Extended Abstract
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Paper Title	The (in)stability of farmer risk preferences

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Abstract	***200 words max***
We test and quantify the (in)stability of farmer risk preferences, accounting for both instability across elicitation methods and the instability over time. We used repeated measurements (N=1530) with Swiss fruit and grapevine producers over 3 years, where different risk preference elicitation methods (domain-specific self-assessment and incentivized lotteries) were used. We find that farmers' risk preferences change considerably when measured using different methods. For example, self-reported risk preference and findings from a Holt and Laury Lottery correlate only weakly (correlation coefficients range from 0.06 to 0.23). Moreover, we find that risk preferences vary considerable over time, i.e. applying the same elicitation method to the same farmer at a different point in time results in different risk preference estimates. For example, self-reported risk preferences are moderately correlated (correlation coefficients range from 0.42 till 0.55) from one year to another. Finally, we find that simultaneous experience of climate and pest related crop damages causes farmers to be more risk loving, consistent with the Cumulative Prospect theory (CPT).	

Keywords	Risk preferences, stability, agricultural shocks
JEL Code	C90, D81, Q12

Introduction	***100 – 250 words***
Uncertainty and risk are essential elements of agricultural production. Hence, farmers' risk perception and risk preferences are key elements of decision-making (Just and Just, 2016). Knowledge of farmers' risk preferences is important for policy and industry. For example, accurate predictions about farmers' decisions and their responses to policy and market changes must consider risk preferences. Agricultural economists use a wide range of methods to elicit risk preferences (Iyer et al., 2020). However, risk preference elicitation results in non-stable results. Firstly, risk preferences can change considerably when measured using different elicitation methods (Pedroni et al., 2017; Berg et al., 2005). Thus, applying different elicitation methods at the same time may result in different conclusions on a farmer's risk preference. Second, risk preferences can change over time (Schildberg-Hörisch, 2018; Bozzola and Finger, 2021). Thus, applying the same elicitation method at a different point in time may result in different estimates of a farmer's risk preferences. This instability challenges the assumption of perfect stability in neoclassical economic theory and poses a great challenge for the use of these results in economic and policy analysis.	

Current studies show farmers' risk preferences are not stable across methods (e.g. Reynaud and Couture, 2012) or time (e.g. Love Robinson, 1984; Bozzola and Finger, 2021). However, studies focus on temporal stability or stability across methods. Therefore, it is unclear how relevant the magnitude of either source of instability is for risk preference elicitation. Finally, no domain specific assessment of risk preferences due to shocks has been conducted.

Methodology	***100 – 250 words***

We combine results from repeated online surveys undertaken with plum, cherry and grapevine producers in Switzerland from 2016 to 2018. We use 1530 observations but face an unbalanced panel structure. Risk preferences were elicited using contextualized self-assessment questions on attitudes towards risk taking in four domains (production, market and prices, external financing and agriculture in general). In 2018, an incentivized multiple price list using lotteries following Holt and Laury (2002) was used, contextualized as pest management choices. Farmers could win up to 200 CHF (ca. 220$).

We test correlations of risk preferences across elicitation methods, i.e. across different domain self-stated risk preferences as well as the lottery, and correlations across years for all self-stated risk preferences.

Next, we test whether changes over time can be associated with the experience of shocks i.e. losses in production. We focus on two sources of yield losses: (i) frost damage, (ii) damages due to Drosophila suzukii an invasive pest, and (iii) a combination of both.

Our estimations are as follows:

$$(Equation\ 1)\ \Delta Risk\ Preference_{it} = \alpha_0 + \alpha_1 DrosophilaSuzukii_{it} + \alpha_2\ Frost_{it} + \varepsilon$$

Coefficients α_1 and α_2 show the effect of a 1-unit increase (1 percentage point) in crop damage due to Drosophila suzukii and frost, respectively, on change in risk preferences of farmer *i* in year t (vis-à-vis year t-1). *ΔRisk preference* ranges from -10 to 10, <0 indicates they became more risk loving and >0 they became more risk averse.

$$(Equation\ 2)\ \Delta Risk\ Preference_{it} = \alpha_0 + \alpha_1 Drosophila\ suzukii_{it} + \alpha_2 Frost_{it} + \alpha_3 DrosophilaSuzukii_{it} * Frost_{it} + \varepsilon$$

Models are estimated using an Ordinary Least Squares estimator with robust standard errors.

Results	***100 – 250 words***

On average farmers are risk averse (Figure 1). Self-reported risk preferences across domains are highly correlated (up to 0.72) but this differs across domains and time (Figure 2). External financial risk domain has the lowest correlation. Self-reported and lottery risk preferences correlate only weakly (0.06 to 0.23). We find a higher correlation between the lottery task and the external financial risk domain. The lottery was contextualized as agricultural production decisions but may reflect risk preferences in financial domains (due to financial pay-outs).

Self-reported risk preferences are moderately correlated (0.42 to 0.55) from one year to another (Figure 3), decreasing when focusing on a two-year time differences (0.20 to 0.48). Temporal stability of risk preferences is highest for production and weakest for marketing.

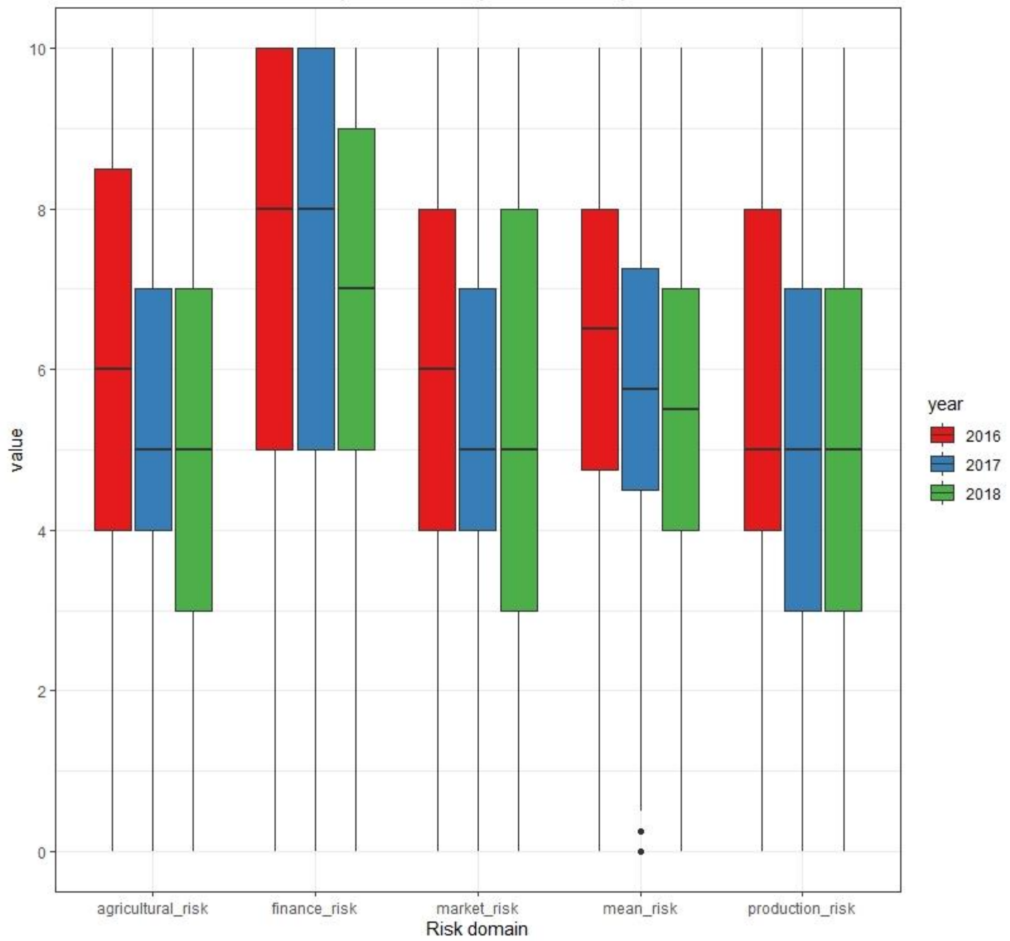
Figure 4 shows coefficient plots for the results of Equation 1 (upper panels) and 2 (bottom panels). Frost only affects risk preferences in the production domain, a 1-percentage point increase in frost damage decreases the change in risk preferences by 0.008. Drosophila suzukii damage only affects marketing risk preferences. A 1-percentage point increase in damage due to Drosphila suzukii decreases the change in marketing risk by 0.091. When the shocks are interacted, there is an effect for the mean risk preferences, agricultural and production risk preferences. For the interaction, we present the marginal effects while holding one shock constant at 25th and 75th percentile. Results suggest that simultaneous experience of shocks cause farmers to be more risk loving, consistent with the CPT.

Discussion and Conclusion	***100 – 250 words***

Using farmer risk preferences across years and elicitation methods for a sample of Swiss fruit producers, we find that self-reported risk preferences across domains are highly correlated, but it differs largely across domains and time. Self-reported risk preference and findings from a Holt and Laury Lottery correlate only weakly. Finally, self-reported risk preferences are moderately correlated from one year to another and weakly correlated across two years. The experience of shocks (weather and pests) explains some variation across years. Results show that instability across years may be more severe than instability across elicitation methods. Yet, the difference between self-reported and the lottery is larger than differences across years.

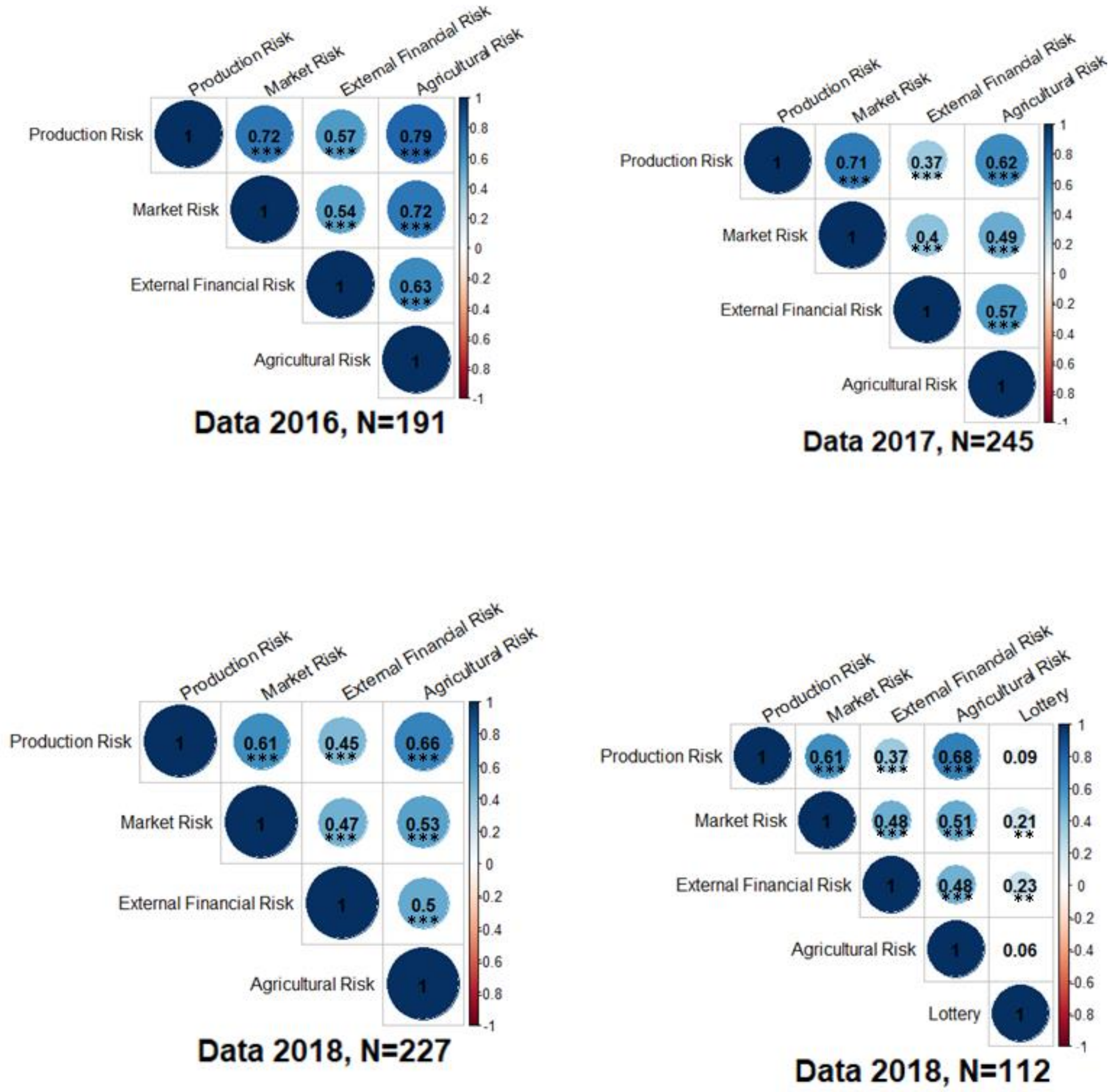
Our results reveal that farmer risk preferences are far from being stable. This poses a challenge for the use of risk preferences in economic and policy analysis. First, farmers' risk preferences may change dramatically and quickly over time due to external influences. Second, policies should not rely on risk preferences derived from a single elicitation method. In contrast, the predictive validity, i.e. the extent to which a method and underlying psychological trait can forecasting behaviour, should receive larger attention in policy analysis (e.g. Rommel et al., 2019). Future research should use multiple elicitation methods to elicit risk preferences. Results also highlight the necessity for domain-specific risk preferences and repeated measurement. More coordinated efforts that allow comparable observations across space (countries, farm types etc.) and time are required to better understand farmer risk preferences.

Figure 1. Summary statistics of risk preferences by domain and year (N=1530)



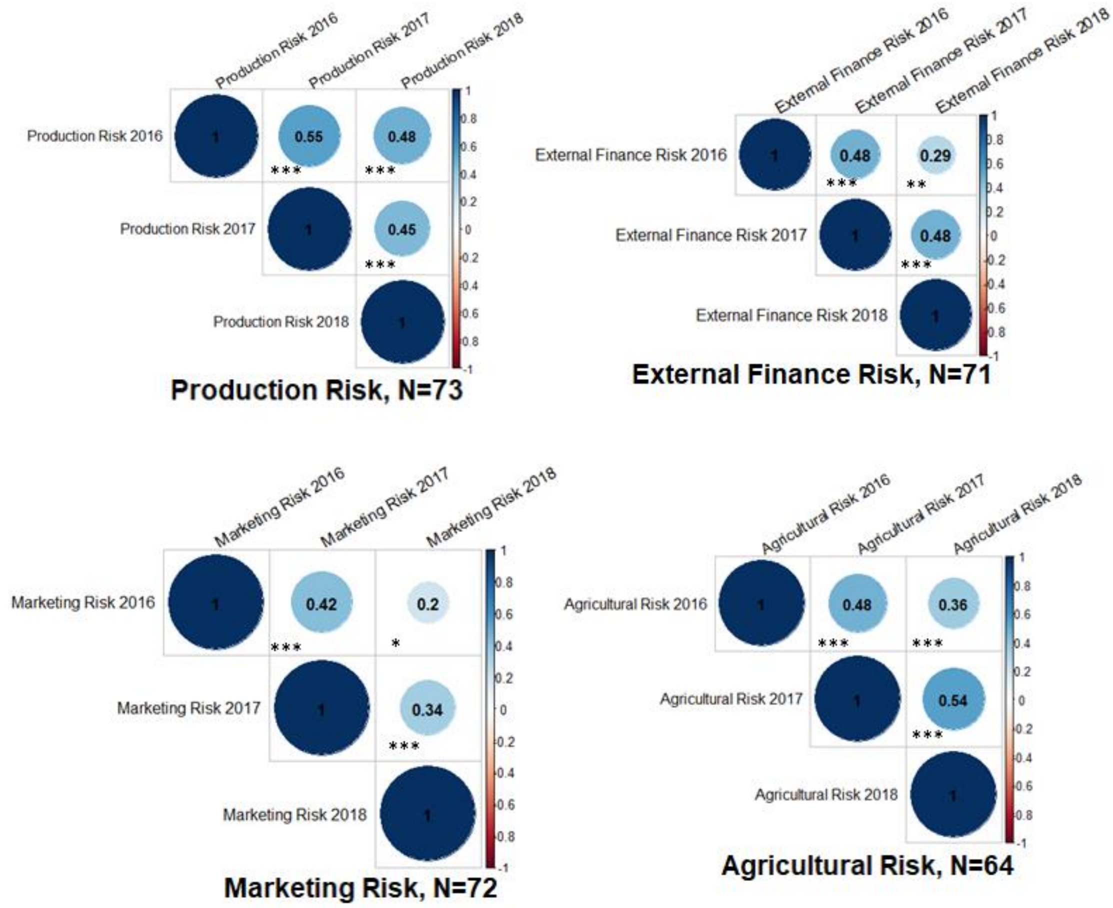
Note: the central line represents the median value; box limits represent the first and third quartiles; the whiskers represent the lower and upper adjacent values; outliers are represented by dots. A value of 5 is risk neutral, <5 is risk loving and >5 is risk averse.

Figure 2. Correlations of risk preferences across different elicitation methods for the years 2016, 2017 and 2018 (with and without lottery task).



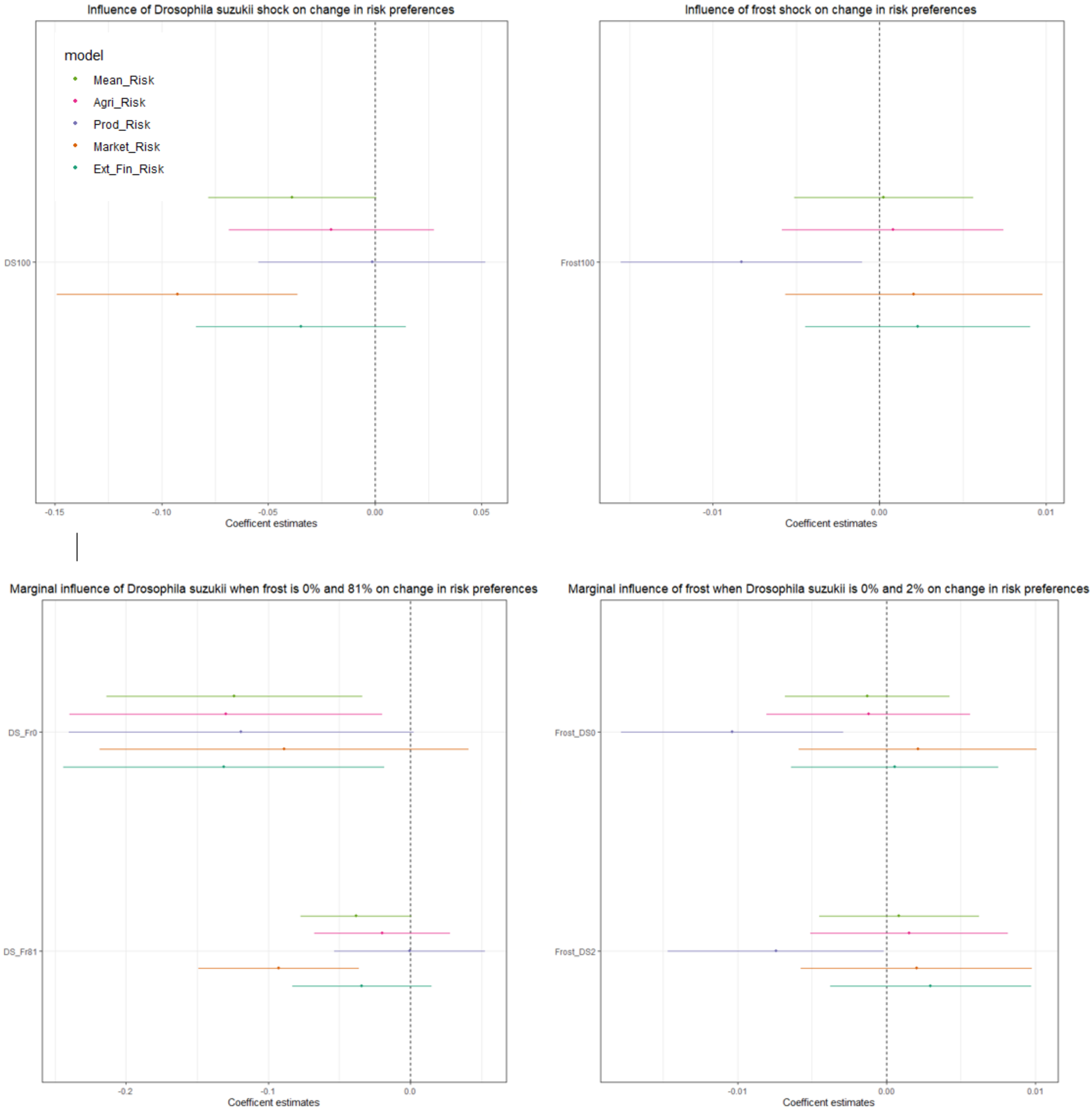
Note: ***, ** and * represent that the null hypothesis of zero correlation is rejected at the 1%, 5% and 10% level of significance, respectively.

Figure 3. Correlations of risk preferences across years for each domain of risk preference



Note: ***, ** and * represent that the Null hypothesis of zero correlation is rejected at the 1%, 5% and 10% level of significance, respectively.

Figure 4. Coefficient plots for effect of shocks on risk preferences



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