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Ethnicity and Gender Differences in Risk, Ambiguity Attitude

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Abstract

We analyze gender difference in risk and ambiguity attitude of subjects across two different ethnicities that differ in the degree of female empowerment. Santal is a patriarchal tribe and Khasi is a matrilineal tribe with men and women being the social head in their respective societies. We compare subject's willingness to take up risk and ambiguity for themselves and on behalf of others. Besides we analyze the differences in risk and ambiguity attitude of subjects from these societies. Our findings show that women in both societies are significantly more risk averse, but not ambiguity averse. Patriarchal male and female are more risk averse in group risk than in individual risk but matrilineal subjects are not. Therefore, higher risk aversion in group is an ethnic trait among Santals. Comparing the between ethnicity differences we find that matrilineal subjects are more risk averse than patriarchal subjects. Regarding attitudes towards ambiguity, we did not find any gender or ethnicity differences.

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1.   Introduction

Although women have made progress in attaining leadership roles in the work place, there has been much less discussion on how they actually lead. Since, leadership style affects welfare outcomes of institutions, investigating the impact of gender on leadership style could be of huge importance. Therefore, for a better understanding of these outcomes, gender differences in leadership style should emerge as a critical item in institutional economics research.

In this study we focus on two aspects of leadership style: in one the group leader makes decisions under risk and in the other under uncertainty, both affecting payoff of all members in the group. These types of decisions can range from choosing an investment decision for a fund subject to joint ownership to implementing new technologies. While the first decision would depend on the risk attitude of the leader, second one would relate more to the ambiguity attitude[2].

Regarding gender differences in individual decisions making one of the stylized finding in the literature is that men and women differ in their propensities to engage in risky activities (for survey see Charness and Gneezy, 2012; Croson and Gneezy, 2009;Eckel and Grossman, 2002; 2008), with men tending to be less risk-averse than women. On the ambiguity front, evidence is rather mixed. There is some evidence on the existence of such differences (Jianakoplos and Bernasek, 1996, Barsky et.al., 1997, Powell and Ansic, 1997), but also some evidence against it (Schubert et.al., 1999).

We use Ellsberg (1961) two color game to investigate gender differences in leadership style with respect to risk and ambiguity aversion of subjects in individual and group decision making. In the individual game payoff is received individually; in the group game each subject's decision additionally determines the payoff of other group members. Therefore, in a way in the group game each subject behaves like an exogenously selected leader who decides on behalf of the group. There are few studies that have considered gender differences in risk taking behavior for others and in groups. For example, Ertac and Gurdal (2012) found that women are more risk-averse than men, in both individual and group context. Interestingly risk attitudes of women have no effect on whether they would like to decide for their group or not. In other words, women who take more risk and women who take less risk individually are equally likely to volunteer to be leaders. Daruvala, (2007) shows that when subjects make choices for others they use combination of their own risk preferences and their predictions

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[2] In literature difference between risk and ambiguity is explained as one in which probability of a distribution is known and another in which there is uncertainty about the probability distribution (Ellsberg, 1961; Heath and Tversky, 1991; Camerer and Weber, 1992; Tversky and Kahneman; 1992; Fox and Tversky 1995; Fox and Weber, 2002).

about the risk preferences of the target group. Both genders predict that women exhibit higher risk-aversion compared to men. Another strand of the literature has considered how groups make risky decisions through voting, compared to individuals. Harrison et al. (2013) use majority voting for group decisions and find that social risk, i.e. the risk taken in groups can be closely approximated by individual decisions. Shupp and Williams (2008) show that group discussion generates higher risk-aversion during decisions involving relatively higher risk. However, to the best of our knowledge such studies do not exist for ambiguity aversion.

In order to understand gender differences in leadership style we introduce leadership using an experimental treatment with subjects from two different social backgrounds. Experimental treatment refers to the above mentioned group treatment in which each subject acts as the exogenously selected leader; takes the decisions on behalf of the group; and her choice determines her group members' payoff. Any gender difference in the choices would then be attributable to the gender differences in leadership style in risk and ambiguity taking attitude. We also analyze if subjects behave differently in making group decisions than in individual decisions to understand the changes in the attitude while deciding for a group. Finally, we implemented the individual and group treatment with subjects from two different cultural backgrounds: Matrilineal Khasi and patriarchal Santal. In Khasi socio-economic power flows more in female line and in patriarchal Santal the cultural norms are similar to that of Hindu norms of preferring men. We argue that other than genetic factors, men and women could have different preferences because they are brought up differently. And if this is true, significant difference in gender and ethnicity differences are likely to occur.

Considering intra-society male-female power relations is not new in experimental economics, but evidence is still scarce. Gneezy, Leonard and List, (2009) conducted an experiment with matrilineal Khasi in India and Patriarchal Massai in Tanzania to analyze gender differences in competitiveness. The subjects were given a choice to participate in ball-throwing game 10 times, either without competition, with each success yielding one dollar, or with competition with an anonymous subject from the same village, which yields three dollars in a win and no money at the loss. Their study found that while men are more inclined to compete among the Massai, Khasi women are more competitive than men and are even weakly more than Massai men. They also ran the investment risk experiment as control to their competition game and found no significant gender differences but significant ethnicity difference, with the matrilineal Khasi being less risk averse than the Massai. Andersen et al., 2013 choosing their subjects from matrilineal Khasi and patrilineal Kharbi investigate whether women are born less competitive or they become so through the process of socialization. By comparing the

children from these tribes they found that the differences in competitiveness starts around puberty and most of the changes takes place only in patriarchal Kharbi where boys start to become more competitive than girls. Recently, Gong, Yan andYang, (2010) in a dictator game also found a reversed gender difference in the matrilineal Mosuo in China with men behaving more selflessly than women. Gong and Yang (2012) conducted another experiments on two different risk tasks with subjects from two ethnic groups, the matrilineal Mosuo and the patriarchal Yi in China. Their study concluded that women are more risk averse than men at both tasks within both ethnic groups. However, the gender gap is smaller in the Mosuo.

We find that women are more risk averse than men in both individual and group game within the two ethnicities. This is consistent with findings in most of the previous studies. Therefore, gender difference in risk attitude is a common phenomenon and does not depend on cultural background of the subjects. Additionally our study shows that there is an ethnicity difference in risk aversion with matrilineal subjects being more risk averse than the patriarchal subjects. Finally differences in group and individual behavior is found only among patriarchal subjects who behave more risk aversely in making group choices than in individual choices. On ambiguity aversion we do not find any evidence of either gender difference or ethnicity difference.

The rest of the paper is organized as follows: Section 2 describes the ethnicity background; Based on the existing literature, Section 3 describes experimental hypotheses; Section 4 presents the experimental design and procedure; Section 5 explains the payment mechanism; Section 6 provides details on how we measure risk and ambiguity attitude; Section 7 describes the data and the descriptive statistics; Section 8 discusses the results and interpretation and finally Section 9 concludes the study.

2.   Ethnicity background
We implemented the same experiment in two different states of India as shown in the map with two different tribes, the Khasi and the Santal. While the structure of the Khasi is matrilineal the structure of the Santal is patriarchal. Comparing these societies will enable us disentangling impact of culture on risk and ambiguity attitude.

Figure 4.1: Location of Khasi and Santal in the India
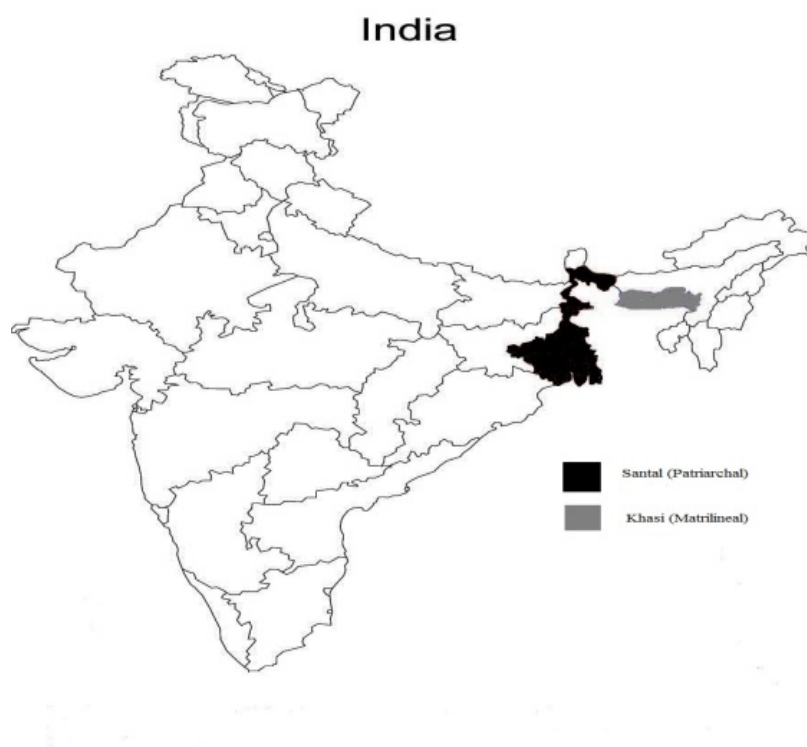
2.1.   Matrilineal Khasi

The Khasi are located in the state of Meghalaya, a northeastern state of India (the gray region in the map). The tribal rules are considered to be matrilineal (Leonetti et al., 2004, Van Ham, 2000). Khasi women have the right to choose their own partner, cohabit and do not require male permission about the marriage. The institution of dowry does not exist; and it is common practice that the man moves to his wife's house after marriage. This stands in sharp contrast to the prevalent Indian system of marriage, in which wives always move to their husbands' house after marriage and there is an economically substantial dowry system (Bloch and Rao, 2002, Anderson, 2003). Khasi families are always organized around the female members (mostly around the grandmother who acts as the head of household); and a child always takes the mother's last name. Instead of the oldest son, the youngest daughter inherits all property establishing women power in the society. It is also an effective way to ensure that the youngest daughter is always around as a support to her parents in their old age. Interestingly, property rights for the youngest daughter and consequential old age support make son preference absent in the society. Incidence of female feticide and domestic violence against women is rare and intra-household access to health, education, and nutrition is equal among male and female family members (for more details see Andersen et al., 2008, 2013 Gneezy, Leonard and List, 2009). With the Khasi, farming is the major economic activity and production is generally controlled by female members of the family. In addition to farming,

women undertake all other economic activities and are often involved in trading with men from other societies.

2.2. Patriarchal Santal

The Santal, the largest tribal group of eastern India, are distributed over the states of Bihar, Orissa, and Tripura as well as in West Bengal, where our study was conducted (which is indicated by the black region in the map in Figure 1). The Santal society is patriarchal and has always avoided giving women equal decision rights and status than men. Santal customary law does not guarantee women inheritance rights in their parental property. They however have contingent rights to inheritance depending upon the circumstances. For instance, a common practice is to endow a married woman with some land in her natal village as a mean to provide financial support in case of unsuccessful marriage. However, according to the Santal Pargana Tenancy Act (SPTA), 1949, in absence of appropriate male heirs, the daughter inherits her father's land (Rao, 2005). Caring for parents in their old age is the responsibility of sons not of daughters. Once married, daughters are expected to spend their life under the supervision of their husbands or other elder men in the husband's family. A post experimental survey in our study revealed that female mobility even within the community is restricted and visiting parents, relatives, and friends by the women always requires taking permission from the adult male in the family. Low female mobility has also resulted in lower labor force participation by women. Similarly, expenditure decisions are mostly taken by men in the family, which is even triggered by the fact that in most household men are the major income earning members. Women's work and work experience differs significantly from those of men, and in some areas women are completely excluded from industrial work (Roy and Murry, 2013). The distribution of family resources among male and female members is unequal and even though women contribute significant amounts of labor to family farms, income earned mostly remains under the control of men. The Santal social norms are not an exception to the Hindu norms of favoring boys over girls, and son preference is prominent.

3. Hypotheses

The previous literature on gender differences in risk and ambiguity aversion gives a direction regarding expected behavior in the experiment. This section aims at understanding the within and between society plausible differences and how far these differences differ in individual decisions making and group decision making. Accordingly we formulate the following hypotheses.

3.1. Within ethnicity difference

The first sets of hypotheses we test are on the gender difference in risk and ambiguity aversion. The hypotheses we study regarding the gender difference pertains to the question why should women fare higher risk and ambiguity aversion than men? Apart from innate differences another suggested explanation could be that profit-maximizing behavior for women is to avoid risky and ambiguous choices because of backlash. For example, directive or authoritative leadership style is shown to work against women as compared to men leaders (Eagly, Makhijani and Klonsky, 1992; Eagly and Johnson, 1990). Bowles, Babcock and Lai (2007) in their study discussed how women are often penalized in job interviews for exhibiting higher negotiation skill than men. This explanation relates to the cultural environment in which women who behaves in a less feminine way are faced with social resistance than a man with similar behavioral traits.

On the other hand, existing studies addressing gender differences in altruism (Gong, Yan and Yang, 2010) and competition (Gneezy, Leonard and List., 2009; Andersen et al., 2013) across matrilineal and patriarchal groups indicate that matrilineal women are more selfish and competitive than men. Since, women matrilineal society seems to behave substantially differently than the women from other societies we expect that the direction of gender differences generally observed in patriarchal set up is likely to reverse in Khasi with women being more risk and ambiguity loving than men.

Taking into consideration this literature we formulate different hypothesis on gender difference for our study groups.

Hypothesis1a. Women in the patriarchal tribe are significantly more risk and ambiguity averse than the men in individual and group decisions.
Hypothesis1b. Women in the matrilineal tribe are significantly less risk and ambiguity averse than the men in individual and group decisions.

Second hypothesis tests for the group versus individual risk and ambiguity attitude. In our set up, subject's decision on whether to be more risk and ambiguity averse (or loving) would depend on subject's perception about the group as well as her own preference (Daruvala, 2007) and how she holds herself responsible for the outcome (Chakravarty et al., 2011; Shutter, 2009; Bolton and Ockenfels, 2010). Depending on these variables then individual behavior might be significantly different when deciding on behalf of others. Since our design does not provide scope of in-group communication we expect subjects to opt more for the riskless option to avoid emotional hazards associated with no payoff to the group due to

subjects' individual choices. Accordingly our hypothesis on group vs. individual decision making is that:

Hypothesis2. Deciding for the group makes individuals significantly more risk and ambiguity averse than deciding only for themselves.

3.2. Between ethnicity differences

A third set of hypotheses concerns differences between societies. The unique feature of our experiment is that it examines whether nurture has any observable impact on individuals personality traits on risk and ambiguity attitude. In contrast to the patriarchal society, since gender norms in matrilineal society favors women more than men, one might expect that the gender outcomes on risk and ambiguity aversion established so far in economic experiments will reverse in matrilineal society. Therefore, we expect women (men) in the matrilineal society have higher (lower) inclination towards risky and ambiguity choices than them in the patriarchal society. This is in line with the findings explained by Gong and Yang, 2012. Such behavioral reversal among matrilineal subjects has also been found by several other studies (Gneezy, Leonard and List, 2009 on competitiveness, Gong, Yan and Yang, 2010 on transfers in ultimatum game). Therefore, we test the following hypotheses on between ethnicity differences.

Hypothesis3a. Matrilineal women will be significantly less risk and ambiguity averse than the patriarchal women in individual as well as group decisions.

Hypothesis3b. Matrilineal men will be significantly more risk and ambiguity averse than Patriarchal men in individual as well as group decisions.

4. Experimental design

We elicited risk and ambiguity attitudes within the framework of the Ellsberg two-color choice task (Ellsberg, 1961). In the game each subject was asked to choose between a certain amount and a gamble which pays with equal probabilities either Rs. 50 or nothing. We use a simple gamble of drawing a ball form a bag containing balls of two different colors and guessing the color before the draw. Subject could earn Rs. 50 if they guessed the color of the ball otherwise nothing. Each subject makes this decision, i.e. either the gamble or the certain amount, 10 times with the same gamble but varying the value of the certain payment from Rs. 5 to Rs.50 (in an increasing order as shown in figure 4.2). Subjects are required to state their preference for all 10 options.

Figure 4.2: Choice list for risky and uncertain prospects for individual and group decision making

Decision sheet: Drawing ball for your (your group) from Bag A/B or a certain amount (Please put a cross against your preferred option)

[1] Draw from bag A/B   O   **or**   O Rs. 5 for certain

[2] Draw from bag A/B   O   **or**   O Rs. 10 for certain

[3] Draw from bag A/B   O   **or**   O Rs. 15 for certain

[4] Draw from bag A/B   O   **or**   O Rs. 20 for certain

[5] Draw from bag A/B   O   **or**   O Rs. 25 for certain

[6] Draw from bag A/B   O   **or**   O Rs. 30 for certain

[7] Draw from bag A/B   O   **or**   O Rs. 35 for certain

[8] Draw from bag A/ B   O   **or**   O Rs. 40 for certain

[9] Draw from bag A/B   O   **or**   O Rs. 45 for certain

[10] Draw from bag A/B   O   **or**   O Rs. 50 for certain

Note: In the actual game subject saw one of the bags A/B in the choice list and decisions were asked to make for themselves and for their group. Groups were kept secret throughout the game.

We use the same structure for the risk and ambiguity game, except that in risk game participants know that the bag (Bag A) contains exactly 10 yellow and 10 pink balls while in ambiguity game participants do not know the proportion of pink and yellow balls in the second bag (Bag B). In the ambiguity game we mixed 7 pink and 13 yellow balls.

Each subject plays risk and ambiguity games with individual and group payments. Altogether, therefore they filled up such choice list four times: Individual risk decision, group risk decision, individual ambiguity decision, and group ambiguity decision. The difference between the group and individual decision making is that in the individual case payoff is determined by subject's own choice, where as in the group case they remained responsible not only for their own payoff but also for the payoffs of others in the same group[3]. Each group is formed anonymously with four randomly chosen participants. While implementing the game each game was explained separately.

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[3] Few subjects made inconsistent choice by switching there preference several times. We took the first switching point to calculate certainty equivalence for them. In Santal inconsistency rates are Individual risk: 19.8%, Group risk: 15.7%, Individual ambiguity: 11.6%, Group ambiguity: 14.3%. In Khasi these rates are 34.3%, 34.3%, 38.5%, and 39.4% respectively. These rates are comparable to the inconsistency rates found in other studies. For example Lammers, Lau and Verbon, 2006 find an inconsistency rate of 66.5% in South Africa; Galarza, 2009 finds an inconsistency rate of 52% in Peru; and Doerr et al., 2011 find an inconsistency rate of 39 % in Ethiopia. For more see Charness and Viceisza, 2012.

To control for the order effect we altered the order of the game. In some sessions subjects play the risk aversion game first and in others the ambiguity game. The four decisions were made one after another and only after the decision sheets are all filled up one was randomly selected for payment (described in details below)Therefore, there is no learning effect arising from the decision sheet filled up before.

5.   Payoffs

The payment mechanism was clearly explained to the subjects before the game implementation. For payment, first, one of the bags i.e. risky or ambiguous prospects is randomly chosen. Second we made a random choice between individual game and group game. In case individual game is selected we selected one of the ten options randomly. On the other hand, if group option is chosen, one of the four members of the group is chosen to play for the whole group. Similarly as the individual game, one of the ten options were selected randomly for the group representatives. Depending on their decisions they either played the gamble or received the certain payoff instead.

6.   Attitude measurement

We define measures of risk and ambiguity attitudes based on certainty equivalents (Wakker 2010, chapter 11; Sutter et al, 2013). As a measure of risk attitude r we use

$$r = 1 - CE_R/\pi$$

Where, CE_R denotes the certainty equivalent of the risky prospect, π is the lottery money. Values of r smaller (larger) than 0.5 indicate risk loving (risk aversion), with risk neutrality for $r = 0.5$. As a measure of ambiguity attitude we employ the value a,

$$a = (CE_R - CE_A)/(CE_R + CE_A)$$

with CE_A being the certainty equivalent of the ambiguous prospect. This measure ranges from −1 (extreme ambiguity loving) over 0 (ambiguity neutrality) to 1 (extreme ambiguity aversion). The larger the difference between the two certainty equivalents, the stronger is the ambiguity attitude, controlling for the absolute level of risk and ambiguity attitude. The normalization controls for the fact that, for example, a Rs.5 difference weighs more heavily for a subject who is relatively risk averse (e.g., with a certainty equivalent of Rs. 7.5) for the risky prospect) than for a subject who is relatively risk neutral (e.g., with a certainty equivalent of Rs27.5 for the risky prospect)[4].

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[4] Subjects who always chose the sure amount were classified as having a certainty equivalent that is halfway in between zero and the sure amount in the first row.

7. Data and descriptive statistics

The experiment was carried out between September 2012 and January 2013 in the states of Meghalaya and West Bengal. The research design is identical in the two states and was conducted in three districts of Meghalaya (Ribhoi, East Khasi Hills and Jaintia Hills) and one district in West Bengal (Purulia). 236 subjects in Meghalaya and 368 subjects in West Bengal participated in the experiment. We expect that our selection of ethnicities will provide contrasting behavioral differences by gender and by ethnicities. We conducted 40 sessions, 16 in the matrilineal society and 24 in the patriarchal society. Each session consists of three or four groups each with 4 members. Thus per session there were either 12 or 16 subjects, generating a sample of 604 subjects in total. Table1 summarizes the number of participants by society and gender[5].

Table 1: Number of subjects by gender and society

	Female	Male	Total
Patriarchal	198	170	368
Matrilineal	146	90	236
Total	344	260	604

We first present information on socioeconomic characteristics collected in the post-experimental survey in Table 2. It includes information on subjects' gender, age, education, marital status, children, farm activity, bank account and group participation by ethnicity. 39% of the Khasi subjects and 46% of the Santal subjects are male. The sessions were either with a male majority or a female majority in the group, and we did not aim for gender equality in the groups on purpose to test whether gender composition has any impact on individual risk and ambiguity attitude. The average age of the subjects is 34.8 years in the case of the Santal sample and 31.08 years in the case of the Khasi sample. Splitting the sample by gender, we find that Khasi men are slightly younger (at a 5% significance level) compared to Khasi women. Average household size in Khasi is 7 and in Santal 6. Furthermore, regarding our measure of education, we consider whether subjects have completed primary school and whether they have achieved an education level higher than primary. On the average, we find that 68% of Khasi women have obtained primary school or more than primary school. In the case of Santal women this is only the case for 46% of the subjects, indicating that Khasi women are on the average more educated than Santal women, especially so for the higher

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[5] In each session we recruited participants in advance to avoid selection bias. A post-experimental discussion revealed that selected participants agreed to take part either because of their pecuniary motives or social motives related to community development. In general, pecuniary motives ranked higher among Santal male participants, while social motives are a strong driver for most female participants.

education. Comparing Khasi and Santal men with respect to their educational levels, we also find a small difference, but it is much less pronounced (no significant societal difference for men). With respect to within society gender differences, we find that at higher levels of education the gap between men and women is large in case of Santal (significant at less than 1%), whereas it does not appear to be the case in Khasi. In Santal we find significantly more participation in group activities than in Khasi, both by male and female. However, in Santal while significantly more female take part in group activities than men, in Khasi we do not find within society gender difference in group participation.

Table 2: Demographic characteristics of the subjects by society and gender

	Matrilineal society				Patriarchal society				(Patriarchal-		
	Pool	Female	Male	(Male-	Pool	Female	Male	(Male-	Pool	Female	Male
		Mean		p-val		Mean		p-val	p-val	p-val	p-val
		(sd)				(sd)					
Male	0.39				0.46				0.06		
	(0.49)				(0.50)						
Male majority	0.26	0.13	0.46	0.00	0.48	0.28	0.71	0.00	0.00	0.00	0.00
	(0.44)	(0.34)	(0.50)		(0.50)	(0.45)	(0.45)				
Age	31.08	32.58	28.70	0.02	34.84	34.21	35.57	0.26	0.00	0.19	0.00
	(12.41)	(12.80)	(11.43)		(11.67)	(10.27)	(13.10)				
Household size	7.03	7.25	6.66	0.15	6.18	5.98	6.42	0.16	0.00	0.00	0.55
	(3.01)	(3.14)	(2.76)		(2.97)	(2.68)	(3.28)				
Primary education	0.17	0.12	0.23	0.04	0.17	0.18	0.17	0.88	0.78	0.19	0.25
	(0.37)	(0.33)	(0.42)		(0.38)	(0.38)	(0.38)				
Higher than Primary	0.58	0.56	0.61	0.49	0.42	0.28	0.58	0.00	0.00	0.00	0.68
	(0.49)	(0.50)	(0.49)		(0.49)	(0.45)	(0.49)				
Marriage	0.54	0.54	0.53	0.83	0.83	0.88	0.78	0.01	0.00	0.00	0.00
	(0.50)	(0.50)	(0.50)		(0.37)	(0.33)	(0.42)				
Group Participation	0.60	0.62	0.58	0.58	0.85	0.97	0.71	0.00	0.00	0.00	0.03
	(0.49)	(0.49)	(0.50)		(0.35)	(0.16)	(0.45)				
Farm activity	0.29	0.33	0.23	0.09	0.81	0.76	0.86	0.01	0.00	0.00	0.00
	(0.45)	(0.47)	(0.42)		(0.39)	(0.43)	0.34				
Own bank account	0.56	0.57	0.53	0.55	0.33	0.30	0.38	0.08	0.00	0.00	0.02
	(0.50)	(0.50)	(0.50)		(0.48)	(0.48)	(0.49)				

The major income-earning activity in the Santal society is farming, as indicated by 81% of the Santal subjects. Small-scale farming mostly involves family labor, whereby control remains in the hands of male adults. This is indicated by the fact that significantly (less than 1%) higher number of Santal male reported their main occupation to be Farming than that by Santal female. Such control patterns have important welfare implications for women, whose economic power is limited. In the case of the Khasi subjects, the major income generating activity is also farming and female control over farming is higher than that by men. In contrast

to the Santal society, farming-related decisions are mostly made by women. Finally looking at the gender difference in percentage of subjects having bank account we find that in Santal significantly (less than 10%) more men have bank account than the women. However, such difference does not exist is Khasi society. These results provide some descriptive evidence of the gender differences between the two societies.

8.   Results and interpretations

Table 3 presents the mean risk and ambiguity aversion in group and individual decision makings by ethnicity and gender. Estimated risk attitude of matrilineal women in individual and group decisions are 0.61 and 0.6 respectively indicating that on average matrilineal women are risk averse. On the contrary matrilineal men behave more risk neutrally with estimated risk attitude 0.52 in individual decisions and 0.50 in group decisions. Interestingly, patriarchal women exhibits similar risk attitude as the matrilineal men with estimated individual risk attitude being 0.50 and group risk attitude being 0.56. However, patriarchal men appear to be more risk loving in individual and group risk attitude (0.36 and 0.42 in individual and group decisions respectively). Therefore, in the two ethnicities we find that on average, women are significantly less risk taking than men in both individual and group decision making. One might expect the gender gap to reverse in the matrilineal society as found in the competition game of Gneezy, Leonard and List, 2009 and dictator game of Gong, Yan and Yang, 2012. Our study, on the contrary shows that higher risk aversion exists even among matrilineal women indicating that risk aversion among women is rather a general phenomenon and does not depend on ethnic norms. We further argue that since we find that the gender difference in risk attitude not only in individual decisions but also in group decisions it could be inferred that the women are risk averse not only in individual choices but also when they are in leading roles (exogenously selected) compared to their male counterparts in.

Looking at differences in risk aversion between individual and group decisions, we find no significant difference in risk and ambiguity attitude in the matrilineal society. But in patriarchal society both male and female subjects are significantly more risk averse in groups than they are individually. Therefore, hypothesis 2 is supported only for risk aversion in patriarchal society (for men and women)[6].

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[6] Additionally, we also tested for gender differences in ethnicity differences and gender differences of group minus individual differences in risk and ambiguity attitude. These differences are all insignificant.

Finally, no significant gender difference or differences individual in group choices could be established in ambiguity attitude of the subjects from these two societies (reported in the last three columns in Table 3). Therefore, we find evidence to support hypothesis1a only for risk aversion and hypothesis 1b is rejected for risk and ambiguity.

Table 3: risk and ambiguity aversion by gender and ethnicity

		IRA	GRA	IRA-GRA	IAA	GAA	IAA-GAA
	Male	0.52	0.5	0.02(0.39)	0.00	0.04	-0.04(0.16)
Matrilineal	Female	0.61	0.6	0.01(0.49)	-0.04	0.00	-0.04(0.62)
	Male	0.36	0.42	-0.07(0.00)***	0.08	0.08	0.00(0.55)
Patriarchal	Female	0.5	0.56	-0.06(0.00)***	0.08	0.08	0.00(0.51)
Gender difference within ethnicities							
		-0.09**	-0.10**		0.04	0.04	
	Matrilineal	(0.03)	(0.03)		(0.57)	(0.72)	
		-0.14***	-0.14***		0.00	0.00	
Male –Female	Patriarchal	(0.00)	(0.00)		(0.74)	(0.71)	

Note: Probabilities are reported in the parentheses are from Wilcoxon ranksum tests. IRA: Individual risk aversion, GRA: Group risk aversion, IAA: Individual ambiguity aversion, GAA: Group ambiguity aversion.

Next, we attempt to analyze the gender differences that we observe in Table 3 in a regression framework with and without socio-economic controls described in Table 2. Regression tables are reported in the appendix. The model we estimate for individual and group risk and ambiguity attitudes is the following (individual subscripts are deleted).

$$L = \beta_0 + \beta_1 Male + \beta_2\ Matrlineal + \beta_3 Matrilineal * Male + \Gamma\ Controls + \epsilon \quad …(1)$$

Gender differences are given by

Matrilineal society: $\beta_1 + \beta_3$ and

Patriarchal society: β_1

Societal differences are given by,

Male: $\beta_2 + \beta_3$ and

Female: β_2

Table 4: Within ethnicity gender differences (male-female) in risk and ambiguity attitude

	With socio-economic controls		Without socio-economic controls	
	Matrilineal	Patriarchal	Matrilineal	Patriarchal
IRA	-0.10(0.08)*	-0.17(0.00)***	-0.10((0.05)**	-0.21(0.00)***
GRA	-0.08(012)	-0.16(0.00)***	-0.09(0.05)**	-0.21(0.00)***
IAA	-0.02(0.68)	-0.04(0.37)	0.01(0.88)	-0.02(0.68)
GAA	0.02(0.73)	-0.01(0.87)	-0.002(0.96)	0.02(0.52)

Note: Probability values of differences are reported in the parentheses

Table 4 presents the estimates of gender differences by ethnicity with and without socio-economic controls. With and without socio-economic controls, women from the two societies are significantly less risk taking than men in individual choice. In group decisions also this gender difference persists in patriarchal society, but vanishes in matrilineal society once the socio-economic variables are included as controls in regression. By and large these results are consistent with the finding in Table 3, indicating that gender difference in risk attitude with women being less inclined towards risky choices is an innate gender trait and is not influenced by cultural norms, and such difference exists even among the exogenously selected leaders in the group game. Again ambiguity attitudes do not show any gender differences with and without the controls.

Table 5 presents ethnicity differences in risk and ambiguity attitude by gender with and without socio-economic controls. Our result shows that matrilineal subjects (men and women) are significantly less risk taking than patriarchal men and women subjects in individual and group decisions. Therefore, these findings do not reflect what we initially anticipated: Khasi women and Santal men will be more risk loving. Instead we find an ethnicity difference in risk taking behavior with Khasi subjects being more risk averse. Therefore, hypothesis 3a is rejected and hypothesis 3b is accepted only for risk attitude. We argue that such ethnic difference in risk attitude might occur due to differences in exposure to economic and environmental risks faced by these communities. Economic development of the entire north east India (where the Khasi people resides) has been historically lagging behind compared to the state of West Bengal (where the Santals are located). According to the 11th Five Year Plan (2007a, 2007b) despite huge investments ($1.5 billion), the infrastructure development in the northeast region has remained poor. Due to low penetration of financial institutions, access to credit is limited, as a result industrial and economic activities remained slow. These have led to a lag of development in most of the northeast region in India. Furthermore, north eastern part of India which is characterized by diverse climatic regimes, high incidence of drought or flood and often experience environmental shocks affecting agricultural production

(Ravindranath et al, 2011). Such economic and environmental could be one critical factor determining the lower risk taking attitude by Khasi subjects[7].

Table 5: Ethnicity (matrilineal –patriarchal) differences in risk and ambiguity attitude

	With socio-economic controls		Without socio-economic controls	
	Male	Female	Male	Female
IRA	0.22(0.00)***	0.15(0.02)**	0.20(0.00)***	0.09(0.07)*
GRA	0.21(0.00)***	0.13(0.02)**	0.19(0.00)***	0.08(0.08)*
IAA	-0.07(0.31)	-0.08(0.20)	-0.01(0.82)	-0.03(0.52)
GAA	-0.06(0.34)	-0.08(0.22)	-0.03(0.61)	-0.003(0.95)

Note: Probability values of differences are reported in the parentheses

Looking at the socio economic characteristics (reported in Table 6 in appendix) we observe that age has a negative and nonlinear correlation with individual ambiguity. Higher household size increases risk aversion in groups; primary education is negatively correlated with risk aversion in groups and group participation in real life is also correlated positively with risk aversion in groups and individual choices. Having a bank account makes individual more ambiguity loving. Finally, higher male presence in the session is found increase group risk aversion and individual ambiguity aversion.

9.   Summary and conclusion

Using Ellsberg two color choice experiments we elicit risk and ambiguity attitude of 604 subjects to investigate whether there is any gender difference in leadership style. There are two specific contributions of this study. First, in our setup each subject is asked to decide for themselves and then on behalf of their group. In the first case payoff is received individually and in the second subject's decision also determined group members' income. Thus, in the second scenario we allow each subject to behave as exogenously determined leader, taking decision on behalf of the group and being responsible also for the outcome. Our objective is to examine whether risk, ambiguity attitudes vary significantly depending on who bears the consequences of a particular choice. Second, we attempt to understand if gender and leadership norms of a society have any impact on risk and ambiguity. To achieve our objective we implemented the same experiment with subjects from two different ethnicities in India- one is a matrilineal tribe known as Khasi with women being the leading gender and another is a patriarchal tribe known as Santal with men being the head of the society. We

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[7] There are a few studies that have analyzed negative association between shocks and risk taking behavior, e.g., Yesuf and Bluffstone (2009); Guiso and Paiella (2008); Gloede, Mankauff and Waibel, 2013

believe that such choice of ethnicities with different power balance would help us to understand the role of norms in shaping risk and ambiguity preference of the subjects.

Our first result suggests a gender difference in risk taking attitude is rather a general trait: women are more risk averse than men in both the ethnicities i.e. irrespective of cultural context women are more risk averse in Santal and Khasi. Second, such difference exists even when subjects are deciding for their group. Therefore, even when subjects are acting as leaders (exogenously selected) the gender difference persists. This is consistent with the general finding in the investment decision but different from Gneezy, Leonard and List (2009) observation of no gender difference in the individual risk decision in both the matrilineal Khasi and the patriarchal Maasai. Third, on the difference between individual and group decisions we find that patriarchal subjects (men and women) are significantly more risk averse in group choices than they are individually; but similar could not be established for matrilineal subjects. Finally, we find that an ethnicity difference exists in risk attitude of the subjects from these two ethnicities with matrilineal subjects being more risk averse than the patriarchal subjects in group as well as individual choices. We argue this might occur due to higher exposure of Khasi subjects to economic and environmental shocks.

Reference

Andersen, S., Bulte, E., Gneezy, U., & List, J. A. (2008). Do women supply more public goods than men? Preliminary experimental evidence from matrilineal and patriarchal societies. The American Economic Review, 376-381.

Andersen, S., Ertac, S., Gneezy, U., List, J. A., & Maximiano, S. (2013). Gender, Competitiveness, and Socialization at a Young Age: Evidence From a Matrilineal and a Patriarchal Society. Review of Economics and Statistics,95(4), 1438-1443.

Anderson, S. (2003). Why Dowry Payments Declined with Modernization in Europe but Are Rising in India. Journal of Political Economy, 111(2).

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. The Quarterly Journal of Economics, 116(1), 261-292.

Barsky, R. B., Juster, F. T., Kimball, M. S., & Shapiro, M. D. (1997). Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. The Quarterly Journal of Economics, 112(2), 537-579.

Bloch, F., & Rao, V. (2002). Terror as a bargaining instrument: A case study of dowry violence in rural India. American Economic Review, 1029-1043.

Bolton, G. E., & Ockenfels, A. (2010). Betrayal aversion: Evidence from brazil, china, oman, switzerland, turkey, and the united states: Comment. The American Economic Review, 628-633.

Bowles, H. R., Babcock, L., & Lai, L. (2007). Social incentives for gender differences in the propensity to initiate negotiations: Sometimes it does hurt to ask. Organizational Behavior and Human Decision Processes, 103(1), 84-103.

Camerer, C. and M. Weber (1992). Recent developments in Modeling Preferences: Uncertainty and Ambiguity. Journal of Risk and Uncertainty, 5 (4), pp. 325-370.

Chakravarty, S., Harrison, G. W., Haruvy, E. E., & Rutström, E. E. (2011). Are You Risk Averse over Other People's Money?. Southern Economic Journal,77(4), 901-913.

Charness, G., & Gneezy, U. (2012). Strong evidence for gender differences in risk taking. Journal of Economic Behavior & Organization, 83(1), 50-58.

Charness, G., & Viceisza, A. (2012). Comprehension and risk elicitation in the field: Evidence from rural Senegal. mimeo.

Croson, R., and Gneezy, U. (2009). Gender Differences in Preferences. Journal of Economic Literature, 47(2): 448-74.

Daruvala, D.(2007). Gender, risk and stereotypes. Journal of Risk and Uncertainty 35, 265–283.

Doerr, U., Toman, O. M., & Schmidt, U. (2011). Overconfidence and risk management of Ethiopian farmers. Working paper.

Eagly, A. H., & Johnson, B. T. (1990). Gender and leadership style: A meta-analysis. Psychological bulletin, 108(2), 233.

Eagly, A. H., Makhijani, M. G., & Klonsky, B. G. (1992). Gender and the evaluation of leaders: A meta-analysis. Psychological bulletin, 111(1), 3.

Eckel, C. C., & Grossman, P. J. (2002). Sex differences and statistical stereotyping in attitudes toward financial risk. Evolution and Human Behavior,23(4), 281-295.

Eckel, C. C., & Grossman, P. J. (2008). Men, women and risk aversion: Experimental evidence. Handbook of experimental economics results, 1(7), 1061-73.

Ellsberg, D. (1961). Risk, Ambiguity and the Savage Axioms,' Quarterly Journal of Economics, 75, pp. 643-669.

Ertac, S., & Gurdal, M. Y. (2012). Deciding to decide: Gender, leadership and risk-taking in groups. Journal of Economic Behavior & Organization, 83(1), 24-30.

Fox, C. R., & Tversky, A. (1995). Ambiguity aversion and comparative ignorance. The quarterly journal of economics, 110(3), 585-603..

Fox, C. R., & Weber, M. (2002). Ambiguity aversion, comparative ignorance, and decision context. Organizational Behavior and Human Decision Processes,88(1), 476-498.

Galarza, F. (2009). Choices under risk in rural Peru. Munich Personal RePec Archive Working Paper 17708, Munich.

Gloede, O., Menkhoff, L., & Waibel, H. (2013). Shocks, individual risk attitude, and vulnerability to poverty among rural households in Thailand and Vietnam.World Development.

Gneezy, U., Leonard, K. L., & List, J. A. (2009). Gender differences in competition: Evidence from a matrilineal and a patriarchal society.Econometrica, 77(5), 1637-1664.

Gong, B., & Yang, C. L. (2012). Gender differences in risk attitudes: Field experiments on the matrilineal Mosuo and the patriarchal Yi. Journal of Economic Behavior & Organization, 83(1), 59-65.

Gong, B., Yan, H., & Yang, C. L. (2010). Gender Differences in the Dictator Experiment: Evidence from the Matrilineal Mosuo and the Patriarchal Yi.Available at SSRN 1655689.

Guiso, L., & Paiella, M. (2008). Risk aversion, wealth, and background risk. Journal of the European Economic association, 6(6), 1109-1150.

Harrison, G. W., Lau, M. I., Rutström, E. E., & Tarazona-Gómez, M. (2013). Preferences over social risk. Oxford Economic Papers, 65(1), 25-46.

Heath, C., & Tversky, A. (1991). Preference and belief: Ambiguity and competence in choice under uncertainty. Journal of risk and uncertainty, 4(1), 5-28.

Jianakoplos, N. A., & Bernasek, A. (1998). Are women more risk averse?.Economic inquiry, 36(4), 620-630.

Lammers, J., Lau, M., & Verbon, H. (2006, June). Perceived HIV-contamination risk, risk aversion and time preferences (A Laboratory Experiment in South Africa). In Conference paper.

Leonetti, D. L., Nath, D. C., Hemam, N.S., Neill, D. B., (2004), 'Do women really need marital partners for support of their reproductive success? the case of the matrilineal khasi of n. e. india, in Michael Alvard (ed.) Socioeconomic Aspects of Human Behavioral Ecology (Research in Economic Anthropology, Volume 23), Emerald Group Publishing Limited, pp.151-174.

Planning Commission of India. (2007a). Spatial development and regional imbalances. The Eleventh Five Year Plan of India, pp. 137–151.

Planning Commission of India. (2007b). Environment and climate change, The Eleventh Five Year Plan of India, pp. 191–207.

Powell, M., & Ansic, D. (1997). Gender differences in risk behaviour in financial decision-making: An experimental analysis. Journal of economic psychology,18(6), 605-628.

Rao, N. (2005). Questioning Women's Solidarity: The Case of Land Rights, Santal Parganas, Jharkhand, India. The Journal of Development Studies, 41(3), 353-375.

Ravindranath, N. H., Rao, S., Sharma, N., Nair, M., Gopalakrishnan, R., Rao, A. S., ... & Bala, G. (2011). Climate change vulnerability profiles for North East India. Current Science (Bangalore), 101(3), 384-394.

Roy, A., Murry, B. (2013). Gender disparity in Socio Demographic variables among the Tribals of Eastern India: a case study of the Santals. International Journal of Human Sciences. 10(1), 343-355.

Schubert, R., M. Brown, M. Gysler & H. W. Brachinger (1999) 'Financial Decision-Making: Are Women Really More Risk-Averse?,' American Economic Review (Papers and Proceedings) 89 (2), 381-385.

Shupp, R. S., & Williams, A. W. (2008). Risk preference differentials of small groups and individuals. The Economic Journal, 118(525), 258-283.

Sutter, M. (2009). Individual behavior and group membership: Comment. The American Economic Review, 2247-2257.

Sutter, M., Kocher, M. G., Glatzle-Rutzler, D., & Trautmann, S. T. (2013). Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. The American Economic Review, 103(1), 510-531.

Tversky, A., D. Kahneman (1992). Advances in Prospect Theory: Cumulative Representations of Uncertainty. Journal of Risk and Uncertainty, Vol. 5 (4), pp. 297-323.

VAN HAM, P. (2000): The Seven Sisters of India: Tribal Worlds Between Tibet and Burma. Munich, London, and New York: Prestel Publishers.

Wakker, P. P. (2010). Prospect theory: For risk and ambiguity (Vol. 44). Cambridge: Cambridge University Press.

Yesuf, M., & Bluffstone, R. A. (2009). Poverty, risk aversion, and path dependence in low-income countries: Experimental evidence from Ethiopia. American Journal of Agricultural Economics, 91(4), 1022-1037.

APPENDIX

Table 6: OLS estimation of risk and ambiguity attitude with socioeconomic controls

	IR	GR	IA	GA	IR	GR	IA	GA
Male	-0.21***	-0.21***	-0.02	0.02	-0.18***	-0.16***	-0.04	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Matrilineal	0.09*	0.08*	-0.04	-0.00	0.15**	0.14**	-0.08	-0.08
	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)	(0.06)	(0.07)	(0.06)
Matrilineal*Male	0.11	0.11*	0.03	-0.03	0.08	0.08	0.01	0.01
	(0.07)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
Male majority	0.05	0.23***	0.18***	0.04	0.08	0.24***	0.13*	-0.00
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
Bag A first	0.11*	0.16***	0.03	0.03	0.11*	0.18***	0.06	0.01
	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
Age					-0.01	-0.01	-0.02**	0.00
					(0.01)	(0.01)	(0.01)	(0.01)
Age sq					0.00	0.00	0.00*	-0.00
					(0.00)	(0.00)	(0.00)	(0.00)
Household size					-0.00	0.01**	0.00	0.01
					(0.01)	(0.01)	(0.01)	(0.01)
Primary education					-0.06	-0.14***	0.02	-0.02
					(0.05)	(0.05)	(0.06)	(0.05)
Higher than Primary education					-0.03	-0.05	0.05	0.02
					(0.04)	(0.04)	(0.04)	(0.04)
Marriage					0.01	0.04	0.03	0.01
					(0.04)	(0.04)	(0.05)	(0.05)
Group participation					0.09**	0.08**	-0.04	-0.05
					(0.04)	(0.04)	(0.04)	(0.05)
Farm activity					0.02	0.01	0.00	-0.03
					(0.04)	(0.04)	(0.05)	(0.04)
Own bank account					0.04	-0.01	-0.07*	0.04
					(0.04)	(0.04)	(0.04)	(0.04)
Constant	0.45***	0.38***	-0.03	0.01	0.47***	0.35**	0.27*	-0.01
	(0.05)	(0.05)	(0.06)	(0.05)	(0.14)	(0.16)	(0.16)	(0.17)
Observations	604	604	604	604	578	578	578	578
R-squared	0.13	0.16	0.07	0.07	0.15	0.17	0.10	0.08

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; The sample size reduces form 604 to 578 as some of the participants failed to finish the post experimental survey.

Risk and Ambiguity Game Instruction

You will play four different games and each time you will fill up a decision sheet with 10 different choices. At the end of the four games we will pay you for one of the games and one of the 10 choices in that game. The game and then the choice will be chosen randomly by us.

Instruction for risk game:

This bag, which we call Bag A, contains 20 balls- 10 pink and 10 yellow. Your task is to decide whether you prefer to receive a fix payment or whether you prefer to draw a ball from the bag. If the decide to draw a ball you have to guess the color before drawing. If the color, you will receive Rs. 50. If the ball has a different color, there will be no payment.

You will be asked to take this decision for different value of the fix payment 10 times. So please pay attention while you are taking different decisions. If this game is chosen for payment we will pay you for only one of them.

You would need to register your decision using a sheet like this one. If you prefer to receive a fix payment, please mark the box on the right. If you prefer to draw a ball, please select the box in the left. When you make the draw we will ask the color before the draw. If you say pink and the ball you draw is also pink, you will gain the Rs. 50. However if the ball is yellow I do not receive any payment.

Let´s look at the first decision. You can either choose to take Rs. 5 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the second decision you can either choose to take Rs. 10 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in right.

In the third decision you can either choose to take Rs. 15 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the fourth decision you can either choose to take Rs. 20 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the fifth decision you can either choose to take Rs. 25 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the sixth decision you can either choose to take Rs. 30 or to draw a ball from the bag If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the seventh decision you can either choose to take Rs. 35 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the eighth decision you can either choose to take Rs. 40 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the ninth decision you can either choose to take Rs. 45 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

In the tenth decision you can either choose to take Rs. 50 or to draw a ball from the bag. If you prefer to draw a ball, please mark the box in the left. If you want the fix amount mark the box in the right.

Now we would distribute the decision sheet. Please pay attention while making your decisions. Please indicate your choice for each of the 10 options. If you need assistance raise your hand we will come to you.

Now you will carry out the same task but this time you make the decision for your group. You have to decide whether you prefer to a fix payment for each person in your group or drawing of a ball from the bag that contains 10 pink balls and 10 yellow balls. If the ball that you draw has the same color as the color you guessed before drawing, each person in the group will receive Rs. 50. If the ball is yellow nobody will receive payment.

If this game is chosen for payment, we will select one member from each group and select one of the 10 choices randomly for payment. All persons in the group will receive same the payment.

Similarly, as before you need to mark your decision using this decision sheet. If you prefer the fix payment for all persons in your group please mark the right box. If you prefer to draw a ball, please market in the right box.

Instruction for ambiguity game:

Consider this bag which we call bag B. In bag B there 20 balls- pink and yellow balls, however, you will not know how many pink and how many yellow balls are there in the bag. Only information you have now is that there are 20 balls. We again ask you to make your choice between a fix amount and drawing of a ball. As before first you will make the decision for yourself then on behalf of the group. Each time you will fill up a decision sheet with 10 options.

Repeat the individual game and then the group game

Thank you for participating in the game.