How Experiments and Behavioral Economics can help design better policies ?

Evidence from SUFISA

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SUFISA

SUFISA

- Conditions – Strategy – Performances
- Farmers differ in their preferences => individual decisions
- How to measure and isolate preferences? Experiments

What are Economic Experiments?

- Experiments are a *controlled data generating process* (Croson Gächter, 2010)
  - Controlled = most factors which influence behavior are held constant and only one factor of interest (the treatment) is varied at a time
  - Crucial for being able to draw causal inferences.
- Natural Experiments: the process occurs naturally (rare cases)
- Lab or Field Experiments: the researcher controls the data generating process (most cases)
- Today the integration of experimental economics into mainstream economics is an established fact.

=> Economics is an experimental science, as well as a theoretical and observational one.

What are Economic Experiments used for?

1. Evaluating the Impact of Policies: Treatment versus Controlled Group
2. Measuring Parameters of theoretical models (simulations): Preferences

What we did: Survey content

- Rather **large survey** containing questions on:
  - Farmer's characteristics – the owner of the farmer
  - Farm characteristics
  - Losses of last year following frost
  - Current and future strategies regarding production, marketing and sales channels
- A **risk task**
- A **discrete choice experiment** on farmer's contractual preferences

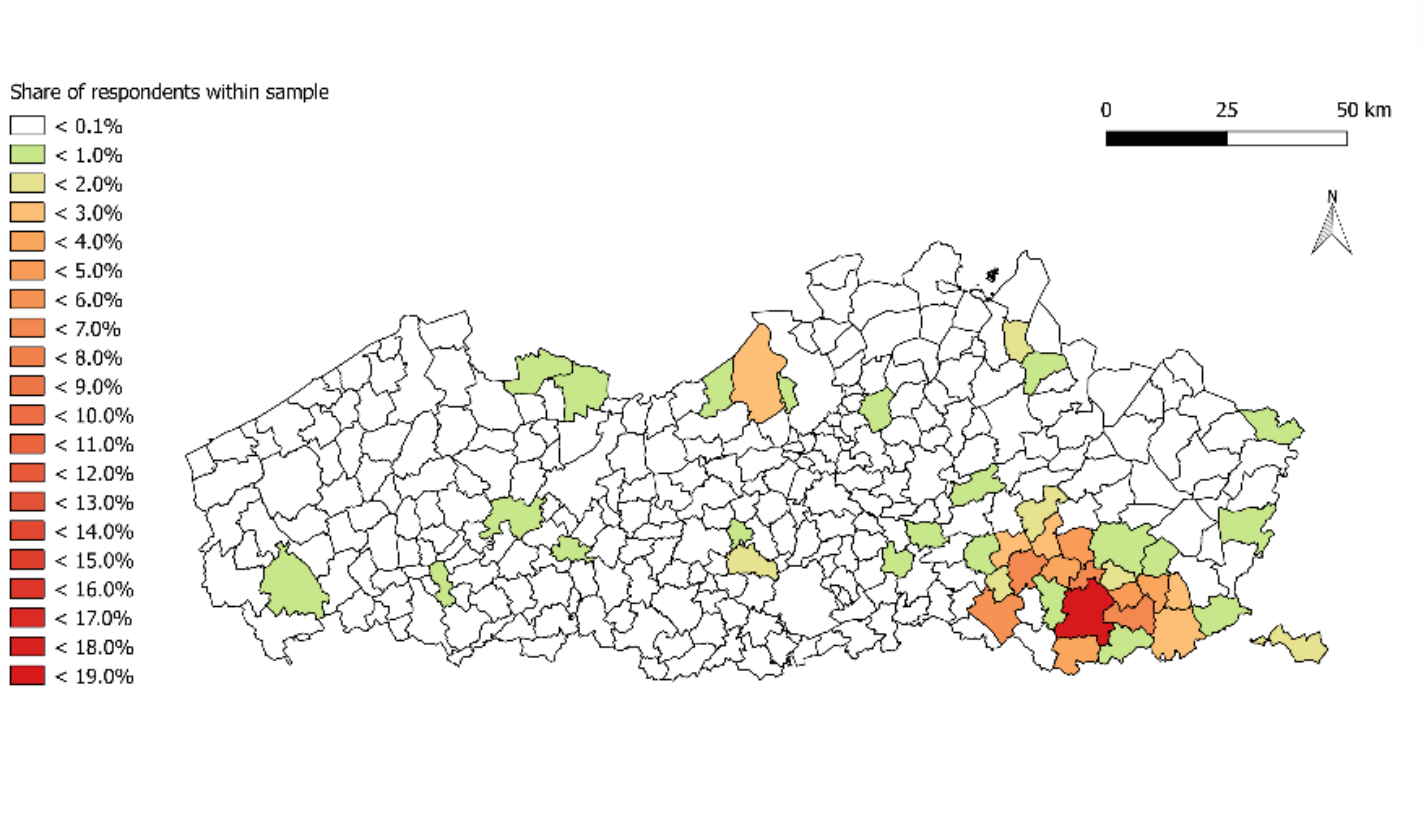
What we did: Survey Method

- Survey from Jan-Mar 2018
- First contact then online completion
- Phone and face-to-face survey were no option: visualisation and trust issues

- Issues with online:
  - sample bias
  - perfect self-understanding is required
- Advantages of online:
  - Insures respondent's anonimity
  - Proximity to their daily context

- Participation rate: about 20%

Sample

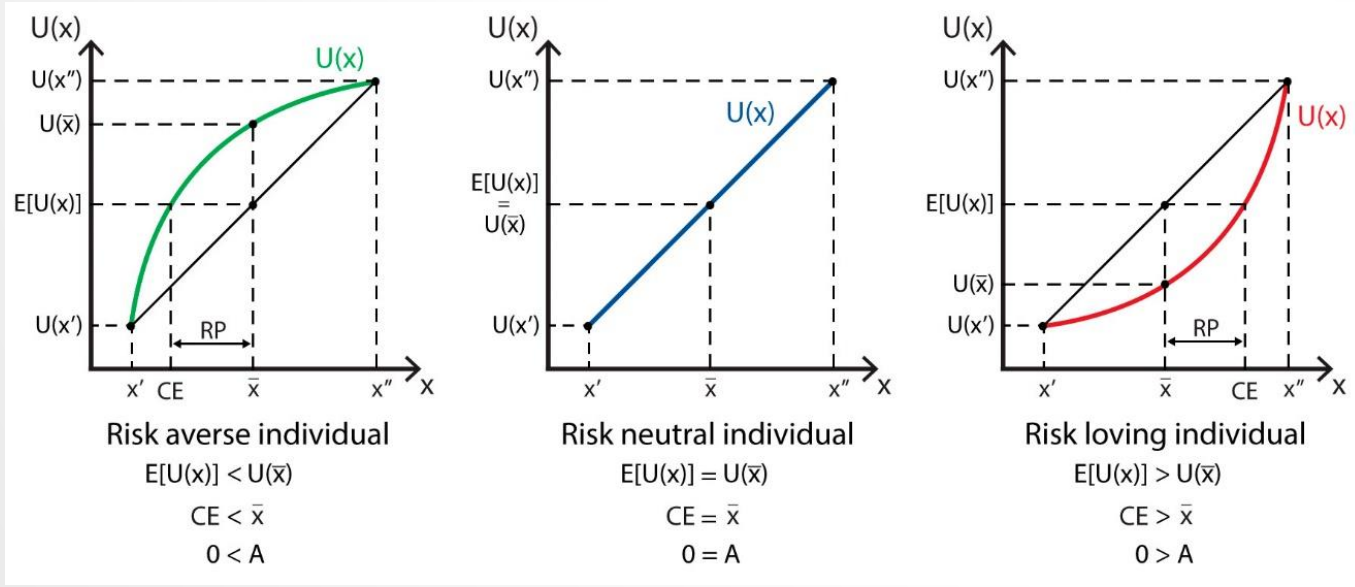

Share of respondents within sample
< 0.1%
< 1.0%
< 2.0%
< 3.0%
< 4.0%
< 5.0%
< 6.0%
< 7.0%
< 8.0%
< 9.0%
< 10.0%
< 11.0%
< 12.0%
< 13.0%
< 14.0%
< 15.0%
< 16.0%
< 17.0%
< 18.0%
< 19.0%
0
25
50 km
N

The 1st Experiment: Risk Preferences

- One key condition: Risk
  - It is intrinsic to agricultural production => plays a key role in the decisions farmers make every day
  - Growing concern because of climatic dysfonctioning: more frequent, unpredictable and deep negative shocks, more years turn out to be unfavourable
  - Market liberalization: increased exposure of farmers to price volatility
- Preferences: “How much an individual like or dislike risk”
- Two issues:
  - Confronting theories
  - Still performing poorly at explaining farmer’s decision-making

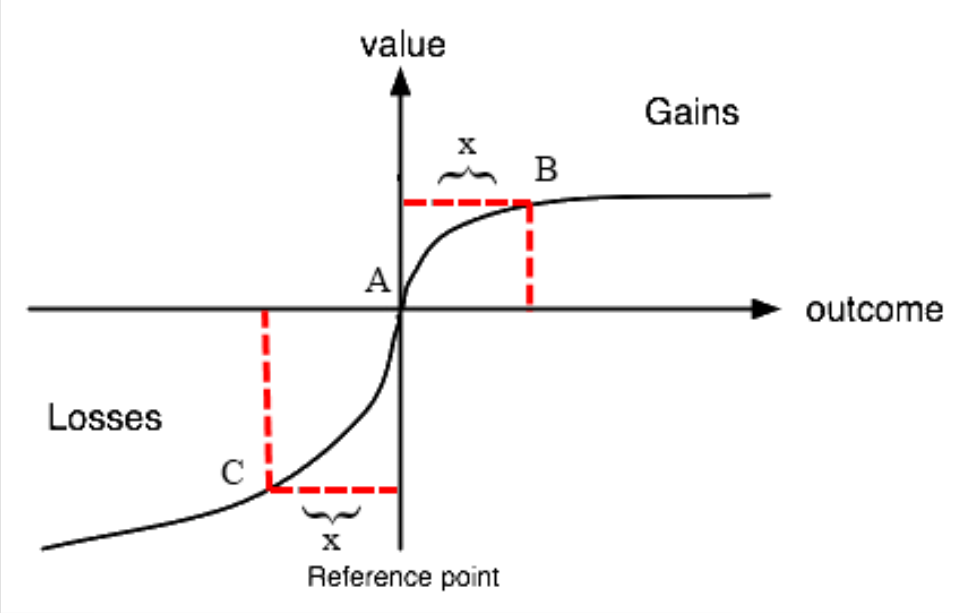
Theory on Risk Preferences

- Farmers are usually assumed to be expected utility maximizers (von Neumann and Morgenstern, 1947)

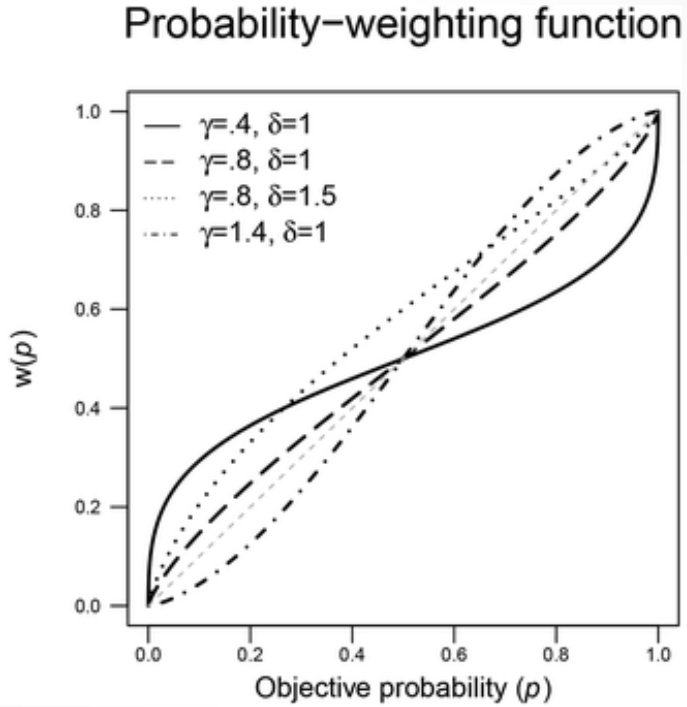


Empirical deviation from EUT

Gain ≠ Loss Domains



Distortion of Probabilities



Kahneman and Tversky (1979, 1992)

Risk and Loss aversion

Case 1 :

- Option A : 100
- Option B : 50% 200

➔ in average agents choose option A hence they are **risk averse**

Case 2 :

- Option A : -100
- Option B : 50% -200

➔ in average agents choose option B hence they are **risk lovers**

Risk and Loss aversion

Case 1 :

- Option A : 100
- Option B : 5% 2000

➔There is an increasing portion of agents choosing option B hence becoming **risk lover in the gain domain**

Case 2 :

- Option A : -100
- Option B : 5% -2000

➔There is an increasing portion of agents choosing option A hence becoming **risk averse in the loss domain**

Alternative theory: Cumulative Prospect Theory (CPT)

- The most convincing alternative to EUT (Kahneman and Tversky, 1992)
- Two innovations:
  - Distinguish between gains and losses: people are allowed to behave differently in the two outcome domains
  - Probability weighting: people are allowed to distort probabilities

➔ Leads to a very different understanding of farmer's decisions!

Literature Review

- CPT is supported by recent experiments
- Number of studies with structurally estimated paramaters is growing but still limited
- There is still work to be done on understanding
  - modelling of farmer's risk preferences
  - the heterogeneity in preferences: farmer's characteristics and risk profile
  - how these preferences influence strategies and performances

The 1st Experiment: Experimental Design

- Risk Task included in our questionnaire to extract risk preferences
- We fully controlled the risk exposure and made it vary:
  - We can measure how much each farmer like/dislike risk
  - We can link it to the rest of the data contained in the questionnaire

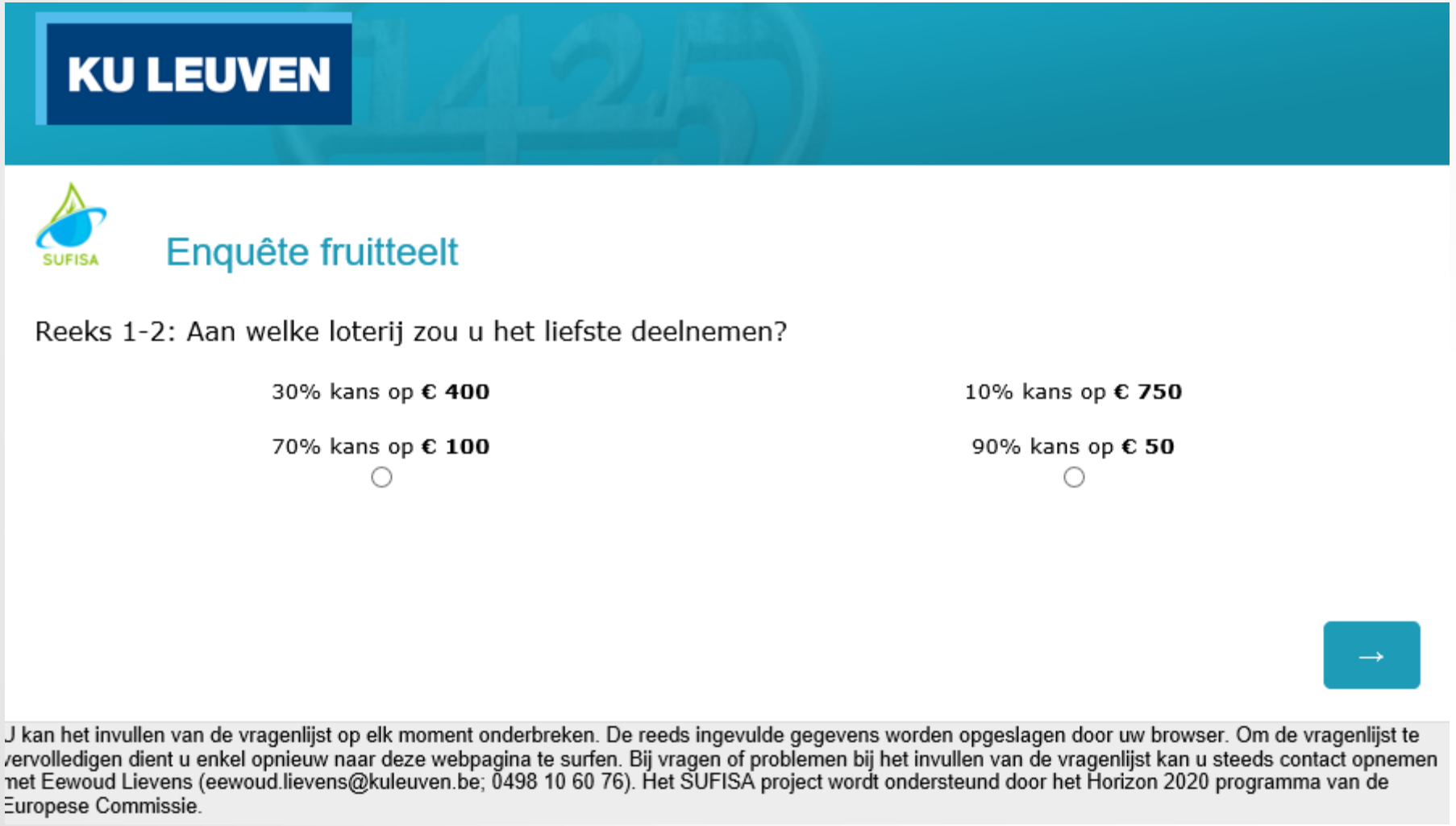
The series

	Lottery A		Lottery B		E(A)-E(B)
Series 1	**30%**	**70%**	**10%**	**90%**	
1	400	300	680	50	77
2	400	300	750	50	70
3	400	300	830	50	62
4	400	300	930	50	52
5	400	300	1060	50	39
6	400	300	1250	50	20
7	400	300	1500	50	-5
8	400	300	1850	50	-40
9	400	300	2200	50	-75
10	400	300	3000	50	-155
11	400	300	4000	50	-255
12	400	300	6000	50	-455

	Lottery A		Lottery B		E(A)-E(B)
Series 2	**90%**	**10%**	**70%**	**30%**	
1	400	300	540	50	-3
2	400	300	560	50	-17
3	400	300	580	50	-31
4	400	300	600	50	-45
5	400	300	620	50	-59
6	400	300	650	50	-80
7	400	300	680	50	-101
8	400	300	720	50	-129
9	400	300	770	50	-164
10	400	300	830	50	-206
11	400	300	900	50	-255
12	400	300	1000	50	-325

	Lottery A		Lottery B		E(A)-E(B)
Series 3	**50%**	**50%**	**50%**	**50%**	
1	250	-40	300	-210	60
2	40	-40	300	-210	-45
3	10	-40	300	-210	-60
4	10	-40	300	-160	-85
5	10	-80	300	-160	-105
6	10	-80	300	-140	-115
7	10	-80	300	-110	-130

Bocquého, Jacquet and Reynaud (2014)


KU LEUVEN
SUFISA
Enquête fruitteelt
Reeks 1-2: Aan welke loterij zou u het liefste deelnemen?
30% kans op € 400
10% kans op € 750
70% kans op € 100
90% kans op € 50
→
J kan het invullen van de vragenlijst op elk moment onderbreken. De reeds ingevulde gegevens worden opgeslagen door uw browser. Om de vragenlijst te
ervolledigen dient u enkel opnieuw naar deze webpagina te surfen. Bij vragen of problemen bij het invullen van de vragenlijst kan u steeds contact opnemen
net Eewoud Lievens (eewoud.lievens@kuleuven.be; 0498 10 60 76). Het SUFISA project wordt ondersteund door het Horizon 2020 programma van de
Europese Commissie.

1st Results

		Model 1: EUT	Model 2: CPT	Model 3: CPT
		(1)	(2)	(3)
r	constant	0.1384***		
		(0.0352)		
σ	*constant*		0.2617***	
			(0.0118)	
λ	*constant*		1.2922***	
			(0.1594)	
γ	*constant*		0.6839***	0.6840***
			(0.0328)	(0.0328)
α	*constant*			0.2618***
				(0.0118)
β	*constant*			0.2934***
				(0.0200)
	H^0: r=1	*p-value: 0.000*		
	H^0: λ=1		*p-value: 0.067*	
	H^0: α=β			*p-value: 0.041*
	N	4247/137	4247/137	4247/137

Standard errors in parentheses

Maximum Likelihood Estimations with standard errors clustered at the respondent level
Stochastic error=0; tech(bfgs 5 dfp 5 nr 5 bhhh 5)

** p<0.10, ** p<0.05, *** p<0.01*

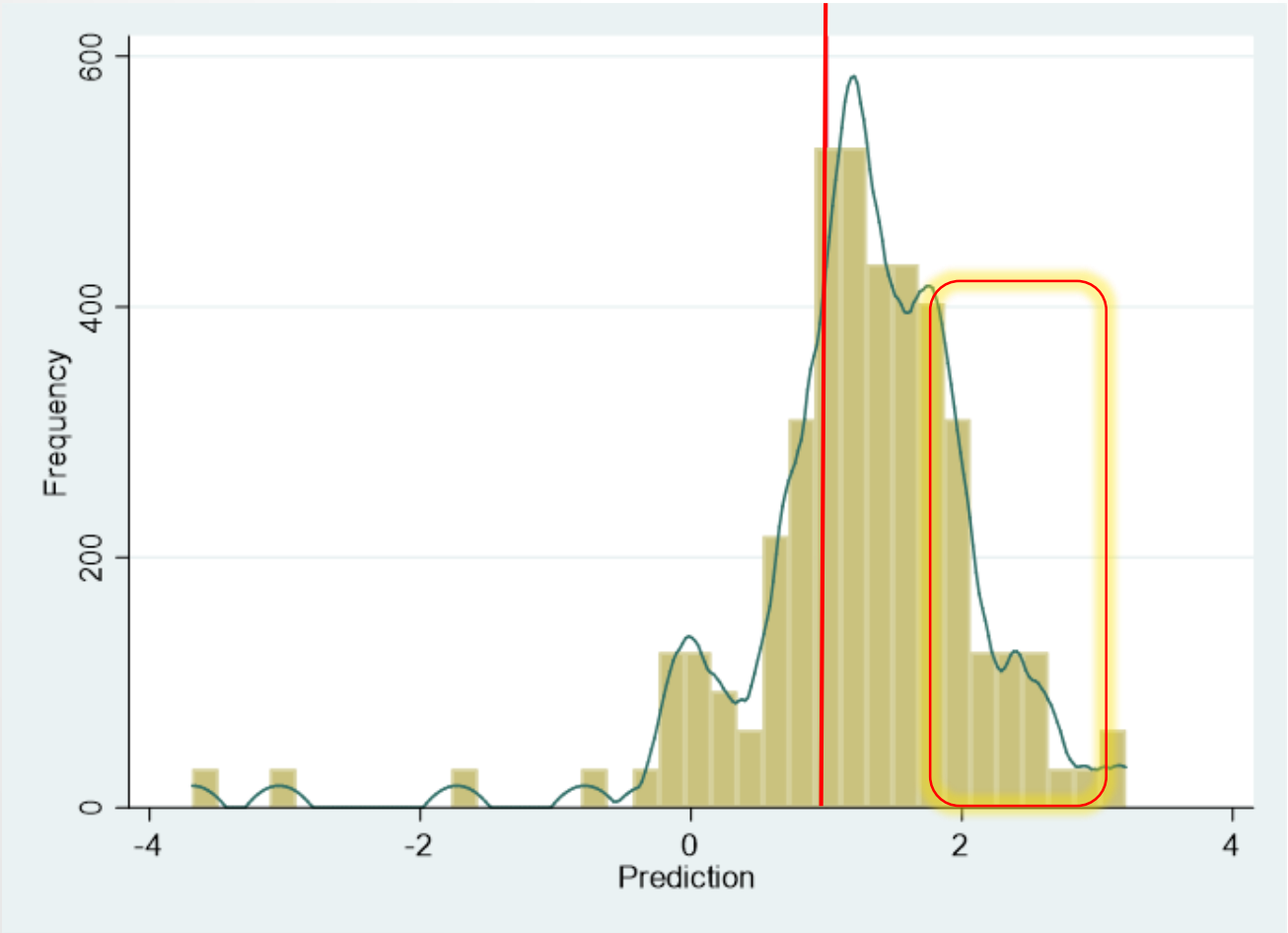
2nd Results: Heterogeneous Model

	Model 1: EUT		Model 2: CPT					
	r		σ	λ	γ	σ	λ	γ
	(1)	(2)	(3)			(4)		
educ_sup	0.0304	-0.0341	-0.0601*	0.133	0.129	-0.0562**	-0.100	0.0949
	(0.0786)	(0.0404)	(0.0313)	(0.372)	(0.0871)	(0.0277)	(0.387)	(0.0768)
resp_age	-0.00117	-0.00421	0.000157	-0.00086	-0.00109	0.000321	-0.0131	-0.00026
	(0.00252)	(0.00279)	(0.00141)	(0.0198)	(0.00507)	(0.00131)	(0.0222)	(0.00492)
coop		0.138*				-0.0501	-0.186	0.231***
		(0.0736)				(0.0381)	(0.435)	(0.0886)
inherited		-0.00828				-0.00345	0.0434	0.0446
		(0.0420)				(0.0268)	(0.345)	(0.0950)
co_manag		-0.198***				-0.00653	-0.425	-0.178**
		(0.0743)				(0.0289)	(0.389)	(0.0890)
area_AP		-0.0047**				-0.00093*	-0.033***	0.00299
		(0.00205)				(0.000557)	(0.0123)	(0.00207)
_cons	0.173	0.432***	0.278***	1.251	0.687***	0.344***	3.061**	0.505*
	(0.140)	(0.166)	(0.0737)	(1.012)	(0.265)	(0.0761)	(1.308)	(0.297)
N	4092	4092		4092			4092	
p>chi2	0.811	0.00120		0.139			0.00733	

Standard errors in parentheses
Maximum Likelihood Estimations with standard errors clustered at the respondent level
Stochastic error=0; tech(bfgs 5 dfp 5 nr 5 bhhh 5)
** p<0.10, ** p<0.05, *** p<0.01*

3rd Results: Distribution of loss aversion parameter

Kernel density of predicted values of parameter λ (CPT, with heterogeneity)



3rd Results: Who are the extremely loss-averse farmers?

Differences in means of observable characteristics between Extremely loss-averse subjects and the rest of the sample

	Group 1: Non Extremely loss-averse		Group 2: Extremely loss-averse		Diff(Group1-Group2)	
	mean	sd	mean	sd	mean	se
coop	0,852	0,355	0,800	0,400	0,0523***	0,014
resp_male	0,966	0,181	0,914	0,280	0,0516***	0,009
educ_level_1	0,534	0,499	0,559	0,497	-0,025	0,018
educ_level_2	0,398	0,490	0,235	0,424	0,162***	0,016
resp_age	50,466	9,076	44,657	10,959	5,809***	0,375
sint_truiden	0,773	0,419	1,000	0,000	-0,227***	0,008
resp_owner	0,898	0,303	1,000	0,000	-0,102***	0,006
inherited	0,432	0,495	0,714	0,452	-0,282***	0,017
co_manag	0,705	0,456	0,371	0,483	0,333***	0,017
area_inprod	40,423	42,427	16,892	9,932	23,53***	0,868
area_owned	27,889	31,429	12,681	10,060	15,21***	0,680
farm_income	580,928	585,899	248,266	175,063	332,7***	13,012
N	2728		1085		3813	

Extremely loss-averse farmers are:

"Relatively young and not so educated farmers, having inherited a relatively small farm that they manage alone"

4th Results: Comparing with other contexts

		Model 1: EUT		Model 2: CPT		Model 3: CPT	Model 2: CPT Consistent only
		(1)		(2)		(3)	(4)
r	constant	0.1384***	0.212***				
		(0.0352)					
σ	constant			0.2617***	0.280***		0.2696***
				(0.0118)			(0.0124)
λ	constant			1.2922***	2.275***		1.1625***
				(0.1594)			(0.1564)
γ	constant			0.6839***	0.655***	0.6840***	0.7002***
				(0.0328)		(0.0328)	(0.0342)
α	constant					0.2618***	
						(0.0118)	
β	constant					0.2934***	
						(0.0200)	
	H^0: $r=1$	*p-value: 0.000*	0.000				
	H^0: $\lambda=1$			*p-value: 0.067*	0.000		*p-value: 0.299*
	H^0: $\alpha=\beta$					*p-value: 0.041*	0.000
	N	4247/137		4247/137		4247/137	3813/123

Standard errors in parentheses

Maximum Likelihood Estimations with standard errors clustered at the respondent level
Stochastic error=0; tech(bfgs 5 dfp 5 nr 5 bhhh 5)

** p<0.10, ** p<0.05, *** p<0.01*

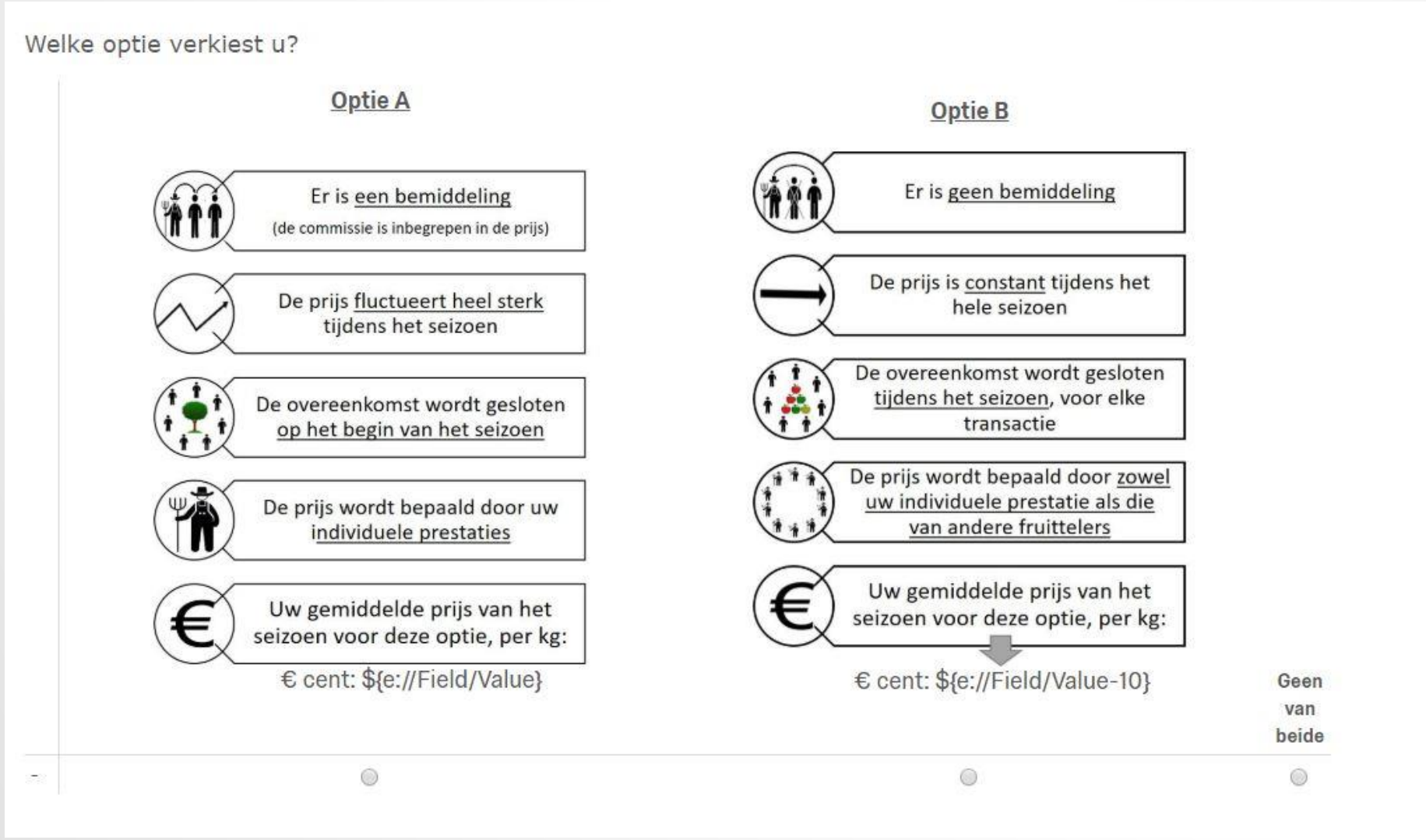
5th Results: How risk preferences shape farmer's strategies and performances?

- Hail insurance take-up is correlated with risk aversion
- Production losses due to frost (april 2017) is correlated with loss aversion
- Marketing strategies:
  - Pre-harvest contract: correlated with loss-aversion
  - Online selling: correlated with probability distortion
- Investment in preventive measures is only explained by wealth

The 2nd Experiment: Contractual Preferences

- One key condition: Institutional Arrangements
  - Value chains are becoming extremely organised, with stricter standards and rules, and farmers do not have much alternatives
  - At the same time, the farmer is currently the main one in the chain supporting risk exposure
- We develop a Discrete Choice Experiment to extract stated-preferences of producers regarding contract's characteristics
- Observational data have limitations:
  - Only current set of chains can be observed
  - Preferences of farmers? Willingness-to-accept

The 2nd Experiment: The Experiment



The 2nd Experiment: The Experiment

- Attributes:
  - There is an intermediary or not
  - When the contract is settled: pre-harvest versus post-harvest contract
  - Price volatility: from low to high
  - Price pooling or not
  - The average price received per kilo of pear

- Objectives:
  - To compare preferences with the real choices made by each producer
  - To test the possibility of developping new types of contracts to reduce individual risk by pooling revenue
  - To measure the willingness-to-accept each of the attributes and levels

Questions?

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