On the Validity of Gamble Tasks to Assess Farmers' Risk Attitudes

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Risk and uncertainty are fundamental elements of modern microeconomic theory and are ubiquitous in economic decisions. From the early theoretical principles of decision making in risky settings (e.g., Arrow 1965; Pratt 1964; Von Neumann and Morgenstern 1944) a substantial literature has emerged empirically assessing the impact of heterogeneous risk attitudes on market outcomes. While understanding and quantifying individuals' risk attitudes is critical for explaining market outcomes and improving policy designs, accurately assessing risk attitudes has proven to be a difficult and uncertain endeavor. Two primary approaches have been used by researchers to assess risk attitudes - revealed preference approaches and stated preference experimental methods. The first relies upon revealed preference data and typically imputes risk attitudes as the residual component explaining divergences between expected profit-maximizing solutions and observed decisions (Moschini and Hennessy 2000). While there are a number of advantages to revealed preference approaches, particularly when market data is available, this approach has been criticized based upon the potential confounding effects of imperfect information and heterogeneous resource endowments (e.g., Lybbert and Just 2007; Just, Khantachavana and Just 2010).

The second approach uses laboratory or field experiments where risk attitudes can be measured under controlled conditions. For example, Holt and Laury (2002) and Eckel and Grossman (2008) elicited risk attitudes in a laboratory setting using gamble-choice tasks based on a multiple price list design. Using experimental methods, the presence of non-trivial individual specific levels of risk aversion and heterogeneous attitudes toward risk has been

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documented in a variety of studies (Binswanger 1980; Harrison, Lau and Rutström 2007; Gaudecker, van Soest and Wengström 2011). While experimental methods based on simple gamble tasks offer tremendous research opportunities, there are a number of concerns that have emerged with the approach. The first and perhaps most troubling is the emerging evidence that risk attitudes appear to vary across different elicitation mechanisms. For example, Reynaud and Couture (2012) find in a sample of French farmers that risk preference measures vary across alternative types of gamble tasks. Similarly, Andersen et al. (2006) find framing effects in their risk preference experiments. This issue of inconsistent measures of risk attitudes is further compounded by limited evidence assessing the external validity of risk measures elicited via experiments. It is unclear from the literature if risk preferences measured in experiments are in fact fruitful in explaining real-world economic behaviors. This question is particularly of concern when considering hypothetical experiments, often the only option available to researchers due to the financial infeasibility of conducting experiments involving gambles over substantial stakes.

In this study we contribute new evidence on these concerns surrounding risk attitude elicitation in experiments by comparing three alternative mechanisms and assessing their relative performance in predicting actual agent behavior in insurance markets. The three methods considered in our experiments differ in terms of the context and payoff of the decision presented to experiment participants. The first method is the recently proposed approach by Dohmen et al. (2011) that abstracts from defining a context or payoff of gamble tasks in lieu of simply asking individuals to self-assess their willingness to take risks. The second method is the increasingly common approach proposed by Eckel and Grossman (2008) that confronts participants with a series of small-stakes 50-50 gambles including a sure payoff and several risky choices with linearly increasing expected payoffs. The third method is our own proposed simple gamble-

choice task that explicitly frames gambles in terms of percentages of annual income from a risky activity. By framing payoffs as income gambles in the context of participants' actual economic activities, our proposed method recasts the Eckel and Grossman approach in a domain and scale that directly pertains to the risk setting actually faced by participants. The impetus for this framing derives from evidence by MacCrimmin and Wehrun (1986,1990) that individuals appear to display different behavior towards risk in different contexts (e.g., recreation vs. business decisions) and different scales (Bombardini and Trebbi 2012). Given that risk attitudes may vary by context and payoff levels indicates that risk attitude measures might be a poor instrument to predict behavior in situations or domains other than those in which the measures were obtained (Weber, Blais, and Betz 2002). We hypothesize (and test) that, by explicitly defining the payoffs in terms of the actual domain and context faced by experiment participants, our proposed gamble-task will better capture risk attitudes and predict actual agent behavior.

The remainder of the paper is organized as follows. In the following section a description of the experiment protocols is provided. Then, a summary of responses and a comparison of elicitation mechanisms are presented. To assess the ability of the three mechanisms to explain actual agent behavior, regression analysis is then conducted to analyze insurance purchase decisions. Finally, we conclude.

Experiment Design

To evaluate the relative performance of alternative risk attitude elicitation mechanisms, a series of experiments were conducted in the spring of 2011 with a sample of 99 farmers in the Province of Trento, Northern Italy, recruited via the local extension service. Farmers, as opposed to

student or university populations, were selected for the purposes of this study for two primary reasons. First, in order to assess the potential impact of framing risk experiments in the appropriate context and payoff domains related to economic decisions, it was critical to have a sample of individuals engaged in a common risky economic activity. Second, farmers have re-emerged in the literature as a popular population subsample for conducting risk experiments due to the nature of their profession entailing regular decisions under risk and uncertainty arising from the inherent weather, pest, and price risks in agricultural production (e.g., Lybbert and Just 2007; Just and Lybbert 2009; Herberich and List 2012). They are a natural sub-population for contrasting alternative mechanisms and testing the external validity of experiment outcomes on real-world choices.

Data was collected via a touch-screen computer assisted face-to-face interview lasting approximately 40 minutes. As compensation for their participation, and to mitigate potential biases due to the hypothetical nature of the experiments, participants received a gift for participation (a hacksaw or a pruning shear valued at approximately 30 Euro). As well, in addition to the use of a cheap-talk script with each participant, farmers were promised feedback regarding their risk attitudes as a non-monetary incentive as in Reynaud and Couture (2012).

Self-Assessment of Risk Preferences

The simplest measure of risk preferences elicited from the sample of farmers was a straightforward self-assessment of their willingness to take risk: "On a scale from 1 to 10, where 1 means "not at all willing to take risks" and 10 means "very willing to take risks", how would you assess your personal inclination to take risks?". A similar question has been investigated by Dohmen et al. (2011) in a representative sample of the German population and by Reynaud and

Couture (2012) in a small sample of French farmers. The appeal of this approach for eliciting risk attitudes rests in its simplicity, giving it wide potential for collecting risk preference measurements at a very low marginal cost. However, because the question is devoid of any context for the underlying risk being measured nor an explicitly defined scale with an underlying economic interpretation, there is potential concern as to whether such a measure captures actual risk preferences and agent choices in risky settings.

Lottery Choice Tasks

In addition to the simple self-assessment of risk preferences, farmers engaged in two different lottery choice experiments. Among the variety of lottery-based mechanisms that have been proposed in the literature, the procedure of Eckel and Grossman (2008) distinguishes itself by its simplicity; an important feature that potentially minimizes choice errors by experiment participants. In the Eckel and Grossman task (hereafter EG), subjects are confronted with a set of 50-50 gambles including a sure outcome and several risky outcomes with linearly increasing expected payoffs and risk (measured as the standard deviation of expected payoffs).

In our experiments, participants were presented two sets of 11 gambles (one sure outcome and 10 risky outcomes). Gambles were numbered from #1 to #11 in order of ascending risk, with gamble #1 being the sure item. For each set of gambles, farmers were asked to select the most preferred among the 11 possible gambles. In the first set of gambles shown to participants, which we refer to as the *Few Euro Gambles*, the gamble payoffs were constructed in terms of modest Euro quantities. Specifically, the sure outcome consisted of a payoff of 10 Euro and the payoffs in risky outcomes were payoff pairs ranging from 9 and 12 Euro (the least risky pair) to 0 and 30 Euro (the most risky pair).

In the second set of gambles presented to participants, which we refer to as the *Farm Income Gambles*, payoffs were constructed analogously to the first set in the *Few Euro Gambles*, but payoffs were in terms of percentages of annual farm ordinary gross income. For this set of gambles, farmers were asked to consider themselves in a situation in which they were given the option to gamble their ordinary farm income for that year. Specifically, the sure outcome consisted of a payoff of 100% of the value of the annual farm ordinary gross income and the risky outcomes consisted of income-share pairs from 90%-120% and 0%-300% of farm income.

A summary of the two different lottery-choice tasks are presented in table 1. The first three columns contain information displayed on the computer screen for each participant in both of the lottery-choice tasks: the gamble number (from #1 to #11), the choice events (A and B), and the probability of each event (50% and 50%). The final piece of information displayed for participants, the payoffs corresponding to each gamble number, differed between the two experiments. In table 1, the column marked *Few Euro Gambles* describes the Euro payoffs used in one set of experiments and the column marked *Farm Income Gambles* describes the farm income percentages used in the other set of experiments. The final three columns of table 1 are calculations (not presented to participants) describing the expected payoff, standard deviation of the expected payoff, and the range of values of the constant relative risk aversion utility function, $U(w) = w^{1-r}/(1-r)$ where r denotes the risk aversion coefficient, that would correspond to an individual choosing that particular gamble.

As in EG, in both gamble tasks the gamble numbers are linearly related to the properties of the gambles (expected return and standard deviation) so that the gamble number can be used as a parametric summary index of risk preferences. This is analogous to the self-assessment approach described above as well. Furthermore, the gambles were designed to satisfy some

important properties. First, payoffs feature only prominent numbers conferring simplicity to the task, reducing subjects' cognitive efforts and limiting rounding and decision-making errors. Second, for comparison among the two lottery-based experiments, gamble payoffs were constructed so that under the assumption preferences are represented by the constant relative risk aversion utility function (CRRA), the range of values of the risk aversion coefficient for which a subject prefers a given gamble is the same across both the Euro payoff experiment and the farm income experiment. Finally, compared to EG who used only five gambles, we have a finer grid with 11 gambles to increase the precision of risk preference measurements.

Table 1. Summary of Lottery-Based Experiments

#	Event	Prob.	Payoff		Expected payoff [a]	Risk [a.b]	CRRA Ranges[.c]
			Few Euro Gambles (€)	Farm Income Gambles (% of Income)			
1	A	50	10	100	1.00 * X	0.00 * X	r>4.92
	B	50	10	100			
2	A	50	9	90	1.05* X	0.15 * X	1.64<r<4.92
	B	50	12	120			
3	A	50	8	80	1.10* X	0.30 * X	1.00<r<1.64
	B	50	14	140			
4	A	50	7	70	1.15* X	0.45 * X	0.72<r<1.00
	B	50	16	160			
5	A	50	6	60	1.20* X	0.60 * X	0.56<r<0.72
	B	50	18	180			
6	A	50	5	50	1.25* X	0.75 * X	0.45<r<0.56
	B	50	20	200			
7	A	50	4	40	1.30* X	0.90 * X	0.38<r<0.45
	B	50	22	220			
8	A	50	3	30	1.35* X	1.05 * X	0.30<r<0.38
	B	50	24	240			
9	A	50	2	20	1.40* X	1.20 * X	0.24<r<0.30
	B	50	26	260			
10	A	50	1	10	1.45* X	1.35 * X	0.16<r<0.24
	B	50	28	280			
11	A	50	0	0	1.50* X	1.50 * X	r<0.16
	B	50	30	300			

[(a)] X=10 in the *Few Euro Gambles* and X=100% of ordinary income in the *Farm Income Gambles*. [(b)] Measured as standard deviation of expected payoff. [(c)] Calculated as the range of values of r in the constant relative risk aversion function $U(w) = w^{1-r}/(1-r)$ for which a subject would chose a given gamble.

Experiment Results

Table 2 presents a breakdown of responses by participants across the three risk preference tasks. Please note that while responses between the *Few Euro Gambles* and the *Farm Income Gambles* are directly comparable in terms of risk aversion attitudes under the assumption of CRRA, responses to the self-assessment survey question are not because of its arbitrary scale.

Table 2. Summary of Respondents' Preferred Choices

#	Self-Assessment	Few Euro Gambles	Farm Income Gambles
1	3.0%	35.4%	46.5%
2	4.0%	17.2%	26.3%
3	13.1%	19.2%	18.2%
4	9.1%	3.0%	3.0%
5	26.3%	6.1%	1.0%
6	9.1%	10.1%	5.1%
7	9.1%	2.0%	0.0%
8	17.2%	0.0%	0.0%
9	3.0%	0.0%	0.0%
10	6.1%	0.0%	0.0%
11	-	7.1%	0.0%

Gamble Task Comparison

Comparing responses between the two gamble tasks, outcomes in the *Farm Income Gambles* imply a higher degree of risk aversion under the assumption of CRRA than would be attributed based upon responses in the *Few Euro Gambles* task. The mean choice selected by respondents is 3.20 in the *Few Euro Gambles* with a standard deviation of 2.76 and the mean choice in the *Farm Income Gambles* is 2.01 with a standard deviation of 1.30. A t-test for the equality of the gamble means across the two tasks rejects equality at the 1% significance level. As well, comparing the distribution of choices by farmers using a Kornbrot test, the null hypothesis that the distribution of responses is equal is rejected at the 1% significance level. As a whole, the

results strongly indicate that responses in the *Few Euro Gambles* and the *Farm Income Gambles* are not equivalent.

Converting the gamble choices into risk aversion coefficients for preferences characterized by constant relative risk aversion, the average CRRA coefficients implied by the *Few Euro Gambles* and the *Farm Income Gambles* are 2.80 and 3.71 respectively. Looking closer at farmer-level responses reveals a clear picture of the difference in behavior under the two tasks and the impact on estimates of CRRA coefficients. Nearly half of the participants (45.9%) choose equivalent gamble numbers in both the *Few Euro Gambles* and the *Farm Income Gambles*. For this subset of participants, the average CRRA coefficient is equal across the two tasks and equal to 3.70. For the remaining 54.1% of respondents who choose different gamble numbers in the two tasks, 39.8% chose a less risky alternative in the *Farm Income Gambles* than in the *Few Euro Gambles* while only 14.3% chose a more risky alternative. Considering this subset of respondents who changed their gamble choices across the two experiment tasks, the implied CRRA coefficient characterizing their attitude towards risk is substantially different. The average CRRA coefficient for individuals who switched to a different gamble between the *Few Euro Gambles* and the *Farm Income Gambles* is 1.71 in the former and 3.09 in the latter. This reflects that individuals who responded differently in the two tasks displayed substantially more risk aversion in the income based task, but still not to the degree of the average participant who remained stable across both experiments. While in the next section the implications of this difference in terms of predicting insurance decisions will be assessed, it is clear from these responses that the measurement of risk attitudes in lottery-based tasks differs substantially depending upon the framing and scale of the risky setting.

Although not directly comparable to either of the lottery-based gamble tasks, the self-assessment of willingness to take risk displays substantially more heterogeneity. For this question the modal response is 5 with a mean of 5.64 and standard deviation of 2.26. Overall, responses to the self-assessment match well with the findings of Dohmen et al. (2011) who found in their representative sample of the German population a modal response of 5 on a 11-point scale and a standard deviation of 2.4 (or 2.18 if rescaled to a ten-point scale). Self-assessments span the entire scale from "not at all willing to take risks" to "very willing to take risks", a feature that does not appear to correspond well with responses to the *Farm Income Gambles* in particular. This is further confirmed by comparing the Pearson correlation coefficients between all three risk preference elicitation mechanisms. While there is a moderate positive correlation between the *Few Euro Gambles* and the *Farm Income Gambles* of 37% (in terms of the selected gamble number), the correlations of the gamble tasks with the self-assessment are weak and even negative with the *Few Euro Gambles* (-10% and 2%). This weak relationship between either of the gamble tasks and the self-assessment raises the question of whether the simple self-assessment appropriately captures risk preferences in the context of monetary gambles.

Prediction Power

While it is clear from the previous section that there are substantial differences between risk preferences elicited via a self-assessment, a small Euro stakes lottery-based task, and a lottery-based task framed in the context and scale of risk actually faced by participants in their economic activities, the critical question remains if these measures are fruitful in predicting actual agent behavior. This is important for not only understanding the relative performance of alternative elicitation mechanisms, but also for validating experimental methods for the elicitation of risk preferences. For the individuals considered in this study, a dominant risk to annual income is

uncontrollable losses due to hail. Based on the available data it is difficult to provide an exact estimate of the damage caused by hail to apple production, however from time series data provided by the local farm association, it can be inferred that hail causes an average loss well in excess of 10% of the aggregate crop value, implying sizable percentage losses for individual farmers' ordinary income. In the extremes, crop losses from hail can reach 90-100% of individual annual farm income.

The primary instrument available to farmers in the region to mitigate losses due to weather events are insurance policies available through Co.Di.Pr.A., a farmer association in charge of crop insurance, that pay an indemnity in the event of crop losses. Based upon the standard theory of risk, it would be expected that farmers who are more risk averse are more likely to purchase insurance against crop losses due to adverse weather events. In this section we test whether the three experimental measures of risk preferences have power in explaining which farmers decide to purchase weather insurance policies for their farm. Given the scale of potential losses due to weather events, *a priori* it is hypothesized that the risk preferences measured via the *Farm Income Gambles* would better capture the relevant attitude towards risk that corresponds with the actual insurance decision process.

In order to appropriately assess the relationship between risk preference measures and insurance purchases, the experiments included a number of survey questions designed to elicit individual-specific factors that could be hypothesized to be related to farmers' decision to protect against weather related farm income losses. In addition to standard socio-demographic and farm characteristics, a number of questions were included to collect data on farmers' past experiences with crop losses and their exposure to information about insurance policies and crop risks. Table 3 provides a summary of the survey questions presented to the experiment participants.

Farmers in the sample have an average age of 43.66 with 22.76 years of farming experience. As is typical in the region, farms are small with an average size of 5.19 hectare of which on average 74.10 percent of the cultivated land is owned. Two questions, *Own Farm Recent Crop Damage* and *Other Farms Crop Damage* – captured farmers' experience with weather related damage in the region. Based upon responses to these questions, the average farmer in the previous five years has experienced between light and moderate crop damage from hail and 86 percent has personally seen very heavy crop damage on other farms in the region. To measure future expectations of weather risks, which would be hypothesized to be related to insurance decisions, farmers were asked to indicate their perceptions of the *Expected Weather Conditions* on a four point scale indicating their level of agreement that climatic conditions will lead to increased hail precipitations in the coming years. These questions, on a four point scale, indicated that farmers expect a moderate increase of hail precipitations.

To account for the impact of information exposure on insurance decisions, three questions were included. The majority of farmers (94%) are members of a local cooperative. Slightly more than half of the farmers reported that they had attended the 2010 information session by Co.Di.Pr.A., the farmer association in charge of crop insurance in the region, and on average farmers had read booklets or participated in 4.99 information sessions by the extension services during the last year.

Table 3. Farm and Farmer Characteristics

Variable Name	Variable Definition	Mean	Stdev
Farm and Farmer Characteristics			
Age		43.66	11.99
Education (years)		10.86	2.63
Farming Experience (years)		22.76	11.87
Full Time	1 if a full time farmer	0.89	0.32
Farm Size (hectare)		5.19	2.61
Apple	% of farm land with apple orchards	84.98	27.68
Cultivated/Owned (%)	% of cultivated land that is owned	74.10	29.00
Income (1000 Euro/month)	Household monthly net income	2.38	1.31
Liquidity unconstrained	1 if able to pay 20,000 Euro within 5 days to cover an unforeseen expense	0.69	0.46
General Level of Concern	Average stated concern (10 point scale) over 10 risk factors	6.12	1.58
Probability Test Score	# of probability questions correctly answered	3.47	1.24
Past Damage and Crop Risk Information			
Own Farm Recent Crop Damage	0-None, 1-Light, 2-Moderate, 3-Heavy, 4-Very Heavy	1.76	1.12
Other Farms Crop Damage	=1 if have seen very heavy crop damage in other farms	0.89	0.54
Insurance Premium (% of crop value)	Basic weather insurance premium	3.87	1.50
Expected Weather Conditions [a]	Expect weather conditions for hail to become more frequent	2.33	0.82
Coop Member	1 if a member of a farmer cooperative	0.94	0.24
Co.Di.Pr.A	1 if attended an information session by Co.Di.Pr.A in 2011	0.56	0.50
Sessions & Articles	# of recently attended information sessions and articles read	4.99	2.39

[a] Scale 0-4 “0=Do Not Agree” and “4=Fully Agree”

Finally, based upon previous literature on risk attitudes and economic decision under uncertainty (Dohmen et al. 2009, 2010; Mansour et al. 2008), three additional questions were asked of participants. A set of seven probability tasks, adapted from Fischbein and Schnarch (1997) was used to assess participants' ability to process probabilistic information. On average, the sample of farmers correctly answered 3.47 questions out of seven. To control for potential liquidity constraints influencing farmers' ability to purchase crop insurance, the question labeled *Liquidity Unconstrained* was included. Nearly 70% of farmers indicated that they would be able to pay 20,000 Euro within 5 days to cover an unforeseen expense. Finally, to capture farmers' general level of concern/optimism, ten different risk factors on a ten point scale was used to construct a composite score of farmers' *General Level of Concern.*

Regression Estimates

Table 4 presents coefficient estimates from three standard probit models where the dependent variable is equal to 1 if the farmer purchased a crop insurance policy for the current year (2011). The independent variables, which are described in table 3, are equivalent across the three models except for the specification of the measure of risk aversion, which takes a different value for each of the three experimental mechanisms: *Self-Assessment*, *Few Euro Gambles*, and *Farm Income Gambles.* For the *Few Euro Gambles* and *Farm Income Gambles* the measure of risk aversion is the midpoint of each CRRA class corresponding to the selected gamble.[2] For the *Self-Assessment*, the measure of risk aversion is the number indicated by the participant on the 10-point scale.

[2] For the first and last gambles, we use 5.5 and 0.08 as class midpoints.

Table 4. Probit Estimates

	Farm Income Gamble Task		*Few Euro Gamble Task*		*Self-Assessment Question*	
Variable Name	**Mean**	**Stdev**	**Mean**	**Stdev**	**Mean**	**Stdev**
Risk Aversion	0.199**	(0.101)	0.100	(0.077)	0.091	(0.088)
Age	-0.154	(0.116)	-0.124	(0.109)	-0.106	(0.104)
Age-Squared	0.002	(0.001)	0.001	(0.001)	0.001	(0.001)
Education (years)	-0.122	(0.114)	-0.175	(0.117)	-0.193*	(0.106)
Farming Experience (years)	0.007	(0.026)	-0.001	(0.026)	0.001	(0.024)
Full Time	0.407	(0.628)	0.417	(0.583)	0.550	(0.602)
Farm Size (hectare)	0.031	(0.071)	0.041	(0.068)	0.029	(0.070)
Apple	0.021***	(0.007)	0.020***	(0.007)	0.019***	(0.007)
Cultivated/Owned (%)	-0.008	(0.007)	-0.006	(0.007)	-0.008	(0.007)
Income (1000 Euro/month)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Liquidity unconstrained	-0.588	(0.480)	-0.683	(0.469)	-0.680	(0.457)
General Level of Concern	0.178*	(0.107)	0.179	(0.121)	0.128	(0.115)
Probability Test Score	0.069	(0.202)	0.075	(0.199)	0.094	(0.197)
Own Farm Recent Crop Damage	0.063	(0.189)	0.071	(0.183)	0.028	(0.188)
Other Farms Crop Damage	0.407	(0.452)	0.313	(0.491)	0.355	(0.487)
Insurance Premium	-0.115	(0.119)	-0.137	(0.129)	-0.160	(0.127)
Expected Weather Conditions	0.544**	(0.239)	0.508**	(0.223)	0.508**	(0.230)
Coop Member	0.665	(0.822)	0.503	(0.817)	0.361	(0.766)
Co.Di.Pr.A	1.034*	(0.547)	1.000*	(0.523)	0.985**	(0.492)
Sessions & Articles	0.118	(0.081)	0.122	(0.083)	0.108	(0.082)
Constant	-1.242	(3.031)	-0.536	(3.051)	-0.204	(3.214)
Wald Chi2	36.73**		28.19		31.43**	
Log-Likelihood	-28.57		-29.65		-29.75	

Note: *, **, and *** denote 10%, 5%, and 1% significance levels, respectively.

The estimated relationships between the three alternative measures of risk preferences and insurance purchases tend to confirm expectations of the superiority of the lottery task framed in the context of annual farm income. The estimated relationship between the CRRA coefficients calculated using the *Farm Income Gambles* is positive and statistically significant at the five percent level. This indicates, as theory would dictate, that farmers who displayed greater levels of risk aversion in the *Farm Income Gambles* are more likely to purchase crop insurance. No

statistically significant relationship between risk preferences elicited in the *Few Euro Gambles* task and insurance purchases is found. This indicates, as hypothesized, that the relationship between decisions in a small stakes Euro gamble and actual behavior in the context of substantial stakes involving actual economic activities do not strongly correspond. When considering the self-assessment of risk attitudes a similar result is found. The relationship is not statistically significant indicating that farmers who self-assess themselves as risk averse in a general context are not more likely to purchase crop insurance.

Considering other variables included in the model to control for additional factors other than risk preferences on insurance decisions, results fall largely in line with expectations. Given the relatively homogenous sample of individuals in the experiments, none of the socio-demographic variables have a statistically significant effect on the likelihood of insurance purchases. As intuition suggests, farmers who perceive future hail risk to become more pronounced are more likely to purchase insurance. As well, operators of apple orchards are more likely to purchase insurance than grape producers, reflecting the higher susceptibility of apples to damage from hail. As well, information effects are found as farmers who had attended the annual member meeting organized by the local farmer association responsible for crop insurance are more likely to purchase insurance.

Conclusion

Despite having a long history in economic analysis, risk remains a difficult individual-specific attribute to quantify in empirical settings. While recent advances in experimental methods offer tremendous promise for the potential to elicit risk preferences in a controlled environment, the consistency of measurements across different experimental methods and the issue of external

validity remain an open question. In this paper we have contrasted three alternative hypothetical methods for assessing risk preferences that vary in terms of the contextual framing and payoff scale. The evidence strongly suggests that risk preference measurements differ substantially across (1) a self assessment devoid of any contextual or monetary farming, (2) a small stakes gamble task with no contextual framing, and (3) a large stakes gamble with a specific framing in terms of income related to actual economic activities. Further analysis relating the three mechanisms to actual market behavior indicated that only the latter approach has power in explaining farmer's insurance purchase decision. Overall, the results of these experiments indicate that it is important when designing risk preference experiments to carefully consider the framing and scale in order to design experiments that engage participants in the appropriate domain.

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