Household Risk Preferences and Community-based Health Insurance Uptake in Rural Villages, Savannakhet Province, Lao People's Democratic Republic: Field Experimental Data

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Abstract

Background: The risk preferences of individuals have an important role in many decisions under uncertainty. Buying insurance is a choice made under uncertain future outcomes. A community-based health insurance (CBHI) scheme has the primary objectives of reducing the health and financial risks related to unexpected catastrophic healthcare expenditures. It is assumed that the more risk-averse or loss-averse that individuals are, the more likely they are to favor the insurance.

Objective: This paper examines the association of rural and self-employed households likelihood of purchasing the CBHI scheme with their own risk preferences (risk aversions for gains and probability prospects, and loss aversion), which are revealed by the field experiment in the rural villages of Savannakhet Province, Lao People's Democratic Republic (PDR).

Method: To attain this objective, first a structured questionnaire-based household survey is employed to collect 580 rural and self-employed households objective data. Moreover, an incentive compatible lottery choice field experiment (Tanaka et al, 2010) is conducted to assess their risk preferences, which allows us to test the validity of the expected utility theory (EUT) and prospect theory (PT) assumptions simultaneously. Second, probit regressions are applied to examine the associations between their CBHI participation and their risk preferences by controlling their demographic and economic backgrounds.

Results: The findings of our study show that the probability of a household's decision to enroll in the CBHI scheme is independent of the risk aversion towards gains but is significantly associated with the risk aversion towards probability prospects. A weak correlation between loss aversion and the choice to participate the scheme is found when CBHI ex-members are excluded and more demographic and economic related variables are controlled in the regression.

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Key words: Prospect theory, risk aversion, probability prospects, loss aversion, community-based health insurance, rural Lao PDR.

1 Introduction

In low income countries, the poor often suffer from high rates of illness due to the low standards of living (Orach, 2009). As a matter of fact, the poor are the most vulnerable group, especially for high exposure to risks and low access to sufficient healthcare services. Additionally, ill health reduces work productivity, which leads to lost income. To reduce this vulnerability, the community-based health insurance (CBHI) scheme is considered one of the most powerful mechanisms to reduce both the health risks and financial risks caused by catastrophic healthcare expenditures expenditures for informally employed people, who are mainly lower-income people.

Although the CBHI scheme has an obvious objective to reduce health and financial risks for the poor, the progress of its actual implementation is very slow, especially in low-income countries. According to an extensive body of empirical work, the four common problems of the CBHI scheme's implementation are low enrollment rates (see, for instance, Basaza et al., 2008; Odeyemi, 2014), adverse selection (Carrin, 2003; Wang et al., 2006; Parmar et al., 2012; Duku et al., 2016), poor quality of healthcare (Delavallade, 2017), and high drop-out rates (Dong et al., 2009; Mebratie et al., 2015; Panda, 2016).

Especially, the low enrollment problem of the CBHI scheme is considered both a primary challenge facing the financial sustainability of the scheme and an indicator of low acceptance of the scheme (Wiesmann & Jutting, 2000). The literature often reports disappointing enrollment percentages, with the percentage of the eligible population covered varying between 1% and 10% (De Allegri et al., 2006; Soors et al., 2010; Alkenbrack & Lin-

delow, 2013; Odeyemi, 2014) for most cases; and rarely it is between 21% and 46% (Panda et al., 2014; Ozawa et al., 2016). Extensive empirical works highlighted some exogenous drivers and obstacles to the CBHI scheme's uptake decisions (see, for example, Kyomugisha et al., 2009; Odeyemi & Nixon, 2013; Parmar et al, 2012; Dhillon et al., 2012). However, the findings are varied for different case studies and scheme settings. Apart from exogenous factors, can individual-specific preferences describe their decisions to opt for the CBHI scheme?

As suggested in the literature, risk preferences are of fundamental importance for individual heterogeneity (Dave et al., 2010) and are found to have a significant role in most important settings. The empirical correlation between risk preferences and economic behaviors under uncertainty is well-documented in a growing number of studies, such as those on migration (Jaeger et al., 2010; Bauernschuster et al., 2014), higher education enrollment (Breen et al., 2014; Heckman & Montalto, 2016), occupational decisions (Cramer et al., 2002; Bonin et al., 2007; Ahn, 2010; Ekelund et al., 2005; Batista, 2014), and technology adoption (Liu, 2013; Qiu et al., 2014). In the research on risky health-related behaviors, several studies have shown that risk preferences are likely to shape the likelihood that a subject engaged in cigarette smoking, drinking alcohol, becoming obese, seat belt non-use while driving, and failing to have insurance (Barsky et al., 1997; Anderson & Mellor, 2008; Pfeifer, 2012).

Since the main purpose of health insurance is to reduce financial and health risks, the more risk-averse individuals are more likely to purchase insurance. There are some studies investigating the links between risk preferences and the likelihood of insurance uptake. For instance, Lammers and Warmerdam (2010) use standard lottery questions with hypothetical rewards to measure the constant relative risk aversion (CRRA) of individuals, which is a measure under EUT. Furthermore, Pierre and Jusot (2017) apply a self-reported questionnaire with 11-point scales to measure self-perceived

risks. Both studies find that the likelihood of health insurance uptake is significantly related with individual risk preference variations. However, both Lammers and Warmerdam (2010) and Pierre and Jusot (2017) elicit individual risk preferences with no monetary incentives. Glaeser et al. (2000) suggests that self-reported attitudes do not always indicate subjects' real attitudes.

To measure more realistic risk preferences, some studies conducted experiments with real money at stake. The study of Alkenbrack and Lindelow (2015) is particularly relevant to this paper as it examines the correlation between individual risk aversion and the CBHI enrollment in urban and semi-urban Lao People's Democratic Republic (PDR). Risk preferences are measured based on the EUT assumption. Household heads encounter with five repeated gambles in which they choose a hand that they think having money. The stake is increasingly heterogeneous starting from "risk free" until the "all or nothing" risk. Another closely related preceding work to the present study is that of Ito and Kono (2010), which assesses the reasons why the uptake of the Yeshasvini microinsurance scheme in India remains so low by focusing on the risk preference parameters of PT. The experiment is designed so that there are equal probabilities of obtaining either a better or worse outcome (the risk aversion for probability prospects cannot be observed). The risk parameters are defined as categorical dummies based on switching points that respondents make accordingly. Despite different theories of prior assumptions, no clear evidence results from the two studies on the relationship between risk preferences and health insurance adoption decisions. Overall, the existing evidence regarding whether individual risk preferences predict individual decisions to buy insurance is rather mixed.

Therefore, this study aims to examine the association of households' risk preferences on their decisions to participate in the CBHI scheme in rural villages of Savannakhet Province, Lao PDR with three main contributions to the literature. First, we conduct a field experiment to elicit parameters

of risk preferences with real money rewards. Second, we measure not only the parameters of risk aversion for gains and loss aversion but also risk aversion for subjective probability prospects (which is omitted in the literature). Third, unlike many preceding studies, experimental data allows us to test the validity of either the or PT assumption[1] simultaneously without a prior assumption.

To attain the objective, we employ the risk elicitation experiment technique of Tanaka et al. (2010). The experiment is designed in a way that is more realistic with varied probabilities of winning better or worse outcomes. Despite an increasing application of this technique in a variety of contexts (Nguyen & Leung, 2010; Liu, 2013; Liu & Huang, 2013; Liebenehm & Waibel, 2014), there are still scarce applications in the health insurance setting, especially with respect to the voluntary CBHI scheme.

We select the CBHI scheme in Lao PDR as a case study because of its chronically low enrollment. According to Sydavong and Goto (2018), evidence shows that the CBHI scheme has indirect positive impacts on the rice production and cow holdings of enrolled households in rural villages of Lao PDR. Thus, to promote greater enrollment, it is necessary to analyze several dimensions of factors that lead to an increased likelihood of the scheme's uptake, including both exogenous and behavior determinants. The remaining sections of this paper are structured as follows. Section two introduces the background of the CBHI scheme in Lao PDR. The next section details the experimental procedures, the estimation model, the data sampling, and the characteristics of the samples. The results are discussed in section four and the conclusions in section five.

2   CBHI scheme in Lao PDR

In Lao PDR, health risk is expected to be an increasing threat to the poor, especially in remote areas (World Health Organization, 2012) where the majority of the population remains dependent on agricultural activities for subsistence and the infrastructure is inadequate. Therefore, the government is concerned with strengthening the health system health financing schemes in particular to ensure health equity for all groups in the population.

To improve the health system, the government launched four health financing schemes targeting specific groups in the population, including State Authority Social Security (SASS) for government workers, Social Security Organization (SSO) for salaried private and state-owned enterprises employees, Health Equity Funds (HEFs) for the extreme poor, and Community-Based Health Insurance (CBHI) for non-poor workers in the informal sector (Ahmed et al., 2013). Among the four schemes, only the CBHI scheme is based on voluntary membership and decentralized implementation.

As of 2014, only 27.2% of the population was covered by any scheme of the health financing system. Moreover, the decomposed coverage by scheme is rather heterogeneous. While the coverage of the SASS and HEF schemes, which targeted nearly 26.5% of the Lao population, achieved approximately 85% of their target, that of the HEFs and CBHI schemes made little progress, with only 6.4% of the targeted group enrolled. In particular, the CBHI scheme, which targets approximately two-thirds of the Lao population, achieved only 3.7% of the target by 2014 (National Health Bureau, 2014). In other words, the CBHI scheme has the largest target but the lowest achievement. Therefore, this study intentionally evaluates the CBHI scheme for three main reasons: 1. the scheme is voluntary, 2. the targeted population is mainly the poor in rural areas with limited infrastructure and geographic constraints, and 3. the scheme has made extremely slow progress

towards the given target.

In 2002, the Ministry of Health (MOH) introduced the CBHI scheme as a pilot project in two districts with technical assistance from the WHO and financial support from the United Nations Human Security Fund. As of September 2015, the scheme was available in 50 of the 148 districts in 17 of the 18 provinces, which is equivalent to 2,271 of the 8,507 villages. The total number of beneficiaries was reported as 33,795 households (179,534 people). Currently, the benefit package of the CBHI scheme covers outpatient and inpatient services, including primary health care, specialist services, diagnostic tests, and prescribed pharmaceuticals that are available in hospitals. The household is the unit of enrollment, and the premiums vary depending on urban or rural residence and the number of household members. The premium rates have not been updated since 2005 (World Bank, 2010). The window period of service access is three months upon enrollment. With the gatekeeping system, CBHI members have to first seek services at contracting facilities, such as dispensaries and district hospitals, and only referral patients are sent to provincial or regional hospitals (Annear et al., 2011). Since 2012, 50% of the schemes revenue has come from premium collection, and the other 50% has come from government subsidization (Lao Government, 2012).

3 Methodology

3.1 Measurement of risk parameters

Tanaka et al. (2010) incorporated prospect theory[2] as an alternative theoretical framework to EUT in the experiment. PT presumes that individuals behave in a risk-averse manner for gains but are risk-seeking for losses. The real power of this methodology is evident in ways that, unlike EUT in which the risk preference depends solely on the gains, the risk pref-

erences of PT are based on the gains, the losses and probability prospects. Therefore, researchers can simultaneously elicit three parameters concerning risk preferences: risk aversion, subjective probability weighting and loss aversion (Tversky & Kahneman; 1992). More importantly, EUT, which is treated as a special case of PT, can be examined in the same experiment. That is, the methodology of Tanaka et al. (2010) enables researchers to statistically test the null hypothesis of the EUT. In PT, risk attitudes are jointly defined by two functions, including a value function of outcomes that explains the attitude towards outcomes (or the subjects valuation of money) and a subjective probability weighting function describing the subjects attitude towards probabilities. Decision making under risk can be viewed as a preference for either prospects or gambles. A utility function according to Tanaka et al. (2010) has the form as follows:

$$U\left(x,p;y,q\right) = \begin{cases} v\left(y\right) + \pi\left(p\right)\left(v\left(x\right) - v\left(y\right)\right) & , x > y > 0 \text{ or } x < y < 0 \\ v\left(y\right) + \pi\left(p\right)v\left(x\right) + \pi\left(q\right)v\left(y\right) & , x < 0 < y \end{cases}$$

$$\text{where } v\left(x\right) = \begin{cases} x^{\sigma} & , \text{ for } x > 0 \\ -\lambda\left(-x^{\sigma}\right) & , \text{ for } x < 0 \end{cases}$$

$$\text{and } \pi\left(p\right) = \frac{1}{exp\left[ln\left(\frac{1}{p}\right)\right]^{\alpha}}$$

where $v\left(0\right) = 0$, $\pi\left(0\right) = 0$, and $\pi\left(1\right) = 1$. $U\left(x,p;y,q\right)$ denotes for the expected value of binary prospects. x and y are the outcomes with the corresponding probabilities p and q, respectively. $v\left(x\right)$ is the power value function defined by the outcomes, while $\pi\left(p\right)$ is the weighting function defined by the probabilities. σ captures the concavity of the value function, which is known as risk aversion[3]. λ illustrates the curvature of below zero compared to that of above zero, which is also stated as the degree of loss aversion (losses are weighed more heavily than gains). Notice that the higher the λ, the more loss aversion that exists[4]. α is the parameter to identify the shape of the probability weighting function[5]. Note that for the special

case where $\pi(p) = p$ for all p resulting from $\alpha = 1$ and $\lambda = 1$, the prospect value function would transform to the traditional EUT[6]. Due to the aforementioned advantages, the utility function of PT is employed in place of the EUT and probability weighting $\pi(p)$ is employed in lieu of p. The loss aversion parameter λ is jointly constructed based on the utility curvature σ and switching point in series 3. Since series 3 of the experiment is designed given equal probability between option A and B, the probability weighting function is ignored.

3.2   Field experiment

As Weber et al. (2002) found that the degree of risk taking of individuals is highly domain-specific, in the present study, it is crucial to assume invariant risk preferences of individuals over time and across decision contexts. Indeed, observing risk preferences of all household members is far beyond our limits due to experimental complexity and budgetary constraints. Thus, we again assume that the risk preferences of the respondents are an applicable proxy for the entire household's preferences[7]. Additionally, we assume that the probability weighting in the scope of this study is interpreted as the probability of financial losses due to health care seeking[8]. This study is based on the risk elicitation experiment of Tanaka et al. (2010) that uses a set of two-outcome prospects with monetary outcomes[9]. The lottery choice experiment is implemented to elicit the parameters of risk aversion, probability weighting and loss aversion of rural dwellers in Savannakhet Province. Our team paid significant effort to collecting the high-quality data. Accordingly, a paper-based method is used in place of a computer-based experiment for better comprehension of the subjects.

As is customary, to identify the household characteristics, each subject is asked a series of questions on socio-economic indicators prior to the experimental session, including their demographic details, household assets,

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microfinance history, CBHI experience, income and expenditure sources, and self-reported illness history in the 12 months preceding the survey. An investigator then distributes a sample sheet and explains the instructions to every single subject separately as follows.

- The subjects can either choose option A or option B in all cases. However, those who start off by choosing option A can switch over to option B at some point, but no double switches are allowed over each series[10]. In contrast, the subject who selects option B in the beginning cannot switch in reverse to option A, given that it is a logically coherent decision

- After all subjects complete the given 35 decision rows, each respondent draws one of 35 numbered balls from a box to determine a decision row at random and does the same from another box of 10 numbered balls to decide the real moneytary reward. The mechanism is that each subject earns the actual money[11] based jointly on the outcome of the lots and the choices that the respondent makes[12].

Table 1 displays the full set of pairwise lottery choices used in the experiment and the expected payoff difference in the rightmost column[13]. According to Tanaka et al. (2010), the experiment is categorized into 3 series of gains and losses. The choices are ranked in order of increasing payoffs. Each subject is confronted with a series of 35 paired choices, as shown in Table 1, but not the expected payoff difference. Subjects are asked to indicate a preference for either option A or option B in each decision row sequentially. Option A is relatively a safe choice, whereas option B has a higher expected payoff and variance. Note, however, that a higher prize can be earned at the cost of a lower probability for both options. The probability of gambles remains unchanged across series. Only the amount at stake in option B varies in each decision row of series 1 and 2 in which the probability of winning the higher prize in option A is relatively superior to that of

option B. For instance, option A has the a 3/10 chance to win 20,000LAK and a 7/10 chance to win 5,000LAK with certainty across series 1, whereas option B has relatively higher stakes but a higher variance of probability that ranged between 2,500LAK and 850,000LAK. Theoretically, only those who are very risk-seeking would choose option B from the beginning, or vice versa. Unlike the first two series, the value of both options systematically varies in series 3.

The range of risk parameters is defined such that the subjects make the switching points following the models in Tanaka et al. (2010). The model is constructed by the manner in which the choices in series 1 and 2 of each subject are incorporated to measure the risk aversion parameters (σ and α), and only the parameter of curvature utility function (σ) is then combined with the subjects choice in series 3 to determine the intervals of loss aversion (λ). However, Tanaka et al. (2010) provides the tables of the approximate values of σ and α, and the experimental data in the present study refers to the point values in those tables[14].

Table 1: Risk experiment sheet

	Option A		Option B		Expected payoff difference
			Series 1		
Probability	3/10	7/10	1/10	9/10	
1	20,000	5,000	34,000	2,500	3,850
2	20,000	5,000	37,500	2,500	3,500
3	20,000	5,000	41,500	2,500	3,100
4	20,000	5,000	46,500	2,500	2,600
5	20,000	5,000	53,000	2,500	1,950
6	20,000	5,000	62,500	2,500	1,000
7	20,000	5,000	75,000	2,500	-250
8	20,000	5,000	92,500	2,500	-2,000
9	20,000	5,000	110,000	2,500	-3,750
10	20,000	5,000	150,000	2,500	-7,750
11	20,000	5,000	200,000	2,500	-12,750
12	20,000	5,000	300,000	2,500	-22,750
13	20,000	5,000	500,000	2,500	-42,750
14	20,000	5,000	850,000	2,500	-77,750
			Series 2		
	9/10	1/10	7/10	3/10	
1	20,000	15,000	27,000	2,500	-150
2	20,000	15,000	28,000	2,500	-850
3	20,000	15,000	29,000	2,500	-1,550
4	20,000	15,000	30,000	2,500	-2,250
5	20,000	15,000	31,000	2,500	-2,950
6	20,000	15,000	32,500	2,500	-4,000
7	20,000	15,000	34,000	2,500	-5,050
8	20,000	15,000	36,000	2,500	-6,450
9	20,000	15,000	38,500	2,500	-8,200
10	20,000	15,000	41,500	2,500	-10,300
11	20,000	15,000	45,000	2,500	-12,750
12	20,000	15,000	50,000	2,500	-16,250
13	20,000	15,000	55,000	2,500	-19,750
14	20,000	15,000	65,000	2,500	-26,750
			Series 3		
	5/10	5/10	5/10	5/10	
1	12,500	-2,000	15,000	-10,500	3,000
2	2,000	-2,000	15,000	-10,500	-2,250
3	500	-2,000	15,000	-10,500	-3,000
4	500	-2,000	15,000	-8,000	-4,250
5	500	-4,000	15,000	-8,000	-5,250
6	500	-4,000	15,000	-7,000	-5,750
7	500	-4,000	15,000	-5,500	-6,500

3.3 Estimation model of CBHI enrollment

In this study, we estimate the likelihood of CBHI scheme adoption decisions by combining household demographic information and experimental data. In the empirical approximation, we initially run the probit regression with risk parameters and then consider the extension of including households demographics and characteristics to examine the sensitivity of the estimates. The distance to the district hospital is added in the regression as a general control for the village's infrastructure. In practice, the following model is estimated as follows:

$$CBHI_i = \beta_0 + \boldsymbol{\beta_1}'\mathbf{RP_i} + \boldsymbol{\beta_2}'\mathbf{SES_i} + \varepsilon_i \tag{1}$$

where $CBHI_i$ takes value of 1 if respondent i (representing the household) is a member of the CBHI scheme and 0 otherwise[15]. $\mathbf{RP_i}$ is the vector of risk parameters and $\mathbf{SES_i}$ is the vector of socio-economic variables (household head gender, household head age, household head education, household size, agriculture area, and distance from village to district hospital). ε_i is the error term.

Because only an interval of λ is measured by the experiment, following Liu (2013), the midpoint of the interval is used as the point estimate in the regression. For the elicited λ with a single bound either lower or upper resulting from selecting all option A or option B, we treat the observed bound as the point estimate.

3.4 Data sampling

This study collects the data of rural households in Savannakhet Province, which is located in the center of Lao PDR. The province has the largest land area and population size. According to the Center National Health Insurance (NHI) Bureau's report, in 2015, Savannakhet Province had the largest

and most fluctuating number of CBHI members of all the provinces. For the sample selection in this study, districts and villages are chosen purposely, but representative households are randomly sampled according to the following reasons.

- There are 15 districts in Savannakhet Province. Since 2014, eight of the districts have reported increasing numbers of CBHI-enrolled households, while the remaining districts have faced a decreasing number of CBHI members over time. Note that the provincial capital district needs to be removed from our selection because its infrastructure differs from that of the other districts. To ensure that the results will account for the views of heterogeneous respondents, we intentionally select two representative districts with increasing and decreasing numbers of CBHI members. Accordingly, we choose Champhone and Xaibouly Districts, which have the largest coverage of CBHI among increasing and decreasing districts[16] for this study.

- As our focus is households in remote areas, to ensure that the experiment can plausibly be conducted in these areas, we purposively designate only type II villages with a homogeneous infrastructure surveillance of **"1 1 0 1 1 1 0"**[17]. Finally, we identify three villages in Champhone District and six villages in Xaibouly District. However, one village in Xaibouly District is removed due to accessibility constraints.

- All informal-sector households that are the targets of the CBHI scheme, are eligible for this study. However, in practice, we purposely omit monks because interviews with them are implausible. The eligible population is stratified into three groups: CBHI active members, non-members, and ex-members. Member respondents are randomly drawn from a list of currently active CBHI members in each village, whereas ex-members are randomly selected from a list of those who dropped out

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before August 2016. Non-members are randomly selected from a list of households in each village, which excludes households that work in formal sectors (employed households), member households and dropout households[18]. Finally, there are 580 stratified random samples[19] that represent 46% of the eligible population. Our samples comprise 210 (36%), 72 (13%), and 298 (51%) active members, ex-members, and non-members, respectively.

As is customary, we visit the chief of each village a few days beforehand to inform him of the objectives and tentative procedures of the experiment. Once the list of random respondents is recruited, a day prior to the experiment, the village chief announces the names of assigned household members to show up with the family book and CBHI member card (if his/her household enrolls CBHI scheme) at the given location (usually at temples). For convenience, every 6 respondents are appointed one-hour intervals from 8 a.m. to 5 p.m.

3.5   Descriptive statistics

The questionnaire-based interview and risk experiment are conducted for the sample of 580 households. Like the results of Tanaka et al. (2010), our samples make rather few switches from option A to option B across all three series, thus suggesting a considerable amount of heterogeneous distribution of risk preferences. Only 27.2%, 22.6%, and 35% of subjects make switching points in series 1, 2, and 3, respectively. A large portion of the respondents prefer option B from the first decision row in all series. Across this lottery choice experiment, the total reward is approximately 22,247LAK earning per respondent, and ranges from -10,500LAK to 500,000LAK[20].

The characteristics and measured risk parameters of the pool samples and subsamples conditioned to the CBHI status are summarized in Table 2. The mean difference tests are performed to examine whether significantly

systematic variations of behavioral predictors and other characteristic confounders exist across subgroups. We compare the characteristics of our samples with those of rural samples from the Lao expenditure and consumption survey, 2012-2013 (LECS V). Overall, our samples tend to be poorer, elderly, less educated and have larger household sizes. This outcome is unsurprising for the reason that only rural households of the informal sector are the eligible population of our study.

On average, the household heads of samples hold just four years of schooling/education. Additionally, the distribution of the last 12 months income is right-skewed, and of these, 61% report incomes below the poverty line. Interestingly, many of the mean tests indicate significantly systematic distributions of the observed variables across subsamples. For instance, the heads of member households are likely to be elderly and better educated. The test still presents substantial differences with respect to household sizes and distance to the nearest hospital among subsamples.

Compared to the risk preferences of Vietnamese villagers in Tanaka et al. (2010), the experimental data suggests that the majority of self-employed individuals in Lao PDR tend to be less risk-averse in gains and less loss-averse. However, the mean value of the risk-aversion in small-probability prospects in losses is close to that of the Vietnamese villagers. The mean test exhibits an undifferentiated risk aversion in gains among subgroups. It is evident that the degree of risk aversion towards probability aspects in losses is considerably heterogeneous, especially among members and non-members. Hence, it is of use to question whether the risk preferences and decisions that involve risk in our samples move in relation to each other.

Table 2: Descriptive statistics

Variables	LECS V		Full sample	Subsample				Mean difference test		
	Total rural	SVK rural[a]		M	EN	N	E	M-EN	M-N	M-E
	(3,616)	(369)	580	(210)	(370)	(298)	(72)			
σ (risk aversion for			0.88	0.9	0.86	0.89	0.75	0.04	0.01	0.15**
gains			[0.58]	[0.57]	[0.59]	[0.58]	[0.60]			
α (risk aversion for			0.71	0.74	0.69	0.69	0.7	0.05	0.05*	0.05
probability prospects)			[0.34]	[0.34]	[0.33]	[0.33]	[0.33]			
λ (loss aversion)[b]			2.28	2.21	2.33	2.31	2.43	n.a	n.a	n.a
Household head gender	0.95	0.93	0.85	0.84	0.85	0.85	0.85	-0.013	-0.001	-0.009
(1=male)	[0.22]	[0.25]	[0.36]	[0.37]	[0.36]	[0.36]	[0.36]			
Household head age	45.89	48.54	50.14	51.4	49.42	48.91	51.53	1.98*	2.92**	-0.12
	[12.52]	[11.68]	[13.42]	[12.44]	[13.92]	[13.84]	[14.12]			
Household head	6.05	6.46	4.47	5.06	4.13	3.91	5.03	0.93***	1.16***	0.03
education	[3.50]	[3.68]	[3.87]	[3.63]	[3.97]	[3.91]	[4.12]			
Household size	5.45	5.49	5.92	6.37	5.67	5.62	5.88	0.7***	0.75***	0.50**
	[2.22]	[2.06]	[2.16]	[2.29]	[2.03]	[2.07]	[1.87]			
Agriculture area (m2)			17,809	17,871	17.774	18,506	14,745	96.11	-635.8	3,125.50
			[22,029]	[20,651]	[22,802]	[24,438]	[13,867]			
Distance to district			15.79	14.79	16.36	16.75	14.72	-1.97***	-1.57***	0.06
hospital (km)			[5.40]	[4.11]	[5.95]	[6.03]	[5.33]			
Annual income	26.7	26.47	15.3	16.6	14.5	14.9	12.91	2.06	1.68	3.67**
(mil.LAK)[c]	[53.40]	[28.49]	[22.50]	[16.50]	[25.20]	[27.50]	[11.44]			

Standard errors are reported in brackets. M, N, EN are CBHI currently active members, non-members, ex- and non-members, respectively.

[a] SVK is Savannakhet Province where is our study area.

[b] Since only interval can be identified by experiment, S.E of the mean is not observed unless midpoints are used.

[c] Last 12 months reported (2015 price base).

4 Empirical results

According to the measured risk parameters, the validity of the EUT hypothesis is tested. The null hypothesis of $\alpha = \lambda = 1$, with the condition that the prospect value function would transform to the conventional EUT, is rejected at 1% confidence interval, thus showing strong evidence that the means of the observed and are significantly different from one. The result suggests that a substantial number of samples behave in a coherent pattern with the PT.

We next examine the linkages between households decisions to enroll in the CBHI scheme and their risk preferences. In addition to the full sample, we estimate separate models for the two subsamples. Subsample 1 is our interest in which the CBHI ex-members are removed from the regression. However, for a comprehensive insight into any significant differences between CBHI members and ex-members, we intentionally include subsample 2 in the analysis. As a sensitivity confirmation, we report the results from four different specifications for all models.

The hypothesis that risk-averse subjects are more likely to engage in the CBHI scheme is confirmed with two main findings in this study. The regression results are summarized in Table 3. Among the three elicited risk parameters of PT (risk aversion for gains, risk aversion for probability prospects, and loss aversion), the risk aversion for probability prospects appears to be the strongest behavioral predictor. The estimates are positive and significant at 5% level in the full sample, but at 10% level in subsample 1. The results are robust, even upon considering the demographic and economic confounders. The findings imply that subjects who are less risk-seeking in moderate- or high-probabilities of losses are more likely to favor the CBHI scheme. Furthermore, weak evidence on the correlation between the loss aversion and the CBHI scheme uptake likelihood are found in subsample 1 when household heads education, household size, agriculture land,

and distance to the district hospital are controlled in the regression. More specifically, there is a growing probability to engage in the CBHI scheme since subjects are more loss-averse.

Additionally, the association between many demographic variables and the likelihood of scheme enrollment is statistically significant and has expected signs throughout all specifications. Like the common findings in previous literature (Ito & Kono, 2010; Alkenbrack & Lindelow, 2015), households with educated and older household heads and larger sizes are associated with an increased probability for the CBHI scheme uptake decision.

Furthermore, what can be captured from subsample 2 is that the risk aversion for gains is positively correlated with the likelihood of scheme uptake decisions. In other words, the subjects who are relatively less risk-averse are likely to enroll, and those who are more risk-averse tend to drop out of the scheme. This finding might imply that because the ex-members are more risk-averse, they therefore enrolled in the CBHI scheme in the first place in order to reduce the risks of unexpected catastrophic healthcare expenditures. However, once enrolled, they might find that they rarely used the healthcare services or the benefits did not meet their expectations, and then they dropped out of the scheme.

Table 3: Risk preferences and the CBHI scheme uptake

Variables	Full sample (580)				Subsample 1 (508)[a]				Subsample 2 (282)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
σ (risk aversion for gains)	0.12	0.11	0.09	0.09	0.07	0.06	0.03	0.03	0.303 **	0.305 **	0.311 **	0.313 **
	[0.23]	[0.26]	[0.36]	[0.36]	[0.5]	[0.54]	[0.79]	[0.8]	[0.15]	[0.15]	[0.15]	[0.15]
α (risk aversion for probability prospects)	0.33 **	0.33 **	0.35 **	0.35 **	0.33 *	0.32 *	0.33 *	0.33 *	0.32	0.32	0.33	0.34
	[0.04]	[0.04]	[0.04]	[0.04]	[0.05]	[0.06]	[0.06]	[0.06]	[0.24]	[0.24]	[0.25]	[0.25]
λ (loss aversion)	0.02	0.02	0.02	0.02	0.02	0.02	0.03 *	0.03 *	0.01	0.01	0.01	0.01
	[0.32]	[0.3]	[0.13]	[0.13]	[0.3]	[0.27]	[0.07]	[0.07]	[0.02]	[0.02]	[0.02]	[0.02]
Household head gender (1=male)		-0.02	-0.06	-0.06		0.008	-0.01	-0.01		-0.06	-0.11	-0.11
		[0.92]	[0.71]	[0.71]		[0.99]	[0.96]	[0.96]		[0.23]	[0.25]	[0.25]
Household head age		0.01	0.004	0.01		0.008 *	0.01	0.01		-0.002	-0.006	-0.006
		[0.12]	[0.29]	[0.3]		[0.05]	[0.1]	[0.1]		[0.01]	[0.01]	[0.01]
Household head education			0.04 ***	0.04 ***			0.05 ***	0.05 ***			0.002	0.0005
			[0.005]	[0.001]			[0.001]	[0.001]			[0.002]	[0.002]
Household size			0.11 ***	0.11 ***			0.12 ***	0.12 ***			0.08 *	0.08 *
			[0.00]	[0.00]			[0.00]	[0.00]			[0.04]	[0.04]
Agriculture area (m^2)				0.0000009				-0.0000004				-0.00009
				[0.000003]				[0.000003]				[0.00005]
Distance to district hospital (km)			-0.04 ***	-0.04 ***			-0.05 ***	-0.05 ***			-0.0002	-0.006
			[0.00]	[0.00]			[0.00]	[0.00]			[0.0019]	[0.0019]
Constant	-0.73 ***	-0.02 ***	-1.11 ***	-1.12 ***	-0.56 ***	-0.97 ***	-1.04 ***	-1.04 ***	0.15	0.3	0.04	0.06
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.26]	[0.49]	[0.57]	[0.57]

The numbers in the brackets are standard deviations.

[a] Subsample 1: sample includes CBHI members and non-members.

Subsample 2: sample includes CBHI members and ex-members.

5 Conclusion

It is well known that health insurance reduces the risks of unexpected catastrophic health expenditures. Thus, individuals with either high risk aversion or loss aversion are expected to favor the insurance. Although there have already been many studies examining the links between individual-specific risk preferences and their decisions to buy health insurance, evidence varies by country, health insurance setting, and the method used to measure risk preferences. Especially with respect to the risk preference measurement, some studies employ self-reported questionnaires or lottery choice experiments with hypothetical rewards (Lammers & Warmerdam, 2010; Pierre & Jusot, 2017), which do not always reflect the real attitudes of subjects. Conversely, some other studies conduct risk experiments with real money at stake, but the experimental design forces the researchers to establish prior assumptions on the theory of decision-making under uncertainty for the subjects, especially under either EUT (Alkenbrack & Lindelow, 2015) or PT (Ito & Kono, 2010). Unlike the previous literature, this study employs the risk elicitation experiment technique of Tanaka et al. (2010), in which the validity of the EUT and PT assumptions can be tested simultaneously. We then relate the measured risk parameters to examine the association between individual risk preferences and the probability of opting for the CBHI scheme in rural villages of Savannakhet Province, Lao PDR.

The findings suggest that a substantial number of samples illustrate risk preferences that support the hypothesis of PT. Subjects are likely to be risk-averse over gains and risk-seeking over losses. For empirical analysis, the results suggest robust evidence that individuals who are less risk-seeking for moderate- or high-probabilities of losses tend to participate in the CBHI scheme. However, once the ex-members are excluded from the regression, we find additional significant but weak evidence on the association between loss aversion and the scheme uptake decisions. Furthermore, we find that

high risk aversion for gains is affiliated with the CBHI scheme dropout. Despite high risk aversion, why did ex-members drop out of the scheme? Further study on the stated preferences for their expected CBHI scheme merits future study, especially to determine whether the benefit package of the current CBHI scheme is a reason leading to the dropout. The significant correlation of the behavioral predictors with the likelihood of CBHI scheme enrollment shows that the decision to engage in the CBHI scheme for rural households in Lao PDR is not completely rational in exogenous predictors.

Acknowledgements

Notes

[1]See Sebora and Cornwell (1995).

[2] In prospect theory, each probability p_i for receiving the separate outcome x_i is transformed to the probability weighting function $p(p_i)$.

[3] If $\sigma < 1$, $\sigma = 1$, or $0 < \sigma < 1$, the subject is considered to be risk-seeking, risk-neutral, or risk-averse, respectively.

[4] The theory expects the results of loss neutrality ($\lambda = 1$) or loss aversion ($\lambda > 1$), but not loss seeking ($\lambda < 1$).

[5] The function would be linear if $\alpha = 1$, but it would be S-shaped and inverted S-shaped if $\alpha > 1$ and $0 < \alpha < 1$, respectively. The inverted-S shape of probability weighting function favors risk-seeking and risk-averse preferences for small-probability and moderate- or high-probability prospects of losses, respectively (Tversky & Kahneman, 1992). As stated in the study of Gonzalez and Wu (1999), probabilities below 30% are treated as small-probabilities.

[6] The risk attitude towards gains would be entirely explained by the value function in the case that the probability weighting function for gains is linear. By the same token, the risk attitude for gains is wholly defined by the probability weighting function for gains if the value function is linear for gains.

[7] We exclusively identify either the household head or spouse as the representative of the household for the experiment. In the local context, the household head or spouse is the key decision maker over the allocation of economic resources within the household. Their risk preferences may be crucially relevant with the decision making of the entire household.

[8] We thank to Professor Shinji KANEKO for his insightful comment on this assumption.

[9] The value of stakes is tailored to be consistent with the income level of rural people in Lao PDR.

[10] Due to the assumption of subjects rationality, monotonic switching is enforced in this experiment.

[11] The average payoff of the experiment is 22,000LAK, or about 70% of a single days wage of unskilled worker. 1USD $\approx$ 8,200LAK in September 2016.

[12] Once a subject completed all the given decisions, he/she also took part in another time discounting preference experiment which is the subject of a separate article related to our CBHI scheme study in Lao PDR.

[13] The expected payoff difference means the maximum amount of money that the subject is willing to give up in exchange for the allocation with certainty. Note that the subjects

in the experiment were not given the payoff difference column. Prior to conducting the experiment, all subjects were asked whether they still wanted to be involved in the experiment in which they might face the possibility of a financial loss of their own money (but not a big amount). Fortunately, all participants were willing to take part in the experimental session.

[14]See Nguyen et al. (2010) for the detailed sample of the risk parameter measurement.

[15]Note that non-members and ex-members are not distinguished.

[16]However, CBHI coverage in the Champhone and Xaibouly Districts accounted for only 0.21% and 0.1% of the provincial population in 2015, respectively.

[17]The Lao Statistics Bureau classifies villages into three types. Village type I indicates an urban village with road access, electricity, water supply, a regular market, and administrative office; Village type II is a rural village with road access; and Village type III is a rural village without road access. For example, the **"1 1 0 1 1 1 0"** condition indicates road access (have), electricity (have), health care facility (no), clean water (have), village drug kits (have), primary school (have), and regular market (no).

[18]The main survey was conducted on 13-27 September 2016 over the course of two days per village, on average. The participants were recruited and gathered with the assistance of the chiefs of the visited villages.

[19]We exclusively identify the household head or spouse as a representative of the household in the experiment. In the local context, the household head or spouse is the key decision-maker over the allocation of economic resources within the household. Exploring their preferences might result in acceptable and successful health insurance intervention in the future. However, only 88.45% of respondents are household heads or spouses.

[20]Apart from the risk experiment, we concurrently conducted a time experiment with real money rewards. Its results will be reported in a separate article, but the costs mentioned above are those of the risk experiment alone.

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