Latent farmer groups in yield insurance markets

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Outline

- Introduction: Finland, CAP, subsidies, heterogeneity
- Data and methods: survey, stated preferences, latent class
- Results: latent farmer classes behind insurance demand
- Conclusions: policy challenge for CAP

Finland, CAP

- In the EU member states the crop damages are mainly compensated by *ad hoc* basis.
- The compensation payment for crop damage amounts to an average of about €920 million per year.
- Individual member state specific programs. In Finland CDC scheme.
- In Finland we have a lacking culture on yield insurances, conformed with serious knowledge caps in development and administration of such insurances.
- The markets for crop insurance are developing in the EU. Premium subsidies could be as large as 65 %.
- For subsidies there are EU wide rules, following strictly WTO green box regulations.

Heterogeneity

- Decoupled income support is preferred in the EU Common Agricultural Policy CAP. Policies support all farms in the same way despite farmers' risk preferences → deductible and scale are typically fixed.
- The purpose of this study was to investigate the demand for crop insurance in Finland. Willingness to pay is interesting, but…

- … we were more interested in seeing, whether the farmers are heterogeneous according the weights they give for insurance attributes (price, deductible, scale and insurance type).
- Moreover, the farmers were grouped according to the weights they assigned to crop insurance attributes.

Data

- No existing markets → no data → hypothetical markets
- The choice experiment survey was conducted.
- The survey was sent to a total of 5,000 farmers in Finland.
- Respondents were shown six crop insurance product cards. Each choice card presented two different crop insurance products with varying attributes.
- The farmers were asked to select the most suitable crop insurance product for them (including “no buy”).

Choice card

INSURANCE CARD 1	Insurance 1	Insurance 2	No buy	levels
Insurance premium €/hectare	12	16	I would not purchase insurance	€4 – 32/ha
Deductible	20%	20%		10%, 20%, and 30%
Insurance type	Yield index insurance, farm inspection is not needed.	Farm yield insurance, inspection of loss at the farm is needed.		yield index, farm yield
Expected compensation €/hectare	300	600		€100/ha €300/ha ($135/acre) €600/ha
MY CHOICE	□	□	□	

… methods

- Stated preferences, choice experiment
- Latent class model, maximum likelihood + iterations based on number of classes
- The farmer classes were determined purely based on the choices made by the individuals in the choice experiment. The individual farm / farmer characteristics were set to be inactive, and they did not consequently affect the latent class model (number of classes)
- Choice models measured utility, thus coefficients are not interpretable in economic terms, despite their signs.
- Class specific implicit prices for attributes are calculated as,

$$IP_k = -\left(\frac{\beta_k}{\beta_p}\right)$$

where β_k is the parameter of *k*th attribute, and β_p is the parameter of price coefficient.

Results

- A model with three farmer classes was selected based on BIC statistics and reasonable class sizes.
- **Insurance type turned out to be insignificant in farmers' choices.**
- The Wald p-values indicate that rest of the attributes were jointly significant.
- Wald* p-values show that only the price attributes were class dependent. However, this is very important for economic interpretation of the results.

Model for Choices						
		Class 1	Class 2	Class 3	Overall	
R^2		0.3393	0.2091	0.2903	0.5395	
$R^2(0)$		0.4213	0.9389	0.4058	0.5774	
size		0.42	0.3	0.28		
Attributes		Class 1	Class 2	Class 3	Wald p-value	Wald* p-value
Reference level		0	0	0	0	0
	1	-1.2442	-7.464	0.0023	0.0024	0.0062
	2	-1.1769	-12.0135	0.0487		
	3	2.4211	19.4775	-0.051		
Price		-0.1219	-0.5788	-0.0752	<0.001	0.029
Deductible		-2.9507	-29.1756	-2.7591	<0.001	0.39
Scale		0.0054	0.0081	0.0044	<0.001	0.3

The reference level for all attributes is set to 0. Constant 3 refers to the "no buy" option.
All estimated parameters are significant at the 99% level based on z-statistics.

Interpretaation

- Implicit prices (IP) are the marginal rates of substitution between price and product attributes.
- Implicit prices provide some guidelines for the labeling of latent farmer groups revealed by the estimation.

IP (€/ha)	Class1	Class2	Class3
Deductible (+10%)	-2.4	-5.0	-3.7
Scale (+ €100/ha)	4.4	1.4	5.9
WTP*)	6.03	-10.92	6.55

*) Deductible 30 % and scale €300/ha

Interpretation

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Yield risk managers, 42%

- Lower (negative) IP for deductible
- Farmers look for insurance products that are more of the catastrophe prevention type.

non-insurers,30%

- Negative WTP
- They have the lowest IP for the scale.

Insurers , 28%

- High and negative IP for the deductible
- Prefer shallow loss type insurances

Interpretation

Since **adverse selection** has been a prominent problem in yield insurances, we described latent farm groups according to farm characteristics.

	%	*Yield risk managers*	*Non-insurers*	*Insurers*
		42%	30%	28%
Production line	Animal husbandry	42	26	32
	Crop farming	45	26	29
Farm size (ha)	10–19.99	29	41	29
	20–29.99	37	43	20
	30–49.99	54	20	26
	50–99.99	41	20	39
	≥100	54	15	31
Region	West	51	22	27
	East	31	29	40
	North	14	29	57
	South	41	30	30

West: Pohjanmaa, Satakunta
East: Kaakkois-Suomi, Kainuu, Savo, Karjala
North: Kainuu, Lappi
South: Uusimaa, Varsinaissuomi

Conclusions

- Used dataset reveals heterogeneity among farmers regarding insurance attributes → one size does not fit all.
- No clear linear connection between latent groups and farm characteristics was found.
- Uniform catastrophic assistance rules for whole Finland would be challenging to implement because of the regional heterogeneity in farmers preferences.

Thank you!

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