The impact of risk perception and preferences on risk management strategies: Evidence for German livestock farmers

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Motivation: decision making process

Risk perception

Farm, farmer`s and household characteristics

Risk management strategy

Risk preferences

Source: Own depiction according to van Raaij (1981)
Research Questions

1. How are farm, farmer’s and household characteristics (incl. risk perception) related to the choice of risk management strategies?

2. Which risk attitude parameter elicited from different risk elicitation methods pertains the farmers’ risk behavior best?
Experimental Design

- Paper pencil survey
- December 2015 and January 2016
- 64 farmers in North-Rhine-Westphalia, response rate = 26%

Source: Own depiction
Risk management strategies

On-farm agriculture:
- Agricultural diversification
- Investment in technologies
- Risk adapted production
- Resistant species

On-farm non-agriculture:
- Non-agricultural diversification
- Work harder/cut private expenses
- Cooperation with other farmers
- Holding financial reserves

Off-farm:
- Forward contracting
- Off farm work
- Off farm investment
- Insurance
Methodology

Group farmer`s choice of risk management strategy: max. mean in each category

<table>
<thead>
<tr>
<th>on-farm agric. mean</th>
<th>on-farm non-agric. mean</th>
<th>off-farm mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Multinominal probit model:

\[ y_{ij}^* = \beta_{ij} x_{ij} + \varepsilon_{ij} \]
\[ \varepsilon_{ij} \sim N(0, \Sigma) \text{ and } j = (0 \ldots 2) \]

with \( y_i = \begin{cases} 
1 & \text{if } y_{i \text{ on-farm agriculture}}^* > 0 \\
2 & \text{if } y_{i \text{ on-farm non-agriculture}}^* > 0 \\
0 & \text{otherwise.} 
\end{cases} \)

\( x_{ij} = \) vector of observable farm and farmer characteristics

\( x_{ij} = \) risk preferences, risk perception, age, risk literacy, experienced past losses, succession, agricultural area, proportion rented land, livestock: pig/piglet, dairy cattle
Risk preferences I

- Risk preference elicitation: 20+ different methods, high between method inconsistencies (→ different methods show different risk preferences of the same individual)
- Use three methods to elicit risk preferences:

1. Multiple price list (MPL) (Holt and Laury 2002)

   Contextualized lottery with 10 agricultural investment decisions
Risk preferences II

2. Self-assessment of general attitude towards risk (Dohmen et al. 2009)

3. Business statements of relative risk preferences in four different domains (Meuwissen et al. 2001)

   i. “I am willing to take on more risks than my colleagues with respect to production.” (1 = agree, 5 = disagree)

   ii. “I am willing to take on more risks than my colleagues with respect to marketing and prices.” (1 = agree, 5 = disagree)

   iii. “I am willing to take on more risks than my colleagues with respect to finances.” (1 = agree, 5 = disagree)

   iv. “I am willing to take on more risks than my colleagues with respect to agriculture in general.” (1 = agree, 5 = disagree)

Higher positive values ➔ more risk aversion
Risk perception

Risk score = Probability that uncertainty happens \times Impact/ negative consequence of occurrence

Score on a five point scale
(1 = very unlikely; 5 = very likely)
Score on a five point scale
(1 = very small impact; 5 = very strong impact)

Market and price risk
Political / structural risks
Production risk
Financial risk
Other risks (legal / environmental)

Manuela Meraner | 03.10.2016
## Results: How are farm and farmer’s characteristics related to the choice of risk management strategies?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Farm &amp; Farming</th>
<th>Risk Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmer characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>$\text{Age}^2$</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Risk illiteracy</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Perceived mp risk</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Perceived other risk</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Experienced past losses</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Household characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Succession</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td><strong>Farm characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural area</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Proportion rented land</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Livestock: pig/piglet</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Livestock: dairy cattle</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

**Risk aversion**
**Results:** Which risk attitude parameter elicited from three different risk elicitation methods pertains the farmers’ risk behavior best?

<table>
<thead>
<tr>
<th>Risk aversion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple price list</td>
<td>+</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>+</td>
</tr>
<tr>
<td>Ø Business statement</td>
<td>+</td>
</tr>
<tr>
<td>Business statement: production</td>
<td>+</td>
</tr>
<tr>
<td>Business statement: marketing and prices</td>
<td>+</td>
</tr>
<tr>
<td>Business statement: finances</td>
<td>+</td>
</tr>
<tr>
<td>Business statement: agriculture generally</td>
<td>+</td>
</tr>
</tbody>
</table>
Conclusion

- Risk perception and risk aversion are directly influencing the decision of risk management strategies applied.

- Greater risk aversion increases the probability that farmer’s focus on on-farm strategies (compared to choosing off-farm strategies).

- Simultaneous analysis of risk management tools is essential.
Thank you for your attention!

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References


