Strong public focus on marine plastic pollution currently in Norway. The society may know that implementing the initiative is very costly. Hence, if asked to contribute relatively little, respondents might not find it credible that measures will be effectively implemented

Divergent effects of a tax

on payment and policy consequentiality

- For higher tax amounts:
 - Stronger policy consequentiality – more likely that responses will affect the decision whether to implement the initiative
 - Weaker payment consequentiality – less likely that the tax will be imposed
-
- Interesting extension of earlier work, where consequentiality was assessed in general and preferences were elicited with a single binary choice format
 - Groothuis et al. (2017):
 - Higher tax amounts weaken perceived consequentiality
 - Did their respondents interpret the consequentiality more like payment consequentiality?
 - Lloyd-Smith et al. (2019):
 - No effect of a tax on preference responses
 - Do the opposite effects balance out?

Robustness check

- Different cut-off for consequentiality: between “Strongly disagree” and “Disagree”
- Theoretically, more consistent with a knife-edge result (?)
 - The knife-edge result: A marginally positive probability of consequences is enough
- For payment consequentiality, results are the same:
 - found to be exogenous
 - a negative effect of a tax on the perceptions
- For policy consequentiality, results are somewhat different:
 - no endogeneity
 - the coefficient of a tax is positive but insignificant

Conclusions

- We contribute to the understanding of consequentiality aspects – payment and policy
- Except for consequentiality, we basically use an incentive compatible setting: single binary choice, tax, no outside options, etc.
- The first investigation of these two aspects for an incentive compatible (single binary choice) format (?)
- Because of some differences in their roles, it might be recommended to separately assess the consequentiality aspects in field surveys

Conclusions

- Respondents who perceive the survey as (payment and/or policy) consequential have a higher likelihood of voting for the initiative
- Weak evidence of endogeneity of consequentiality perceptions
 - Potentially good news for previous studies where endogeneity was not controlled
 - And for multinomial choice settings where we do not have a tool yet
 - Despite that, we suggest testing for endogeneity if possible
- We contribute to earlier evidence
 - socio-demographic variables do not typically affect consequentiality perceptions
 - consequentiality perceptions might be a function of experimental design features: here, a tax decreases payment consequentiality and increases policy consequentiality
- Growing evidence that the experimental design does have an effect
 - Groothuis et al. (2017) – an effect of a tax
 - Lloyd-Smith et al. (2019) – an effect of a position of a consequentiality elicitation question
- Possible context dependence – e.g., a contribution amount and how likely it is for implementation, media coverage, public awareness of the policy costs

THANK YOU!

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