

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 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 endogeneity especially in studies using socio-demographics as instruments:
 - Vossler et al. (2012) – a generalized method of moments over-identification test
 - Interis and Petrolia (2014) – a two-step instrumental variable probit model
- Groothuis et al. (2017) – a bivariate probit approach; perceived consequentiality found endogenous; unobserved factors strengthen the consequentiality and decrease the likelihood of voting for the program
- Lloyd-Smith et al. (forthcoming) – a special multi-step estimator for a scaled probit model; importance of controlling for endogeneity; with no endogeneity control, perceived consequentiality affects voting behavior, but the effect disappears for the special regressor

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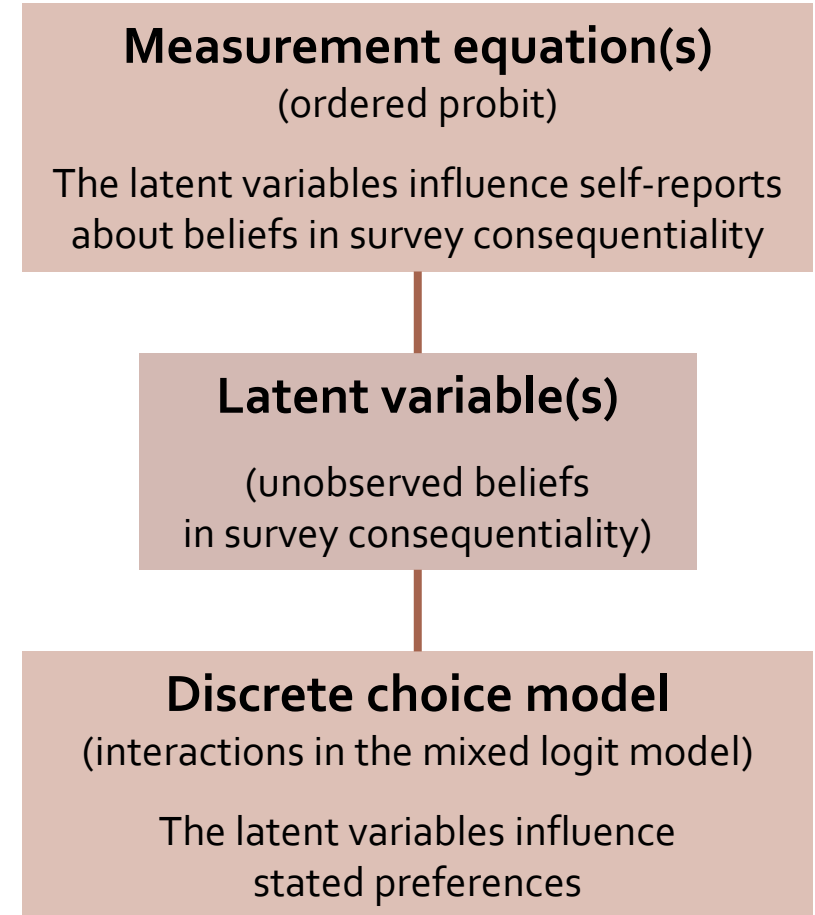
Limitations:

- 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

Our approach: Hybrid choice model

Budziński and Czajkowski (2018)

- Hybrid choice models incorporate 'soft' (not objectively measurable) 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

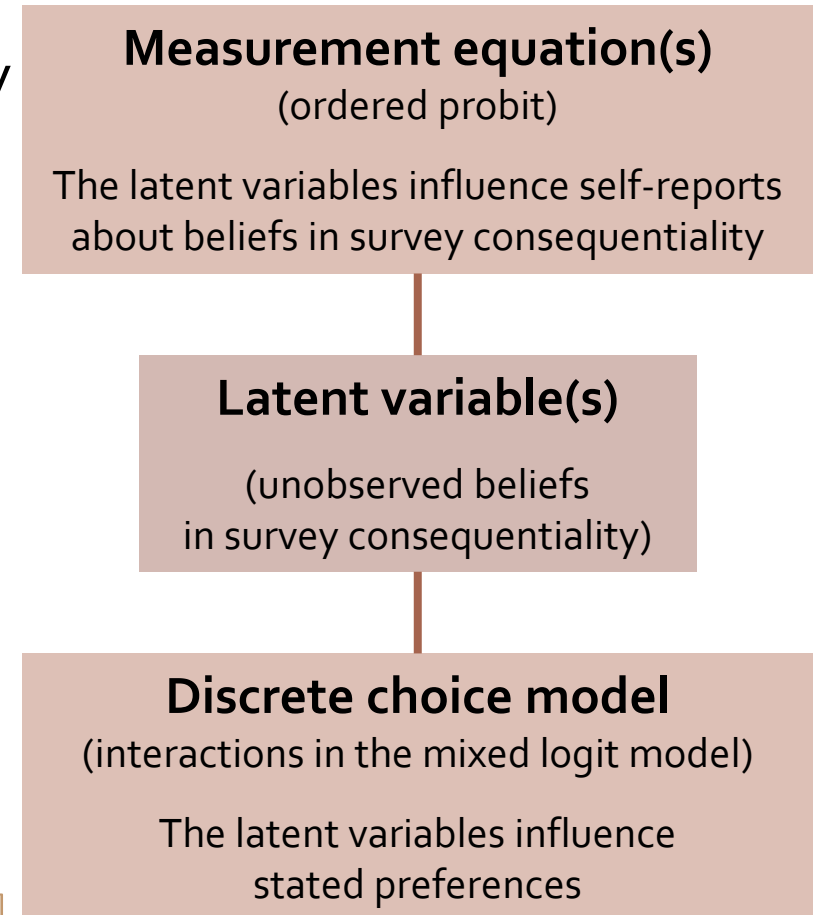


Endogeneity control in hybrid choice models

Budziński and Czajkowski (2018)

- Standard hybrid choice models do not resolve endogeneity **Model 1**
- Types of endogeneity:
 - 1) A latent variable is endogenous
 - 2) The indicator variable is endogenous, but the latent variable is not
- Solutions:
 - Directly modeling the correlation between the latent variable and random parameters – help (1) **Model 2**
 - Adding another latent variable to account for correlation between error terms – help (1) and (2) **Model 3**

Here, we present the first application of these approaches







Empirical data

- We use the hybrid choice model 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 (a 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% | no change | { + 25%, + 50%, no change |
|  Drama theaters | + 50% | no change | |
|  Children's theaters | no change | no change | |
|  Experimental theaters | + 50% | no change | |
| Annual cost for you (tax) | 50 PLN | 0 PLN | 5, 10, 20, 50 PLN |
| Your choice | <input type="checkbox"/> | <input type="checkbox"/> | |

Consequentiality elicitation

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

I think that ...

[1] ... by participating in this survey, I will have influence on the future theater offer.

[2] ... the results of this survey will determine if to change the theater offer.

[3] ... the results of this survey will be used to decide if to change the theater offer.

[4] ... if the theater offer is decided to be changed, the results of this survey will be used to decide which type of shows will be played more and less.

[5] ... if the theater offer is decided to be changed, the results of this survey will be used to decide if to change the (tax) fees used for funding theaters.

[6] ... the increase of the theater offer as described in this survey is possible to be implemented.

[7] ... a decision to expand the theater offer will indeed result in more shows and premiers, as described in this survey.

[8] ... a decision to expand the theater offer will indeed result in higher (tax) fees, which will increase my household expenditures, as described in this survey.

[9] ... I am one of many people participating in this survey, so my responses do not have a chance to affect the survey final results.

[10] ... a decision whether to change the theater offer will be taken independently of the survey results.

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 (except for the last two)

| | 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

| | 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*** |
| <i>Interactions with LV</i> | | |
| 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*** |

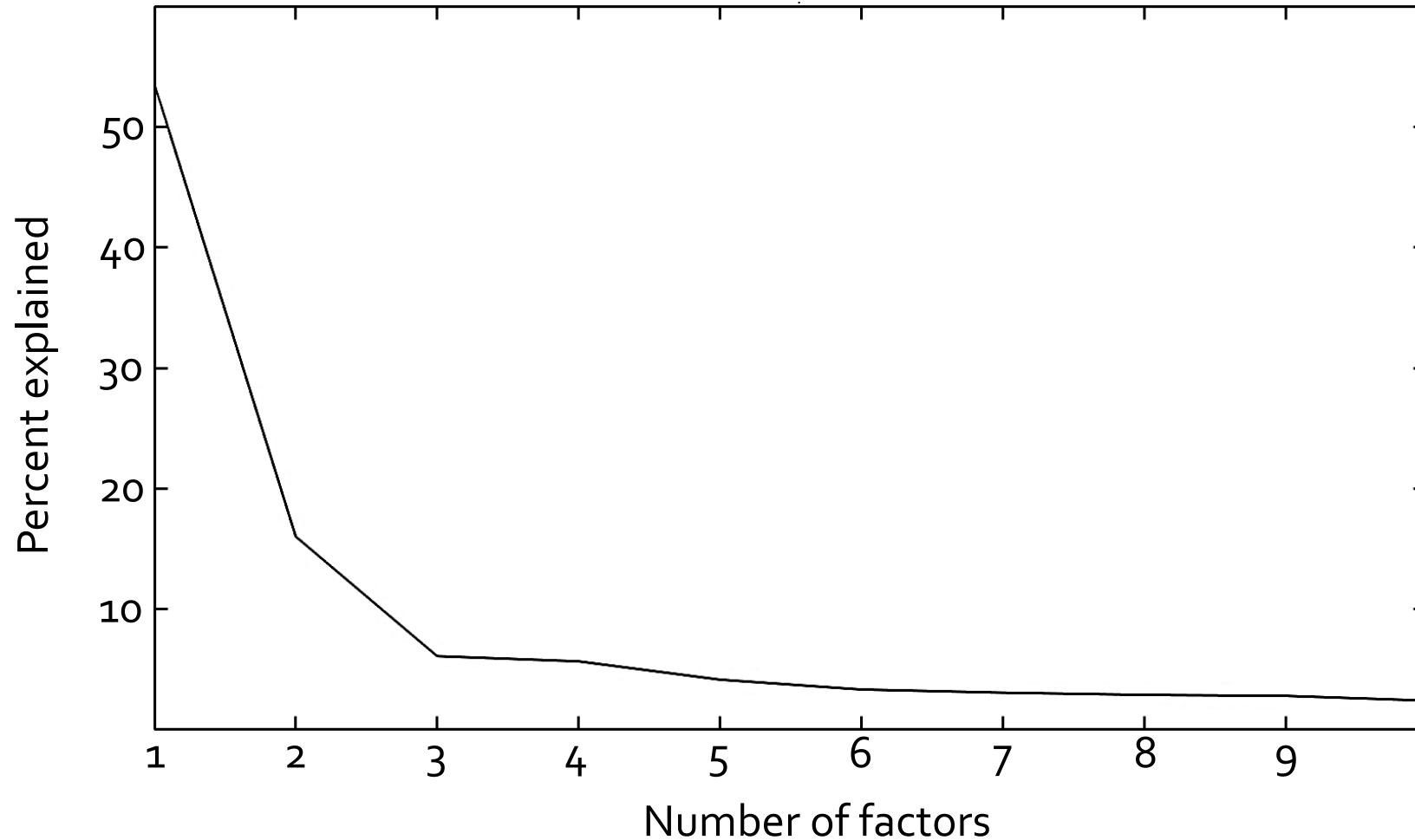
- Preference parameters are random (mixed logit)
- For all, standard deviations are highly significant
- Mean coefficient estimates are reported
- Model 2 accounts for one endogeneity type: endogeneity of the latent variable
- Endogeneity control matters for the cost attribute
- And so it changes willingness-to-pay values

| | 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*** |
| <i>Interactions with LV1</i> | | |
| 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** |
| <i>Interactions with LV2</i> | | |
| Status quo | | -0.0595 |
| Entertainment | | 0.0259 |
| Drama | | 0.0281 |
| Children's | | 0.2930 |
| Experimental | | 0.0877 |
| – Cost (10 EUR) | | -0.2668* |

Results

- LV2 explains significantly all indicator questions in the measurement equations – positive correlation
- In Model 3, LV1 is correlated negatively with the last two statements and positively with all others
- LV2 can be another dimension of consequentiality / yea-saying
- Or a negligible role of 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 (or for other aspects captured by the ten statement responses)
 - 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:
 - Some evidence of endogeneity issues – particularly important for the cost attribute
 - Accounting for consequentiality (or other) dimensions appears to be more important for the model fit than controlling for 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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