Communications and attitudes toward uncertainty of different types of subjects: Experimental evidence from Bangladesh

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Introduction

- Individuals' attitudes toward uncertainty are an important behavioral factor in decision-making. As such, risk aversion, one type of uncertainty, is among the important factors determining choices such as technology adoption
- Another type of uncertainty that is less studied is ambiguity aversion. *Ambiguity aversion* implies that an agent has a preference for a known risk over an unknown risk.
- A limited strand of literature also demonstrates that attitudes toward uncertainty change when subjects are allowed to communicate among themselves before making choices over risky and ambiguous prospects in the experiments.
- Sometimes, the behavior of others (mostly peers, neighbors, or people in the same network) influences own decisions and therefore it is important to examine whether communication among agents changes attitudes toward uncertainty.
- There is a large literature on measuring attitudes toward risk and ambiguity using student subjects. However, little is known about R&A for farmers in developing countries, who are one of the major stakeholders in development practitioners' plans.

The objective of the study is:

1. To measure the coefficients of risk and ambiguity aversion of farmers and of students from two universities in Bangladesh using data from experiments.
2. To investigate whether attitudes change due to communications where subjects were allowed to communicate in groups of 3 and 6 before making choices over uncertain prospects in separate rounds of the experiments.
3. To investigate whether demographic variables affect attitudes toward risk and ambiguity aversion in different environments subjects face the uncertain prospects.

Context of the Experiment and the Data

- To elicit the farmers' risk attitudes, 115 farmers were chosen from Jessore and Magura districts of Bangladesh to participate in a series of behavioral field experiments.
- Farmers were from 15 villages in two districts: 48 farmers from 6 villages in Jessore and 67 farmers from 9 villages in Magura agreed to participate. 11 farmers were dropped after the experiment due to not completing the sessions.
- The same series of experiments have also been conducted with 194 students from two universities in Bangladesh.
- The experimental lottery is shown in the following table:

Table A2: Certainty Equivalent Procedure risk experiments

Turn	Option one: Urn (P(Payoffs))	Option two: Certain Payments BDT	Switch-point from 1 to 2	CE at Switch-point BDT
1	0.5(0),0.5(400)	0	-	0
2	0.5(0),0.5(400)	20	1 to 2	10
3	0.5(0),0.5(400)	40	2 to 3	30
4	0.5(0),0.5(400)	60	3 to 4	50
5	0.5(0),0.5(400)	80	4 to 5	70
6	0.5(0),0.5(400)	100	5 to 6	90
7	0.5(0),0.5(400)	120	6 to 7	110
8	0.5(0),0.5(400)	140	7 to 8	130
9	0.5(0),0.5(400)	160	8 to 9	150
10	0.5(0),0.5(400)	180	9 to 10	170
11	0.5(0),0.5(400)	200	10 to 11	190
12	0.5(0),0.5(400)	220	11 to 12	210
13	0.5(0),0.5(400)	240	12 to 13	230
14	0.5(0),0.5(400)	260	13 to 14	250
15	0.5(0),0.5(400)	280	14 to 15	270
19	0.5(0),0.5(400)	300	15 to 16	290
17	0.5(0),0.5(400)	320	16 to 17	310
18	0.5(0),0.5(400)	340	17 to 18	330
19	0.5(0),0.5(400)	360	18 to 19	350
20	0.5(0),0.5(400)	380	19 to 20	370
21	0.5(0),0.5(400)	400	20 to 21	390

* 0.5 is the probability of winning the lottery.

Experimental Design and Procedure

- The design of the experiment makes the subjects reveal *certainty equivalents* (CE) for the lotteries. The elicited CEs can be used to compare risk preferences across respondents as well as to measure the coefficients of relative risk aversion. Furthermore, we conducted the same exercise with subject groups of 3 and subject groups of 6 to investigate the behavioral patterns when the subjects were alone versus being with peer farmers.
- The method used a constant relative risk aversion utlity function to measure risk aversion
- It used the following formula to calculate ambiguity aversion:

$$Ambiguity\ aversion\ (\theta) = \frac{CE_R - CE_A}{CE_R + CE_A} \qquad (1)$$

Table: Ambiguity aversion of subjects across male and female groups

		Alone		Group of 3		Group of 6	
		Median	Mean	Median	Mean	Median	Mean
Famers	Overall (104)	0.063	0.184	0	0.081	0	0.125
Students	Overall (194)	0.063	0.12	0	0.03		
	Male (114)	0	0.094	0	-0.03	NA	NA
	Female (80)	0.083	0.153	0.031	0.11		
DU Students	Overall (105)	0.083	0.137	0	0.03		
	Male (61)	0	0.107	0	-0.012	NA	NA
	Female (44)	0.091	0.178	0	0.077		
NSU Students	Overall (89)	0	0.097	0.118	0.035		
	Male (53)	0	0.08	0	-0.043	NA	NA
	Female (36)	0.073	0.122	0.121	0.149		

Results

Risk Aversion

- In all cases, farmers and students, on average, were found to be risk averse.
- The risk preferences, however, changed with the presence or absence of communication with other farmers and students, in the corresponding groups, and with the size of the group.
- Both students and farmers tended to be less risk averse communicating with two other peers. Students tended to show a greater decline in risk aversion.

Table: Summary statistics of the estimated risk aversion coefficients

	Farmers		Students		DU students		NSU Students	
	Median	Mean	Median	Mean	Median	Mean	Median	Mean
Alone	0.463	0.447	0.383	0.381	0.463	0.490	0.293	0.252
Group of 3	0.463	0.319	0.383	0.217	0.463	0.452	0.069	-0.06
Group of 6	0.535	0.501	NA	NA	NA	NA	NA	NA
N	104		194		105		89	

Ambiguity Aversion

Studies in field experiments measuring ambiguity preferences in developing countries are not common. Farmers and students are, in general, ambiguity averse with DU female students showing the highest ambiguity aversion. However, with communications both farmers and students exhibit less ambiguity aversion, with female students having less ambiguity aversion.

- In groups of 3, male students exhibit ambiguity loving behavior, on average.
- While median ambiguity aversion tends to decline for both students and farmers when facing uncertainty with communication, NSU students' median ambiguity aversion is higher due to female student attitudes.
- Male students show more variation than female students.

Demographic Characteristics and Attitudes toward Uncertainty

The following equation was used to estimate factors affecting farmers' attitudes toward uncertainty.

$U_i = \alpha + X\beta + \varepsilon_i$

where U_i is farmer *i*'s attitudes toward uncertainty, both in risky and ambiguous situations, *X* is the set of the farmer's characteristics including age, household size etc., and ε_i is an idiosyncratic error term. In order to estimate the factors affecting extreme risk aversion, a probit regression was estimated. In order to check robustness, since the same exercise was repeated, a panel random-effect tobit model was estimated.

The regression results suggest that:

For Farmers:

- When facing uncertainty alone, age and distance from farmer's residence to nearest important road/highway increase risk aversion, but years of schooling reduces it.
- When facing uncertainty in groups, education and distance show similar influences on the risk attitudes, with self-reported risk attitudes exhibiting positive association with risk aversion.
- An individual's age increases risk aversion, but average age of the group of 6 reduces it.

For Students:

- Student's parental education reduces risk and ambiguity aversion, while poor health increases it.
- In group of 3, poor health raises risk aversion, while the male-dominant group tended to show less risk aversion. Number of siblings increases risk aversion, while it reduces ambiguity aversion. A higher-order position among siblings raises ambiguity aversion.

Who change their minds after communication?

For Farmers: older farmers and farmers with less schooling than the those of group average are more likely to be less risk averse in group than alone.

For Students: Having higher high school grades than the group average reduces the likelihood of being more risk aversion in group than alone.

Conclusions

1. Both Bangladeshi students and farmers in our sample are risk and ambiguity averse. Levels and distributions of their risk and ambiguity aversion differ when they face an uncertain circumstance alone rather than when they communicate with other peers before making decisions in uncertain situations.
2. A farmer's demographic characteristics affect his/her attitudes toward uncertainty differently depending on which measure of attitudes toward uncertainty is used. Age, household location, and health status influence farmers attitudes toward uncertainty, while parental education, high school grades and health status affect student's attitudes toward uncertainty. Our findings suggest that attitudes toward uncertainty are dissimilar across different groups of subjects and in different environments such as facing uncertainty alone or in groups of different sizes such as 3 and 6.