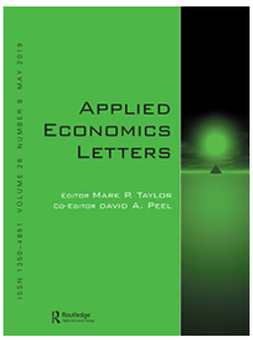

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ARTICLE

Is households' risk attitude robust to different experimental payoffs?

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ABSTRACT

We compared risk attitudes among rural people in Tanzania and Kenya using an experimental design where payoffs were defined and quantified in maize and milk production. About 42% of the sample revealed different risk attitude between the two payoff types. The difference was mainly explained by household livelihood strategy, geographical location and ethnicity. Hence, appropriate pay-off metrics differ across contexts and different metrics may provide noncomparable results that does not reflect intrinsic risk attitude.

KEYWORDS

Risk attitude; Greater Serengeti-Mara Ecosystem; Production-based risk experiment

JEL CLASSIFICATION

D13; D15; C93

I. Introduction

Assessment of households' risk attitude is increasingly elicited through experimental approaches (Eckel & Grossman, 2008; de Brauw & Eozenou, 2014). Designing the experiments requires relevant contextual information about, e.g. income and production. Although most studies use monetary payoffs or experimental lottery designs (Tanaka and Munro 2014; Wik et al. 2004; Yesuf & Bluffstone, 2009), payoffs in economic studies are increasingly defined using household production decisions (de Brauw & Eozenou, 2014). Considerations in adopting production-based payoff metric in risk attitude experimental designs include: (i) making the experiments realistic to the respondents and (ii) reducing the cognitive burden on the respondents (de Brauw & Eozenou 2014).

The production-based experimental approach often enables evaluation of risk attitude at a lower cost compared to monetarily based approaches and reflects households' context-specific and relevant risk attitude. However, large-scale implementation of production-based experiments (e.g. the World Bank in Ethiopia using milk production) could introduce bias as contexts (e.g. livelihood strategies) may vary at relatively small spatial scale, potentially affecting households risk attitude elicitation accuracy. Previous studies have indicated potential variations of households' risk attitude across regions in a country (Tanaka and Munro 2014) and experiment context (e.g. households experience with agricultural products) (de Brauw & Eozenou, 2014). However, no study has so far empirically compared risk attitude between payoff metrics that are defined using different production strategies.

Hence, using risk experiment data where the payoffs are defined as maize and milk production, we explore whether households risk attitude differs between the two experiments and identify the factors that explain observed differences in the Greater Serengeti-Mara Ecosystem (GSME) in Tanzania and Kenya. The GSME was selected as the region hosts both pastoralists, agriculturalists and agro-pastoralists.

II. Method

The study covers 25 selected villages in Tanzania and Kenya to represent the variation in ethnicity, biophysical characteristics, administrative organization and proximity to protected area boundaries. A total of 1000 households – about 40 in each village – were selected from the latest village census using stratified random sampling (10, 15

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Supplementary materials can be accessed here.

and 10 poor, intermediate and wealthy households, respectively, identified based on participatory wealth ranking). Sampling weights were used in the analysis.

Data was collected using questionnaire interviews. Socio-economic data collection followed the Poverty Environmental Network guidelines (Supplementary Materials, Appendix 1). Risk attitude data was collected using the ordered list experimental approach, where the respondents are presented with a list of ordered choices (gambles) with differing payoffs and risk and asked to make only one choice reflecting their preference (Eckel & Grossman, 2008). This method is considered performing better in developing countries than other methods (e.g. multiple price list method) (Dave et al. 2010). We conducted two experiments where the payoffs were defined in terms of either maize production (in bags per hectare per cropping season) or milk production (in litre per day per cow) (Supplementary Materials; Appendix 2). The type of products, units and level of payoffs were determined based on focus group discussions prior to surveys to ensure realism to respondents. Each household was presented with both experiments, each containing six choices. Households were assigned a risk aversion class following Binswanger (1980) (Supplementary Materials, Appendix 2). We controlled for order effects by randomly presenting to respondents three different patterns of the two experiments. Three households were unavailable, 61 households responded only to the milk experiment, and the remaining responded to both experiments. The risk preference choices were made by the household head or the most senior household member (in the rare cases when the head was absent, estimated around 1%), and it is assumed that they are in the best position to make economic decisions on behalf the household.

Following the literature on risk aversion (Binswanger 1980; Wik et al. 2004), we used the risk aversion class to assess households risk attitude (Appendix 2; Supplementary Materials). The proportion of households in each aversion class is presented in Appendix 3 for each tribe, Livelihood Strategy (LS) group (see below) and district (Supplementary Materials). We used chi-squared tests on a matrix of risk aversion class to establish household differences in risk attitude between the two experiments. We then used a multinomial logit model (MLM) with four categories to identify covariates associated with differences in households risk aversion class between experiments. The four categories are (i) households with the same risk aversion attitude in maize and milk production (S), (ii) households more risk-averse in milk compared to maize production (MC), iii) households more risk-averse in maize compared to milk production (CM) and (iv) households with no answer for maize production (NA). We hypothesize that LS, location, ethnicity and exposure to livestock and crop-related shocks explain differences in households risk attitude between maize and milk production. Three LS were identified (i.e. livestock-based, crop-based and mixed) based on k-means cluster analysis of income and assets that are specific to maize and milk production (Appendix 4; Supplementary Materials). As we aim to explain differences between risk attitude in the two experiments we omit traditionally tested determinants of risk attitude such as education, age, gender and household composition and size from our main model.

III. Results

Table 1 presents the distribution of households risk attitude elicited using maize and milk production experiments. The results show that 13.8% of the households (all of them are Maasai pastoralists) fall in the NA group likely reflecting lack of experience with maize production. Of the 859 households that responded to both the maize and the milk production experiments, 146 and 130 households (17% and 15%) belong to CM and MC categories, respectively. The overall distribution of households' risk attitude between the two experiments were significantly different (Chi-squared (30) = 1309.1, $p < 0.01$ and Chi-squared (25) = 1387.6, $p < 0.01$ with and without the no answer group, respectively) implying that households' risk attitude is context specific, and that the way payoffs are defined and quantified significantly affects households preference.

Table 2 presents the covariates explaining the difference in risk attitudes based on the MLM. LS and district variables were effect coded and

Table 1. Distribution of households risk attitude based on maize and milk production as the percentage of sample and number of households in parenthesis.

		←High to low→ risk aversion category based on maize production							
		No answer	Extreme	Severe	intermediate	Moderate	Slight to neutral	Neutral to preferring	Total
←High to low→ risk aversion category based on maize production	Extreme	2.6 (26)	20.7 (206)	0.9 (8)	2.0 (20)	0.3 (3)	0.6 (6)	3.8 (38)	30.8 (307)
	Severe	1.6 (16)	2.2 (22)	4.7 (46)	0.6 (6)	0.7 (7)	0.8 (8)	1.8 (18)	12.3 (123)
	Intermediate	3.4 (34)	0.9 (9)	0.6 (6)	6.2 (62)	0.6 (6)	0.6 (5)	1.3 (13)	13.6 (136)
	Moderate	1.7 (17)	1.0 (10)	1.3 (13)	0.5 (5)	4.5 (45)	0.2 (2)	0.8 (7)	10.0 (100)
	Slight to neutral	3.2 (32)	0.8 (7)	0.4 (4)	0.5 (5)	0.6 (5)	3.0 (29)	0.6 (6)	9.0 (89)
	Neutral to preferring	1.3 (13)	2.9 (29)	0.3 (3)	0.2 (2)	0.7 (6)	0.4 (4)	18.5 (184)	24.3 (242)
	Total	13.8 (138)	28.4 (283)	8.1 (81)	10.1 (100)	7.3 (73)	5.6 (56)	26.7 (266)	100.0 (997)
		Pearson Chi-squared (30) = 1309.1***							

Table 2. Marginal effects of the covariates of the difference of risk attitudes between maize and milk production in relation to location, livelihood strategy and household shock experience.

	S	MC	CM	NA
Livelihood strategy				
Livestock-based	−0.2202***	0.1606***	0.0480	0.0116*
	(0.0487)	(0.0173)	(0.0401)	(0.0069)
Crop-based	0.1392***	−0.1056***	−0.0218	−0.0119
	(0.0327)	(0.0184)	(0.0293)	(0.0080)
District				
Meatu	−0.1139	0.0516	0.0627*	−0.0004
	(0.0839)	(0.0573)	(0.0373)	(0.0092)
Bariadi	−0.1778**	0.1169***	0.0513	0.0096
	(0.0872)	(0.0484)	(0.0399)	(0.0108)
Serengeti	0.0335	−0.0555	0.0284	−0.0064
	(0.0608)	(0.0371)	(0.0269)	(0.0081)
Tarime	0.0251	−0.0179	0.0064	−0.0136
	(0.0580)	(0.0367)	(0.0230)	(0.0105)
Ngorongoro	0.1327	−0.0259	−0.1273***	0.0205
	(0.0923)	(0.0490)	(0.0489)	(0.0171)
Shock experienced				
Livestock related	−0.0118	−0.0402	0.0461	0.0059
	(0.0659)	(0.0682)	(0.0526)	(0.0050)
Crop related	0.3826***	0.0036	−0.0800	−0.3063***
	(0.0487)	(0.0343)	(0.0597)	(0.0637)

Notes: ***, ** and * significance at 0.01, 0.05 and 0.1 level; values in parenthesis are SEs clustered at the village level.
S = same risk aversion attitude in maize and milk production, MC = more risk-averse in milk compared to maize production, CM = more risk-averse in maize compared to milk production, NA = no answer for maize production; Log pseudolikelihood of model is −910.60.

can hence be interpreted without comparison to a reference category. Households with livestock-based livelihood were unlikely to have similar risk aversion (S), and likely to be more risk-averse in milk than maize production (MC). Households with crop-based livelihoods were more likely to have similar risk attitude in both experiments and unlikely to be more risk-averse in milk than maize production (MC). Experience of a crop shock was positively associated with similar risk attitudes (S) and negatively associated with not revealing a risk attitude in maize production (NA). Living in Bariadi, inhabited primarily by agro-pastoralists, was associated with lower likelihood of similar risk aversion (S) and a higher likelihood of being more risk-averse in milk than maize production (MC). Households who live in Ngorongoro, inhabited primarily by pastoralists, were unlikely to be more risk-averse in maize than milk production (CM). Differences were also explained by households' ethnicity, which mainly overlaps with location (Appendix 5; Supplementary Materials).

IV. Discussion and conclusions

We find that a nontrivial number of households (42%, including CM, MC and NA groups) reveal different risk attitude depending on payoff definition as either maize or milk production. Our results highlight the importance of contextual understanding for the design of production-based risk attitude experiments. Households with crop-based livelihood strategies more likely had similar risk attitude for milk and maize production while households with livestock-based livelihood strategies were more risk-averse in the livestock-based risk experiment. The difference was also

associated with location and ethnicity. These findings are robust to alternative model specification with adult equivalent units, gender and education level of the household head as control variables (Appendix 6; Supplementary Materials). This suggests that particular attention should be paid to households with predominantly livestock-based livelihood strategies whose expectations of risk may affect their investment decisions constraining economic development. The results imply that experimental designs using different metrics and payoffs may be needed even within a relatively restricted ecosystem such as the GSME to encompass different contexts and livelihood strategies. However, different payoffs will likely provide inconsistent risk attitudes. Hence, this study suggests choosing and defining risk attitude experiments in terms of the best available common LS component, which in this case is milk production (as did the World Bank), possibly because all households have some experience with dairy cows but not maize production. Another option is monetary-based risk attitude experiments. However, studies comparing households risk attitude using monetary and livestock-based experiments are needed.

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Disclosure statement

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