DISENTANGLING IMPACTS OF POLICY AND PAYMENT CONSEQUENTIALITY AND RISK ATTITUDES ON STATED PREFERENCES

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Stated preference methods

- Used to determine public's preferences
- Based on surveys
- Flexible – valuation of hypothetical states
- Provide estimates of the benefits for cost-benefit analysis

BUT much skepticism whether survey responses reflect actual preferences

- Surveys are often (seen as) hypothetical
- Lack of economic-based incentives to answer a survey truthfully
- Questioned incentive compatibility

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How to obtain true preferences of survey respondents?

A necessary condition: Consequentiality

- Literature defines conditions for truthful preference disclosure.
  (Carson and Groves 2007; Carson et al. 2014; Vossler et al. 2012; Vossler and Holladay 2016)

- One of the conditions: Respondents view the survey as consequential.

- "Consequentiality describes a condition in which an individual faces or perceives a non-zero probability that
  - their responses will influence decisions related to the outcome in question
  - and they will be required to pay for that outcome if it is implemented."
  (*Contemporary Guidance for Stated Preference Studies*, Johnston et al. 2017)

Policy consequentiality

Payment consequentiality

A measure of consequentiality perceptions

- Perceptions of consequentiality are typically assessed on the basis of:
  To what extent do you believe that your choices will affect the decision of public authorities? (Not at all – Very strongly)

- Does the question measure the perceptions precisely enough?

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  To what extent do you believe that your choices will affect the decision of public authorities? (Not at all – Very strongly)
- Does the question measure the perceptions precisely enough?
- No differentiation between policy and payment consequentiality
- How do respondents understand the general question?
  Do they take the two consequentiality aspects into account?
- Literature addresses
  - uncertainty about the good provision
  - and uncertainty about the payment collection,
  though separately.
- These two uncertainties may affect stated preferences differently.

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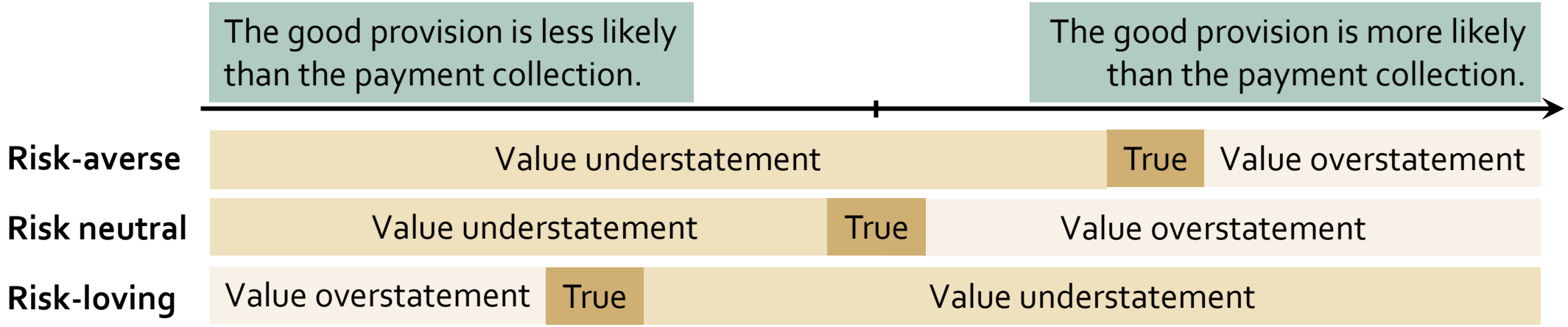
  - and uncertainty about the payment collection, though separately.

  An exception: Mitani and Flores (2014)
- These two uncertainties may affect stated preferences differently.

Mitani and Flores (2014)

- They show in a theoretical model how probabilities of the good provision and the payment collection affect truthful preference disclosure:



- They test the predictions in an experiment: induced-value, voluntary contributions, open-ended.

Findings:
- Probability of the good provision increases stated values.
- Probability of the payment collection reduces stated values.
- Risk aversion reduces stated values.
- No significant effect of an interaction of the probabilities and risk preferences.

Our goals

- **The role of consequentiality**:
  To deepen the understanding of the influence of consequentiality on stated preferences, by distinguishing between policy consequentiality and payment consequentiality
- **Measurement of consequentiality perceptions**:
  To help design questions to measure respondents' unobservable beliefs about consequentiality
- **Risk attitudes and consequentiality**:
  To verify whether the impacts of policy and payment consequentiality on stated preferences differ in risk attitudes
- **Field study**:
  To provide evidence from a field application of a stated preference survey

Study design

- Discrete Choice Experiment; CAPI; A representative sample of 800 citizens of Poland
- Public good scenario: Development of renewable energy sites

	Wind energy	**Biomass energy**	**Solar energy**	**I am indifferent**
Distance of a site from residential areas	600 m	2500 m	300 m	900 m
Size of a site	Large (35-50 turbines)	Large (15-25 tanks)	Small (0.5-5 hectares)	Medium
Number of sites	4	5	5	3
Share of the area protected from renewable energy expansion	20%	50%	10%	30%
Energy transmission lines	Underground	Underground	Overhead	Overhead
Change in the electricity bill per month (per year)	+30 PLN (+360 PLN)	-10 PLN (-120 PLN)	+30 PLN (+360 PLN)	0 PLN
My choice	□	□	□	□

- Six choice tasks per respondent; Bayesian C-efficient design; January 2016

Study design – consequentiality

- Perceptions of consequentiality are measured through respondents' statements to what extent they believe the survey results will affect the following:

  "The project of development of renewable energy infrastructure will indeed be conducted in Poland in the next five years."

  "For the purpose of development of renewable energy infrastructure, the electricity bill will indeed change in the next five years."

- A five-degree Likert response scale:
  "I definitely agree", "I agree", "I do not know", "I disagree" and "I definitely disagree"

- Answered after all choice tasks

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Policy consequentiality (*pol*)

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5 4 3 2 1

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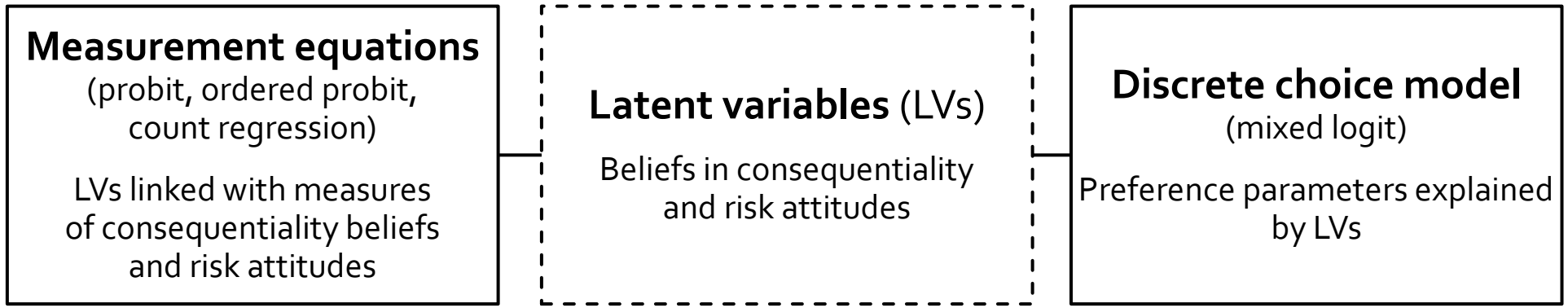
Study design – risk attitudes

- Risk attitudes are assessed based on a similar design to Holt and Laury (2002).
- Respondents make choices in two series of comparisons of two lotteries: A and B.
- Lottery A is safe. Lottery B is risky.
- The expected payoff from lottery B increases from one comparison to the next comparison, so choosing the risky lottery becomes more and more attractive.
- The point at which a respondent switches from safe lottery A to risky lottery B informs about his risk preferences: the later the respondent chooses lottery B, the higher his risk aversion.

Econometric approach: Hybrid Choice Model

- A structural model that includes
  - a choice component (the discrete choice experiment)
  - and a non-choice component (the measures of consequentiality perceptions and risk attitudes).
- The hybrid choice model incorporates unobservable perceptions into the random utility framework: beliefs in policy consequentiality, beliefs in payment consequentiality, and attitudes towards risk.
- These perceptions (unobservable, and subject to measurement error) are captured through separate latent variables.
- The model is estimated with a maximum simulated likelihood method.



Discrete choice model

	Means	Standard Deviations
Wind	1.906***	2.171***
	(0.327)	(0.202)
Solar	3.805***	1.728***
	(0.323)	(0.269)
Biomass	0.811**	0.191
	(0.337)	(0.529)
Distance (km)	0.324***	0.470***
	(0.054)	(0.085)
Size	-0.058	0.032
	(0.069)	(0.193)
Number	-0.009	0.066
	(0.041)	(0.108)
Protected area	0.653**	0.327
	(0.298)	(1.068)
Underground lines	0.195**	0.342
	(0.086)	(0.316)
Cost per month (EUR)	-1.700***	1.043***
	(0.085)	(0.087)

Note: Standard errors are given in brackets.

- Respondents prefer renewable energy development to the status quo.
- Solar energy is preferred most; biomass energy is preferred least.
- More expensive projects are less preferred.
- Significant standard deviations indicate preference heterogeneity.

Model characteristics	
Log-likelihood (constants only)	-14,391.4
Log-likelihood	-10,420.3
McFadden's pseudo R^2	0.276
AIC/n	4.707
n (observations)	4,464
k (parameters)	85

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Cost is assumed to be log-normally distributed.
(A natural exponent for interpretation)

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Measurement equations

Policy and payment consequentiality

	Measurement Equation 1 (ordered probit) **Dependent variable: *pol***		Measurement Equation 2 (ordered probit) **Dependent variable: *pay***
LV_{pol}	0.334*** (0.100)	LV_{pay}	0.520*** (0.158)
LV_{risk}	0.053 (0.046)	LV_{risk}	-0.004 (0.048)
Cutoff 1	-1.388*** (0.078)	Cutoff 1	-1.354*** (0.107)
Cutoff 2	-0.103 (0.451)	Cutoff 2	-0.154 (0.248)
Cutoff 3	0.032 (0.452)	Cutoff 3	-0.032 (0.256)
Cutoff 4	1.639*** (0.466)	Cutoff 4	1.370*** (0.393)

Discrete choice model

	Means	Standard Deviations	Means interacted with LV_{pol}	Means interacted with LV_{pay}
Wind	1.906***	2.171***	3.178***	-0.150
			(0.408)	(0.409)
Solar			2.899***	-0.147
			(0.433)	(0.346)
Biomass			3.374***	0.069
	(0.337)	(0.529)	(0.476)	(0.455)
Distance (km)	0.324***	0.470***	0.198**	-0.101
	(0.054)	(0.085)	(0.093)	(0.085)
Size	-0.058	0.032	-0.206*	0.312***
	(0.069)	(0.193)	(0.112)	(0.098)
Number	-0.009	0.066	-0.017	0.147***
	(0.041)	(0.108)	(0.064)	(0.056)
Protected area	0.653**	0.327	-0.308	1.175**
			(0.487)	(0.476)
Underground lines			0.016	-0.141
			(0.143)	(0.138)
Cost per month (EUR)			-0.383***	0.512***
			(0.093)	(0.094)

Respondents strongly believing in policy consequentiality like the project over the status quo substantially more.

Respondents convinced about policy consequentiality are less cost sensitive.

Respondents believing in payment consequentiality are more cost sensitive.

Measurement equations:
"Don't know" about consequentiality

	Measurement Equation 3 (probit) **Dependent variable: *pol_dk***		Measurement Equation 4 (probit) **Dependent variable: *pay_dk***
LV_{pol_dk}	1.042*** (0.416)	LV_{pay_dk}	1.539*** (0.452)
LV_{risk}	0.090 (0.190)	LV_{risk}	0.106 (0.215)
Constant	-3.380*** (0.382)	Constant	-4.068*** (0.533)

Note: *dk* denotes "don't know".

Discrete choice model

	Means	Standard Deviations	Means interacted with LV_{pol_dk}	Means interacted with LV_{pay_dk}
Wind			-1.932***	-3.069***
			(0.477)	(0.447)
Solar			-2.425***	-3.459***
			(0.439)	(0.481)
Biomass			-0.337	-3.203***
	(0.337)	(0.529)	(0.448)	(0.486)
Distance (km)	0.324***	0.470***	-0.017	-0.028
	(0.054)	(0.085)	(0.091)	(0.108)
Size	-0.058	0.032	0.079	0.010
	(0.069)	(0.193)	(0.100)	(0.132)
Number	-0.009	0.066	0.103	-0.010
	(0.041)	(0.108)	(0.063)	(0.071)
Protected area	0.653**	0.327	0.727	-0.262
	(0.298)	(1.068)	(0.484)	(0.553)
Underground lines	0.195**	0.342	0.032	-0.347*
	(0.086)	(0.316)	(0.160)	(0.192)
Cost per month (EUR)	-1.700***	1.043***	-0.172*	-0.088
	(0.085)	(0.087)	(0.093)	(0.153)

"Don't know" respondents reveal much weaker interest in any of the proposed projects (stronger preference towards the status quo).

Measurement equations

Risk attitudes (lottery choices)

	Measurement Equation 5 (Poisson regression) **Dependent variable:** **Safe lottery choices in Series 1**		Measurement Equation 6 (Poisson regression) **Dependent variable:** **Safe lottery choices in Series 2**
LV_{risk}	-0.797*** (0.033)	LV_{risk}	-1.612*** (0.067)
Constant	1.609*** (0.034)	Constant	0.587*** (0.072)

Discrete choice model

	Means	Standard Deviations	Means interacted with LV_{risk}
Wind	1.906***	2.171***	-0.085
	(0.327)	(0.202)	(0.258)
Solar	3.805***	1.728***	-0.296
	(0.323)	(0.269)	(0.259)
Biomass	0.811**	0.191	0.071
	(0.337)	(0.529)	(0.269)
Distance (km)	0.324***	0.470***	-0.026
	(0.054)	(0.085)	(0.051)
Size	-0.058	0.032	0.057
	(0.069)	(0.193)	(0.062)
Number	-0.009	0.066	0.021
	(0.041)	(0.108)	(0.038)
Protected area	0.653**	0.327	-0.525*
	(0.298)	(1.068)	(0.283)
Underground lines	0.195**	0.342	0.031
	(0.086)	(0.316)	(0.081)
Cost per month (EUR)	-1.700***	1.043***	-0.206***
	(0.085)	(0.087)	(0.068)

- From Measurement Equations 1, 2, 3 and 4: respondents' risk attitudes do not influence perceptions of policy and payment consequentiality.
- Measures of consequentiality beliefs are not related to preferences towards risk, which contradicts the hypothesis of Mitani and Flores (2014).
- Risk attitudes affect mainly marginal utility from money: high risk aversion leads to more cost sensitivity.

Conclusions

- Latent beliefs in policy and payment consequentiality affect stated preferences differently:
  - Policy-consequential respondents prefer the project to the status quo more.
  - Payment-consequential respondents are more cost sensitive.
- Respondents with no opinion about consequentiality differ from others in their stated preferences; they are much less interested in the project implementation.
- Risk attitudes do not influence measures of consequentiality beliefs, and have a negligible impact on stated preferences.
- Overall, our empirical findings:
  - evidence importance of assessing respondents' beliefs in policy consequentiality and payment consequentiality separately;
  - suggest the need for developing questions to elicit beliefs in consequentiality more precisely;
  - question the theoretical presumption about the impact of risk attitudes interacted with consequentiality beliefs on stated preferences.

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