Endogeneity of Self-Reported Consequentiality in Stated Preference Studies

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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

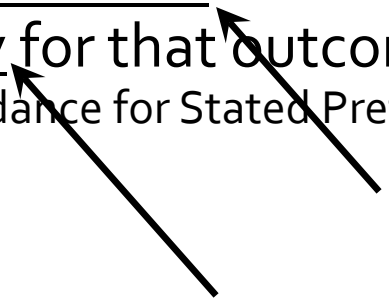
Conditions for truthful preference disclosure
(Carson and Groves 2007; Carson et al. 2014; Vossler et al. 2012)

One of the conditions requires the survey consequentiality

A necessary condition for truthful preference disclosure:

Consequentiality

- "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

Any other dimensions of consequentiality?
E.g., pivotality?

Challenges with consequentiality

- **Consequentiality communicated** via survey scripts (information about actual consequences) does not necessarily affect consequentiality perceptions (Czajkowski et al. 2017; Lloyd-Smith et al. forthcoming)

→ • How to **elicit consequentiality perceptions**?
  - A single general question: To what extent do you believe that the survey outcome will affect the decision of public authorities?
  - Questions differentiating between policy and payment consequentiality
  - More indicator (measurement) questions

→ • How to include data on consequentiality perceptions in **preference modelling**?
  - Endogeneity concerns: Self-reports on perceived consequentiality are likely driven by similar (unobservable) factors as stated preferences

Our study addresses these questions

Endogeneity of consequentiality perceptions

explored in previous studies

- Herriges et al. (2010) – an exogenous information treatment and a Bayesian treatment-effect model; importance of controlling for endogeneity
- No significant problem of endogene
  demographics as instruments:
  - Vossler et al. (2012) – a generalized m
  - Interis and Petrolia (2014) – a two-ste
- Groothuis et al. (2017) – a bivariate p
  found endogenous; unobserved fact
  decrease the likelihood of voting for
- Lloyd-Smith et al. (forthcoming) – a
  model; importance of controlling for endogeneity; with no endogeneity control, perceived consequentiality affects voting behavior, but the effect disappears for the special regressor

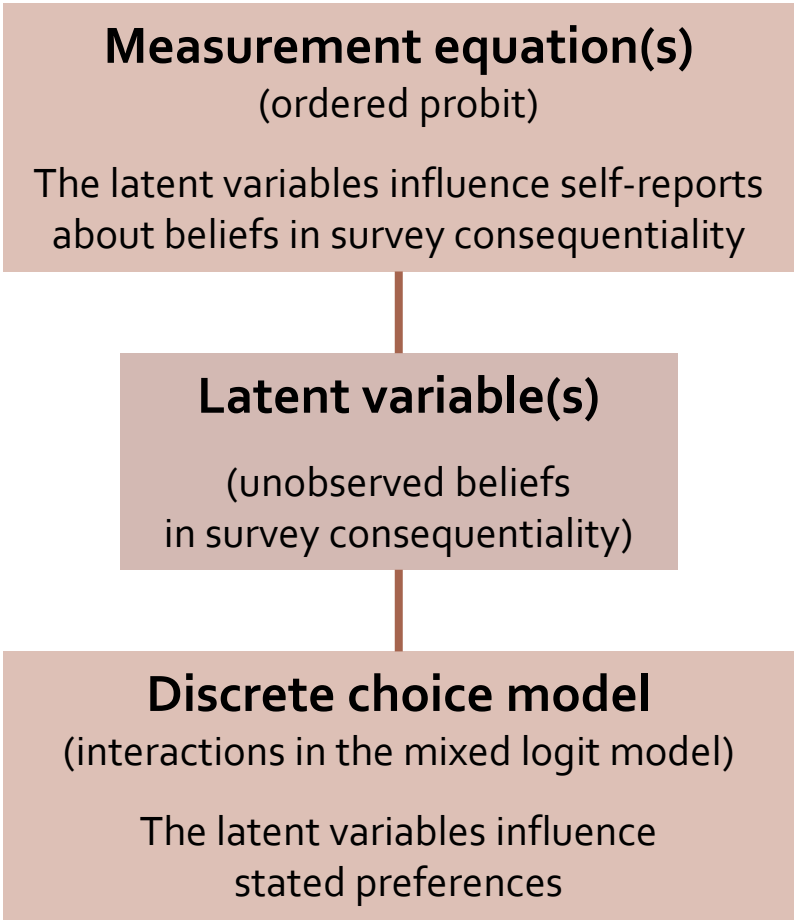
Limitations:

- Little evidence – very few studies
- Mixed evidence
- Mostly for binary choice data (not discrete choice experiments)
- Step-wise procedures
- Single indicator (measurement) questions for consequentiality

Novel approach: Hybrid choice model

Budziński and Czajkowski (2018)

- Hybrid choice models incorporate 'soft' (not objectively measureable) variables, such as perceptions and attitudes, into the choice model
- Here, the 'soft' variable: beliefs about survey consequentiality
- Directly including indicator variables (e.g., self-reports about perceived consequentiality) into a choice model may lead to biased estimates due to endogeneity and measurement problems
- All equations are estimated simultaneously



Novel approach: Hybrid choice model

Budziński and Czajkowski (2018)

Model 1

- Standard hybrid choice models do not resolve endogeneity
- Types of endogeneity:
  1) A latent variable is endogenous
  2) The indicator variable is endogenous, but the latent variable is not

Model 2

- Solutions:
  - Directly modeling the correlation between the latent variable and random parameters – help (1)
  - Adding another latent variable to account for correlation between error terms – help (1) and (2)

Model 3

Here, we present the first application of this approach

Measurement equation(s)
(ordered probit)

The latent variables influence self-reports about beliefs in survey consequentiality

Latent variable(s)

(unobserved beliefs in survey consequentiality)

Discrete choice model
(interactions in the mixed logit model)

The latent variables influence stated preferences

Empirical data

- The hybrid choice model is applied to examine the role of consequentiality and of endogeneity control for value estimates
- Data from three large-scale discrete choice experiments
- Samples from 801 to 2,863 respondents
- Various valuation contexts: public theater offer, renewable energy
- Various ways of eliciting consequentiality perceptions: from one to several indicator questions
- This presentation focuses on one application only

Discrete choice experiment

- Public-good scenario: Extension of public theater offer in Poland (the number of shows)
- 4 choice tasks per person; CAWI; a representative sample of 2,863 residents of Poland

	Variant A	Variant B No changes	Attribute levels
Entertainment theaters	25% more	no change	25% more, 50% more, no change
Drama theaters	50% more	no change	
Children's theaters	no change	no change	
Experimental theaters	50% more	no change	
Annual cost for you (tax)	50 PLN	0 PLN	5, 10, 20, 50 PLN
Your choice	☐	☐	

Consequentiality elicitation

- 10 statements assessed on a seven-level Likert scale (from 'definitely disagree' to 'definitely agree') + don't know
- All used in the measurement → 10 ordered probit models as measurement equations

Uważam, że …
[1] … wypełniając tę ankietę, będę mieć faktyczny wpływ na przyszłą ofertę teatralną.
[2] … wyniki tej ankiety zadecydują o tym, czy zmieniać ofertę teatralną.
[3] … wyniki tej ankiety zostaną wykorzystane do decyzji, czy zmieniać ofertę teatralną.
[4] … jeśli oferta teatralna będzie zmieniana, wyniki tej ankiety zostaną wykorzystane do decyzji, których spektakli ma być więcej, a których mniej.
[5] … jeśli oferta teatralna będzie zmieniana, wyniki tej ankiety zostaną wykorzystane do decyzji, o ile zmienić opłaty (w formie podatków) wykorzystywane do dotowania teatrów.
[6] … zwiększenie oferty teatralnej opisane w tej ankiecie jest możliwe do wprowadzenia.
[7] … decyzja o zwiększeniu oferty teatralnej faktycznie przełoży się na więcej spektakli i premier, tak jak opisano w ankiecie.
[8] … decyzja o zwiększeniu oferty teatralnej faktycznie przełoży się na wyższe opłaty (w formie podatków), co zwiększy moje wydatki, tak jak opisano w ankiecie.
[9] … jestem jedną z wielu osób biorących udział w tej ankiecie, więc moje odpowiedzi nie mają szansy wpłynąć na jej ostateczne wyniki.
[10] … decyzja o zmianie oferty teatralnej zapadnie niezależnie od tego, jakie będą wyniki tej ankiety.

Results

Measurement equation(s)
(ordered probit)

The latent variables influence self-reports about beliefs in survey consequentiality

Latent variable(s)

(unobserved beliefs in survey consequentiality)

Discrete choice model
(interactions in the mixed logit model)

The latent variables influence stated preferences

- One latent variable (LV): Perceived consequentiality
- Responses to each consequentiality statement are explained with the latent variable
- The latent perceived consequentiality is positively correlated with the statements

	Model 1	**Model 2**	**Model 3**
	Standard	Corr. LV and random parameters	+ 1 LV
LL	-41,858	-41,841	-41,556
AIC/n	7.328	7.326	7.278

→ better → even better

Results

- Preference parameters are random (mixed logit)
- For all, standard deviations are highly significant
- Mean coefficient estimates are reported

	Model 1	**Model 2**
	Standard	Corr LV and random parameters
Status quo	0.3837**	0.4652***
Entertainment	0.9375***	1.0439***
Drama	0.6133**	0.5158*
Children's	0.0029	0.0483
Experimental	-0.5546*	-0.5113*
– Cost (10 EUR)	4.1475***	4.0275***
Interactions with LV		
Status quo	-0.3611**	-0.5576**
Entertainment	0.3587	-0.1656
Drama	0.4487*	1.2045***
Children's	0.1170	0.0170
Experimental	1.0192***	0.7649*
– Cost (10 EUR)	-0.5166***	1.0675***

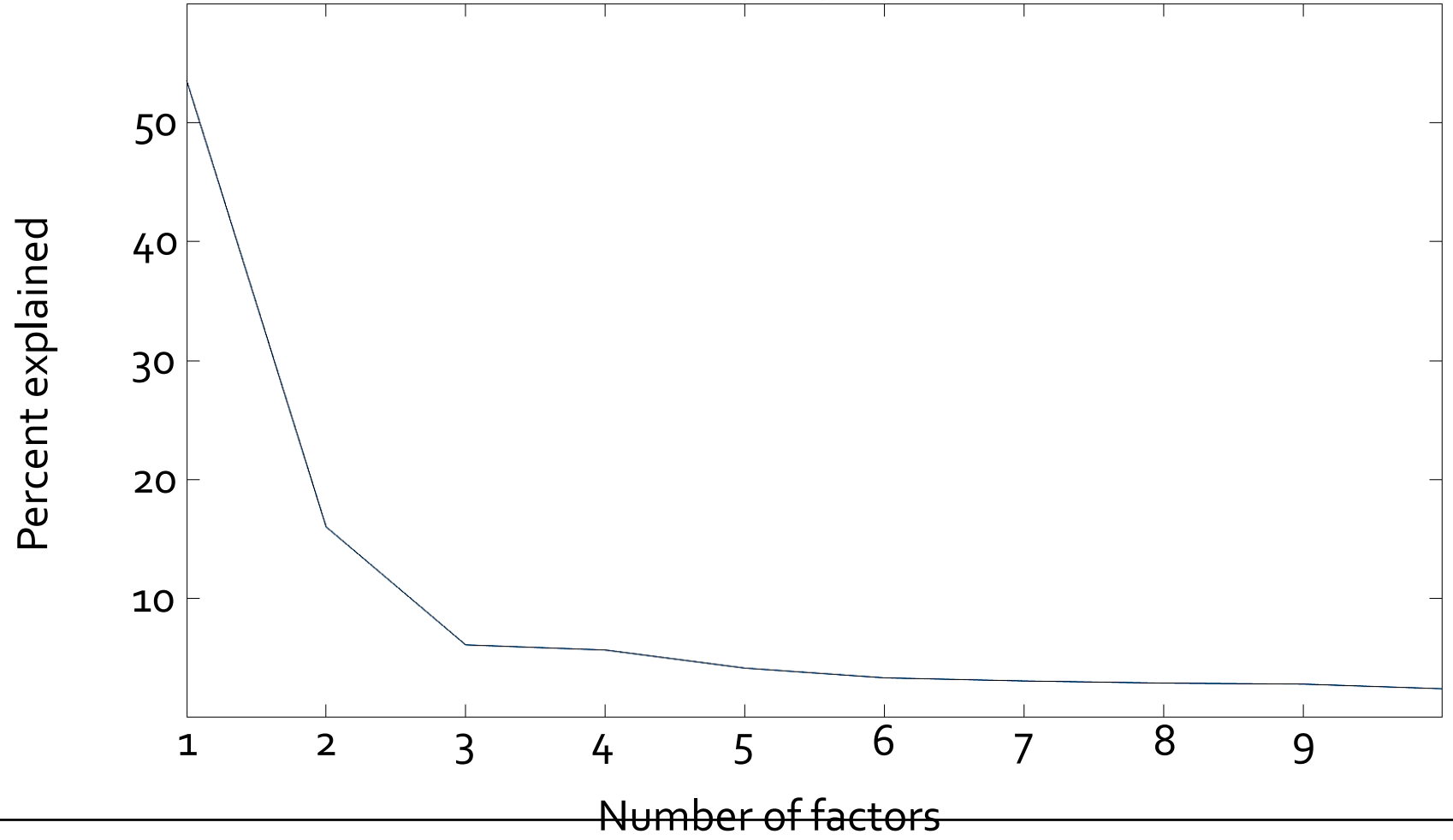
- Model 2 accounts for one endogeneity type: endogeneity of the latent variable
- Endogeneity control matters for the cost attribute estimate

Results

	Model 1	Model 3
	Standard	+ 1 LV
Status quo	0.3837**	0.4473***
Entertainment	0.9375***	0.9280***
Drama	0.6133**	0.5096**
Children's	0.0029	-0.0860
Experimental	-0.5546*	-0.2998
– Cost (10 EUR)	4.1475***	3.7717***
Interactions with LV1		
Status quo	-0.3611**	-0.3860**
Entertainment	0.3587	0.5477**
Drama	0.4487*	0.3940
Children's	0.1170	0.1653
Experimental	1.0192***	0.9112***
– Cost (10 EUR)	-0.5166***	-0.3611**
Interactions with LV2		
Status quo		-0.0595
Entertainment		0.0259
Drama		0.0281
Children's		0.2930
Experimental		0.0877
– Cost (10 EUR)		-0.2668*

- LV2 explains significantly indicator questions (in the measurement equations)
- LV2 is likely another dimension of consequentiality, rather than endogeneity
- Or negligible role of endogeneity
- Controlling for consequentiality dimensions appears to matter more for the model fit than accounting for endogeneity
- How many dimensions of consequentiality do we have?

How many dimensions of consequentiality do we have?



Closing thoughts

- More research:
  - Model specifications with more latent variables to control for more dimensions of consequentiality
  - Other datasets with several indicators of consequentiality
  - The need to (theoretically) identify dimensions of perceived consequentiality and to design ways (indicator questions) of eliciting the perceptions
- For now:
  - Limited evidence of endogeneity issues
  - Accounting for consequentiality dimensions appears to be more important for model fit than controlling endogeneity
  - Similar findings from other datasets we have considered
- **The first application of a hybrid choice model in theory correcting for endogeneity**

THANK YOU!

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