ADDRESSING EMPIRICAL CHALLENGES RELATED TO THE INCENTIVE COMPATIBILITY OF STATED PREFERENCE METHODS

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Stated preference methods

• Used to determine public’s preferences, especially towards non-market goods
• Survey-based – in specially designed surveys respondents state what they would do
• Flexible – enable valuation of hypothetical states
• Important for cost-benefit analysis – allow to estimate the benefits
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BUT much scepticism whether survey responses reflect actual preferences
- Surveys are often (seen as) hypothetical
- Lack of economic-based incentives to answer a survey truthfully
- Empirical evidence on hypothetical bias
- Strategic voting
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How to obtain true preferences of survey respondents?
Conditions for incentive compatibility
(Carson and Groves 2007; Carson et al. 2014)
Incentive compatibility = Revealing true preferences is the respondent’s optimal strategy.

1. Respondents understand and answer the question being asked.
2. The survey is seen as a take-it-or-leave-it offer.
3. The survey involves a yes-no answer on a single project. (the Gibbard-Satterthwaite theorem)
4. The authority can enforce the payment (coercive payment).
5. The survey is perceived as consequential:
   - Respondents care about the good being valued.
   - Respondents believe that their responses will affect the finally implemented policy.
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Later advancements:
- A sequence of questions
  Vossler et al. 2012
- Open-ended format
  Holladay and Vossler 2016
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EXISTING EVIDENCE ON
the role of consequentiality for stated preferences

- Studies that exogenously vary **communicated consequentiality** (defined by a researcher)
  - Manipulate the probability of a voting being binding (Carson et al. 2014; Cummings and Taylor 1998; Landry and List 2007)
  - Assign various weights to respondents’ votes in determining the final action (Vossler and Evans 2009)
  - Include / exclude scripts about informing policy makers about the survey results (Meyerhoff et al. 2014; Drichoutis et al. 2015)

- Studies that control respondents’ beliefs in policy consequentiality (**perceived consequentiality**)
  - Measured through respondents’ self-reports to a direct question, e.g., „Do you believe that your votes will be taken into account by policy makers?”
  - Response scale:
    - Binary – yes/no (Broadbent 2012)
    - Likert scale (Herriges et al. 2010; Vossler et al. 2012; Vossler et al. 2013)
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Our research questions

**Communicated consequentiality**

1) How to **design survey scripts** to induce respondents to believe in consequentiality?

“The effect of consequentiality scripts in stated preference surveys is in its infancy.”
(Kling, Phaneuf and Zhao 2012)

**Perceived consequentiality**

2) How to appropriately include measures of unobservable beliefs about consequentiality in **econometric models** of stated preferences?

We propose a Hybrid Mixed Logit model – a comprehensive framework:
- to identify effects of unobservable beliefs on stated preferences,
- whilst incorporating observable measures of these beliefs.
Study design

- Discrete Choice Experiment; CAWI; A representative sample of 1,700 citizens of Warsaw
- Public good scenario: Cheap tickets to municipal theatres in Warsaw, Poland

<table>
<thead>
<tr>
<th>Alternative A</th>
<th>Alternative B</th>
<th>Attribute levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entertainment theatres</td>
<td>Continuation of the current policy</td>
<td></td>
</tr>
<tr>
<td>Drama repertory theatres</td>
<td>Tickets for 5 PLN</td>
<td>Tickets for 5 PLN, No change</td>
</tr>
<tr>
<td>Children’s theatres</td>
<td>No change</td>
<td>10, 20, 50, 100 PLN</td>
</tr>
<tr>
<td>Experimental theatres</td>
<td>Tickets for 5 PLN</td>
<td></td>
</tr>
<tr>
<td>Annual cost for you (tax)</td>
<td>100 PLN</td>
<td></td>
</tr>
<tr>
<td>Your choice</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

- 12 choice tasks per respondent
- Design optimised for Bayesian D-efficiency
Study design

• Communicated consequentiality
  – Exposition of actual consequences following from the survey
  – 4 treatments (split-sample):
    1 → no particular information about future consequences
    2 → at the beginning the survey states that the respondents’ choices
        might influence future policies
    3 → Treatment 2 + reminders in two more places about possible
        ties to actual policy
    4 → Treatment 3 + a highlighted reminder about potential actual
        consequences right before choice tasks

• Perceived consequentiality
  – A follow-up question: “Do you think that your choices in the survey will influence future decisions
    regarding financing municipal theatres in Warsaw?”
  – Five-degree Likert scale (1 – definitely no, ..., 5 – definitely yes)
Econometric approach
How to include measures of unobservable beliefs?

- Directly including stated measures of beliefs may be problematic:
  - stated beliefs are measured imprecisely; possible measurement error,
  - stated beliefs may be correlated with other unobserved factors that influence choices.

- Herriges et al. (2010) use instrumental variables to identify the impact of perceived consequentiality on preferences.

- Vossler et al. (2012) and Vossler and Watson (2013) mention binary probit instrumental variable models.

- We propose a Hybrid Mixed Logit model.
Econometric approach
Hybrid Choice Model

- Incorporate **perceptions**, psychological factors into the random utility model

- Here, the psychological factor: beliefs about survey consequentiality

- Enable to **model explicitly** the effect of an experimental condition on respondents’ perceptions, and the effect of the perceptions on their (observed) choices

- Avoid endogeneity
1. **Discrete choice model** in WTP-space with random parameters (Mixed Logit);

Utility derived by consumer $n$ choosing alternative $j$ in choice task $t$ ($U_{njt}$):

$$U_{njt} = \alpha_n c_{njt} + b_n X_{njt} + \varepsilon_{njt} = \alpha_n \left( c_{njt} + \beta_n X_{njt} \right) + \varepsilon_{njt}$$

- **monetary attribute**
- **non-monetary attributes**
- **error term**

**consumer-specific, log-normally distributed (random) parameter**

**consumer-specific, normally distributed (random) parameters**

**money-metric marginal utilities of attributes (willingness to pay, WTP)**

The means of the random parameters are explained by the latent variable.
Econometric approach
Hybrid Mixed Logit Model

2. **Structural equation** – a linear regression

\[ LV_n = \Psi' X^{str}_n + \zeta_n \]

\( LV_n \) – the latent variable, \( X^{str}_n \) – socio-demographic variables, \( \Psi \) – a matrix of coefficients, \( \zeta_n \) – error terms

3. **Measurement equation** – ordered probit

\[ I^*_n = \Gamma' LV_n + \eta_n \]

\( I_n \) – an indicator of the latent variable (responses on a five-degree Likert scale), \( I^*_n \) = \[\begin{cases} 1 & \text{for } I^*_n < \gamma_1 \\ 2 & \text{for } \gamma_1 \leq I^*_n < \gamma_2 \\ \vdots \\ 5 & \text{for } \gamma_4 \leq I^*_n \end{cases}\]

\( \Gamma \) – a matrix of coefficients, \( \eta_n \) – error terms

All equations are estimated simultaneously, using the simulated maximum likelihood method.

(10,000 scrambled Sobol draws)
Structural equation

Dependent variable:
Belief in consequentiality (latent variable, LV)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.2992***</td>
<td>[0.0615]</td>
</tr>
<tr>
<td>Age</td>
<td>-0.0037**</td>
<td>[0.0019]</td>
</tr>
<tr>
<td>High school degree</td>
<td>0.1531*</td>
<td>[0.0896]</td>
</tr>
<tr>
<td>University degree</td>
<td>-0.0300</td>
<td>[0.0896]</td>
</tr>
<tr>
<td>Household income</td>
<td>0.1272***</td>
<td>[0.0312]</td>
</tr>
<tr>
<td>Children</td>
<td>0.0143</td>
<td>[0.0443]</td>
</tr>
</tbody>
</table>

- Individual socio-demographic characteristics influence latent beliefs in consequentiality.
- Respondents who perceive the survey as more consequential:
  - female,
  - younger,
  - wealthier.

***, **, * - Significance at the 1%, 5% and 10% level, respectively.
Standard errors are given in brackets.
## Measurement equation

Dependent variable:
Indicator of the belief in consequentiality (self-reported)

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>0.1762***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[0.0361]</td>
</tr>
<tr>
<td>Threshold 1</td>
<td>-1.6173***</td>
</tr>
<tr>
<td></td>
<td>[0.0512]</td>
</tr>
<tr>
<td>Threshold 2</td>
<td>-0.7364***</td>
</tr>
<tr>
<td></td>
<td>[0.1570]</td>
</tr>
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<td>Threshold 3</td>
<td>0.6206***</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Threshold 4</td>
<td>1.5957***</td>
</tr>
<tr>
<td></td>
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Latent beliefs in consequentiality are positively correlated with self-reported measures of the beliefs.

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<table>
<thead>
<tr>
<th>Category</th>
<th>Means</th>
<th>St. Dev.</th>
<th>Interactions with treatment</th>
<th>Interactions with LV</th>
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<tbody>
<tr>
<td>Status Quo</td>
<td>2.5542</td>
<td>43.7707***</td>
<td>1.0524</td>
<td>-6.1479***</td>
</tr>
<tr>
<td></td>
<td>[1.6409]</td>
<td>[1.5122]</td>
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<tr>
<td>Entertainment theatres</td>
<td>32.5676***</td>
<td>5.4877</td>
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Influence of communicated consequentiality on WTP

Status Quo

Entertainment Theatres

Drama Theatres

Children's Theatres

Experimental Theatres

Cost
Influence of communicated consequentiality on WTP

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Beliefs over consequentiality may largely be “homegrown”; little room for the researcher to significantly influence them.
## Discrete Choice Experiment (WTP-space, in PLN)

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Influence of latent beliefs on WTP

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### Status Quo

**Children's Theatres**

- **High**
  - Data points
- **Low**
  - Data points

**Entertainment Theatres**

- **High**
  - Data points
- **Low**
  - Data points

**Drama Theatres**

- **High**
  - Data points
- **Low**
  - Data points
Influence of latent beliefs on WTP

**Research goal**

- Latent consequentiality is a catalyst for a policy change
- Stronger beliefs:
  - lower WTP for the status quo
  - higher WTP for the attributes
Influence of perceived consequentiality on WTP

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Status Quo

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Drama Theatres

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Cost
### Robustness of our results

**Other model specifications**

<table>
<thead>
<tr>
<th>Model modification</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levels of communicated consequentiality as independent interactions in the discrete choice part (dummy variables instead of a continuous variable)</td>
<td>Results do not change.</td>
</tr>
<tr>
<td>Communicated consequentiality as an explanatory variable(s) in the structural equation, instead of interactions with the attributes</td>
<td>Communicated consequentiality strengthens latent beliefs, and indirectly, through latent beliefs, increases WTP.</td>
</tr>
</tbody>
</table>
| Communicated consequentiality as an explanatory variable(s) in the measurement equation | • Communicated consequentiality do not explain the differences in the self-reported consequentiality beliefs.  
• The survey scripts do not affect the stated beliefs.  
• The Likert-scale question may not capture the latent beliefs. |
| No variables in the structural equation | • Results do not change.  
• Socio-demographic characteristics are not the drivers of the found relationships. |
Conclusions

- Latent consequentiality beliefs have a significant effect on WTP.
- Communicated consequentiality significantly influences WTP.
- Communicated consequentiality has no significant effect on perceived consequentiality
  - Need to develop other / more precise follow-up questions?
  - Need to develop more convincing consequentiality scripts?
- Overall, we propose the econometric framework for the analysis of links between:
  - perceived consequentiality,
  - communicated consequentiality,
  - respondents’ preferences,
  - their socio-demographic characteristics.

The importance of the theoretical assumption on survey consequentiality is empirically confirmed.
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