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THE IMPACT OF SHOCKS ON RISK PREFERENCE CHANGES BETWEEN SEASONS FOR SMALLHOLDER FARMERS IN VIETNAM

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Abstract

Previous studies emphasize that shocks can cause households to fall into poverty traps and to remain there because of risk aversion, yet to date there has been no attempt to discern whether shocks increase risk aversion over time in a developing country. We examine whether shocks increase risk aversion from the lean season to the harvest season among smallholder farmers in northwestern Vietnam. The risk preference elicitation techniques encompass a non-hypothetical lottery game and six hypothetical methods. Except for one assessment method, risk preferences are not stable. The influence of shocks on risk preference changes varies depending on the elicitation method. We find evidence that shocks for which the government provides far-reaching ex-post support – namely, drought and widespread livestock deaths – do not increase risk aversion, while shocks the government provides no such assistance for – namely, illness, death, flooding, or yield loss from pests – increase risk aversion. This indicates that government policies may be able to prevent individuals' risk aversion from increasing over time from shocks.

Keywords

Risk preference stability, shocks, lottery game, smallholders, Vietnam.

1 Introduction

Adverse shocks can cause households to fall into poverty traps (Carter et al., 2007; Hoddinott, 2006), which they may be unable to escape from because of high degrees of risk averse, causing them to pursue low-risk, low-return livelihood strategies (Dercon, 1996; Lybbert and McPeak, 2012; Morduch, 1994; Rosenzweig and Binswanger, 1993). If shocks cause individuals to become even more risk averse, this could increase the likelihood that households remain trapped in poverty because of pursuing more extreme low-risk, low-return livelihood strategies. Despite the literature's emphasis on the connection between shocks and risk aversion with poverty traps as well as the importance for poverty traps and development of determining whether shocks increase risk aversion, to the best of our knowledge this is the first study to examine whether shocks increase risk aversion over time among smallholder farmers or in a developing country. Although the influence of shocks on risk preference changes over time has been examined in developed countries (e.g., Andersen et al., 2008; Brunnermeier and Nagel, 2008; Sahm, 2008; Vlaev et al., 2009), given the different livelihood strategies and mechanisms to cope with shocks in developing countries, it is important to examine whether risk preference changes are influenced by shocks in a developing country setting. Therefore, this paper examines whether various types of shocks increase risk aversion from the lean season to the harvest season among smallholder farmers living in an upland environment characterized by poverty and food insecurity in northwestern Vietnam. The study area is a remote area with marginal lands, increasing population density, and with poor availability of formal credit, savings, and insurance. Therefore, it is important to understand dynamics within poverty traps, namely whether shocks induce higher degrees of risk aversion, so that policy recommendations can be made to help keep households out of poverty traps and to escape them. To further contribute to the literature, we elicit risk preferences based on seven different methods, including both widely applied and locally-adapted methods. This allows us to examine whether the elicitation technique matters for both the stability of risk preferences and the determinants of risk preferences changes across seasons. This paper examines the following questions. Are risk preferences stable over time? Do shocks increase risk aversion over time? Do risk preference changes and its determinants vary by elicitation technique?

There is no consensus on whether risk preferences are stable over time. Findings from previous studies greatly vary: In some, risk preferences are stable (e.g., Andersen et al., 2008; Chiappori and Paiella, 2011; Cohen and Einav, 2007; Harrison et al., 2005), while in others they are unstable (e.g., Doss et al, 2008; Guiso et al., 2011; Horowitz, 1992; Meier and Sprenger, 2010; Sahm, 2008). A possible cause for this disparity is that these studies elicited risk preferences using quite disparate methods, such as lottery games or gambles (Andersen et al., 2008; Baucells and Villasís, 2010; Harrison et al., 2005; Vlaev et al., 2009), hypothetical income gambles (Baucells and Villasís, 2010; Sahm, 2008; Vlaev et al., 2009), hypothetical stock allocations (Horowitz, 1992), self-assessment questions (Baucells and Villasís, 2010; Guiso et al., 2011; Malmendier and Nagel, 2011; Vlaev et al., 2009), rankings of self-identified risks (Doss et al., 2008), and real-life decisions about insurance contracts (Cohen and Einav, 2007) or the share of risky assets (Brunnermeier and Nagel, 2008; Chiappori and Paiella, 2011; Malmendier and Nagel, 2011). In general, studies eliciting risk preferences based on real-life decisions find that risk preferences are stable. This may be explained by "sticky" decisions since it requires a high time input, for example, to choose new insurance deductibles or to reallocate assets into or out of stocks. On the other hand, studies eliciting risk preferences using self-assessment questions find that risk preferences are not stable (Guiso et al., 2011; Meier and Sprenger, 2010; Vlaev et al., 2009). In addition, studies eliciting risk preferences using gambles find a variety of outcomes: unstable risk preferences (Guiso et al., 2011), stable risk preferences (Andersen et al., 2008; Harrison et al., 2005), and only "modest changes" in risk preferences (Sahm, 2008). Besides differences in elicitation techniques across studies, time lags between survey rounds also greatly vary, yet based on our literature review we infer that the different elicitation methods rather than the various time lags are more influential in determining whether risk preferences are found to be stable. Contrary to previous studies which relied upon only one or a few elicitation methods to examine risk preferences stability, we systematically apply three widely-applied methods – a lottery game developed by Holt and Laury (2002), a self-assessment scale developed by the German Institute for Economic Research (DIW Berlin), and the financial risk tolerance question which originates from the U.S. Federal Reserve Board's Survey of Consumer Finances – and four locally-adapted methods which are hypothetical gambles of prices and yields for maize and rice based on Hill (2009). Thus, this paper explicitly examines whether risk preference stability over time varies by the elicitation technique in a within-sample study.

Most studies examining whether shocks are significant in changing risk preferences over time have found that national- or community-level shocks are significant, while household- or individual-level shocks are not (Guiso et al., 2011; Malmendier and Nagel, 2011; Sahm, 2008). However, these studies were conducted in developed countries: Doss et al. (2008) is the only study conducted in a developing country which analyzes panel data on risk preferences, however, their measure of risk preferences is based on a self-identified rankings of risk perceptions and are thus not comparable across contexts. Nevertheless, the findings from Doss et al. (2008) support those from developed countries that risk preferences are affected by covariate shocks and not by idiosyncratic shocks. Covariate rather than idiosyncratic shocks may cause risk preference changes because households may be less able to borrow from others in the area if a covariate shock occurs (e.g., Platteau and Abraham, 1987). Moreover, covariate shocks may be trigger a collective communication process, affecting risk perceptions (Slovic, 1987). Idiosyncratic shocks, on the other hand, may be less talked about in groups and thereby less influenced by social processes and common opinion. Therefore, we expect that risk preference changes will be more affected by covariate rather than idiosyncratic shocks. In addition to examining the effect of covariate and idiosyncratic shocks, to identify whether particular types of covariate shocks are more influential for risk preference changes than others, we also examine the effect of drought, animal death, and other covariate shocks, separately from other idiosyncratic shocks. Lastly, to identify whether changes in risk preferences are affected by the time component of a shock, we examine whether shocks experienced closer to the interview date have a greater influence on risk preference changes.

The empirical results find strong evidence that risk preferences are not stable across seasons and that the influence of shocks on risk preference changes vary depending on the elicitation method. In addition, we find that the directional impact of time-invariant factors on risk preference changes differs in the two self-identification techniques compared to the gambles. Surprisingly, the two most widespread shocks, namely, drought and livestock death, for the most part do not impact risk preference changes, whereas other shocks do. In particular, we find that: drought increases risk aversion in one elicitation method only (the financial risk tolerance question); animal deaths have no significant effect in any elicitation method; other covariate shocks increase risk aversion over time in three elicitation methods (the maize yield, maize price, and rice yield gambles); and idiosyncratic shocks increase risk aversion in three elicitation techniques (the lottery game and the maize price and rice yield gambles). Several robustness checks confirm the main results. In light that the government provides far-reaching ex-post support for widespread drought and cattle deaths, but does not provide such support for other shocks, the results indicate that government policies targeting specific shocks may be effective in preventing such shocks from increasing risk aversion over time.

The remainder of this paper is organized as follows. Section 2 presents the study area with regards to the importance of shocks and sample selection. Section 3 describes the risk preference elicitation techniques. Section 4 presents the conceptual framework. Section 5 describes the econometric methods. Section 6 examines and discusses the results. Conclusions are in the final section.

2 The data

Data were collected in a random sample of 300 households, representative of Yen Chau district, Son La Province in northwestern Vietnam. A cluster sampling procedure was followed in which first a village-level sampling frame was constructed. All villages in Yen Chau district were included except for those in four sub-districts bordering Laos because of difficulties in obtaining research permits there. Of these villages, 20 were randomly selected using the Probability Proportionate to Size (PPS) method (Carletto, 1999) based on the number of households in each village. Within each selected village, 15 households were then randomly selected using updated, village-level household lists as the sampling frames. This sampling procedure results in a self-weighting sample since the PPS method accounts for the difference in the number of households between villages (Carletto, 1999). Risk preferences were elicited using from 549 respondents residing in 291 households in the lean season in April and May of 2011 and elicited again from 540 respondents residing in 288 households seven to eight months later during the maize harvest season in November and December of 2011. Nine respondents could not be interviewed in the harvest season because they were either deceased, sick, or absent for an extended period of time and two respondents with missing socioeconomic information are excluded. Descriptive statistics are shown in Table 1.

Yen Chau district is a marginal upland area inhabited primarily by ethnic minorities of which the largest are Black Thai and H’mong, accounting for 55% and 20% of the district’s population, respectively. Kinh (“ethnic Vietnamese”) constitute another 13%. Rice is grown in paddy fields in the lowlands mainly for home consumption, although nearly half do not produce enough rice to meet their consumption needs. Maize, on the other hand, is grown in the uplands as a cash crop with the vast majority of households selling almost all harvested maize. Social capital is important to secure credit, which is mainly used to finance food purchases, agricultural inputs, social events, education, and health care. Most loans are collateral-free and are lent by neighbors, acquaintances, or relatives who live within the village or district. Thus, most credit transactions rely on social collateral rather than physical collateral (Karlan et al., 2009). The area is also characterized by poverty and food insecurity: Average daily per capita expenditures are equivalent to $2.35 in purchasing power parity and nearly three-quarters of household heads reported worrying about exhausting food supplies.

One cause of poverty and food insecurity is shocks; the most frequent are drought, livestock death, yield loss from pests or diseases, and illness of a household member. For example, nearly all households reported losses from drought in an unusually cold winter of 2010/2011 which resulted in widespread livestock deaths. Households relied on consumption smoothing (by using savings and selling livestock) and asset smoothing (by reducing food and non-food consumption). Previous studies have identified shocks as a major cause for households to fall into poverty (e.g., Carter et al., 2007). Household heads in Yen Chau confirmed this: 29% stated that the most important cause to fall into poverty is drought and 20% stated that it is the illness or death of a working household member. Mechanisms to cope with negative shocks also impact non-poor households who may not be vulnerable to falling into poverty by depleting assets. The key question this paper seeks to address is whether shocks influence risk preference changes over time and whether these impacts vary by the elicitation method.

Table 1: Descriptive Statistics of Time-Invariant Characteristics (N = 538)

Variable	**Description**	**Mean**	**Standard deviation**
Individual-level			
Gender	Dummy = 1 if the respondent is female	.52	.50
Age	Age of respondent in years.	44.43	11.74
Education	Years of formal schooling completed.	5.78	3.98
Helping others norm	Dummy = 1 if the respondent agrees that others in the village are expected to help a household who takes a risk and loses, 0 otherwise.	.66	.47
Sharing with others norm	Dummy = 1 if the respondent agrees that a household who takes a risk and gains is expected to share its gain with others in village	.46	.50
Organizational membership	Number of organizations the respondent is a member of	1.36	.76
Household-level			
Dependency ratio	Ratio of household dependents (< 15 or > 64 years of age) to non-dependents.	.29	.22
Network-reliance w/…	The sum of “easy” responses from: “If you or another household member asked, would it be easy or not easy to borrow money for education (health expenses, positive social event, negative social event, to borrow a water buffalo, or to ask for labor) from (distinct social network)"		
First-degree relatives		5.77	.88
Extended family		4.47	1.97
Friends		4.80	1.84
Village head		3.95	2.70
Connections to authorities	The number of authorities at the commune, district, or provincial level that household members know personally	3.24	4.70
Village population	Number of people living in the village	547.64	272.86

3 Methods to elicit risk prefernece s

In contrary to previous studies which used only one or a few elicitation methods, we systematically apply seven methods to elicit risk preferences: a non-hypothetical lottery game called the multiple price list technique (hereafter, MPL) – the so-called gold standard – developed by Holt and Laury (2002), a self-assessment scale, the financial risk tolerance question, and four locally-adapted methods involving gambles of prices and yields for maize and rice. In all methods applied, larger numbers indicate a higher degree of risk aversion.

In the MPL, subjects were given a set of ten choices between two options – a relatively safer option (Option A) and a relatively riskier option (Option B). Each option had two possible payouts with different probabilities of each payout being realized. The payouts in the safer option had a lower variance than those in the riskier option. In the first four choices, the expected value (which was not shown to subjects) of the safer option was greater than that of the riskier option, whereas in the last six choices the opposite was the case because the probability of the high payout being realized increased by 10 percentage points in both options with each subsequent choice. Risk preferences are based on the point at which subjects switched from the safer option to the riskier one. The highest payout amount, 79,000 VND, is equivalent to about 3.3 times the average daily per capita expenditures in our sample, $2.35 at purchasing power parity. Therefore, the highest potential payout can be considered substantial for respondents. After all ten choices had been completed, subjects were shown their selections and given an opportunity to change any responses before one of the ten choices was randomly selected for an actual payout. There are several approaches to analyze selections in the MPL. Similar to other studies using this technique (e.g., Holt and Laury, 2002), we base risk preference labels on the total number of safer options chosen. Moreover, we calculate the Coefficient of Relative Risk Aversion (CRRA) interval based on the CRRA utility function: $U(Y) = Y^{(1 - r)}/(1 – r)$ for $r \neq 1$, where r is the CRRA and Y is the payout amount in the lottery. The CRRA is less than 0 for subjects who are risk lovers, equal to 0 for subjects who are risk neutral, and greater than 0 for subjects who are risk averse. Using this utility function, we can calculate the lower and upper bounds of a subject's CRRA. Risk preferences are determined by the midpoint of the CRRA interval though subjects who chose the safer option nine (zero) times are assigned a CRRA equal to the lower (upper) bound of the CRRA interval since the upper (lower) bound equals infinity (negative infinity).

Unlike the other methods, the financial risk tolerance question and self-assessment scale allow subjects to explicitly identify their own willingness to take risks and risk preferences are categorical classification. The financial risk tolerance question originates from the U.S. Federal Reserve Board's Survey of Consumer Finances and has been widely applied in the U.S. to gauge risk preferences (e.g., Gilliam et al., 2010). Respondents were asked the amount of financial risk they are willing to take: (1) substantial financial risks, expecting to earn substantial returns; (2) above average financial risks, expecting to earn above average returns; (3) average financial risks, expecting to earn average returns; or (4) not willing to take any financial risks. The self-assessment scale is based on the German Socio-Economic Panel Study and has been widely applied to elicit risk preferences. In addition, Dohmen et al. (2012) have confirmed the behavioral validity of this measurement. In the self-assessment scale, subjects were shown a scale with integers ranging from 0 (= fully avoiding risks) to 10 (= fully prepared to take risks) and asked to point to the integer best matching their willingness to take risks. Afterwards, responses were rescaled so that 0 represents the most risk preferring and 10 the most risk averse.

The last set of hypothetical methods to assess risk preferences consists of gambles with varying yields and prices of maize and rice. The maize and rice gambles relate to local conditions and are thus more familiar to respondents because they relate to the main cash crop and food crop, respectively. The gambles are based on Hill (2009); however, we use yields and prices which lie within the minimum and maximum ranges in the study area. Respondents were asked which of four options of varying yields and prices for maize and rice they would prefer every year, assuming that prices and yields remain constant, respectively. Each gamble includes four options: The first option has a 100% chance of the median price or yield from Yen Chau, while each subsequent option has a 50/50 chance of a price or yield which is 15% lower or higher than the median. Based on the scenario chosen, a CRRA interval can be calculated. We determine risk preferences based on the midpoint of the CRRA interval; however, unlike the MPL, the maize and rice gambles include no explicit risk neutral or risk preferring options. In the first (second) survey round, median yields and prices were based on data from 2009 (2010).

Assessing risk preferences from such a wide range of techniques allows us to examine how determinants of risk preference instability across seasons may vary based on the elicitation technique and provide more robust findings across the elicitation methods.

4 Conceptual framework

There is no consensus on whether risk preferences change over time and if so, what causes these changes. Although previous studies have analyzed whether time-invariant characteristics, such as gender, influence the stability of risk preferences, they fail to provide a conceptual framework. Based on theoretical justifications and the inclusion of particular parameters in previous studies, we hypothesize that changes in risk preferences across seasons are a function of the season in which risk preferences were elicited (the lean season or the harvest season), the decision domain, time-invariant characteristics, and time-variant characteristics.

Risk preferences were first assessed in the lean season in April and May of 2011 after an unusually cold and dry winter and then reassessed seven to eight months later in the maize harvest season (hereafter, harvest season). The season in which risk preferences were elicited could affect risk preferences given the different conditions of households in each season as well as varying emotions at these different times of the year. Previous studies have found that emotions, past experiences, and even moods can induce changes in risk preferences (e.g., Guiso et al., 2011; Kuhnen and Knutson, 2011; Leith and Baumeister, 1996; Lerner and Keltner, 2011; Slovic et al., 2004). For example, Kuhnen and Knutson (2011) found that visual cues to induce anxiety at the neural-level made subjects less likely to invest in risky assets. In the lean season, households wait to harvest rice and are either depleting their stored rice, purchasing rice, or borrowing rice from others. Some households mix cassava, an inferior food item in Yen Chau, with rice to avoid having to deplete stored rice or purchase rice. Maize is harvested in November and December and is a major source of cash income. Weddings and other ceremonies are more common in the harvest season than at any other time of the year. Although weddings are a jovial event involving heavy drinking, households are obligated to give monetary gifts. Given these different situations: on the one hand, respondents could become less risk averse in the harvest season if elicited risk preferences reflect more current situations since cash is more plentiful and households are better able to purchase food and other essentials in the harvest season; on the other hand, respondents could become more risk averse if risk preferences reflect the future more since respondents could be anxious about the possibility of another harsh winter. Nevertheless, risk preferences may not change at all. In classical theory, individuals have one value function throughout their lifetime wealth and thus risky decisions should take into account the same value function and would be subject to the same risk preferences (Cohen and Einav, 2007).

The decision domain refers to the sphere in which the assessment method pertains to and is captured by the various elicitation methods relating to non-hypothetical windfall gains (the MPL), income-generating activities (the maize gambles), household food security (the rice gambles), financial investments (the financial risk tolerance question), an overall willingness to take risks (the self-assessment scale), self-assessment of risk preferences (the financial risk tolerance question and self-assessment scale), and gambles (the MPL, maize gambles, and rice gambles). The decision domain has been found to be an important factor to consider in measuring risk preferences (e.g., MacCrimmon and Wehrung, 1990; Soane and Chmiel, 2005) and thus may be a determinant of the stability of risk preferences across seasons.

Descriptions and summary statistics of the time-invariant characteristics hypothesized to influence changes in risk preferences across seasons are shown in Table 1. Although some variables labeled as time-invariant can clearly change over time, such as age and education, some did not change between the lean and harvest seasons (such as gender and age) and others are unlikely to change, such as social capital which is quite persistent and likely to remain stable over seven months (Azariadis and Stachurski, 2005; Hulme and Shepherd, 2003). Therefore, we label these variables as time-invariant in this study. The time-invariant individual-level variables include gender, age, and education. Women may become more risk averse in the harvest season because men gamble and drink more in the harvest season. In addition, women may be more concerned with how to extend the family budget as far into the winter as possible: Cash is important in the coming months since nearly half of households do not grow enough rice to meet consumption needs. The older and less educated may become more risk averse because they may have fewer available mechanisms to cope with the upcoming winter compared to younger and more educated respondents. While some previous studies have found that education has a decreasing effect on risk aversion over time and that age and female gender have an increasing effect (Guiso et al., 2011; Sahm, 2008), others have found that these exert no influence (Doss et al., 2008; Malmendier and Nagel, 2011).

5 Econometric methods

The stability of risk preferences and determinants of changes in risk preferences from the lean season to the harvest season is analyzed through basic statistical methods and first-difference regressions. First-difference regressions allows us to examine the effect of various time-variant and time-invariant characteristics on changes in risk preferences elicited at two very different times of the year. Moreover, they remove any observed or unobserved time-invariant heterogeneity in preferences and individual characteristics and control for aggregate shocks. First-difference regressions rather than fixed effects, random effects, or pooled OLS, for example, were chosen because we are interested in determinants of risk preference *changes* across seasons rather than determinants of risk preferences in general. In addition, first-difference regressions have been applied in studies examining determinants of changes over time in risk preferences (Andersen et al., 2008; Baucells and Villasis, 2010; Chiappori and Paiella, 2011; Guiso et al., 2011) and discount rates (Meier and Sprenger, 2010).

In first-difference regressions, the dependent variable equals the change in risk preferences from the lean season to the harvest season. Therefore, a positive (negative) dependent variable indicates that respondents become more (less) risk averse from the lean season to the harvest season and a dependent variable equal to zero indicates that respondents had no change in risk aversion. Shock impacts are also first differenced and therefore equal the difference between the monetary shock impacts experienced between the harvest season and lean season minus the monetary shock impacts experienced seven to eight months before the lean season. All models adjust for cluster effects within households and the reported standard errors are robust. Cluster effects need to be accounted for at the household-level because household-level variables are the same for both a household head and spouse. Not accounting for cluster effects would lead to underestimation of the population variance because the variation of the error term would be the same for two respondents residing in the same household.

6 Results and discussion

In both seasons, most elicitation methods indicate that respondents are quite risk averse, although the degree of risk aversion varies by method. The highest degree of risk aversion is found in risk preferences elicited from the maize and rice gambles, while the lowest is found in risk preferences elicited from the financial risk tolerance question. Examining the results both among all respondents and among non-censored respondents only provides strong evidence that risk preferences are not stable over time given the significance of the mean change in risk aversion over time in all but one elicitation method (the financial risk tolerance question) and the low correlation coefficients across the elicitation techniques. A respondent is considered censored if the most (least) risk averse option was selected in both harvest seasons, since that respondent had no other option but to choose the more (less) risky option again. We also find that the direction and degree of risk preference changes depends on the elicitation technique, given that CRRA decreased by about 0.37 in the MPL and increased by a range of 0.37 to 0.94 in the maize and rice gambles. Thus, for all but one elicitation method, risk preferences are not static from the lean season to the harvest season. This supports some previous studies (e.g., Doss et al, 2008; Guiso et al., 2011; Meier and Sprenger, 2010; Sahm, 2008) and runs counter to others (e.g., Andersen et al., 2008; Chiappori and Paiella, 2011; Cohen and Einav, 2007; Harrison et al., 2005). Risk preferences of smallholders in Vietnam may be more unstable over seven to eight months than risk preferences of people from developed countries because of higher vulnerability to poverty and greater uncertainty across seasons for smallholders.

Influencing factors of changes in risk preferences over time are explored in Table 2. F-tests indicate that the null hypothesis that all regression coefficients are jointly zero can be strongly rejected in most models. Exceptions are the maize price gambles which are not presented, as well as the rice yield and rice price gambles ($P = 0.145$ and $P = 0.160$, respectively). The R-squared ranges from a low of 0.06 in the rice yield gamble to 0.13 in the financial risk tolerance question. Before examining the impact of shocks, we first analyze a few major findings based on the effect of time-invariant factors on risk preference changes. Varying proxies of social capital have different effects on risk preference changes. The results indicate that cognitive social capital (proxied by norms) and linking social capital (proxied by connections to local authorities) are more influential in determining risk preference changes compared to low vs. high closure (proxied by the village population and its square) and structural social capital (proxied by membership in organizations and network-reliance). Perhaps most importantly, the directional impact of time-invariant factors depends on whether risk preferences are based on a self-identification method (i.e., the financial risk tolerance question or the self-assessment scale). This holds true all statistically significant time-invariant factors except for network-reliance with extended family in the financial risk tolerance question and maize yield gamble. For example, while women became less risk averse in the harvest season according to the financial risk tolerance question, they became more risk averse according to the MPL and the rice price gamble.

The results demonstrate that influencing factors of changes in risk preferences across seasons vary greatly when risk preferences are based on methods relying upon respondents to self-identify their risk preferences compared to methods which rely upon either hypothetical or non-hypothetical gambles. This supports findings in Guiso et al. (2011) that gender has varying impacts on risk preference changes in quantitative and qualitative measures. An explanation for why influencing factors may have the opposite impact on risk preference changes in the self-identification methods compared to the gamble methods, is that the self-identification methods may reflect how respondents handled already-experienced risks, rather than how they currently or would handle future risks. After all, the maize and rice gambles asked respondents to choose yields and prices for the future, whereas the financial risk tolerance and self-assessment scale asked respondent to assess the degree of risk they are currently willing to take. In summary, the time-invariant factors influence risk preference changes and their directional impact depends on whether the elicitation technique is based on a self-identification method or a gamble.

Table 2: Determinants of Changes in Risk Preferences

	Multiple price list	Financial risk tolerance	Self-assessment scale	Maize yield gamble	Maize price gamble	Rice yield gamble
Observations	522	527	537	421	399	413
Constant	**-1.874*** (.653)	**.742*** (.424)	**1.246** (1.196)	**1.348*** (.774)	**1.997**** (.791)	**.671** (.767)
Gender	**.243***** (.082)	**-.224***** (.076)	**-.137** (.192)	**.079** (.115)	**.100** (.116)	**.006** (.118)
Age	**.001** (.004)	**-.005** (.004)	**-.014** (.012)	**.002** (.007)	**.002** (.007)	**.005** (.006)
Education	**.005** (.012)	**.021*** (.011)	**.008** (.035)	**-.031*** (.019)	**-.002** (.018)	**-.001** (.018)
Helping others norm	**.195** (.120)	**.507***** (.107)	**1.534***** (.279)	**-.218** (.163)	**-.286*** (.147)	**-.184** (.158)
Sharing gains norm	**-.083** (.105)	**-.405***** (.093)	**-.792***** (.260)	**.145** (.151)	**.086** (.142)	**.242** (.151)
Dependency ratio	**.185** (.207)	**.143** (.200)	**-.389** (.626)	**-.515** (.371)	**-.101** (.327)	**-.221** (.305)
Poorest tercile	**.326***** (.116)	**-.172*** (.103)	**-.814**** (.361)	**.258** (.189)	**-.254** (.173)	**.281** (.183)
Wealthiest tercile	**.026** (.125)	**-.168** (.105)	**-.528** (.321)	**.134** (.164)	**-.109** (.156)	**-.011** (.153)
Network- reliance with…						
First-degree relatives	**.047** (.088)	**-.127**** (.052)	**-.104** (.134)	**-.098** (.097)	**-.068** (.092)	**-.023** (.111)
Extended family	**.026** (.025)	**.074***** (.024)	**.030** (.069)	**.067*** (.037)	**.056** (.034)	**.050** (.035)
Friends	**.044** (.028)	**-.003** (.028)	**-.019** (.078)	**.044** (.042)	**-.030** (.037)	**.028** (.041)
Connections to authorities	**.007** (.010)	**.021**** (.009)	**.084**** (.030)	**-.032**** (.014)	**-.001** (.011)	**-.017** (.014)
Organizational membership	**.056** (.058)	**-.133**** (.052)	**-.276*** (.154)	**-.038** (.092)	**-.015** (.083)	**-.055** (.093)
Village population	**.001** (.001)	**-4.0e-04** (7.7e-04)	**-.001** (.002)	**-.038** (.092)	**-.002** (.001)	**-.001** (.001)
Village population squared	**-2.8e-07** (6.3e-07)	**3.3e-07** (5.9e-07)	**3.8e-07** (1.8e-06)	**8.5e-07** (9.0e-07)	**1.2e-06** (8.5e-07)	**8.6e-07** (8.8e-07)
Difference in impacts from…						
Drought	**.009** (.020)	**.034**** (.015)	**.016** (.056)	**.011** (.045)	**.030** (.037)	**.022** (.033)
Livestock death	**-.023** (.032)	**.017** (.023)	**-.009** (.058)	**-.047** (.055)	**-.016** (.035)	**-.034** (.053)
Other covariate	**.019** (.070)	**.058** (.041)	**-.087** (.150)	**.242***** (.079)	**.319***** (.097)	**.296***** (.086)
Other idiosyncratic shocks	**.046**** (.020)	**.001** (.019)	**.028** (.065)	**-.031** (.045)	**.055**** (.027)	**.095***** (.033)

F statistic	(19, 267) = 1.89**	(19, 264) = 4.06***	(19, 268) = 2.92***	(19, 242) = 2.61***	(19,233) = 1.80**	(19, 233) = 1.60*
R^2	.068	.126	.093	.083	.067	.067

Source: Own survey data.

Notes: First-difference regressions were applied. Coefficients are shown in bold with their robust standard errors in parentheses. All regressions are clustered at the household level. The maize price gamble is not shown because it is not overall statistically significant.

*** indicates statistical significance at the 1% level, ** at the 5 percent level, and * at the 10 percent level.

We now focus on the effect of shock impacts on risk preference changes over time. The results show that the two most common shocks affecting households, namely drought and livestock deaths, are not significant in impacting risk preference changes with the exception being drought in the financial risk tolerance question, though its impact is very small. This is surprising given the widespread nature of these shocks as well as the fact that livestock deaths impact a major household asset. Instead, other covariate shock impacts have an increasing effect on CRRA in the maize yield, maize price, and rice yield gambles: CRRA of individuals living in households experiencing such a shock between the lean and harvest season which inflicted a loss equivalent to the household's annual per capita expenditures will increase between 0.24 and 0.32 ($P < 0.001$) depending on the elicitation method, assuming that all other variables are held constant and that the household did not experience such a shock in the eight months prior to the lean season. Given that the range in the midpoint of CRRA in these methods is between 0.58 and 1.36, this impact is quite large. Idiosyncratic shock impacts also have an increasing effect on risk preference changes over time according to the MPL, maize price gamble, and rice yield gamble. Nevertheless, the impact is rather small in comparison to that of other covariate shocks, increasing CRRA between 0.05 and 0.10.

In summary, we find evidence that drought and livestock deaths have no significant impact on risk preference changes, whereas other covariate and idiosyncratic shocks do. Follow-up interviews conducted with village heads provide insight into these findings. We conducted open-ended interviews with village heads of 18 of the 20 villages randomly selected for this study to examine overall coping mechanisms. The village heads reported that they can request for government assistance for widespread drought or cattle deaths and receive assistance within four to six weeks after a request is made on behalf of affected households. Support for drought is mainly maize seed and in some cases rice seed, fertilizer, and pesticide, whereas support for livestock deaths is cash payouts based on the age of the cattle. Other covariate shocks such as chicken or pig disease outbreaks, flooding, and yield losses from pests or diseases do not receive any support from the government and are also not covered by any insurance mechanisms. Moreover, for treatments of serious illnesses, households must pay 70% of the costs. The support given to household affected by widespread drought and livestock deaths may explain the lack of statistical significant of drought and animal deaths, while the lack of support given to households affected by other shocks may explain why these shocks were statistically significant in increasing risk aversion overtime in some methods. We therefore find evidence that government assistance targeting specific shocks may be effective in preventing these shocks from increasing risk aversion over time among affected individuals.

6.3 Robustness checks

Several robustness checks were conducted to ensure that the main results are robust to different model specifications. Unless specified otherwise, all robustness checks account for cluster effects at the household level. In the first, we analyze determinants of risk preference changes over time among all respondents rather than among non-censored respondents only. The only difference is that when including censored respondents, the model of risk preferences based on the maize yield gamble is no longer statistically significant overall when shocks are divided into idiosyncratic and covariate shocks. In a second robustness check, rather than categorizing shocks into idiosyncratic and covariate based on information provided by household heads, we divide shocks into idiosyncratic and covariate based on the following: drought, flood, yield loss from pests or diseases, animal death, price changes, demand changes, and lack of credit are considered covariate, while theft, illness, death, divorce, and payment of a fine are considered idiosyncratic. In a third robustness check, we examine whether winning the higher amount (in either option or in the riskier option only) in the lottery game in the first survey round had an effect on risk preference changes in the MPL (this robustness check had to exclude 125 respondents became of missing information on lottery game winnings): no effect was found and the main findings remain unchanged when controlling for the lottery game winnings.

Through fixed effects, random effect, and pooled OLS models we analyze whether the average effect of shock impacts on risk preferences via vary from the effect of shock impacts on risk preference changes over time, both when including and excluding censored respondents. The Hausman test (Hausman, 1978) with the null hypothesis that random effect estimates are consistent indicates that the only models in which the null hypothesis can be rejected ($P < 0.01$) are those when risk preferences are based on the MPL. Thus, we examine the average effects of shocks on risk preferences elicited from the MPL via fixed effects models, whereas we rely upon random effects models for the other elicitation methods. The null hypothesis of homoskedasticity in the modified Wald test for group-wise heteroskedasticity in the residuals of fixed effects models is rejected for each model ($P < 0.01$) and thus we use Generalized Least Squares (GLS) models (Greene, 2000). With only a few exceptions of some variables losing their statistical significance and animal deaths having a small significant decreasing effect on risk aversion in the rice gambles when including censored respondents, we find that the shocks which are significant in increasing risk aversion from the lean season to the harvest season shown in Table 2 also have a significant increasing effect on average risk aversion based on the fixed effects and random effects models. Nevertheless, for most models we fail to reject the null hypothesis of no random effects according to the Breusch-Pagan Lagrangian multiplier test (Breusch and Pagan, 1980) and thus pooled OLS are preferable. Pooled OLS regressions were tested for autocorrelation through the Arellano-Bond test with the null hypothesis of no autocorrelation (Arellano and Bond, 1991). The null hypothesis can be rejected for the MPL (when including censored respondents), the maize and rice yield gambles (when excluding censored respondents), and the rice price gamble (both when including and excluding censored respondents). Thus, for these models we use pooled OLS regressions using Newey-White (1987) standard errors, which account for autocorrelation, although these modules cannot account for cluster effects. In the pooled OLS regressions, the main results are robust, with only a few exceptions of some variables losing their statistical significance or becoming statistically significant.

In summary, the above robustness checks confirm the main results in terms of the impacts – or lack thereof – of various types of shocks on risk preference. Thus, the robustness checks support our main findings that for most risk preference elicitation methods, losses from drought and livestock deaths have no significant impact on risk preferences or risk preference changes, whereas losses from other covariate shocks do.

7 Conclusions

Previous literature has established that shocks can cause households to fall into poverty traps and that risk aversion can cause households to remain trapped in poverty (Carter et al., 2007; Dercon, 1996; Hoddinott, 2006; Lybbert and McPeak, 2012; Morduch, 1994; Rosenzweig and Binswanger, 1993). This paper analyzed whether risk preferences assessed from seven elicitation techniques are stable for smallholder farmers in northwestern Vietnam from the lean season to the harvest season and then examined influencing factors of risk preference changes across seasons using first-difference regression analyses, focusing on the impact of various types of shocks. The results indicate that for all but one assessment method – the financial risk tolerance question – risk preferences are not stable across seasons. Respondents became less risk averse according to the lottery game and self-assessment scale, while they became more risk averse according to the maize and rice gambles. Explanations for unstable risk preferences include measurement error, learning effects, and fundamentally unstable preferences (Binswanger, 1980; Meier and Sprenger, 2010), though given the various interview techniques employed, such as combinations of visual, oral, and written explanations, we believe that measurement error is less likely than the other explanations (Duklan and Martin, 2002), although the likelihood of measurement error is higher in the MPL than in the other techniques.

Given the high degree of risk aversion and the perception among smallholders that the current livelihood strategy – maize production on steep slopes which highly erodes the soil – is a low-risk income earning activity, respondents should be supported by the government to adopt new technologies and production systems which do not entail as much environmental degradation, yet which may be viewed as too risky (Feder et al., 1985). Support for adopting new production systems could be in the form of credit and/or subsidized inputs. Local field trials are another mechanism to promote the adoption of new production systems and technology. These would allow smallholders to better assess risks associated with new production systems. In follow-up interviews, several village heads stressed the importance of smallholders seeing and visiting field trials first-hand before they might adopt new systems. Although over half of household heads stated that the most important way to escape poverty is hard work, previous research indicates that the poor remain poor (Lybbert et al., 2004; Naschold, 2012). Thus, given the high risk aversion, government support may help households escape poverty traps given previous research which has found that high risk aversion can cause households to remain trapped in poverty (e.g., Rosenzweig and Binswanger, 1993). Based on our finding that impacts from shock for which the government provides far-reaching ex-post support do not increase risk aversion over time, whereas impacts from non-supported shocks do increase risk aversion, the government should expand ex-post support to help households cope with shocks. Specific recommendations include effective cash or food transfer programs, lower deductibles for medical expenses, and agricultural insurance. Households should be supported to make investments perceived as risky and to recover quickly from shocks. Such support could open the door to new livelihood strategies, helping farmers overcome their high degree of risk aversion and preventing further increases in risk aversion from shocks.

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