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CONVERGENT AND EXTERNAL VALIDITY OF RISK PREFERENCE ELICITATION METHODS: EVIDENCE FROM VIET NAM

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Abstract

In this study, we add to the body of evidence on the reliability of risk preference measurements using evidence from a survey and experiment in rural Viet Nam. We conducted a field survey and experiment with a random sample of 350 households. Subjects face various incentivized elicitation methods, including multiple price lists and Gneezy-Potters-style tasks as well as non-incentivized tasks and general attitude questions about willingness to take on risk. Most elicitation methods provide evidence that respondents are, on average, risk-averse. Respondents appear less risk-averse in the self-assessment method than with other methods. Therefore, comparing risk preferences elicited from the survey and experiments should be done with caution. Unlike other studies on supporting the use of self-assessment of risk attitude in surveys such as Dohmen et al. (2011), we find that self-assessment, both in general and in specific contexts, has limited validity as it has the smallest or no relation with other measures. This finding could reflect the differences between developed and developing countries. Lastly, the multiple price list and loss–gain measures are stronger at predicting behaviors in experiments and predicting risky behaviors than other elicitation measures.

Keywords: risk preferences, experiment, validity

JEL Classification: D90, O10

Contents

1. INTRODUCTION

Risk is inherent in economic decision-making and differences in risk preferences across individuals or households account for differences in behaviors across a wide number of domains, including savings, investment, and health protection. The measure of risk preferences is critical for policy prescriptions in determining the appropriate level of risk reduction and in helping people, especially the poor, the vulnerable, and marginalized groups, to cope with shocks in daily life. Therefore, figuring out ways to accurately measure this important parameter can shed light on the sources of differences in individual preferences and their role in fundamental economic choices. Economists and psychologists have developed a variety of methodologies to elicit individual risk attitudes. In general, methods for assessing risk preferences can be categorized into two primary groups: incentivized (or experimental) methods involving real financial implications, and hypothetical measures. In hypothetical measures, subjects make choices among risky options, but they do not receive actual payoffs based on their choices; alternatively, they express their own perceived level of risk tolerance through self-rating questions on their attitude towards risk. While non-incentivized questions are generally deprecated by economists, hypothetical measures are easier and less costly to implement on a larger scale, which can be important if evidence on risk preferences a subsidiary part of a larger survey exercise is. For example, in the specific case of Viet Nam, the large-scale and nationwide Viet Nam Access to Resources Household Survey (VARHS) has recently incorporated hypothetical questions designed to measure risk attitudes. The well-known work of Dohmen et al. (2011) for Germany and Hardeweg, Menkhoff, and Waibel (2013) for Thailand has provided evidence that hypothetical questions can be reliable in particular circumstances, but it is not clear whether such circumstances include rural families in developing countries. Indeed, the original source of skepticism towards hypothetical questions and much of the impetus towards incentivized questions came from the careful work of Binswanger (1980) in low-income agricultural areas of India. Thus, to extend the evidence on the reliability of hypothetical and attitude questions, we conduct a series of parallel tasks amongst farmers in southern Viet Nam.

More specifically, we focus on five elicitation methods commonly used in the literature, namely:

(i) self-assessment survey questions;

(ii) lottery tasks (hypothetical settings);

(iii) loss–gain tasks (hypothetical or incentivized settings);

(iv) multiple price list (MPL) tasks (hypothetical or incentivized settings); and

(v) incentivized investment tasks.

We view *reliability* as having two important components: consistency across different elicitation methods and the ability of each elicitation method to predict actual individual or household risk-taking behaviors. Given this, we focus on five sub-research questions:

- Do the subjects understand the questions?
- Are the responses consistent among subjects across elicitation methods?
- Are elicitation methods significantly correlated with each other?

- Do the responses given in the hypothetical measures predict actual risk-taking behavior in the incentivized measures?
- Does risk preference, from each elicitation method, predict observed individual and household behaviors?

To answer the above research questions, we conduct a field survey and an experiment with a random sample of 350 households. The hypothetical elicitation methods contain a set of self-assessment questions that are adopted from Dohmen et al. (2011) and a set of hypothetical questions taken from the Viet Nam Access to Resources Household Survey (VARHS). The experimental methods include three tasks, two of which are modified from the equivalent hypothetical questions in the VARHS and an incentivized investment task. Thus, our major contribution is the wider range of elicitation tasks that we use compared to other studies, which when combined with data on risk lifestyles enables us to probe more carefully for consistency and predictive validity.

To preview the main results, most of the participants have no difficulty in understanding the elicitation tasks. Meanwhile, most elicitation methods, except for the self-assessment method, provide evidence that respondents are, on average, risk-averse. In addition, the degrees of risk aversion are slightly lower in the MPL than in the investment task.[1] Hence, when comparing risk preferences derived from survey or hypothetical and experimental methods, caution is advised. Results from an internal consistency test show that in the MPL task, 75% of subjects are consistent or nearly consistent when making a choice between a hypothetical and an experimental situation. However, many more people (more than half of the sample) show inconsistent responses between experiment and hypothetical questions for loss aversion. Meanwhile, the strongest correlation is between questions that have the same design such as the MPL and loss–gain tasks. The investment task also shows a strong association with other methods like MPL and loss–gain.

In contrast to Dohmen et al. (2011), for example, we find that self-assessment, both in general and in specific contexts, has limited validity as it has the smallest or no relation with other measures. This finding is in line with Binswanger (1980) and could reflect the differences between developed and developing countries.

The rest of the study proceeds as follows. Section 2 begins by laying out the research design and describes elicitation methods used for this study. Section 3 analyzes the results of internal consistency. Section 4 presents and discusses the findings of experimental and behavioral relevance validity tests. Section 5 concludes the study.

2. SURVEY AND EXPERIMENTAL DESIGN

2.1 Research Area

The field survey and experiment were conducted in rural areas of two provinces, Kien Giang and Long An, located in the Mekong Delta region of southern Viet Nam. Kien Giang is known for fishing, shrimp growing, and rice farming with nearly 90% of its population living in rural areas. Long An is situated in an advantageous position in the Southern Key Economic Region of Viet Nam. It serves as a bridge between the big city—Ho Chi Minh City in the north—and 12 provinces in the Mekong Delta in the

[1] In the MPL, the mean Constant Relative Risk Aversion (CRRA) is 1.12 (SD 1.07) for the hypothetical setting and 1.09 (SD 1.13) for the experimental setting while the mean midpoint of the CRRA interval in the investment task is 2.51 (SD 1.76).

south. Due to its low-lying geography, Long An has some areas that are subject to flooding during the rainy season and is susceptible to sea level rises caused by climate change. In recent years, the two provinces have experienced major shocks such as saltwater intrusion (Kien Giang) and flooding (Long An). The main economic activities in Long An are rice production and growing crops. The two provinces share similar geographical and economic characteristics and are suitable places to examine the impact of shocks on the daily decisions of people and their attitude towards risk.

2.2 Survey and Experimental Design

We conducted a field survey and an experiment from January to May 2019 with a random sample of 350 households. Twenty-five households were interviewed in each of six rural villages in two communes in Kien Giang province and 25 households in each of eight rural villages in two communes in Long A province. The households were randomly chosen from a complete population list of the villages by systematic sampling.[2] One month before the real survey and experiments, we provided training for enumerators and implemented a pilot survey. In each household, we interviewed a household representative member face-to-face. The interview lasted about 1.5 hours and comprised two main parts: survey and experiment parts. The first part was the survey part consisting of detailed demographic information, hypothetical elicitation questions, and risk perceptions. After completing the survey part, subjects participated in an experiment. The experiment part included three main tasks with some similar elicitation methods to those in the survey part. However, subjects were paid in this section depending on their choice. To prevent a spillover effect in the thinking process, the time gap between when subjects answered the hypothetical questions and the experimental questions was about 45 minutes.

To help subject comprehension, the enumerators read the questions aloud and used examples, pictures, and red and black tokens to explain about 50:50 probability. As for the implementation of the payout, before starting the interview, subjects were informed that after they had completed both the survey and experiment parts, they would receive a fixed participation fee of VND90,000. In addition, they might lose or gain some amount of money aside from the participation fee depending on their choice in the experiment. After a participant had completed the experiment, subjects pulled a chip from a bag to determine which question became relevant for that participant's payoff.

2.3 Data Description

Table 1 presents key summary statistics of the sample. More than 70% of the participants are household heads. The average age is 48.3 years old, and the average number of years of schooling is six. Females account for about 30% of the sample and 97% of sampled individuals are married. On average, a household has four members. Nearly 40%, 30%, and 10% of participants report that they smoke, drink, and play a lottery very often, respectively.

[2] Systematic sampling is a probability method in which researchers select members of the population at a regular interval determined in advance. In our case, the commune leaders provided us with a list of household heads in each village in alphabetical order. We decided to sample every 20th or 30th household in each village.

Table 1: Descriptive Statistics (N = 350)

	Mean
Household head	0.71
Age	48.38
Male	0.71
Years of schooling	6.07
Household size	4.70
Number of children	2.86
Married	0.97
Kinh (Ethnic Vietnamese)	0.94
No religion	0.83
Dependency ratio	0.49
Household income (log)	18.39
Average consumption per month (log)	15.52
Agriculture land, acre	26.55
House ownership (= 1)	0.98
Lottery	0.09
Smoking	0.37
Drinking	0.28

Note: Playing lottery, smoking, and drinking = often doing the activities.

The average survey and experimental earning for the three tasks was VND196,242 (about USD19 at the time), equivalent to about six to nine days' wages for casual unskilled labor such as harvesting and construction work.

3. METHODS TO ELICIT RISK PREFERENCES

Overall, five methods were used: survey questions, lottery task (low- and high-stake), loss–gain task, multiple price list, and investment task. Notably, among these methods, the study utilized a set of hypothetical elicitation questions from the Viet Nam Access to Resources Household Survey (VARHS).[3] A detailed description of each elicitation method is presented below:

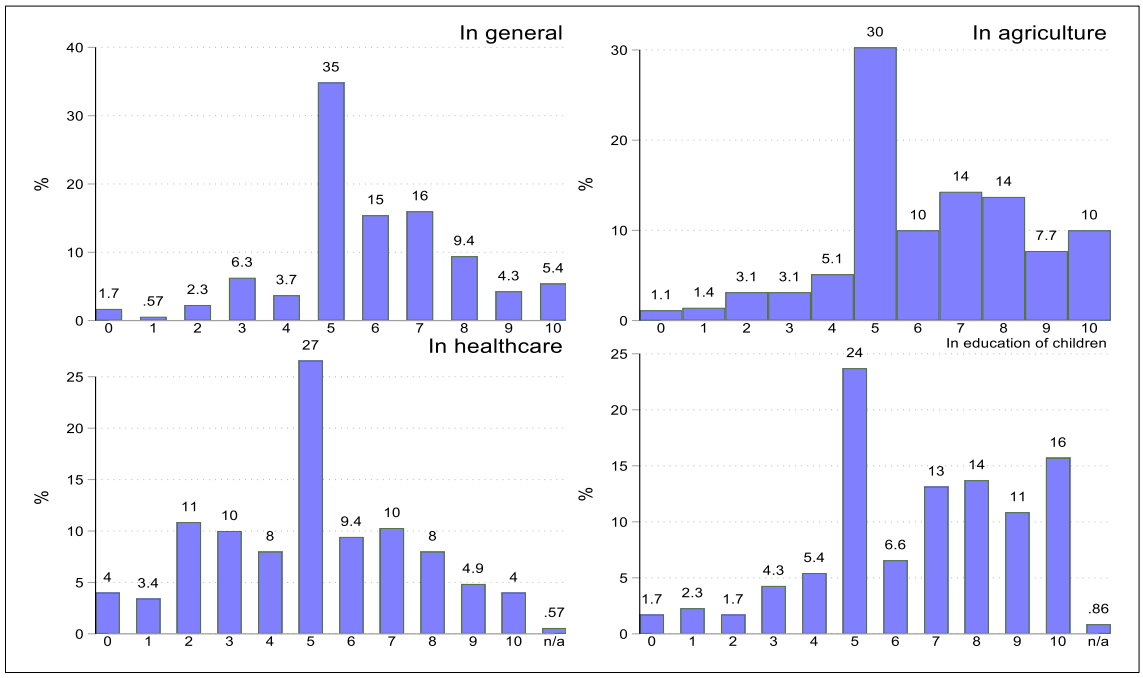
3.1 Self-assessment Willingness to Take Risks

The survey questions are adopted from Dohmen et al. (2011). They measure the subject's willingness to take risks in general and in some specific activities such as agriculture, healthcare, and investment in the education of children. Participants look at a Likert scale with integers ranging from zero (= completely unwilling to take risks) to 10 (= completely willing to take risks) and select the integer that best matches their own willingness to take risks.

[3] The VARHS is a longitudinal household survey constructed biannually by the University of Copenhagen in collaboration with the Central Institute for Economic Management, the Institute for Labor Studies and Social Affairs, and the Institute of Policy and Strategy for Agriculture and Rural Development for rural areas of 12 provinces in Viet Nam. The survey includes questions to measure risk preferences. In particular, hypothetical lottery and loss–gain tasks are included in three waves: 2010, 2012, and 2014. A hypothetical multiple price list was added to the questionnaire in 2016 and 2018.

Figure1 presents the distribution of self-assessment risk attitudes in general and in three specific domains. Although a considerable proportion of subjects chose the middle score of "5" (about 24%–35% of the sample), there was substantial heterogeneity in willingness to take risk.[4] Responses to the general self-assessment scale (mean = 5.86) were similar to those in Nielsen, Keil, and Zeller (2013). Compared to Dohmen et al. (2011), we find that Vietnamese farmers reported greater tolerance of risk than typical German adults, with more than half of the total sample choosing the upper scale. This is the same across all domains. The finding is consistent with Vieider et al. (2019) that Vietnamese farmers are more risk-tolerant than Western subjects, and with Charness and Viceisza (2016) that participants in rural Senegal, particularly women, are more risk-tolerant than typical experimental subjects in the Western world. In general, a relatively small fraction of subjects chose values from 0 to 2, indicating that they are least willing to take risks, while a somewhat larger fraction, roughly from 5% to 16% of all subjects, chose 10, indicating that they are very willing to take risks. In healthcare, responses were spread out over the entire range.

Figure 1: Responses to the Question of Willingness to Take Risk in General and in Four Specific Domains



Note: 0 = very unwilling to take risks; 10= fully willing to take risks; n/a = non-applicable case.

There are also significant correlations among self-rating questions. The correlation magnitude varies from 0.21 to 0.63, with the strongest correlation being between willingness to take risks in general and in agriculture (0.63). This could be because

[4] There are several reasons why subjects might choose the middle score, including their true preferences, no interest, or not understanding the questions. In terms of whether participants would choose the middle score because they may not understand the question, we hypothesize that participants who are less educated and get low cognitive scores would tend to choose "5." To examine this, we ran a probit regression of "whether the answer is 5" on other variables of participants' characteristics such as age, gender, education and cognitive ability, and other controls. The results show that less educated people are more likely to select "5" only in the general case. Age, gender, and cognitive level did not have a significant impact on their answers.

most of the participants were farmers and agricultural activities are their main income source. The lowest correlation is between willingness to take risks in the education of children and in healthcare (0.21). Willingness to take risks in doing business also has the lowest correlation with other willingness-to-take-risk domains (0.20–0.30).

3.2 Survey Question: Hypothetical Lottery

The hypothetical lottery questions are from the VARHS based on Hartog, Ferrer-i-Carbonell, and Jonker (2002).[5] Subjects imagine they are given the chance to join a state-run lottery where only ten people can enter, and one person will win the prize. Subjects are asked how much they would be willing to pay for a 1 in 10 chance of winning a low-stake prize of VND2,000,000 (equivalent to USD100) and a high-stake prize of VND20,000,000 (equivalent to USD1,000), respectively. We call this task "lottery2 and lottery20." Participants' responses are considered as reservation prices.

We observe that risk aversion is the most frequent situation. Some 60% of subjects would like to pay a low amount, from VND10,000 to less than VND60,000, in both situations. About 20% of participants are not willing to buy either a low- or high-stake lottery ticket. From our interview experience, these zero responses have mixed implications. They may truly reveal strong risk aversion. Alternatively, they may not provide comprehensive information about the risk attitude of a person as some of the participants have never played a lottery and for a variety of reasons related to moral objection. Very few subjects would like to pay a high amount (above VND200,000). We follow Hartog, Ferrer-i-Carbonell, and Jonker (2002) to compute risk preference parameters without specifying a utility function and obtain the Arrow-Pratt measure of absolute risk aversion (ARA).[6]

3.3 Multiple Price List

The Multiple Price List (MPL) is based on Holt and Laury (2002), including hypothetical and experimental settings. In the hypothetical setting, the MPL questions are obtained from the VARHS. The task provides respondents with a pair of choices of safe and risky options. In the safe option, they receive a fixed amount of VND2,000,000 certainly[7] (equivalent to about USD100). The risky option involves an equal chance and hence varies the payoff. In all choices, the risky option yields a higher expected value than that in the safe option. In the experimental setting, the safe and risky options are adjusted 20 times lower in value than the hypothetical ones. To ensure a compatible incentive in the experimental MPL, and so it can be compared with the hypothetical MPL, the adjusted amount in the experimental MPL is based on the current price change as well as a payout equal to about six to nine days' wages for casual unskilled labor in rural areas.

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[5] "*Among 10 people, 1000 guilders are disposed of by lottery. What is the most that you would be willing to pay for a ticket in this lottery?*" Questions such as this have appeared widely in some national surveys, such as the Brabant Survey in the Netherlands in 1993, the Bank of Italy Survey of Household Income and Wealth (SHIW), and the Japanese Household Panel Survey on Consumer Preferences and Satisfaction in 2011–2012.

[6] Please find details of risk preference computation from lottery2 (low-stake) and lottery20 (high-stake) in the Appendix.

[7] VND20,000 = USD1 .

Notably, the hypothetical MPL includes instructions to guide subjects after each of their choices. For instance, after the subject makes a decision in the first row, depending on their choice in that row, the enumerator decides to ask for their decision in the next row or another row, and so some rows might be skipped. Because of that, no subjects make irrational responses. On the other hand, in the experimental MPL, subjects deliberately make their decisions in all rows without guidance from the enumerator and so no row is skipped. Therefore, there might be inconsistent answers. We assess a subject's risk attitude based on the point at which subjects switched from the risky option to the safe one.

Following Holt and Laury (2002), we compute their degree of risk aversion based on expected utility theory with a CRRA utility function. Table 2 presents the proportion of subjects with total numbers of safe options chosen, and their equivalent constant relative risk aversion (CRRA) interval in hypothetical and experimental setups. In both settings, more than half of the respondents are risk-averse and 20%–25% of them always choose the safe option.

Compared to some previous studies, the mean CRRA in our study, 1.12 (SD 1.07) for the hypothetical setting and 1.09 (SD 1.13) for the experimental setting, is higher, such as 0.68 in northern Viet Nam (Tanaka, Camerer, and Nguyen 2010) and 0.63 in the marginal upland area in northwestern Viet Nam (Nielsen, Keil, and Zeller 2013). About 20% of participants in each setup have a CRRA of less than 0.31 and nearly 25% of them have a CRRA larger than 2.91.

Table 2: Risk Preferences in Multiple Price List Task

	With Incentives (Experimental MPL)		Without Incentives (Hypothetical MPL)	
Numbers of Safe Options Chosen	**% of Subjects**	**CRRA Interval if Switch to Safe Option**	**% of Subjects**	**CRRA Interval if Switch to Safe Option**
Always choose safe options	21.71	NA	24.86	NA
4	14.86	$r \geq 2.91$	NA	NA
3	12.86	$1 < r < 2.91$	16.86	$r \geq 2.91$
2	16.57	$0.31 \leq r < 1$	7.71	$1 < r < 2.91$
1	11.14	$0 \leq r < 0.31$	14.29	$0.31 \leq r < 1$
Always choose risky options	18.57	$r < 0$	36.29	$r < 0.31$
Inconsistent responses	4.29		0	

Note: Inconsistent response = multiple or irrational switching.

In general, subjects seemed to be more likely to be risk-averse in the incentivized task than in the hypothetical one. Approximately 36.29% of the subjects exhibited risk-loving behavior, always choosing the risky option in the hypothetical MPL, whereas only 18.57% of them made the same choices in the experimental setup. Inconsistent responses are noted when participants make multiple or illogical switching. In the experimental context, 4.29% of participants provided inconsistent responses.

3.4 Loss–Gain Task

The loss–gain task (or lottery choice task) comes from Fehr and Goette (2007) and Gächter, Johnson, and Herrmann (2022), including hypothetical and experimental settings. Hypothetical lotteries are the same as those in the VARHS, with six lotteries in total. For each of six lotteries, subjects decide whether they want to accept or reject it.

Each lottery includes both gaining and losing awards with an equal chance. The winning amount is unchanged at VND6,000 and the loss varies between VND2,000 and VND7,000. In the experimental setting, the payoff is adjusted five times higher based on the price change at that time. There are five lotteries of both gaining and losing awards with an equal chance. In each lottery, the winning amount is unchanged at VND30,000 and the loss varies from VND5,000 to VND25,000 at intervals of VND5,000.

Table 3 presents choices in the loss–gain task in both settings. In both settings, more than 30% of subjects do not accept playing the lottery. Subjects are more likely to accept playing the lottery in the hypothetical task than in the experiment. More than half of the participants accept playing the lottery at least once in the hypothetical context while nearly 40% of participants accept it at least once in the experimental setup. Nevertheless, a greater number of participants agree to participate in all the lotteries within the experimental setup (26%) than in the hypothetical scenario (11.7%). Irrational responses are similar in both situations at around 1% of the sample.

Table 3: Choices in Loss–Gain Task in Hypothetical and Experimental Settings

Option Where Subject Refuses Lottery	Accept the Lottery				Expected Value	Numbers of Accepted Lotteries	Proportion of Subjects Accepted
	P	Payoff (VND)	P	Payoff (VND)			
Hypothetical questions from the VARHS							
1	0.5	–2,000	0.5	6,000	2,000	Refuse all	33.71
2	0.5	–3,000	0.5	6,000	1,500	1	11.43
3	0.5	–4,000	0.5	6,000	1,000	2	17.43
4	0.5	–5,000	0.5	6,000	500	3	8.57
5	0.5	–6,000	0.5	6,000	0	4	8.29
6	0.5	–7,000	0.5	6,000	–500	5	7.71
						Accept all	11.71
						Inconsistency	1.14
Experiment							
1	0.5	–5,000	0.5	30,000	12,500	Refuse all	35.14
2	0.5	–10,000	0.5	30,000	10,000	1	13.43
3	0.5	–15,000	0.5	30,000	7,500	2	8.86
4	0.5	–20,000	0.5	30,000	5,000	3	12.57
5	0.5	–25,000	0.5	30,000	2,500	4	2.57
						Accept all	26.00
						Inconsistency	1.43

Note: VND1,000 = 5 cents; Inconsistent response = multiple or irrational switching.

In this lottery choice task with low stakes, a refusal to play a lottery with a positive expected value arguably reflects loss aversion rather than risk aversion (Gächter, Johnson, and Herrmann 2022). A subject is more loss-averse when s/he refuses to play more lotteries. To compute the loss aversion parameter (λ), we apply a similar approach to that in the MPL, assuming expected utility theory to be true and using a CRRA utility function. Following Tanaka and Munro (2014), we estimate the loss aversion (λ) by using the utility function $U(x) = -\lambda\frac{(-x)^{1-r}}{1-r}$ for losses, in which the mean of the risk aversion parameter (r) is obtained from the MPL tasks. We equate the expected utilities between two lotteries. The loss aversion parameter is determined when the subject changes from agreeing to refusing to play a lottery. Details of the loss aversion parameter are presented in the Supplementary Material.

3.5 Investment Task

The investment task was pioneered by Gneezy and Potters (1997)[8] and implemented only in the experimental setting. Subjects imagine they have just won VND100,000 (about USD5) in a lottery. In the experiment, they receive this amount as an endowment. Right after winning the lottery, they receive a financial offer that they can use a part of or the entire winning prize to invest. There is a chance they might double their money. However, it is also equally likely that they will lose half of the amount invested. The loss is deducted from their endowment. The participants need to consider and decide how much they would like to invest among six options: VND 0 (no investment), 20,000, 40,000, 60,000, 80,000, or 100,000 (invest all). The amount that subjects decided to invest is used as the measure of their risk preferences. Nearly 70% of the participants chose to invest less than or equal to VND40,000. The average amount subjects would like to invest was about VND40,000.

Table 4: Risk Preferences in the Investment Task

Investment Scenarios	Lose		Win		CRRA Interval	Proportion of Subjects
	P	Payoff	P	Payoff		
0	0.5	100,000	0.5	100,000	$r \geq 4.91$	27.71
20,000	0.5	90,000	0.5	120,000	$1.64 \leq r < 4.9$	20.57
40,000	0.5	80,000	0.5	140,000	$1 \leq r < 1.64$	19.43
60,000	0.5	70,000	0.5	160,000	$0.72 \leq r < 1$	10.57
80,000	0.5	60,000	0.5	180,000	$0.56 \leq r < 0.72$	4.29
100,000	0.5	50,000	0.5	200,000	$r < 0.56$	17.43

Table 4 shows the investment scenarios together with CRRA ranges. We compute an interval CRRA parameter by using the investment amount of each individual together with their initial wealth level before the investment. Specifically, a given investment choice implies that the expected utility from this option must be equal to or greater than the expected utility from the next largest and next smallest possible investment choice. By solving these two conditions using the individual's utility function and substituting the endowment level, we can get the upper- and lower-bound values for the CRRA parameter. The CRRA lies between 0.56 and 4.9. Nearly half of the participants are very risk-averse with a CRRA bigger than 1.64.

4. VALIDITY TESTS AND FINDINGS

In this section, we examine the consistency of responses among subjects and the correlations among elicitation methods.

Do Subjects Understand Elicitation Questions?

We first observe whether the participants understand each of the elicitation tasks. Inconsistent responses may occur when participants have multiple or reverse switching between options, especially in the MPL and loss–gain tasks. For example, they rejected a lottery that has an equal chance of losing VND2,000 or gaining VND6,000 in

[8] It was then refined in Charness and Gneezy (2010) and hence originally known as the CGP method. The CGP method has been widely used in the literature thanks to its relative simplicity (Haigh and List 2005; Charness, Gneezy, and Imas 2013).

one option. However, they accepted a lottery that loses VND3,000 or gains VND6,000 in the next option.

Overall, our results show that most participants (94% of the sample) understand the tasks and make rational choices. Although the participants appear to have more challenges in understanding the tasks that entail making choices between options and requiring a probability explanation such as the MPL and loss–gain tasks,[9] the percentage is very low. In short, 4% of the sample give inconsistent responses in the experimental MPL and about 1% give inconsistent responses in both hypothetical and experimental loss–gain tasks.

4.1 Internal Consistency

Internal Consistency Between Hypothetical and Experimental MPL

Table 5 presents the internal consistency of responses within subjects between the hypothetical and experimental MPL in terms of the CRRA midpoint. Subjects are categorized into three groups based on their midpoint CRRA in each setting. In general, 75% of sampled individuals are consistent or nearly consistent between the two settings:

(C) *Consistent in risk aversion:* Subjects in the same range of CRRA are marked by a capital C in the table. In other words, they show the same degree of risk attitude in both hypothetical and experimental settings. Nearly half of the participants remain consistent between hypothetical and experimental tasks.

Table 5: Responses Between Hypothetical and Experimental MPL

CRRA Midpoint in Hypothetical MPL	CRRA Midpoint in Experimental MPL					
	0	**0.16**	**0.66**	**1.96**	**2.91**	**Na***
0.31	12.54	8.36	6.87	2.39	3.28	3.28
	C	C	NC	IC	IC	IC
0.66	2.69	1.49	3.88	2.69	2.39	1.79
	IC	NC	C	NC	IC	IC
1.96	1.49	0.60	0.90	1.19	2.09	0.60
	IC	NC	NC	C	NC	NC
2.91	0.60	0.90	2.99	4.48	5.97	2.69
	IC	IC	NC	NC	C	NC
Na*	2.09	0.30	2.69	2.69	1.79	14.33
	IC	IC	IC	NC	NC	C

Na* = always choose safe option in MPL; C = consistent; NC = nearly consistent; IC = inconsistent.

(NC) *Nearly consistent in risk aversion:* Subjects are either in one CRRA interval in one task and in the next CRRA interval in the other task, or their CRRA interval in each task is next to each other. For instance, subjects have a CRRA midpoint of 0.31 ($r < 0.31$) in the hypothetical MPL and a CRRA midpoint of 0.66 ($0.31 \leq r < 1$) in the experimental MPL. About 30% of subjects are nearly consistent.

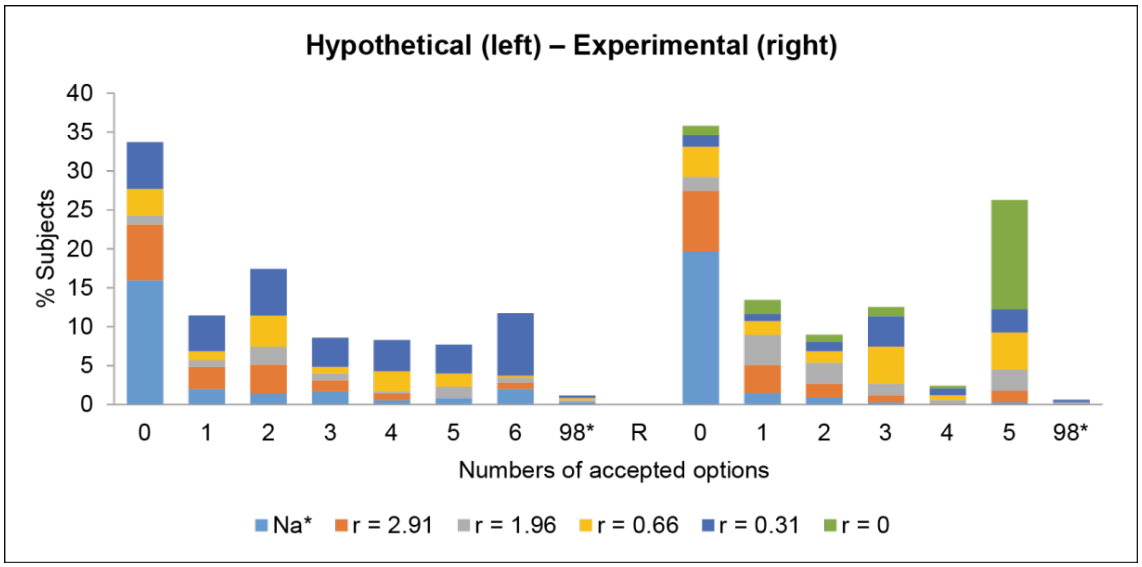
[9] We also checked for the difference between consistent and inconsistent subjects and found no significant differences between them in terms of education, cognitive ability, or gender.

(IC) *Inconsistent in risk aversion:* Subjects who respond contrast between two tasks. For instance, they are highly risk-averse (r > 2.91) in the experimental MPL while being much less risk-averse (r < 0) in the hypothetical MPL. These subjects are concentrated in the top-right and bottom-left corners of the table. They account for nearly 25% of the sample.

Internal Consistency Between MPL and Loss–Gain Tasks

In Section 3.4, we obtained the loss aversion interval for each individual in each hypothetical and experimental loss–gain task by using their equivalent risk preferences from hypothetical and experimental MPL tasks, respectively. If an individual has the same risk preferences in both hypothetical and experimental MPL tasks, they may have the same loss aversion interval. If the risk preferences are different in both cases, we would like to examine whether their loss aversion intervals overlap in both cases. Figure 2 shows the distribution of individual responses between numbers of accepted lotteries in the loss–gain task and their associated risk preference in the MPL task. The left side of the figure is for the hypothetical situation while the right side of the figure is for the experimental case. The X-axis shows numbers of accepted lotteries in the loss–gain task, while the Y-axis shows the proportion of subjects, and the Z-axis shows the risk preference parameter (r) in the MPL.

Figure 2: Percentage Responses from MPL and Loss–Gain Tasks



Na* = Always choose safe option A in MPL; 98* = Irrational answers.

The figure shows a relatively clear pattern in which a more risk-averse person, who has a higher value of the risk aversion parameter (r) in the MPL task (shown along the Z-axis), has lower numbers of accepted lotteries. In other words, more risk-averse people are less likely to agree to participate in the lottery. Subjects who always choose the safe option in the MPL task mostly reject or accept only one or two lotteries as observed in the light blue column: 22% of the participants in the experiment and nearly 20% of them in the hypothetical task. Similarly, the trend is reversed when subjects are less risk-averse (r is smaller than 1) in the MPL task. They tend to have higher numbers of accepted lotteries and their distributions skew to the right of the figure.

Internal Consistency Between Hypothetical and Experimental Loss–Gain Tasks

A subject is considered to be consistent between the two loss–gain tasks when their two loss intervals from hypothetical and experimental cases overlap. And if the intervals do not overlap, they are inconsistent in revealing their loss preferences. After excluding irrational participants and participants who always choose the safe option in the MPL tasks,[10] we categorize the participants by looking closely at their two loss aversion intervals:

- (C_L) *Consistent in loss aversion:* Subjects whose two loss aversion intervals overlap.
- (NC_L) *Nearly consistent in loss aversion:* Subjects have the two loss aversion intervals that are next to each other or have one common point.
- (IC_L) *Inconsistent in loss aversion:* Subjects have two loss aversion intervals that do not overlap and are not next to each other. Depending on the gap between the two loss aversion intervals, we have different degrees of inconsistency: Subjects are *very inconsistent* if the gap is very big or the two intervals are very far away from each other, particularly if the gap is larger than or equal to 1; individuals are *inconsistent* if the gap is from 0.12 to 1; and individuals are *slightly inconsistent* if the gap is smaller than 0.12.

In general, 60% of subjects are inconsistent in loss aversion while 40% are consistent or nearly consistent in loss aversion.

4.2 Correlation Among Elicitation Methods

Table 6 presents correlation among elicitation methods.[11] Correlations are larger and more statistically significant among subjects who answered tasks that have a similar design rationality. Specifically, for the lottery, MPL, and loss–gain tasks, the association is substantially high and significant. The degree of correlation in most cases is more than half. For instance, there is a highly significant and positive correlation between the lottery2 and the lottery20 with a magnitude of 0.86. In the MPL task, the correlation between hypothetical and experimental cases is 0.52, while in the loss–gain task, the correlation between hypothetical and experimental ones is relatively low (0.38). The observed correlation might be explained by the fact that people might not perceive or feel the loss in the hypothetical case as clearly as in the experimental case. In the loss–gain experiment, the respondents are aware that the loss would be deducted from their endowment (in this case, the participation fee) and so they might take a longer time to think and consider before making a final decision in the loss–gain experiment.

[10] In which there are 21 irrational subjects who have multiple or reverse switching and 107 subjects who always choose the safe option in the MPL tasks, so their risk parameter interval is unidentified (referred to as “NA” in the MPL tasks). In the end, 222 subjects have two specific intervals of loss aversion parameters.

[11] We do not include the self-reported questions in the specific domain as we find no significant correlations between most self-assessment methods and other elicitation methods. Also, the lottery tasks, both low-stake (lottery2) and high-stake (lottery20), do not have a significant connection with most of the methods.

Table 6: Correlations Between the Elicitation Methods (N = 329)

	Hypothetical Tasks					Incentivized Tasks		
Hypothetical Tasks	**WTTR**	**Lottery2**	**Lottery20**	**MPL**	**Loss–Gain**	**MPL**	**Loss–Gain**	**Amount Invested**
WTTR in general	1.00	–0.06	–0.02	–0.10	0.01	–0.04	0.04	0.07
Lottery2 (low-stake)	–0.06	1.00	**0.86**	–0.07	**0.24**	–0.04	0.12	0.12
Lottery20 (high-stake)	–0.02	**0.86**	1.00	–0.08	**0.22**	–0.05	0.13	0.09
Hypothetical MPL	–0.10	–0.07	–0.08	1.00	**–0.39**	**0.49**	**–0.38**	**–0.34**
Hypothetical loss–gain	0.01	**0.24**	**0.22**	**–0.39**	1.00	**–0.42**	**0.34**	**0.28**
Incentivized Tasks								
MPL	–0.04	–0.04	–0.05	**0.49**	**–0.42**	1.00	**–0.56**	**–0.48**
Loss–gain	0.04	0.12	0.13	**–0.38**	**0.34**	**–0.56**	1.00	**0.48**
Amount invested	0.07	0.12	0.09	**–0.34**	**0.28**	**–0.48**	**0.48**	1.00

Note: Spearman correlations reported. Inconsistent responses are excluded. A higher score in WTTR in general reflects more willingness to take risks; lottery and investment tasks are measured in terms of amount invested; the MPL task is measured in terms of numbers of safe options chosen; the loss–gain task is measured in terms of numbers of accepted lotteries. Correlations above 0.20 are in **bold**. *** significant at 1%, ** significant at 5%, and * significant at 10%.

The correlation between the MPL and the loss–gain task is also high and significant. Negative signs show that safer options chosen in the MPL task are associated with fewer accepted lotteries in the loss–gain one. The strongest association is between the experimental MPL and loss–gain tasks (0.66). In the investment task, the invested amount has strong and significant connections with other responses in the loss–gain and MPL tasks. The strongest relation is with the experimental loss–gain task (0.52) and the experimental MPL task (–0.53). A negative relationship between the amount invested and the experimental MPL task indicates that a higher amount invested from the investment game is linked with fewer safe options chosen in the incentivized MPL. In other words, people who have more numbers of safe options chosen in the experimental MPL task or are more risk-averse also tend to invest less in the investment scenario.

To conclude, in the validity test of internal consistency, the strongest correlation is between hypothetical and experimental tasks with the same design, for instance, the MPL and loss–gain tasks, the MPL and loss–gain tasks. The investment scenario also shows a strong association with other methods like MPL and loss–gain. Self-assessment and hypothetical lottery tasks have the smallest or no relation with other measures. A possible explanation for his may be that people's perception of "risk" in the self-assessment is quite different from the "risk" in the MPL or loss–gain tasks. In the latter, the risk is only defined by the two choices (50:50) and by monetary gains/losses, while the term "risk" in the self-rating questions people would perceive as being much more complex than what the MPL/loss–gain tasks would capture.

4.3 Experimental Validity of Elicitation Measures

In this section, we examine the experimental validity of elicitation measures in two ways. We explore whether responses from hypothetical tasks can predict actual responses in the experimental tasks. For example, we want to study whether greater willingness to take risks in general and in specific contexts is closely connected with more choices of risky options in the experimental multiple price list. If this is the case, using hypothetical or survey tasks can be a time-efficient and cost-saving substitution for experiments. The following equation expresses the relationship of behaviors between elicitation methods:

Responses from experimental tasks = α + β(Responses from hypothetical tasks) + controls + ε*

Table 7 reports the coefficient estimate based on a separate regression of the respective experimental elicitation method on a particular hypothetical risk measure with a set of controls. The results show that the self-report survey measure and the lottery tasks (both low- and high-stake) show no significant relation to all three experimental measures.

Table 7: Validity of Experimental Relevance

	(1) Experimental MPL	(2) Experimental Loss–Gain	(3) Investment
Willingness to take risk			
In general context	–0.0694	0.0593	0.108
	(0.0720)	(0.0778)	(0.0936)
In agricultural activities	–0.0776	0.101	0.127
	(0.0696)	(0.0655)	(0.0798)
Lottery2	0.0427	–0.0227	0.0206
	(0.0329)	(0.0294)	(0.0433)
Lottery20	0.00518	–0.00474	–0.00145
	(0.00488)	(0.00540)	(0.00557)
Hypothetical MPL	0.551***	0.0254	–0.559***
	(0.112)	(0.0999)	(0.0992)
Hypothetical loss–gain	–0.389***	–0.0837	0.399***
	(0.0831)	(0.0745)	(0.0849)
Controls	Yes	Yes	Yes
Observations	259	257	350

Note: Interval regression coefficient estimates. Each row reports coefficient estimate based on a separate regression of the particular risk measure and a set of controls. The set of controls includes age, gender, education, ethnicity, household consumption (log), household size, numbers of children, and dummies for enumerator. Multiple price list is measured in terms of numbers of safe options chosen. Loss–gain task is measured in terms of numbers of accepted risky options. Investment task is measured in terms of amount willing to invest from 0 to 100. Willingness to take risk is measured on a scale from 0 to 10; a higher score corresponds with higher willingness to take risk. Lottery tasks are measured in terms of the amount one is willing to pay for the lotteries. Details of the regressions are presented in the Appendix. Robust standard errors are reported in brackets below the coefficient estimates in each regression. *** p < 0.01, ** p < 0.05, * p < 0.1.

On the other hand, hypothetical MPL and hypothetical loss–gain tasks are the most significantly relevant predictors in predicting actual risk-taking behaviors in the experimental multiple price list and investment tasks. The coefficients are significant at any conventional level, indicating that the responses given in the hypothetical measures do predict behaviors in the experiments. The sign of coefficients is also as expected. For instance, in column (1), the negative sign of coefficient (–0.389) indicates that when a subject accepted more risky options in the hypothetical loss–gain tasks, they also tended to choose more risky options in the experimental MPL. In general, this section confirms the validity of the experimental relevance of hypothetical MPL and loss–gain tasks in comparison to other methods such as self-assessment and lottery tasks.

4.4 Validity of Risk Preference Measures in Relation to Risky Behaviors

In this section, we examine the validity of the elicitation measures with respect to several real-life behaviors that are vital for the subjects' livelihood. The relationship between them is expressed in the following equation:

$$Risky\ behaviors = \alpha + \beta^{*}(Responses\ from\ elicitation\ methods) + controls + \varepsilon,$$

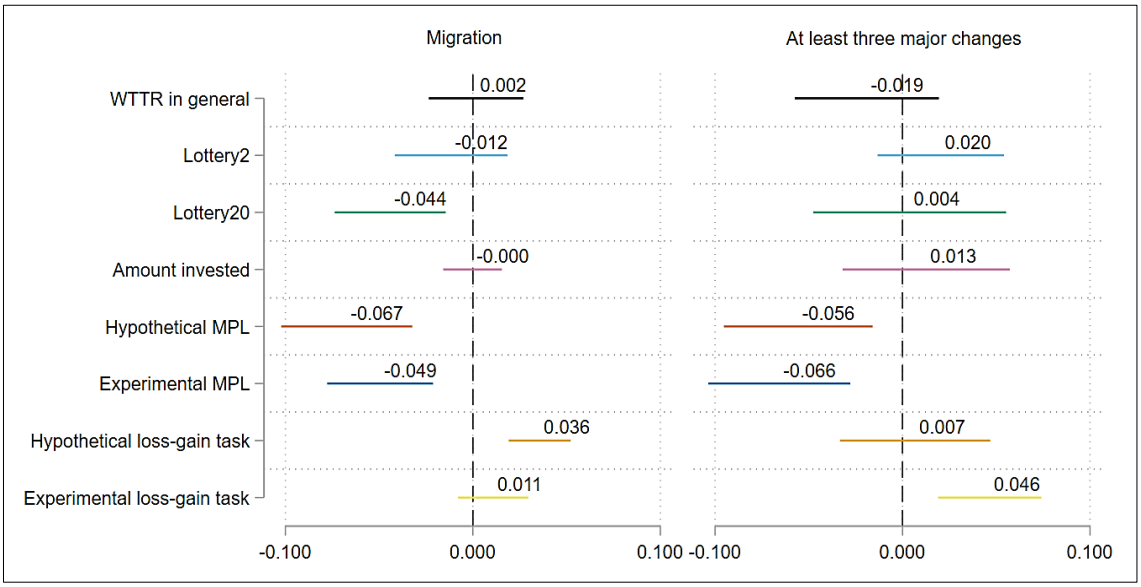
where risky behaviors include health-related behaviors such as smoking and drinking. Other risky behaviors are migration and major changes that a household has made since 2010 to manage farming and livelihoods. When asked about how risky the participants think migration is in comparison to not moving, more than 90% of the respondents stated that migration is riskier than staying in one place. The survey area is located in the Vietnamese Mekong Delta – a rural lowland area that is exposed to severe conditions and climate change such as drought, salinization, and flooding (Trinh and Munro 2023). More than 80% of the sampled households were affected by severe drought and salinity intrusion during 2015–2016. Respondents were asked about major changes they had made to manage farming and livelihood over the last ten years.[12] There are five major changes: adjusting planting calendar (50%); crop/livestock/aquaculture diversification or changing varieties (78%); investing in irrigation (38%); finding other nonfarm activities for income (22%); and moving to other provinces or cities for working and living (3%). Each change inherits higher risks and more other uncertainties than other changes: for instance, trying new seeds in crop diversification, and moving to new places.

Therefore, more changes inherently increase risks and uncertainties, and so it requires more willingness to take risks when adopting more adjustments. In our sample, among those we surveyed, 7% didn't make any changes. Around 60% made one or two changes, while 30% made at least three changes. We then examine whether risk-averse subjects (measured by each elicitation method) are more likely to adopt fewer than three major changes. The results in Figure 3 show that risk preferences measured by the MPL (both hypothetical and experimental settings) and by the loss–gain task (experiment) are significantly related to the implementation of at least three major changes. A one-standard-deviation increase in the numbers of safe options chosen in the hypothetical MPL task is associated with a nearly 6% increase in the probability of making at least three major changes or an 18% increase over the mean. In addition, Figure 3 shows that risk preferences from the MPL task and the hypothetical loss–gain task significantly predict the propensity to migrate. A one-standard-deviation increase in accepted risky options in the loss–gain task is associated with about a 4% increase in the probability of migration.

Smoking is used in many studies as a risky health behavior. Furthermore, smoking has been used as a proxy for risk preferences where there are no direct measures of risk attitude (Dohmen et al. 2011). The corresponding variable is equal to 1 if the subject smokes. For smoking and drinking, willingness to take risks in the domain of health and more risky options chosen in the loss–gain tasks have a stronger and highly significant association with smoking and drinking as shown by the larger marginal effect (Figure 4).

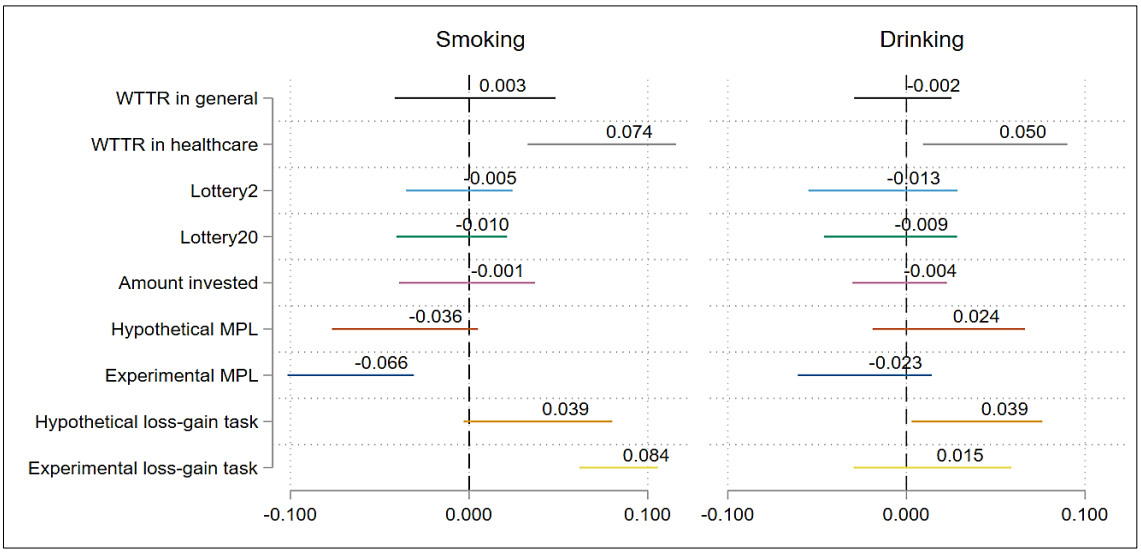
[12] The original question was: "*In the past 10 years, has your family made any big adjustments or changes in agricultural activities and living?*"

Figure 1: Risky Behavior Validation



Note: Separate logit regression models are estimated for each behavior as outcome and each elicitation method as control variable of interest. The confidence interval is 90%. Behavior outcomes are binary. All risk measures are standardized. Reported coefficients are probit marginal effect estimates, evaluated as the means of independent variables. Therefore, the coefficients show the impact of a one-standard-deviation change in the corresponding measure of risk preferences. Other controls include gender, age, education, household affected by climate change in 2015, household land, household consumption (log), number of children, household size, and dummies for the enumerator. Robust standard errors allow for clustering at the village level.

Figure 2: Health-Related Behaviors: Predictive Validity



Note: Separate logit regression models are estimated for each behavior as outcome and each elicitation method as control variable of interest. The confidence interval is 90%. Behavior outcomes are binary. All risk measures are standardized. Reported coefficients are probit marginal effect estimates, evaluated as the means of independent variables. Therefore, the coefficients show the impact of a one-standard-deviation change in the corresponding measure of risk preferences. Other controls include gender, age, education, household land, household consumption (log), number of children, household size, and dummies for the enumerator. Robust standard errors allow for clustering at the village level.

A one-standard-deviation increases in willingness to take risks in healthcare is associated with a 7% increase in the probability of being a smoker and a 5% increase in the propensity to drink. Given a sample mean of 37%, this translates into an 18.8% increase for smoking. The finding about smoking is similar to that of Dohmen et al. (2011), who show that a one-standard-deviation increase in willingness to take risks in healthcare increases the likelihood of being a smoker in Germany by 20% of the mean.

5. DISCUSSIONS AND CONCLUSIONS

This study examines the validity of various elicitation methods in the context of rural areas in Viet Nam. We conducted a field survey and an experiment with 350 households. The elicitation methods include four hypothetical and three experimental tasks, in which we utilize a set of hypothetical questions from a Vietnamese household survey. We provide a more comprehensive validity test of elicitation methods than other existing studies (e.g., Nielse, Keil, and Zeller 2013; Dohmen et al. 2011). This study is also the first to investigate the validity of hypothetical elicitation questions in a household survey in Viet Nam.

Most of the participants have no difficulty in understanding the elicitation tasks. Most elicitation methods, except for the self-assessment method, provide evidence that respondents are, on average, risk-averse. This finding supports other studies in Viet Nam (e.g., Tanaka, Camerer, and Nguyen 2010; Nielsen, Keil, and Zeller 2013). Respondents appear less risk-averse in the self-assessment method than in other methods such as in the MPL and investment tasks. In addition, the degrees of risk aversion are slightly lower in the MPL than in the investment task.[13] Hence, when comparing risk preferences derived from survey or hypothetical and experimental methods, caution is advised. Discrepancies may arise due to the broad context brought by surveys, despite their simplicity, ease of use, and cost-effectiveness. Characteristics of each type of elicitation may have also contributed to the difference in the perception of "risk."[14] Notably, people would perceive the term "risk" in the self-assessment as being much broader and more complex than what MPL/loss–gain tasks would capture. In comparison, the "risk" in the MPL or loss–gain tasks is only defined by the two choices (50:50) and by monetary gains/losses. In addition, survey methods often lack a clear theoretical background, limiting their usefulness in estimating utility function parameters, thereby restricting their applicability in structural modeling.[15] As usually happens with self-report questions, this may be biased due to framing effects because about 20% of total subjects selected the middle category.[16]

Our findings show that MPL and loss–gain tasks perform best amongst the methods in this context. Self-assessment, in general and in most specific contexts (except for self-assessment in healthcare), has limited validity since it has the smallest or no relation with other elicitation measures and risky behaviors. This finding is similar to those reported by Nielsen, Keil, and Zeller (2013) for Vietnamese farmers, Lönnqvist et al. (2015) for German students, Ding, Hartog, and Sun (2014) for Chinese students,

[13] In the MPL, the mean CRRA is 1.12 (SD 1.07) for the hypothetical setting and 1.09 (SD 1.13) for the experimental setting, while the mean midpoint of the CRRA interval in the investment task is 2.51 (SD 1.76).

[14] The respondents were given a clear definition of risk and risk taking at the beginning of the survey and experiment.

[15] Eckel, C. C. 2019. Measuring Individual Risk Preferences. IZA World of Labor: https://wol.iza.org/articles/measuring-individual-risk-preferences/long.

[16] As proposed by Nielsen, Keil, and Zeller (2013), the self-assessment task can be rescaled, such as from 0 to 9, to avoid an easily identifiable middle category.

Bauer, Chytilová, and Miguel (2020) for Kenyan farmers, and Binswanger (1980) for Indian farmers[17] but differ from other studies that support the use of self-assessment of risk attitude in surveys, such as Dohmen et al. (2011) and Hardeweg , Menkhoff, and Waibel (2013). A possible explanation for the opposite result might come from differences in the study context. Subjects in Dohmen et al. (2011) are German adults from a range of backgrounds, while subjects in our study are Vietnamese farmers. They may have different life experiences, living and working environments, and personal traits, so their perception of risks and interview behavior may differ. Understanding whether the differences between our and Binswanger's (1980) results, on the one hand, and those in Dohmen et al. (2011), on the other, are driven by differences between developing and industrialized countries requires further research from a wider range of cultures and population subgroups.

[17] Nielsen, Keil, and Zeller (2013) find that the correlation between self-assessment scale and multiple price list is weak (0.19). Ding, Hartog, and Sun (2014) found a low association among the hypothetical lottery question, the self-assessment question, and an experimental lottery.

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APPENDIX

Tables

Table A1: Subjects with Consistent and Inconsistent Answers

	Mean		
Variables	**Consistent**	**Inconsistent**	**P-value**
Female	0.28	0.43	0.21
Highest education	6.75	6.19	0.83
Cognitive ability	2.00	2.10	0.71
Observations	329	21	350

Table A2: Classification of Risk Preferences by Elicitation Methods (% of Subjects)

	Self-report Survey Questions: Willingness to Take Risk in…					With Incentives			Without Incentives	
Risk Preference Label	**General**	**Agriculture**	**Business**	**Healthcare**	**Investment in Education of Children**	**Lottery2 (low-stake)**	**Lottery20 (high-stake)**	**MPL**	**MPL**	**Investment**
Extremely risk-averse	Choose 0, 1, or 2 on the scale of 0 to 10					Choose not to play lottery	Choose not to play lottery	Always choose safe option	Always choose safe option	Choose to invest nothing
	4.57	5.71	19.51	18.39	5.77	20.86	20.29	21.71	24.86	27.71
Moderately risk-averse	Choose 3 or 4 on the scale of 0 to 10					1–3	1–9	Choose 3 or 4 safe options	Choose 3 safe options	Choose to invest 20k or 40k ($1 \leq r < 4.9$)
	8.58	8.28	23.35	18.11	9.8	61.42	64.01	27.72	16.86	40
Approximately risk-neutral	Choose 5, 6, or 7 on the scale of 0 to 10					4–7	10–50	Choose 1 or 2 safe options	Choose 1 or 2 safe options	Choose to invest 60k or 80k ($0.56 \leq r < 1$)
	66.29	54.58	47.04	46.54	43.81	8.0	13.43	27.71	22	14.86
Risk-loving	Choose 8, 9, or 10 on the scale of 0 to 10					Choose to play at the three highest amounts	Choose to play at the three highest amounts	Always choose risky option	Always choose risky option	Choose to invest all
	19.15	31.42	10.11	16.96	40.63	9.72	2.29	18.57	36.29	17.43

Note: Inconsistent responses are excluded. Labels are similar to those in previous studies.