The arbitrary choice of price vector. Investigating the price vector effect in a pilot discrete choice experiment valuating risk reductions in death

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Background

Part of IMPROSA project

- Go develop a scientific basis for implementing socio-economically efficient measures to improve road safety in Denmark.

Preferences for risk reductions

- Fatal ➔ Value of a Statistical Life (VSL /VPF)
- Non-fatal ➔ Value of Preventing an Injury (VPI)

Previous VSL using stated preference methods

- Contingent valuation: Eg., Jones-Lee et al., 1985; Kidholm, 1995; Carthy et al., 1999
- Discrete Choice Modelling: Eg., Johansson-Stenman et al., 2008; Rheinberger 2010: Alberini et al., 2011

The questionnaire

1. Socio-demographic questions
2. Questions relating to traffic behaviour and safety (how much do you drive, what do you drive etc.)
3. Risk communication

Common for all survey splits

4. Respondents randomised into one of 23 SP ”routes”/survey splits

5. Debriefing & follow up

Common for all survey splits

The pilot study

- Data collected in November 2012
- Test of complete questionnaire including a range of selected SP splits
  - Among these test of price level effect in DCE
  - 50 respondents per split

The DCE Scenario

- Initiative that would reduce the risk of a fatal traffic accident (better lightening, better signaling etc)
- Annual risk reduction for the next decade
- Yearly extra tax per household for the next decade
- Cheap talk: budget reminder and other risks

- The same Bayesian efficient design (with conditions to avoid dominant alternatives)
- 10 choice sets per respondent (no blocking)

Example of a choice set (base case)

Tiltag A	Tiltag B
120 undgåede trafikdræbte per år	**180** undgåede trafikdræbte per år
Dette svarer til en årlig risikoreduktion på **2 ud af 100.000** for alle borgere	Dette svarer til en årlig risikoreduktion på **3 ud af 100.000** for alle borgere
Din husstands ekstra skattebetaling vil være **100** kr. per år	Din husstands ekstra skattebetaling vil være **5000** kr. per år

Hvad foretrækker du?

- ☐ Tiltag A
- ☐ Tiltag B
- ☐ Ingen af tiltagene

Attributes and levels

Attributes	Description	Levels
Risk reduction	Risk reduction (from 4 in 100,000 every year)	1/100,000; 2/100,000; 3/100,000
	Number of lives saved (from 240 fatalities every year)	60;120;180
Yearly tax increase	Split 1: Base	100; 500; 1200; 2000; 5000
	Split 2: Tighter range	200; 500; 1200; 2000; 4000
	Split 3: Lower mid values	100; 400; 800; 1200; 5000

Price level effects: Previous findings

- Kanninen (1995) suggests that a general rule-of-thumb for bid design is to limit the bids to be within the 10th and 90th percentiles for double bounded CV models
- Alberini (1995) tests the impact of extreme tails of the WTP distribution on goodness of fit. She finds that researchers should avoid placing bids in the extreme tails of the WTP distribution
- Carlsson and Martinsson (2008) found that by increasing the whole price range by SEK 200 has a significant effect on preference estimates and WTP estimates which might be due to anchoring or a yea-saying effect.

Price level effects: Previous findings (2)

- Hanley et al. (2005) examine how two different price vectors (a base price vector and a price vector three times larger than base) affect the parameter values and the WTP estimates. The find neither the parameter values nor the WTP estimates to differ (only the prob. of choosing SQ)
- Kragt (2012) test a split sample with price vector higher in one version than the other. Higher cost levels did not lead to significantly higher value estimates. But respondents are found to anchor their choices on the relative cost levels presented in the survey with results suggesting that people are more sensitive to relative rather than absolute cost vectors.

Price level effects: Previous findings (3)

- Morkbak et al (2011) report on the results from a split sample choice experiment examining the effect of changing the maximum level of the cost attribute Results suggest that the size of the maximum price level does matter, and that changing the maximum price level has a statistically significant effect on both the general preferences structure and the WTP estimates
- Luisetti et al (2012) examine range bias in a DCE valuating wetland recreation sites wrt the distance attribute in a split sample design (near and far distance split). The find that respondents react to the distance – but relatively

Results: Choice probabilities

Split 1 (n=520)						
Price level	Opt-out	100	500	1200	2000	5000
Observed	.312	.587	.458	.346	.199	.067
Predicted	.322	.572	.519	.351	.253	.046
Split 2 (n=590)						
Price level	Opt-out	200	500	1200	2000	4000
Observed	.295	.475	.431	.369	.277	.174
Predicted	.275	.534	.507	.391	.329	.116
Split 3 (n=510)						
Price level	Opt-out	100	400	800	1500	5000
Observed	.224	.549	.518	.412	.340	.078
predicted	.218	.578	.540	.366	.309	.068

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Regression results: MNL

	Coeff.	(Std.er.)	p-value	WTP in DKK	[95% CI]
Split 1					
Risk reduction	17250.94	(9252.409)	0.062	29,489,004	[1,863,925; 57,114,083]
Price	-.000585	(.0000737)	0.000		
Status_quo	-.4843768	(.1642236)	0.003	-828.0	[-1444; 212]
LL(model)	-503.84				
N=1560					
Split 2					
Risk reduction	21671.93	(8547.124)	0.011	56,039,606	[20,156,808; 91,922,405]
Price	-.0003867	(.0000588)	0.000		
Status_quo	-.2759187	(.1568375)	0.079	-713.5	[-1572; 145]
LL(model)	-618.51				
N=1770					
Split 3					
Risk reduction	34006.16	(8451.742)	0.000	61,633,621	[35,522,608; 87,744,633]
Price	-.0005517	(.0000642)	0.000		
Status_quo	-.5206183	(.1705449)	0.002	-943.6	[-1617; 271]
LL(model)	-481.72				
N=1530					

Regression results: WTP space

	WTP (in 1000 DKK)	(Std.er.)	p-value	[95% CI]
Split 1				
Risk reduction	35,175	(3,471)	0.000	[28,373; 41,977]
Std.dv.	57,193	(5,693)	0.000	[46,035; 68,350]
Status_quo	-573	(65)	0.000	[-700; -446]
Std.dv.	2,689	(316)	0.000	[2,069; 3,309]
LL(model)	-348.12			
Split 2				
Risk reduction	85,428	(11,453)	0.000	[62,981; 107,875]
Std.dv.	226,485	(22,734)	0.000	[271,044;181,926]
Status_quo	-2,231	(339)	0.000	[-2,894;-1,567]
Std.dv.	8,488	(975)	0.000	[6,577; 10,399]
LL(model)	-373.86			
Split 3				
Risk reduction	109,088	9,506	0.000	[90,456; 127,721]
Std.dv.	226,471	16,514	0.000	[194,104; 258,838]
Status_quo	-2,023	301	0.000	[-2,612; -1.434068]
Std.dv.	1,477	213	0.000	[1,059;1,896]
LL(model)	-296.73			

Conclusion

- Not only the difference between the levels are important, but also the absolute levels!

- We find some differences in probabilities, preference estimates and WTP values
- It seems that respondents reacted to absolute prices
- It thus appears that the difference we observed *mostly* is driven by design dimensions (appropriate price intervals and range) and less by behavioural patterns
- Study highlights the importance of thorough piloting – especially when the focus is elicitation of *precise* WTP values