Certain and Uncertain Utility and Insurance Demand: Results From a Framed Field Experiment in Burkina Faso

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Abstract

In this paper, we argue that discontinuous preference over certain and uncertain outcomes (as in Andreoni and Sprenger, 2009; 2012) have a dampening effect on the demand for insurance. The intuition is that if agents exhibit a disproportionate preference for certain outcomes, they would undervalue uncertain insurance indemnity payments compared to certain premium cost and exhibit lower demand for insurance compared to a classic expected utility maximizer. Inspired by the seminal work of Andreoni and Sprenger, we design games to identify agents with a disproportionate preference for certain outcomes and play them with 571 cotton farmers in Western Burkina-Faso. We then provide experimental evidence that this is a powerful framework to understand demand for micro-insurance. Specifically we show that agents with discontinuous preference respond positively to an alternative presentation of a classic insurance contract: they are willing to pay more for a given contract if the premium cost is artificially made uncertain by being directly deducted from indemnity payments. We also explore alternative behavioral arguments such as loss aversion but argue that they offer less appealing framework to understand the full set of our results. Our results have practical implications for the design of insurance contracts.

Keywords: Index Insurance, Risk and Uncertainty, Discontinuity of preferences, Field Experiments

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1 Introduction

Despite a decade of effort to promote micro-insurance as a tool for poverty reduction in developing countries, the take up of the micro-insurance product remains unexpectedly low (Gine et Yang, 2009; Cole et. al 2013; Hill and Robles, 2011). In the last years, a growing body of research investigates the reasons behind these disappointing results. Cole et al. (2013) use randomized control trials to explore the reasons for the low take-up of rainfall insurance in rural India. They suggest that lack of product understanding, liquidity constraints and trust are the most important reasons of the rainfall insurance low take up. Dercon et al. (2011) shows that lack of trust also has direct implication on the take-up of a health insurance product in Kenya. Some studies have insisted on the relevance of behavioral explanations to understand insurance uptake in low income countries. For example, Elabed and Carter (2014) show that ambiguity aversion decreases the demand for index insurance.

In this paper we argue that the dichotomy between certain premium payment and uncertain indemnity benefits may dampen the willingness to pay for an insurance contract if agents exhibit discontinuous preferences over certain and uncertain outcomes. The concept of discontinuous preferences over certain and uncertain outcomes was first introduced by Andreoni and Sprenger (2009;2012). They show that violation of expected utility theory in the neighborhood of certainty can be explained by discontinuous preferences (Andreoni and Sprenger, 2009) and, that while subjects exhibit a strong preference for certainty when it is available, they behave largely as simple expected utility maximizer away from certainty (Andreoni and Sprenger, 2012).

The application of this concept to insurance demand was motivated by farmers' repeated complaints over the necessity to pay a premium even in adverse situations typically covered by the insurance. "You mean I have to pay the premium even when there is a drought!" was a typical comment. This attitude indicates that farmers associate a special weight to the payment of the premium. Because the payment of the premium is certain, while the indemnity benefit are uncertain, discontinuous utility over certainty may offer a compelling framework to understand farmer's attitude. To test this idea, we conduct a framed field experiment in Western Burkina Faso, as part of a baseline data collection for the evaluation of an insurance project.[1]To test the relevance of the arguments discussed above, we designed games to elicit this discontinuity of preferences over certain and uncertain outcomes and to examine whether the willingness to pay for an insurance contract is modified when the premium is made uncertain. The first set of games is directly inspired by Holt and Laury (2002). In the insurance willingness to pay game, we propose two insurance contracts. The classic contract entails a premium that is always charged and

[1]This insurance is an innovative multi scale index insurance contract that reduces basis risk relative to conventional, single-scale index insurance contract.

indemnities paid in bad states of nature. The alternative contract involves the same net outcomes in each states of nature but the premium is then uncertain: the premium is paid only in good states while the indemnities are reduced by the amount of the premium in the bad states.

The risk aversion games reveals that 30% of the farmers have discontinuous preferences over certain and uncertain outcomes. The results of the insurance games indicate that players' willingness to pay for insurance is 10% higher when they are offered the alternative contract. In addition, it is precisely agents with discontinuous preferences over certain and uncertain outcomes who drive this average difference in willingness to pay.

This paper is related to a few separate lines of research. First it contributes to a growing list of empirical studies that attend to bring additional insights to the study of the insurance demand. In particular, previous studies have investigated different factors potentially linked to the low uptake of the micro insurance such as the presence of basis risk (Gine et al. 2008); lack of insurance understanding and trust (Cole et al. 2013; Dercon et al. 2011); liquidity constraints (Carter et al. 2011), and compounded risk aversion (Elabed and Carter, 2014). Other related works belong to the studies of decision making under risk. At this regard, the main references are the theoretical investigation on the discontinuity of preferences by Schmit (1998) and the experimental tests of discontinuity of preferences by Andreoni and Sprenger (2009; 2012).

Our results suggest that discontinuous preferences over certain and uncertain outcomes can have an effect on the insurance demand and, in turn, on the welfare of the farmers.

The rest of the paper is structured as follows: Section 2 presents a conceptual framework analyzing the discontinuity of preferences in the insurance context. Section 3 and section 4 describes our experimental design and the results. Section 5 presents a discussion of the results. Section 6 introduces the welfare implication of our experiment. And Section7 concludes.

2 Conceptual framework: Insurance Demand under Expected Utility Theory and Discontinuity of Preferences over Certain and Uncertain Outcomes

The goal of this section is to introduce a simple conceptual framework to explore the relationship between insurance demand and discontinuous preferences over certain and uncertain outcomes. In particular we examine how the introduction of an alternative insurance contract that involves an uncertain premium may increase insurance demand for agents with discontinuous preferences for certainty.

We consider two farmers with different preferences. The first farmer is a standard expected utility maximizer while the second farmer has discontinuous preferences over certain and uncertain outcomes. The preferences of the first farmer are captured by a concave Von Newman Morgenstern Utility function $u(.)$.The preferences of the second farmer are discontinuous, whereby certain outcomes are evaluated with a utility function $v(.)$ while uncertain outcomes are evaluated with $u(.)$. We follow Anderoni and Sprenger (2009; 2012) and set $v(x) = x^{\alpha}$ and $u(x) = x^{\alpha-\beta}$ with $0 \leq \beta < \alpha < 1$. With these notations, β can be interpreted as the penalty associated with uncertain outcomes. We further assume that the farmer's utility in a given state of the world is additively separable in its certain and uncertain elements.

Farmers have a monetary endowment w and a stochastic farm income. There are two states of the world. In particular, with probability p_b yields are low and farmers earn a farm income y_b, and with probability $1 - p_b$ yields are high and farmers earn a farm income y_g . In this context farmers may buy an insurance contract to smooth consumption. We abstract from time dimension and suppose that the insurance premium is paid after the harvest.[2]

Demand for a traditional insurance contract (contract A) We first consider a traditional insurance contract that involves a premium π and an insurance payment I^A in the bad state of the world. To decide whether to take up insurance, farmers compare their utility with and without the insurance contract. Calling EU_{NI} the expected utility of the first farmer when he is not insured and EU_I^A his expected utility when he is insured, this farmer buys insurance if and only if:

$$EU_{NI} \geq EU_I^A$$
$$p_b u(w + y_b) + (1 - p_b)u(w + y_g) \geq p_b u(w + y_b + I^A - \pi) + (1 - p_b)u(w + y_g - \pi)$$

In contrast, the second farmer values his monetary endowment and the premium with the function v and the stochastic farm revenue and indemnity with u. Calling W_{NI} his utility when he is not insured and W_I^A his expected utility if he is insured, he buys insurance if and only if:

$$W_{NI} \geq W_I^A$$
$$v(w) + p_b u(y_b) + (1 - p_b)u(y_g) \geq v(w - \pi) + p_b u(y_b + I^A) + (1 - p_b)u(y_g)$$

Demand for an alternative insurance contract with uncertain premium (contract B) Consider an alternative insurance contract that involves the same premium π but, in this case, π is only

[2] In the real insurance contract offered to the cotton farmers the premium is a part of the input loan.

paid in the good state of the world. The new indemnity $I^B = I^A - \pi$ is received in the bad state of the world. Note that this contract involves exactly the same net income flow as the traditional contract. In the good state an insured farmer consumes $w + y_g - \pi$, in the bad state he consumes $w + y_b + I^B = w + y_b + I^A - \pi$. As a result an expected utility maximizer like the first farmer is indifferent between contract B and contract A. In contrast an agent with discontinuous preferences over certain and uncertain outcome now values the premium with a different function. In particular, his utility with insurance becomes:

$$W_I^B = v(w) + p_b u(y_b + I^B) + (1 - p_b)u(y_g - \pi) = v(w) + p_b u(y_b + I^A - \pi) + (1 - p_b)u(y_g - \pi)$$

The premium payment is now valued with the function u instead of v and the associated disutility is discounted by the penalty for uncertainty. This raises the attraction of the alternative contract. However v and u are valued at different levels of consumption and if the certain consumption level is relatively high the disutility of paying the premium out of it may be relatively low. Using the functional forms introduced above, it is easy to show that a sufficient condition for $W_I^A < W_I^B$ is $w < y_b + I^A - \pi$.

We design an experiment to elicit farmers' demand for a classic insurance contract and an alternative one involving an uncertain premium. Specifically we randomize the contract proposed to farmers and compare their average willingness to pay under a classic and alternative contract. In addition we adapt Andreoni and Sprenger's games (2009;2012) and use them to identify agents with discontinuous preferences in order to test whether these agents are responding more favorably to the alternative contract than standard expected utility maximizers.

3 Experimental design and data

3.1 Experimental Procedure

We run the experiment with 56 randomly selected cotton groups (GPCs) allocated in 30 villages in the provinces of Tuy and Bale in the Southern-West Burkina-Faso. Within each cooperative thirteen farmers were randomly chosen to be part of a base-line survey for an impact evaluation of a micro-insurance program and to participate in the experimental games. As a result a total of 571 cotton farmers participated in the game and we have detailed information on individual, farm and household characteristics for all of them. Table 17in Appendix A provides descriptive statistics for the participants.

Both data collection and experimental games took place in January and February 2014. Three rural area animators translated the experimental protocol from French to Doula and More, the local languages, and ensured that it was easily understood by cotton farmers. Game trials were conducted with university students in Namur, Belgium and with cotton farmers who were not part of the final experimental sample.

The experiments took place in an open space with at most thirteen members of the same cotton cooperative, and they lasted around two and a half hours. Farmers took part in three activities.The first two activities were built in order to elicit risk aversion and to test for discontinuity of preferences over certain and uncertain outcomes.The third activity was meant to elicit the insurance demand and the willingness to pay for the insurance.

Games were incentivized as farmerswere paid at the end of the three activities only for one activity randomly selected. We used this truthful incentive device in order to encourage the players to choose carefully. The animator announced the payment procedure to the players at the beginning of each activity. At the end of the session, participants received their game winnings in cash, in addition to a show up fee of 100 FCFA. Minimum and maximum earnings, excluding show up fee, were 0 FCFA and 3200 FCFA and mean earnings were 1792 FCFA[3]. The daily wage for a male farm labor in the areas where we ran the experiments is around 1000 FCFA.

3.2 The Games

In this section we present the structure of the games. In the first two games we test for preference discontinuity and we randomize the order of the games. In the third game we elicit the willingness to pay for the insurance and we randomize the insurance frames.[4]

3.2.1 Game 1 and 2: Testing for Discontinuity of Preferences

The combination of the outcomes of the first two games enables to identify players with discontinuous preferences. The general idea is to compare players behavior when they are asked to choose between two risky lotteries (risky vs risky game) to their behavior when they are asked to choose between a risky and a degenerate lottery (risky vs degenerate game). The basic intuition is that players with discontinuous preferences for certainty exhibit a disproportionate preference for the degenerated lottery. We first present in details the first two games before precisely describing how outcomes are used to distinguish expected utility maximizer from agents with discontinuous preferences.

[3]The gains correspond to the amounts shown to the player divided by 100 FCFA.

[4]Tables 16and 18in Appendix A show respectively the randomized sample and the balance of the randomization .

Risky vs risky lottery game (RR) In this game we simply present subjects with a menu of choices that permits measurement of risk aversion. In particular the game is based on eight choices between paired lotteries as described in Table 1.

Note that for the first two choices, lottery R dominates lottery S as it involves larger pay-offs than lottery S in both states of nature. Starting with the third pair, the player faces a classic risk-return trade-off as lottery R implies a greater expected payoff but a lower payoff in the bad state of the world. As we move from one pair of choices to the next, only the payoff of R in the bad state changes making lottery R less and less attractive to a risk averse agent.

The switching point from the riskier to the safer lottery provides an estimate of subjects' degree of risk aversion. To avoid multiple switching points we ask the subjects to indicate the pair starting from who they would choose lottery S to lottery R. Column (4) of Table 1 reports the ranges of RRA of players who switch at each pair. In order to compute the coefficients of risk aversion we assume constant relative risk aversion, and we use an utility function $u(x) = \frac{x^{1-\alpha}}{1-\alpha}$. This specification implies risk aversion for $\alpha \geq 1$, risk neutrality for $\alpha = 0$ and risk loving for $\alpha < 0$[5]. The coefficient of risk aversion reported in Column(5) in Table 1 is the average of the CRRA ranges.[6]

Note that in this design probabilities are held constant across decision rows and we vary only the lowest outcome of the risky lottery. In other words we use a simple outcome scale game to measure the risk aversion. Design of this sort are very common in the decision analysis and have been used in experimental economics by Schubert et al. (1999), even if it is more common to vary probabilities over decision rows and to hold outcomes constant as in Holt and Laury (2002).Our choice of an outcome scale was motivated by the low literacy of the players: field tests revealed that variations of prizes were more easily understood than variation of probabilities.

The game was implemented using visual aids and examples. In particular, players were facing 8 boxes, one for each of the pairs of lottery. Each box contained two bags, a blue one and a green one. The blue one corresponded to the safer lottery and the green one to the riskier lottery. In each bag there were two balls, one pink, corresponding to the low outcome and one orange, corresponding to the high outcome. We used pair one as an example and indicated that lottery R was undoubtedly superior in that case. We then showed the outcomes of all eight boxes and discussed the tradeoffs in choosing one over another.We then asked the players to indicate the number of the box from which they wanted to switch from the riskier to the safer lottery. Players must individually chose their preferred bags' combination indicating it on a paper reporting all the possible combinations.

[5]When α=1,the natural logarithm is used to evaluate risk preferences.

[6]There is not a coefficient of risk aversion associated to the first two pairs, since lottery R respectively strictly and weakly dominates lottery S.

Pair	Riskier(R) (1)				Safer (S) (2)				$EV^R - EV^S$ (3)	CRRA (4)	avg CRRA (5)	Risk Pref. (6)
	p	l	1-p	h	p	l	1-p	h				
1	1/2	90000	1/2	320000	1/2	80000	1/2	240000	45000	-	-	NotEut
2	1/2	80000	1/2	320000	1/2	80000	1/2	240000	40000	-	-	NotEut
3	1/2	70000	1/2	320000	1/2	80000	1/2	240000	35000	$1.58 < \alpha$	+inf	ExtrRA
4	1/2	60000	1/2	320000	1/2	80000	1/2	240000	30000	$0.99 < \alpha < 1.58$	1.28	HighRA
5	1/2	50000	1/2	320000	1/2	80000	1/2	240000	25000	$0.66 < \alpha < 0.99$	0.82	VeryRA
6	1/2	40000	1/2	320000	1/2	80000	1/2	240000	20000	$0.44 < \alpha < 0.66$	0.55	RA
7	1/2	20000	1/2	320000	1/2	80000	1/2	240000	10000	$0.15 < \alpha < 0.44$	0.29	SlightRA
8	1/2	0	1/2	320000	1/2	80000	1/2	240000	0	$0 < \alpha < 0.15$	0.075	RN

The CRRA ranges are computed assuming a CRRA utility function of the form $U(x) = \frac{x^{1-\alpha}}{1-\alpha}$ with coefficient of relative risk aversion equal to α. The CRRA range associated to each lottery pairs are computed considering the moment in which the player switches to S . We found the CRRA ranges equalizing the expected utilities. For example, considering the fourth pair, the lower bound of the range is found equalizing the expected utility associated to the fourth pair in lotteryR with the one in lottery S, $EU_R^4 = EU_S^4$, and solving for 0; while the upper bound is found equalizing the expected utility associated to the third pair in lottery R with the expected utility associated to the third pair in lottery S,$EU_R^3 = EU_S^3$,and solving for zero.

Table 1: Risky vs Risky Lottery

Risky vs degenerate lottery game (RD) This game is very similar to the previous one, except that a degenerated lottery replace the "safer" lottery, while the ranges of risk aversion are the same as in RR game. Table 2 presents the outcomes for each lottery pairs.

From pair 3 to 8 , the outcome of the degenerated lottery is such that an expected utility maximizer (with CRRA preferences as described above) would choose the same switching pair as in RR Game.[7] In contrast, an agent with discontinuous preferences over certain and uncertain outcomes could switch earlier in the RD game. This is because a player with strong preferences for certainty would attach a special value to the sure alternative. She would thus be willing to give up extra expected return for this alternative, compared to what her risk aversion level would predict. Note that, as in the RR game, in the first two pairs, lottery R dominates lottery D. Again the first pair was used as an example. While choosing D over R in the second pair may appear irrational, Gneezy et al. (2006) show that individuals value risky prospects less than its worst possible realization.[8]

As for the other game, we illustrate the eight pairs of the game with eight boxes. Each box a

[7]We test the sensibility of the choice to the functional form chosen for the utility function. Specifically if we consider constant absolute risk aversion instead of constant relative risk aversion, most expected utility maximizers would still switch exactly at the same pair in the first and in the second game. Appendix D presents the ranges of absolute risk aversion associated with each switching point in the two games.

[8]Gneezy et al. (2006) show that the average willingness to pay for a gift certificate of 50$ was 38$, and the average willingness to pay to participate in a lottery with 1/2 probability to receive a gift certificate of 50$ and 1/2 probability to receive a gift certificate of 100$ was 28$. In practice, individuals were valuing the risky prospects less than its worst possible realization. This is called uncertainty effect. Andreoni and Sprenger (2009) show that the discontinuity of the preferences over certain and uncertain outcomes can explain the uncertainty effect shown by Gneezy et al (2006). In Appendix B we run some Robustness checks including these agents as Discontinuous Preferences for Certainty agents.

Pair	Riskier(R) (1)				Degenerate (D) (2)	$EV^R - EV^D$ (3)	CRRA (4)	avg CRRA (5)	Risk Pref. (6)
	p	l	1-p	h					
1	1/2	90000	1/2	320000	60000	145000	-	-	NotEut
2	1/2	80000	1/2	320000	80000	120000	-	-	NotEut
3	1/2	70000	1/2	320000	127200	67800	$1.58 < \alpha$	+inf	ExtrRA
4	1/2	60000	1/2	320000	139000	51000	$0.99 < \alpha < 1.58$	1.28	HighRA
5	1/2	50000	1/2	320000	146000	39000	$0.66 < \alpha < 0.99$	0.82	VeryRA
6	1/2	40000	1/2	320000	150700	29300	$0.44 < \alpha < 0.66$	0.55	RA
7	1/2	20000	1/2	320000	157400	12600	$0.15 < \alpha < 0.44$	0.29	SlightRA
8	1/2	0	1/2	320000	160000	0	$0 < \alpha < 0.15$	0.075	RN

Table 2: Risky vs Degenerate Lottery

contained two bags, a green one and a red one. The green sack corresponded to the risky lottery and was identical as the green bag of the first game. The red bag corresponded to the degenerate lottery and only contained one yellow ball. The way in which we proceed for the game was exactly the same used in the RR game.

3.2.2 Game 3: Eliciting willingness to pay (WTP) for the insurance

In the third game we want to compare farmers' WTP for a traditional insurance contract and an alternative contract that is actuarially equivalent but involves an uncertain premium. As described in Section 1, our idea is that agents with discontinuous preferences for certainty would be willing to pay more for an insurance presented with uncertain premium.

As in the example developed in Section 1, the traditional contract involved a premium that had to be paid regardless of the state of the world while the premium in the alternative contract was only paid in the good state. In the bad state the insurance pays an indemnity that is lowered by the amount of the premium in the case of the alternative contract

The activity started with a careful description of the stochastic yield realization and the implied revenue for the player who all were endowed with one hectare of land planted in cotton in the game. Before to play the insurance activity the participants learned how to determine their yields and the resulting revenue. In particular, farmers drew their yield realizations from a bag containing 4 orange balls and 1 pink ball. The orange balls correspond to a good yield, y_g , equal to 1200 Kg/ha, while the pink ball corresponds to a bad yield, y_b , equal to 600 Kg/ha. Considering the historical yield in the area of study, the probability to have a good yield was set at 4/5 and the probability to have a bad yield was set at 1/5.

A player profit without any insurance contract was equal to the cotton revenue minus the input

	FrameA		**FrameB**	
	good yield	bad yield	good yield	bad yield
Indemnity	0	50000	0	30000
Premium	20000	20000	20000	0

Table 4: Premium and Insurance Indemnity

expenses (set to 100.000 FCFA). Cotton price was set to 240 FCFA. Finally players had an initial monetary endowment, w, equal to 50.000 FCFA[9] .

$$profit = py_i - Inputs$$

The Table3 presents the revenue components in both states of the world, in the absence of any insurance contract.

	Good Yield	**Bad Yield**
Profit	188000	144000
w	50000	50000
Total Revenue	238000	94000

Table 3: Revenues

The insurance contract involved an indemnity paid in the case of a bad yield and a premium, π, which was either payed regardless of the state of nature (traditional frame) or waived in the bad state of nature (alternative frame)[10] In the traditional frame (frame A), the payment of the premium was certain. The indemnity was then set to 50.000 FCFA. In contrast, in the alternative frame (frame B), the payment of the premium was uncertain. The indemnity was then set to 30.000 FCFA. In other words, the net insurance payment (indemnity - premium) was the same under both frames. Table 4 summarizes the contract terms under both frames.The premium, π, was fixed at 20.000 CFA. The actuarially fair price of the insurance was 10.000 CFA.

[9]Fake money were distributed at the beginning of the third game.

[10]As mentioned above, the frame was randomly allocated across cotton groups (at a given farmer was presented only one frame).

During the game farmers had to decide whether or not to buy the insurance contract for various prices. The willingness to pay corresponds to the highest price farmers are willing to pay for the insurance. We decrease the price of the insurance contract from its base price of 30.000 CFA to 0 CFA, by decreases of 5.000 CFA (30.000-25.000-20.000-15.000-10.000-5000-0)[11]. The farmer must decide whether to buy the insurance and in latter case he had to choose the maximum price to pay for the insurance.

The visual representation of the game was exactly the same used for the other two games. In other words we used eight boxes, each one with two bags, a green one representing the not insurance and a blue one representing the insurance. In particular, in each pair farmers could see the insurance price, the savings[12] and the family money with and without the insurance. The first box was used as example and corresponded to a price of 50.000 CFA.

4 Analysis of experimental results

4.1 Results of game 1 and game 2: Eliciting Agents' Type

Table 5 reports the frequency of farmers switching at each of the possible eight pairs in the first two games. The first column of the table reports the switching points of the risky vs degenerate game and the second column the switching points of the risky vs risky game. Players are relatively evenly distributed over the range of switching points with a concentration of about 30% of the sample between points 3 and 4.

The majority of farmers present a coefficient of risk aversion between high and very high. Moreover, 11% and 13 % of the players respectively in RR game and in RD game appear risk lovers. These farmers never switched in the games. In Table 5 they are identified with pair 9.

Table 6 presents the cross tabulation of switching points in both games. Expected utility maximizers (Eut) are on the diagonal since they are switching at the same pair in both games. We then have two kinds of agents with discontinuous preferences. Agent with discontinuous preferences revealing strong preferences for certainty, named agents with "Discontinuous Preferences for Certainty" (DPC), and the ones having strong preferences for uncertainty, named "Players". DPC are below the diagonal since they switched earlier in the Risky vs Degenerate game than in the Risky vs Risky one. The Players are in the area above the diagonal.

Based on the combination of switching points in the two games, Table 8 presents the frequencies

[11] In Appendix A we report the detailed information available for the farmers at each pair.
[12] Saving are considered as family money at the net of the insurance price.

	Switching Risky vs Degenerate			Switching Risky vs Risky		
	Freq	pct	cumpct	Freq	pct	cumpct
2	65	11.38	11.38	84	14.71	14.71
3	78	13.66	25.04	76	13.31	28.02
4	89	15.59	40.63	96	16.81	44.83
5	82	14.36	54.99	89	15.59	60.42
6	59	10.33	65.32	55	9.63	70.05
7	59	10.33	75.66	43	7.53	77.58
8	64	11.21	86.87	64	11.21	88.79
9	75	13.13	100.00	64	11.21	100.00
Total	571	100.00		571	100.00	

Table 5: Switching Points

		Risky vs Degenerate Game									
		2	3	4	5	6	7	8	9	Total %	Total freq
Risky vs Risky Game	2	**50.77**	17.95	10.11	3.66	3.39	10.17	12.50	12.00	14.71	84
	3	*12.31*	**26.92**	22.47	12.20	10.17	10.17	3.12	4.00	13.31	76
	4	*12.31*	*24.36*	**31.46**	21.95	15.25	10.17	7.81	4.00	16.81	96
	5	*3.08*	*11.54*	*17.98*	**32.93**	30.51	8.47	10.94	6.67	15.59	89
	6	*1.54*	*10.26*	*4.49*	*8.54*	**20.34**	18.64	10.94	6.67	9.63	55
	7	*3.08*	*3.85*	*3.37*	*6.10*	*13.56*	**15.25**	12.50	6.67	7.53	43
	8	*7.69*	*2.56*	*6.74*	*9.76*	*5.08*	*22.03*	**31.25**	9.33	11.21	44
	9	*9.23*	*2.56*	*3.37*	*4.88*	*1.69*	*5.08*	*10.94*	**50.67**	11.21	44
	Total %	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	
	Total freq	65	78	89	82	59	59	64	75		571

Table 6: Cross Tabulation Switching Points

Agent Types	**Standard**	**Conservative**
Expected Utility Agent	33%	63%
Discontinuous Preferences for Certainty Agent	29%	16%
Player Agent	38%	21%
N	571	571

Table 8: Agent types

of agent types using two classification criteria. The first is the standard classification and it considers as expected utility maximizers only those switching at the same pair in both games, while the second is a conservative classification since it allows for small departures from the standard model by calling expected utility maximizers even those who switch just below or above the diagonal.

4.2 Results of the game 3: WTP by Agents' Type

Table 9 reports the average willingness to pay for the insurance for the whole sample, for the sub-sample of farmers offered the traditional contract, FrameA, and for the sub-sample of farmers offered the alternative contract, Frame B.[13] The average willingness to pay for the insurance was 15.796 FCFA. This price was 5.796 FCFA above the actuarially fair price of the insurance set at 10.000 FCFA. The average willingness to pay for the the alternative insurance contract was 16.549 FCFA and for the traditional one was 15.052 FCFA, with a significative difference in the WTP of 1.457 FCFA. An interesting contrast emerges if we incorporate informations from Risky vs Risky game and Risky vs Degenerate game to compare the WTP of the various "types" of farmers. Table 9 distinguishes between Discontinuous Preferences for Certainty agents, Players and Expected Utility agents. While EUT and Players are not willing to pay significantly more for the insurance contract presented with uncertain premium, Discontinuous Preferences for Certainty agents are willing to pay 30% more when the contract was presented with frameB than with frameA. In other words, the average difference in WTP seems driven by agents with Discontinuous Preferences for Certainty, since the difference in WTP across the two insurance contracts is significantly different from zero only for agents with Discontinuous Preferences for Certainty, as we can clearly see in the last row of the Table 9 where we report the p-values of the

[13] About 10% of farmers chose never to buy the insurance. We consider that they have a willingness to pay equal to zero.

	All agents	DPC	Players	EUT
WTP	15.796 (10.438) 571	15.271 (10.677) 166	15.576 (9.659) 217	16.515 (11.088) 188
WTP under Frame A	15.052 (10.356) 287	13.526 (10.540) 95	15.631 (9.642) 103	16.011 (10.875) 89
WTP under Frame B	16.549 (10.486) 284	17.605 (10.483) 71	15.526 (9.716) 114	16.969 (11.312) 99
ttest(p-value)	0.08	0.01	0.9	0.5

Table 9: Average WTP for the Insurance

ttest of equality of means.[14]

4.2.1 Discontinuity of Preferences and Insurance Demand: Econometric Analysis

In order to test whether the average difference in WTP across frames and agent types holds, we control for individual characteristics and order effects. We use as dependent variable the individual willingness to pay for the insurance, $price_i$, and we control for the frame used to present the insurance, $frameA$, the agent types (agent with Discontinuous Preferences for Certainty is the reference category), the interaction between the agent types and the frame, and a series of individual characteristics[15], X. We also control for order effects between the Risky vs Risky and the Risky vs Degenerate game. In particular, $OrdereffectsRR_i$ is a dummy variable that takes value one if we started with the risky vs risky game and value zero if we started with the risky vs degenerate game.

We thus estimate the following tobit model:

$$price_i = \alpha_0 + \alpha_1 FrameA_i + \alpha_2 Eut_i + \alpha_3 frameA_i * Eut_i + \alpha_4 Players_i + \\ + \alpha_5 frameA_i * Players_i + \alpha_6 OrdereffectsRR_i + X\beta + \epsilon_i$$

[14]We perform the ttest of equality of means. In particular we test whether the average willingness to pay for the insurance is the same within the two frames. We consider the full sample and each agent's type.

[15]The individual characteristics used in the regression are age, years of schooling, religion, ethnicity, household size, agricultural surface 2013, years spent inside the cotton group

where the dependent variable is censored by below at zero, since we do not observe the WTP for those agents not buying the insurance.

Table 10 presents the estimated coefficients of the Tobit regressions using the standard definition of our agents. In the first column of Table 10 we report the results without controlling for individual characteristics and in the second column we add individual characteristics as controls[16]. Table 11 isolates the marginal effects of FrameA on the WTP for the insurance separately for each agent type: agents with Discontinuous Preferences for Certainty, Players and Expected utility agents. All standard errors are clustered at cotton group level (GPC). We can see that agents with discontinuous preferences for certainty are willing to pay 4.538 FCFA less for an insurance presented with frameA than with frameB. This coefficient is significatively different from zero. Neither EUT agents nor Players are willing to pay significatively more when the insurance is presented with frameB. Interesting the order of the first two games presented has a significative impact on the WTP. In particular we observe that starting from the risky vs risky game people are willing to pay more for the insurance. But the order of the first two games does not have any effect on the probability to be a determinate agent type[17].

	TOBIT	TOBIT using controls
Frame A	-4367.6**	-5172.8**
	(2093.0)	(2035.0)
Expected Utility Agent	-589.0	-412.6
	(2275.1)	(2187.9)
FrameA*Expected Utility Agent	2983.6	3404.1
	(2960.7)	(2865.8)
Player Agent	-1618.6	-2302.5
	(1864.7)	(1803.8)
FrameA*Player Agent	4262.3*	5319.1**
	(2563.5)	(2604.7)
Order Effect:Risky vs Risky First	3180.2***	3545.3***
	(1182.5)	(1243.2)
N	571	559

Standard errors in parentheses, cluster GPC level. Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Estimated WTP for the Insurance

[16] In Appendix B we report the results of the tobit regression with detailed individual characteristics
[17] Appendix C

	TOBIT	TOBIT with controls
Frame A		
Discontinuous Preferences for Certainty Agent	-3838.2**	-4538.7**
	(1862.0)	(1810.7)
Player Agent	-93.49	129.5
	(1259.4)	(1425.7)
Expected Utility Agent	-1237.4	-1589.8
	(1884.8)	(1848.2)
N	571	559

Standard errors in parentheses,cluster GPC. Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Estimated Marginal Impact of Frame A on WTP

We run the regression also considering the conservative definition of our agent types. We can see that our results is robust to this definition. In particular, Table 12 reports the results of the Tobit regression and Table 13 the marginal effects of the frame on the willingness to pay for the insurance, given a determinate agent type. This effect is significant only for agents with Discontinuous Preferences for Certainty.

	TOBIT	TOBIT with controls
Frame A	-4959.5*	-6297.6**
	(2989.6)	(2920.9)
Expected Utility Agent	-1907.6	-2242.2
	(2501.5)	(2384.5)
FrameA*Expected Utility Agent	2882.9	3999.7
	(3408.2)	(3306.8)
Player Agent	-4205.2	-5105.5*
	(2822.6)	(2621.0)
frameA*Players agent	6066.1	7649.7**
	(3703.4)	(3521.4)
Order Effect:Risky vs Risky First	3182.8***	3497.7***
	(1198.0)	(1259.1)
N	571	559

Standard errors in parentheses,cluster GPC.Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Estimated WTP for the Insurance under Conservative definition

	TOBIT	TOBITindiv
Frame A		
Discontinuous Preferences for Certainty Agent	-4435.5*	-5617.0**
	(2694.4)	(2633.9)
Player Agent	971.0	1181.6
	(1673.7)	(1807.3)
Expected Utility Agent	-1845.2	-2046.2
	(1312.0)	(1287.0)
N	571	559

Standard errors in parentheses, cluster GPC. Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Estimated Marginal Impact of Frame A on WTP under Conservative definition

5 Discussion: alternative behavioral explanations

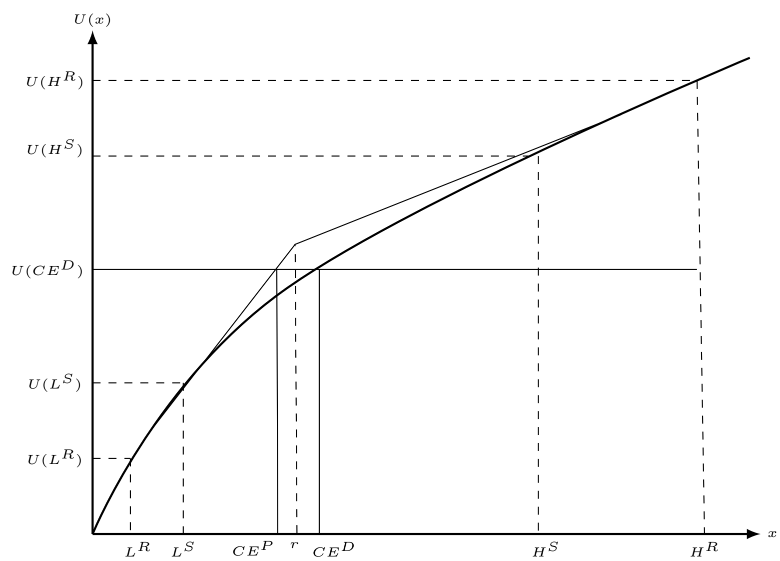
Prospect theory and, in particular loss aversion and probability weighting are natural alternative candidate for explaining departure from expected utility maximization. In the following sections we analyze the prospect theory implications of our experiment.

5.1 Loss Aversion

In this section we explore whether loss aversion may provide a satisfactory framework to account simultaneously for a disproportionate preference for a certain payoff and a higher willingness to pay under the premium rebate contract.

Let's consider first the risk aversion games. The disproportionate preference for the degenerate lottery in RD game may be compatible with loss aversion, provided the reference point that define losses and gains is appropriately chosen. Indeed loss aversion can explain that agents behave as if very risk averse in the vicinity of the reference point. To see it, consider the situation illustrated in Figure 1.

Figure 1: Prospect Theory: Loss Aversion



The function $U(.)$ depicts the preferences of an EU maximizer indifferent between the riskier lottery (L^R, H^R) and the safer lottery (L^S, H^S) in RR game. The certainty equivalent for both lottery is CE^D. By definition, if the safer lottery is replaced by CE^D, as we did in RD game, an agent would be indifferent between CE^D and the riskier lottery. Suppose now that the individual has preferences captured by the function $V(.)$ which captures loss aversion in a very stylized way: at the reference point r, a marginal decrease in income has a greater impact on $V(.)$ than a marginal increase in income. The indifference between the safer and the riskier lottery is compatible with the preferences represented by the function $V(.)$. However, when faced with the choice between CE^D and the riskier lottery, an individual with utility $V(.)$ would strictly prefer CE^D to the riskier lottery since $CE^D > CE^P$, where CE^P is the certain equivalent associated to the riskier lottery for an agent using a value function $V(.)$.

Loss aversion may thus be compatible with a disproportionate preference for the degenerate lottery, provided the reference point is between the low and the high outcome of the risky lottery. But since our games are framed in a way that subjects always experiment gains, it seems quite extreme to impose a reference point different from zero.

Turning to the results of the insurance game, prospect theory alone can not explain a preference for frame B. In particular, assuming as reference point the initial monetary endowment of the agents, agents will never perceive a loss. Agents may therefore perceive some outcomes as losses as long as the reference point is greater than the low yield, but the losses are exactly the same under both frames. For loss aversion to play a role, it must be that agents have separate mental accounts over gains and losses and value them individually. For example, if agents have a reference point r, such that $w \leq r < y_b + I$, and apply separate mental account for losses and gains, they might get more utility from the insurance product under frame B. The idea is that they perceive $y_b + I'$ and $y_b + I$ as gains but π as a loss. To illustrate it, we assume the simplistic loss aversion utility function used above (where $\lambda > 1$):

$$u(x) = \begin{cases} (x-r) & if \quad x \geq r \\ \\ -\lambda(-(x-r)) & if \quad x < r \end{cases}$$

If agents use the liquid endowment, w, as their reference point, the utility levels reached with the traditional and the alternative insurance contract are:

$$\begin{aligned} V_{I,A} &= u(-\pi) + p_b u(y_b + I) + (1-p_b)u(y_g) + (1-p_b)u(-\pi) \\ &= -\lambda\pi + p_b(y_b + I) + (1-p_b)y_g \end{aligned}$$

$$
\begin{aligned}
V_{I,B} &= p_b u(0) + p_b u(y_b + I') + (1-p_b)u(-\pi) + (1-p_b)u(y_g) \\
&= p_b(y_b + I') - \lambda\pi(1-p_b) + (1-p_b)y_g
\end{aligned}
$$

Comparing the value of both contracts reveals that the alternative contract provides a higher utility level (loss aversion implies $\lambda > 1$) :

$$V_{I,B} > V_{I,A}$$

$$\iff p_b(y_b + I') - \lambda\pi(1-p_b) + (1-p_b)y_g > -\lambda\pi + p_b(y_b + I) + (1-p_b)y_g$$

$$\iff p_b y_b + p_b I' - \lambda\pi + \lambda\pi p_b > -\lambda\pi + p_b y_b + p_b I$$

$$\iff p_b(I - \pi) + \lambda\pi p_b > +p_b I$$

$$\iff -\pi + \lambda\pi > 0$$

$$\iff -\pi + \lambda\pi > 0$$

$$\iff \lambda > 1$$

Prospect theory and separate mental accounting can therefore completely explain the preferences for frame B assuming that there is not risk taking over losses. If we introduce risk taking over losses we will also find some values of risk and loss aversion such that the traditional frame, FrameA, is preferred to the alternative one, FrameB.

5.2 Probability Weighting

In this section we use cumulative prospect theory (CPT) and the one-parameter form of Drazen Prelec's (1998) weighting function to re-estimate our first two games where we elicit the discontinuity of the preferences. Two distinctive features of CPT must be considered. First, cumulative prospect theory segregates value into gain and losses, with separate weighting function for losses and gains. Second, cumulative prospect theory applies decision weights to cumulative distribution functions rather than single events.[18] That is, each outcome x is weighted not by its probability, but by the cumulated probabilities of obtaining an outcome at least as good as x if the outcome is positive, and at least as bad as x if the outcome is negative. Rank dependence is motivated by the concern that non linear weights applied directly to multiple single outcomes can give rise to violations of stochastic dominance. For distance, a prospect that offers 200$ with probability 0.8 and 0$ with probability 0.2, will be preferred to a prospect that offers 210$ with probability 0.4, 200$ with probability 0.4 and 0$ with probability 0.2, also if the second prospect dominates the first one.

More formally consider a chance prospect $X = (p_1, x_1; ...p_n, x_n)$ with outcomes ordered in increasing order of preferences $u(x_1) < ... < u(x_n)$. The rank dependend utility associated to X will be $RDU(X) = \sum_i \pi(p_i, X)u(x_i)$ where the probability weighting is represented by $\pi(p_i, X) = w(p_i + ... + p_n) - w(p_{i+1} + ... + p_n)$. Notice that the decision weight $\pi(p_i, X)$ now is a difference between two expressions that no longer depend only on p_i but also on the rank of outcome x_i in relation to other outcomes and thus on the whole distribution of outcomes, X. In particular, the first expression is the sum over the probabilities of all outcomes that are at least as great as x_i; the second expression is the sum over the probabilities of all outcomes that are greater than x_i. For instance, consider the risky lottery in our first game. The probability weighting associated to the high outcome corresponds to $\pi(1/2)$ that is around 0.4, as estimated in the literature, Abdellaoui (2000). This implies that the probability weighting associated to the low outcome is equal to $1 - \pi(1/2) = 0.6$.

In the following analysis we assume that it does not exists a reference point generating losses in the games (Section 5.1 for explanations). We use a CRRA utility function, $u(x) = \frac{x^{1-\alpha}}{1-\alpha}$, and the one parameter Prelec's (1998) probability weighting function, $\pi(p) = e^{-(-lnp)^\gamma}$ for $0 < p \leq 1$ and $\gamma > 0$, with $\pi(0) = 0$,$\pi(1) = 1$. The parameter γ represents the concavity/convexity of the weighting function. In particular, if $\gamma < 1$, the weighting function is inverted S-shaped, i.e., individuals overweight small probabilities and underweight large probabilities, as shown by Tversky and Kahneman (1992). If $\gamma > 1$, then the weighting function is S-shaped, i.e., individuals underweight small probabilities and overweight large probabilities. [19]

To elicit the two parameters of interest, α and γ, we use the series of paired lotteries designed for RR game and RD game..

[18]The theory of rank dependent utility has been first introduced by Quiggin (1982) and then integrated in the prospect theory by Khaneman and Tversky (1992). The result is the cumulative prospect theory that is a version of rank dependent utility where decision weights are not just ranked, but also sign dependents.

[19]Different weighting functions have been proposed in the literature (Khaneman and Tversky 1979;1992; Lattimore et al., 1992). However, the first axiomatically derived weighting function was the one of Prelec (1998).

The switching points in RR game and RD game jointly determine γ and α. For example, suppose a subject switched from Option R to D at the fourth pair in RD game and at fourth pair in RR game. We will have a system of two equations where the first equation represents the indifference condition for a switching at pair 4 in the first game and the other represents the indifference condition for a switching at pair 4 in the second game. We will be therefore able to find the values of α and γ solving the following system.

$$\begin{cases} \pi(1/2)v(320000) + [1-\pi(1/2)]v(60000) = \pi(1/2)v(240000) + [1-\pi(1/2)]v(80000) \\ \pi(1/2)v(320000) + [1-\pi(1/2)]v(60000) = v(139000) \end{cases}$$

In the Table 13 we report all the possible combinations of (γ, α) rationalizing the switch at pair 4 in the RD game (4.12;2.65), (1.03;1.01), (-0.14;0.24), (-0.72; -0.18), (-1.21; -0.59), (-1.34; -0.70), and the ones rationalizing the switching at pair 4 in the RR game (-0.72, 0.28), (1.03, 1.01), (3.11, 1.7), (8.95, 3.35), or (0.4, 28.8). By intersecting these parameter ranges from RR game and RD game, we obtain predictions of (γ, α) for all possible combinations of choices. As in the literature about probability weighting and rank dependent utility (Quiggin, 1982; Gonzalez and Wu, 1999; Stott 2006; Khaneman and Tversky 1992) we observe that, as soon as α increases, the probability associated to the realization of the low outcomes, $1-\pi(p)$, decreases since individuals are underweighting probabilities associated to small outcomes. The converse holds as soon as α decreases. This pattern induces consistent differences in the weighting associated to the probability 1/2 along all the pair, and no probability weighting for individuals switching at the same pair in both games. These individuals are the ones on the diagonal of Table 13.

In this new setting, Discontinuous Preferences for Certainty agents are the ones behind the diagonal of Table 13. It follows that in order to rationalize the presence of Discontinuous Preferences for Certainty agents we need to assume a probability weighting always lower than $\pi(p) = 0.5$. This implies that Discontinuous Preferences for Certainty agents will always associate low probabilities to the realization of high outcomes and will always have α lower than 0.2. For instance, consider an agent switching at pair 6 in the RR game and at pair 4 in the RD game. We classify this agent as Discontinuous Preferences for Certainty agent. His probability weighting function is equal to $\pi(p) = 0.27$ for high outcomes and $1-\pi(p) = 0.73$ for low outcomes, with $\alpha = -0.18$. The presence of this probability weighting function can justify earlier switchings in the RD game with respect to the RR one. In particular, in our example, the value of the degenerate lottery associated to pair 4 and estimated with the new combination of curvature and probability weighting is 138.190 CFA . It follows that the presence of probability weighing

		Risky vs Degenerate Game					
		3	4	5	6	7	8
	3						
	α	**1.59**	2.65	4.54	28	30	inf
	$\pi(p)$	**0.50**	0.80	0.97	0.99	1	
	4						
	α	*0.28*	**1.01**	1.7	3.35	28.8	inf
	$\pi(p)$	*0.27*	**0.50**	0.72	0.96	1	
	5						
	α	*-0.35*	*0.24*	**0.67**	1.17	24	inf
Risky vs Risky Game	$\pi(p)$	*0.18*	*0.34*	**0.50**	0.67	0.99	
	6						
	α	*-0.71*	*-0.18*	*0.14*	**0.44**	20	inf
	$\pi(p)$	*0.14*	*0.27*	*0.38*	**0.50**	0.99	
	7						
	α	*-1.02*	*-0.59*	*-0.34*	*-0.16*	**0.17**	inf
	$\pi(p)$	*0.11*	*0.20*	*0.28*	*0.35*	**0.50**	
	8						
	α	*-1.97*	*-0.70*	*4.54*	*28*	*30*	**0**
	$\pi(p)$	*0.10*	*0.19*	*4.54*	*28*	*0.42*	**0.50**

Table 14: Parameters Estimation

can justify the attitude of Discontinuous Preferences for Certainty agents to sacrifice money in order to choose the sure option, but only if we admit that the same agent weights the same probability, 1/2, in very different ways along all the pairs, and he is very pessimistic at the same time.

6 Welfare Analysis

In Table 15 we report the willigness to pay for the insurance distinguishing between the traditional, Frame A, and the alternative, Frame B, insurance frames. The actuarially fair price of the insurance is 10.000 FCFA. If we consider a price above the actuarially fair price of the insurance contract, for example 20.000 FCFA, 52% of farmers will buy the insurance under frame B, and 45% will buy the insurance under Frame A. This implies a 15.5% increase in the number of farmers buying the insurance if the insurance is presented with Frame B instead of Frame A.

It follows that framing the insurance product with uncertainty about the payment of the premium will increase the insurance take-up and, in turn, the number of people eligible for an insurance coverage in case of a shock in the cotton production. The presence of this index insurance contract might also induce an increase in the ex-ante investment decision of the cotton farmers, as observed by Elabed and Carter (2014) in Mali with the same insurance product. In particular, they show that the presence of the insurance resulted in a 15% increase in the area cultivated in cotton, and a 14% increase in

Insurance Price	**Frame A** cumpct	**Frame B** cumpct
30000	15.68	20.42
25000	27.88	34.86
20000	44.60	52.11
15000	60.98	64.08
10000	70.74	75.35
5000	81.19	84.15
0	100	100

Table 15: WTP for Insurance

the expenditure on seeds per ha. In our case it is difficult to predict the effects of the insurance on the investment decision of the different agent types, and in particular on agents with discontinuous preferences for certainty. But this field of analysis remains open to future research.

7 Conclusion

In recent years the demand of index insurances has been characterized by a surprisingly low take up, although index insurances provides a good alternative to the informal risk managing mechanism.

In this paper we have attempted to demonstrate how behavioral economics could help in designing supply insurance policies in respect to the farmers behavior. Behavioral lab experiments have uncovered a wealth of evidence that people do not approach risk in accord with economics' workhorse theory of "expected utility". This behavioral evidence would seem to have rich implications for the design of, and the demand for insurance, but to date efforts have been sparse to develop those implications (Elabed and Carter, 2014).

In particular, we presented a novel way to understand the low micro-insurance take-up rates, using the concept of discontinuity of preferences. In a framed field experiments conducted with cotton farmers in Burkina Faso, we elicited the coefficients of risk-aversion and the WTP for the insurance. We found that 30% of the farmers generally did not behave in accordance with expected utility theory, and show discontinuous preferences over certain and uncertain outcomes as observed by Discontinuous Preferences for Certainty and Sprenger (2009). Moreover the farmers that revealed themselves to have discontinuous preferences are the ones willing to pay more for an insurance contract presented with uncertain premium. It follows that discontinuous preferences must be considered in the design of micro-insurance contracts in order to improve farmers' welfare.

References

[1] Abdellaoui, M. 2000. “Parameter-free elicitation of utility and probability weighting functions”. *Management Science* 46,1497-1512.

[2] Andreoni, J., and Sprenger, C. 2012. “Risk Preferences are not time preferences.”*American Economic Review* 102(7): 3357-76.

[3] Andreoni, J. and Sprenger, C. 2009. “Certain and Uncertain Utility: The Allais Paradox and Five Decision Theory Phenomena.”

[4] Carter, M. R., Cheng, L. and Sarris, A. 2011., "The impact of interlinked index insurance and credit contracts on financial market deepening and small farm productivity." Mimeo

[5] Cole, S., Gine, X., Tobacman, J., Topolova, P.,Townsend, R. and Vickery, J. 2013. “ Barriers to Household Risk Management: Evidence from India”. *American Economic Journal: Applied Economics* 5(1):104-135.

[6] Dercon, S., J.W. Gunning, and A. Zeitlin. 2011., “The demand for insurance under limited credibility: evidence from Kenya.” In International Development Conference, DIAL.

[7] Elabed, G., and Carter, M.R.. 2014. “Basis risk and Compound- Risk Aversion: Evidence from a WTP experiment in Mali.” Working Paper

[8] Gine, X., and Yang, D. 2007. “Insurance, Credit and Technology Adoption: Field Experiment Evidence from Malawi.” *Journal of Development Economics,* 89 (2009): 1–11

[9] Gine, X., Townsend, R. and Vickery,J. 2008. “Patterns of Rainfall Insurance Participation in Rural India.” *The World Bank Economic Review,* 22(3): 539–566.

[10] Gneezy, U., List, J.A. and Wu, G. 2006. “The Uncertainty effect: When a Risky Prospect Is Valuated Less Than Its Worst Possible Outcome.” *Quartley Journal of Economics*, 121(4): 1283-309.

[11] Gonzalez, R. and Wu, G. 1999. “On the shape of the probability weighting function”. *Cognitive Psychology*, 38:129-166.

[12] Hill, R.V. and Robles, M. 2011. “Flexible insurance for heterogeneous farmers: Results from a small scale pilot in Ethiopia.” IFPRI discussion papers.

[13] Holt, C. A., Laury, S. K. 2002." Risk Aversion and Incentive Effects." *American Economic Review* , 92(5): 1644-1655

[14] Khaneman, D., and Tversky, A. 1979. "Prospect Theory: An Analysis of Decision under risk." *Econometrica*, 47(2): 263-91.

[15] Khaneman, D., and Tversky, A.1984. "Choices, Values and Frames." *The American Phycologist*, 39: 341-350.

[16] Khaneman, D. and Tversky, A.1992. "Advances in prospect theory: Cumulative Representation of Uncertainty". *Journal of Risk and Uncertainty,* 5(4):297-323

[17] Lattimore, P.K., Baker, J.R. and White, A.D. 1992. "The influence of probability on risky choice-a parametric examination". *Journal of Economic Behavior and Organization* 17, 377-400

[18] Prelec, D. 1998. "The probability weighting function". *Econometrica,* 66: 497-527.

[19] Quiggin, J.1982. "A theory of Anticipated Utility". *Journal of Economic Behavior and Organization*, 3: 323-343.

[20] Schubert, R., M. Brown, M. Gysler and H. W. Brachinger .1999. "Financial Decision-Making: Are Women Really More Risk-Averse?" *.American Economic Review*, 89 (2): 381-385.

[21] Shmit, U. 1998.,"A Measurement of the Certainty Effect." *Journal of Mathematical Psychology,* 42: 32-47

[22] Sydnor, J. 2010. "(Over) Insuring Modest Risks." *American Economic Journal: Applied Economics*, 2(4): 177-99.

[23] Stott, H.P. 2006. "Cumulative Prospect Theory's Functional menagerie". *Journal of Risk and Uncertainty,* 32:101-130.

[24] Thaler, R. H. and Shefrin,M. 1981. "An Economic Theory of Self Control." *Journal of Political Economy* ,89: 392-406.

[25] Thaler, R. H. 1999. "Mental Accounting matters." *Journal of Behavioral Decision Making,* 12: 183-206.

Appendix

A: Tables

Randomization

Table 16 presents the results of the randomization. In particular, we have 144 agents starting with risky vs degenerate activity and at whom was proposed the insurance frame with uncertain premium (Frame B); 140 agents starting with risky vs risky activity and at whom was proposed the insurance frame with uncertain premium (Frame B); 138 agents starting with risky vs degenerate activity at whom was proposed the traditional insurance frame (FrameA); 149 agents starting with risky vs risky activity at whom was proposed the traditional insurance frame (FrameA).

	RD vs RR	RR vs RD	Total
FrameB	144	140	284
FrameA	138	149	287
Total	282	289	571

Table 16: Players Randomization

Individual characteristics and balanced randomization

Table 17 reports detailed individual characteristics. The values reported for each individual characteristic are the Mean, the Standard Deviation and the Number of Observations. The variables considered are the age of the farmer (age), the number of years the farmer spent in the GPC (yearsinGPC), the years since the farmer is at the head of the household (yearsHH), the years of education (yearschooling), whether the farmers is educated (education), the religion (1.Animist 2.Christian 3.Muslim), the ethnical

	mean	sd	N
age	44.11	12.82	571.00
yearschooling	0.98	2.17	561.00
education	0.22	0.42	561.00
Musulman	0.41	0.49	571.00
Animiste	0.34	0.47	571.00
Christian	0.25	0.44	571.00
Bwaba	0.39	0.49	571.00
Mossi	0.38	0.49	571.00
Other	0.23	0.42	571.00
hsize	8.73	5.27	570.00
nchildr	4.29	3.15	570.00
yearsinGPC	10.36	6.23	569.00
yearsHH	15.89	11.64	570.00
totcotsup2013	3.86	3.26	571.00
totagrsup2013	10.18	7.07	571.00
leader	0.08	0.28	571.00

Table 17: Individual Characteristics

group (1.Bwaba 2.Mossi 3.Other), the household size[20] (hsize), the number of children in the family[21] (nchildren), the surface cultivated with cotton in 2013(totcotsup2013), the agricultural surface in 2013 (totagrsup2013) and whether the agent is the leader of the cotton group[22].

In the Table18 we test for each agent's type whether there is a significative difference in the individual characteristics of agents at whom was presented the frameA and the ones at whom was presented the frameB . We can see that the randomization of the frames is balanced.

[20]We consider only members alive and living inside the family

[21]We consider children alive and with an age lower than 19

[22]Leader takes value 1 if the agent is President or Secretaire of the GPC

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DPC_FrameA	DPC_FrameB	ttest_DPC	Eut_FrameA	Eut_FrameB	ttest_Eut	Player_FrameA	Player_FrameB	ttest_Player
age	43.04	44.45		45.13	47.11		42.98	42.40	
	(12.51)	(12.74)		(12.49)	(14.12)		(12.06)	(12.58)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.48			0.31			0.73
yearschooling	0.94	0.55		1.27	0.96		0.79	1.25	
	(2.24)	(1.62)		(2.36)	(2.04)		(1.90)	(2.55)	
	94.00	67.00	161.00	88.00	97.00	185.00	103.00	112.00	215.00
			0.23			0.33			0.13
education	0.18	0.16		0.27	0.23		0.20	0.26	
	(0.39)	(0.37)		(0.45)	(0.42)		(0.40)	(0.44)	
	94.00	67.00	161.00	88.00	97.00	185.00	103.00	112.00	215.00
			0.78			0.47			0.34
Musulman	0.54	0.32		0.42	0.35		0.44	0.36	
	(0.50)	(0.47)		(0.50)	(0.48)		(0.50)	(0.48)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.01			0.38			0.25
Animiste	0.26	0.30		0.38	0.37		0.30	0.40	
	(0.44)	(0.46)		(0.49)	(0.49)		(0.46)	(0.49)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.64			0.91			0.12
Christian	0.20	0.38		0.20	0.27		0.26	0.24	
	(0.40)	(0.49)		(0.40)	(0.45)		(0.44)	(0.43)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.01			0.26			0.67
Bwaba	0.31	0.37		0.48	0.30		0.44	0.41	
	(0.46)	(0.49)		(0.50)	(0.46)		(0.50)	(0.49)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.41			0.01			0.72
Mossi	0.48	0.38		0.33	0.37		0.34	0.39	
	(0.50)	(0.49)		(0.47)	(0.49)		(0.48)	(0.49)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.18			0.49			0.48
Other	0.21	0.25		0.19	0.32		0.22	0.20	
	(0.41)	(0.44)		(0.40)	(0.47)		(0.42)	(0.40)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.52			0.04			0.70
hsize	9.29	8.30		8.87	9.03		8.22	8.63	
	(5.83)	(4.87)		(6.00)	(5.07)		(4.51)	(5.24)	
	95.00	70.00	165.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.25			0.84			0.54
nchildr	4.51	4.24		4.25	4.42		3.99	4.33	
	(3.86)	(2.66)		(3.13)	(2.97)		(2.77)	(3.32)	
	95.00	70.00	165.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.63			0.69			0.41
yearsinGPC	9.95	10.62		10.62	10.97		9.87	10.24	
	(6.17)	(6.30)		(5.85)	(6.76)		(6.09)	(6.26)	
	95.00	71.00	166.00	89.00	99.00	188.00	101.00	114.00	215.00
			0.49			0.70			0.67
yearsHH	14.29	17.34		14.84	17.08		17.04	15.05	
	(11.23)	(12.96)		(10.62)	(12.52)		(11.06)	(11.54)	
	95.00	71.00	166.00	89.00	99.00	188.00	102.00	114.00	216.00
			0.11			0.19			0.20
totcotsup2013	3.88	3.70		3.95	3.66		3.61	4.26	
	(3.56)	(3.51)		(2.92)	(2.97)		(2.92)	(3.63)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.74			0.49			0.15
totagrsup2013	9.92	10.75		9.88	9.90		9.65	11.00	
	(6.95)	(7.05)		(6.70)	(6.77)		(7.08)	(7.74)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.45			0.99			0.18
leader	0.08	0.10		0.06	0.07		0.08	0.11	
	(0.28)	(0.30)		(0.23)	(0.26)		(0.27)	(0.31)	
	95.00	71.00	166.00	89.00	99.00	188.00	103.00	114.00	217.00
			0.75			0.69			0.49

p-value reported for the ttest

Table 18: ttest Balanced Randomization

Third game: WTP game

		NI			A		B		
		bad yield	good yield	EV	bad yield	good yield	bad yield	good yield	EV
pair 1	savings	50.000	50.000		0	0	50.000	0	
	family money	**238.000**	**94.000**	209.200	**94.000**	**188.000**	**94.000**	**188.000**	169.200
pair 2	savings	50.000	50.000		20.000	20.000	50.000	20.000	
	family money	**238.000**	**94.000**	209.200	**114.000**	**208.000**	**114.000**	**208.000**	189.200
pair 3	savings	50.000	50.000		25.000	25.000	50.000	25.000	
	family money	**238.000**	**94.000**	209.200	**119.000**	**213.000**	**119.000**	**213.000**	194.200
pair 4	savings	50.000	50.000		30.000	30.000	50.000	30.000	
	family money	**238.000**	**94.000**	209.200	**124.000**	**218.000**	**124.000**	**218.000**	199.200
pair 5	savings	50.000	50.000		35.000	35.000	50.000	35.000	
	family money	**238.000**	**94.000**	209.200	**129.000**	**223.000**	**129.000**	**223.000**	204.200
pair 6	savings	50.000	50.000		40.000	40.000	50.000	40.000	
	family money	**238.000**	**94.000**	209.200	**134.000**	**228.000**	**134.000**	**228.000**	209.200
pair 7	savings	50.000	50.000		45.000	45.000	50.000	45.000	
	family money	**238.000**	**94.000**	209.200	**139.000**	**233.000**	**139.000**	**233.000**	214.200
pair 8	savings	50.000	50.000		50.000	50.000	50.000	50.000	
	family money	**238.000**	**94.000**	209.200	**144.000**	**238.000**	**144.000**	**238.000**	219.200

Table 19: WTP game

B: Robustness checks

Tobit regression controlling for individual characteristics

Tables 20 and 21 report the results of the Tobit regression controlling for individual characteristics. In Table 20 we use a standard definition of the agent types while in Table 21 we use the conservative definition of agent types.

	TOBIT
Frame A	-5172.8**
	(2035.0)
Expected Utility Agent	-412.6
	(2187.9)
FrameA*Expected Utility Agent	3404.1
	(2865.8)
Player Agent	-2302.5
	(1803.8)
FrameA*Player Agent	5319.1**
	(2604.7)
age	-75.36
	(56.97)
2.Mossi	1265.8
	(1997.3)
3.Other	-509.2
	(1497.1)
2.Christian	782.8
	(1399.8)
3.Musulman	2268.4
	(1921.5)
yearschooling	380.9
	(288.6)
yearsinGPC	130.6
	(103.8)
hsize	-183.7
	(126.9)
totagrsup2013	189.4**
	(95.82)
Order Effect:Risky vs Risky First	3545.3***
	(1243.2)
_cons	14908.9***
	(2875.5)
sigma	
_cons	11963.5***
	(465.7)
N	559

Standard errors in parentheses,cluster GPC.Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 20: Estimation WTP: controls in detail

	TOBIT with controls
Frame A	-6297.6**
	(2920.9)
Expected Utility Agent	-2242.2
	(2384.5)
FrameA*Expected Utility Agent	3999.7
	(3306.8)
Player Agent	-5105.5*
	(2621.0)
FrameA*Player Agent	7649.7**
	(3521.4)
age	-68.58
	(55.97)
2.Mossi	1009.1
	(1944.4)
3.Other	-598.6
	(1485.4)
2.Christian	859.3
	(1429.9)
3.Musulman	2308.9
	(1867.0)
yearschooling	426.4
	(280.1)
yearsinGPC	137.2
	(104.9)
hsize	-180.5
	(124.2)
totagrsup2013	182.2*
	(94.54)
Order Effect:Risky vs Risky First	3497.7***
	(1259.1)
_cons	16181.3***
	(3360.7)
sigma	
_cons	11964.1***
	(467.7)
N	559

Standard errors in parentheses, cluster GPC.Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 21: Estimation WTP: controls in detail under Conservative definition

Gneezy agents: Agents with Discontinuous Preferences for Certainty or Expected Utility Agents?

Andreoni and Sprenger (2009) show that Gneezy agents can be easily considered as agents with extreme preference for certainty and therefore agents with Discontinuous Preferences for Certainty. In the following we run a Tobit regression including Gneezy agents in the category of agents with Discontinuous Preferences for Certainty. In particular, we consider as Gneezy the farmers switching at pair 2 in both games. We report the results of the Tobit regressions and the marginal effects both for the standard and the conservative definition of our agents. We can see that our results is completely robust when use the standard definition of our agent types, as reported in Table 22 and 23.

	TOBIT	TOBIT with controls
Frame A	-3948.2**	-4539.4**
	(1914.6)	(1860.8)
Expected Utility Agent	-2707.4	-2280.3
	(1927.6)	(1804.4)
FrameA*Expected Utility Agent	2042.2	2077.4
	(2724.1)	(2621.2)
Player Agent	-2614.4	-3183.9*
	(1722.1)	(1675.8)
FrameA*Player Agent	3840.2	4683.0*
	(2337.3)	(2387.2)
Order Effect:Risky vs Risky First	3209.9***	3565.5***
	(1188.8)	(1251.8)
N	571	559

Standard errors in parentheses, cluster GPC. Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 22: Estimation WTP: Gneezy agents considered as agents with discontinuous preferences for certainty

	TOBIT	TOBITindiv
Frame A		
Discontinuous Preferences for Certainty Agent	-3544.2**	-4069.2**
	(1736.6)	(1683.7)
Player Agent	-95.95	127.1
	(1257.1)	(1426.4)
Expected Utility Agent	-1661.5	-2161.7
	(1860.6)	(1808.7)
N	571	559

Standard errors in parentheses,cluster GPC. Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 23: Estimated Marginal impact of Frame A on WTP: Gneezy agents considered as agents with Discontinuous Preferences for Certainty

	TOBIT	TOBIT with controls
Frame A	-4129.9	-4940.6**
	(2579.8)	(2467.3)
Expected Utility Agent	-3750.8*	-3750.0*
	(2189.5)	(1967.3)
FrameA*Expected Utility Agent	1521.6	2086.0
	(2991.0)	(2809.9)
Player Agent	-5431.7**	-5996.4***
	(2383.2)	(2198.5)
FrameA*Player Agent	5592.6*	6440.4**
	(3019.4)	(2850.9)
Order Effect:Risky vs Risky First	3026.1**	3418.2***
	(1190.2)	(1248.2)
N	571	559

Standard errors in parentheses,cluster GPC.Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 24: Estimation WTP under Conservative definition: Gneezy agents considered as agents with Discontinuous Preferences for Certainty

When we consider the conservative definition,Table 24 and 25, the results are still significant only when we control for individual characteristics. In particular we have that agents with Discontinuous Preferences for Certainty are willing to pay 4533 FCFA less for an insurance presented with frameA. But also expected utility agents are willing to pay less for an insurance presented with frame A. In general, expected utility agents are willing to pay less than agents with Discontinuous Preferences for Certainty for an insurance presented with frameB. Players are acting as in the previous specification. In particular, they are willing to pay less than agents with Discontinuous Preferences for Certainty for an insurance presented with frameB and the marginal effect for an insurance presented with frame A is bigger for Players than for agents with Discontinuous Preferences for Certainty.

	TOBIT	TOBIT with controls
Frame A		
Discontinuous Preferences for Certainty Agent	-3797.3	-4533.2**
	(2385.1)	(2273.5)
Player Agent	1291.6	1318.1
	(1506.9)	(1676.0)
Expected Utility Agent	-2287.3*	-2510.9**
	(1317.9)	(1275.8)
N	571	559

Standard errors in parentheses,cluster GPC.Controls: age, years of schooling, religion, ethnicity, household size,agricultural surface 2013, years spent inside the cotton group
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 25: Estimated Marginal impact of Frame A on WTP under Conservative definition: Gneezy agents considered as agents with discontinuous preferences for certainty

C: The Nature of the "Players"

In the Table 26 we report the detailed individual characteristics relative to the three agent types: Player, Discontinuous Preferences for Certainty and expected utility agents. The values reported for each individual characteristic are the Mean, the Standard Deviation and the Number of Observations. The variables considered are the age of the household (age), the number of years the farmer spent in the GPC (yearsinGPC), the years since the farmer is at the head of the household (yearsHH), the years of education (yearschooling), whether the farmers is educated (education), the religion (Animist Christian Muslim), the ethnical group (Bwaba Mossi Other), the household size (hsize), the number of children in the family(nchildren), the surface cultivated with cotton in 2013(totcotsup2013), the agricultural surface in 2013 (totagrsup2013) and whether the agent is the leader of the cotton group.

We run a multinomial probit to check for the individual characteristics affecting the probability to be of a determinate agent type. We cluster at GPC level.

In the Table 27 we report the results of the multinomial probit estimation. The reference category is represented by the eut agent. The other two categories are agents with Discontinuous Preferences for Certainty and Players. We can see that the individual characteristics with a significant effect are the age of the farmer "age" and the years since the farmer is at the head of the family, "yearsHH". In particular, we can see that a one unit increase in "age" induces a decrease in the probability of being an agent with Discontinuous Preferences for Certainty with respect to the probability to be an expected utility agent. Moreover a one unit increase in the age induces a decrease in the probability of being

	(1) Players mean/sd/N	(2) eut mean/sd/N	(3) DPC mean/sd/N
age	42.68 (12.31) 217	46.18 (13.37) 188	43.64 (12.59) 166
yearschooling	1.03 (2.27) 215	1.11 (2.20) 185	0.78 (2.01) 161
Musulman	0.40 (0.49) 217	0.38 (0.49) 188	0.45 (0.50) 166
Animiste	0.35 (0.48) 217	0.38 (0.49) 188	0.28 (0.45) 166
Christian	0.25 (0.43) 217	0.24 (0.43) 188	0.28 (0.45) 166
Bwaba	0.42 (0.50) 217	0.39 (0.49) 188	0.33 (0.47) 166
Mossi	0.36 (0.48) 217	0.35 (0.48) 188	0.44 (0.50) 166
Other	0.21 (0.41) 217	0.26 (0.44) 188	0.23 (0.42) 166
hsize	8.44 (4.90) 217	8.95 (5.51) 188	8.87 (5.45) 165
nchildr	4.17 (3.07) 217	4.34 (3.04) 188	4.39 (3.40) 165
yearsinGPC	10.07 (6.16) 215	10.80 (6.33) 188	10.23 (6.21) 166
yearsHH	15.99 (11.33) 216	16.02 (11.68) 188	15.60 (12.06) 166
leader	0.09 (0.29) 217	0.06 (0.25) 188	0.09 (0.29) 166
totcotsup2013	3.95 (3.32) 217	3.80 (2.95) 188	3.80 (3.53) 166
totagrsup2013	10.36 (7.45) 217	9.89 (6.72) 188	10.28 (6.99) 166
order effect:Risky vs Risky first	0.48 (0.50) 217	0.52 (0.50) 188	0.52 (0.50) 166

Table 26: Individual Characteristics and Agent types

Player with respect to the probability to be an expected utility maximizer. Concerning the yearsHH the effect is more clear if we look at the marginal effect, Table 29. It is clear that the age and the yearsHH do not significatively affect the probability to be Discontinuous Preferences for Certainty, but they have a significative and opposite effect on the probability to be an expected utility maximizer and a gambler. In order to facilitate the interpretation of these coefficients we first introduce a new variable in order to get ride of the correlation between the age of the farmer and the years since the farmer is at the head of the household, yearsHH.

	mprobit
Discontinuous Preferences for Certainty Agent	
age	-0.0271***
	(0.00859)
yearschooling	-0.0744
	(0.0467)
hsize	-0.0336
	(0.0334)
2.Christian	0.244
	(0.224)
3.Musulman	0.108
	(0.308)
2.Mossi	0.416
	(0.348)
3.Other	0.0164
	(0.281)
yearsinGPC	-0.00645
	(0.0152)
yearsHH	0.0172
	(0.0107)
nchildr	0.0523
	(0.0479)
totcotsup2013	0.0268
	(0.0340)
leader	0.258
	(0.335)
Order Effect:Risky vs Risky First	0.0650
	(0.177)
Player Agent	
cmage	-0.0368***
	(0.00939)
yearschooling	-0.0389
	(0.0449)
hsize	-0.0496
	(0.0320)
2.Christian	-0.00447
	(0.244)
3.Musulman	-0.00840
	(0.289)
2.Mossi	0.187
	(0.291)
3.Other	-0.201
	(0.228)
yearsinGPC	-0.00825
	(0.0150)
yearsHH	0.0289**
	(0.0117)
nchildr	0.0575
	(0.0486)
totcotsup2013	0.0280
	(0.0278)
leader	0.210
	(0.355)
Order Effect:Risky vs Risky First	-0.0837
	(0.191)
N	558

Standard errors in parentheses,cluster GPC

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 27: Estimation of Probability to be a determinate agent type

	Player	Eut	DPC
age	-0.00684***	0.00877***	-0.00194
	(0.00226)	(0.00207)	(0.00190)
yearsHH	0.00591**	-0.00639**	0.000475
	(0.00280)	(0.00262)	(0.00233)
Order Effect:Risky vs Risky First	-0.0331	0.00458	0.0285
	(0.0472)	(0.0437)	(0.0392)
N	558	558	558

Standard errors in parentheses, cluster GPC
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 29: Marginal effects of main regressors on Probability to be a determinate agent type

We consider the age at which farmer become chef of the household, ageHH. This regressor is given by the difference between the age of the farmer and the years since the farmer is at the head of the household. We classify the variable ageHH in three different categories, as shown in Table 30.

	ageHH	
	freq	pct
20	110	19.30
25	156	27.37
35	191	33.51
45	113	19.82
Total	570	100.00
N	570	

Table 30: Ranges of Age at which farmer become HH

In Table 31 we report the marginal effect of the age at which farmer become chef of the household, ageHH, on the probability to be a determinate agent type.

We can clearly see a monotonically increasing effect of this variable on the probability to be an expected utility agents and a monotonically decreasing effect on the probability to be a Player. The effect is not significant for agents with Discontinuous Preferences for Certainty, but it is monotonically decreasing. In practice we can see that it is 10% less likely to be a Player if a farmer become chef of the household when he is between 35 and 45 years old than around or lower than 20 years old.

We can therefore conclude that Player are agents that got their independence earlier than expected utility agents.

	Player	Eut	DPC
25.age at which farmer become HH	-0.0526	-0.0218	0.0773
	(0.0669)	(0.0621)	(0.0526)
35.age at which farmer become HH	-0.115**	0.0739	0.0413
	(0.0574)	(0.0565)	(0.0542)
45.age at which farmer become HH	-0.148**	0.158**	-0.0121
	(0.0674)	(0.0677)	(0.0581)
N	558	560	560

Standard errors in parentheses,cluster GPC.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 31: Marginal effects of Age at which the farmer become HH on the probability to be a determinate agent type

D: CRRA vs CARA

In this section we assume that our agents apply a CARA utility function, instead of a CRRA utility function and we explore the implications of estimating this utility function in our game. We remind that the property of a CRRA utility function, $\frac{x^{1-\alpha}}{1-\alpha}$, is that the marginal effect of an increase in the outcome on the risk aversion is null. This implies that if we multiply or divide by the same constant all the outcomes of the game, the risk aversion must remain unchanged. In the case of a CARA utility function, $1 - e^{(-\alpha x)}$, the marginal effect of an increase in the risk aversion on the relative risk aversion is equal to α . This implies that if we multiply or divide by the same constant all the outcomes of the game, the risk aversion will change.

In the Table 31 we report the ranges of relative risk aversion obtained with a CRRA utility function (Column 1) and the ranges of absolute risk aversion obtained with a CARA utility function (Column 2 and 3) for both games. Assuming a CARA utility function we can see that the ranges are extremely close to zero for all pairs. Moreover we can see that the ranges of the RR game are slightly different from the ranges of the RD game. This implies that an expected utility agent using a CARA utility function and switching at the the third pair in the RR game must also switch at the third pair in the RD game.

Due to the small value of the ranges, in order to facilitate the comparison between the two games, we simply multiply the coefficients for 100.000. Column 2 and 4 of Table 32 respectively report the

		Risky vs Risky	Risky vs Degenerate
	CRRA (1)	CARA (2)	CARA (3)
3	$1.58 < r$	$1.02(10^{-5}) < \alpha$	$1.11(10^{-5}) < \alpha$
4	$0.99 < r < 1.58$	$6.65(10^{-6}) < \alpha < 1.02(10^{-5})$	$6.76(10^{-6}) < \alpha < 1.11(10^{-5})$
5	$0.66 < r < 0.99$	$4.58(10^{-6}) < \alpha < 6.65(10^{-6})$	$4.53(10^{-6}) < \alpha < 6.76(10^{-6})$
6	$0.44 < r < 0.66$	$3.15(10^{-6}) < \alpha < 4.58(10^{-6})$	$3.08(10^{-6}) < \alpha < 4.53(10^{-6})$
7	$0.15 < r < 0.44$	$1.25(10^{-6}) < \alpha < 3.15(10^{-6})$	$1.12(10^{-6}) < \alpha < 3.08(10^{-6})$
8	$0 < \text{r} < 0.15$	$0 < \alpha < 1.25(10^{-6})$	$0 < \alpha < 1.12(10^{-6})$

Table 32: CARA and CRRA

average CARA ranges for the RR and the RD game. The main difference between the ranges of the two games results from the pair 3 of the RR game and the pair 4 of the RD game. In other words, it is possible to consider expected utility maximizer people switching at pair 3 in the RR game are then switching at pair 4 in the RD game. We control for these agents in the using the conservative definition of our agent types.

	Risky vs Risky		Risky vs Degenerate	
	CARA(1)	avg CARA(2)	CARA (3)	avg CARA (4)
1	-	-	-	-
2	-	-	-	-
3	$1.02 < \alpha$	+inf	$1.1 < \alpha$	+inf
4	$0.66 < \alpha < 1.02$	0.84	$0.67 < \alpha < 1.1$	0.88
5	$0.45 < \alpha < 0.66$	0.55	$0.45 < \alpha < 0.67$	0.56
6	$0.31 < \alpha < 0.45$	0.38	$0.30 < \alpha < 0.45$	0.37
7	$0.12 < \alpha < 0.31$	0.21	$0.11 < \alpha < 0.30$	0.20
8	$0 < \alpha < 0.12$	0.06	$0 < \alpha < 0.11$	0.06

Table 33: CARA*100000

E: Protocol

Insurance presented with TRADITIONAL FRAME (FrameA) “An insurance on cotton production is something you buy before you know your yield. The insurance gives you some money after the harvest, but only in case of bad yield. Let me explain how the insurance works.

The amount of your savings is 50.000 CFA. You decide to buy an insurance before you know your yield. The insurance price is 20.00 CFA.You pay the insurance with your savings. Therefore you remain with 30.000 CFA

- In case of a bad yield [indicate pink ball in the poster]

  You payed the insurance, your savings left are 30.000 CFA [indicate amount in the poster].The cotton revenue [indicate image in the poster] is 44.000 CFA [indicate amount in the poster]. The insurance [indicate image in the poster]gives you 50.000 CFA [indicate amount in the poster] since you had a bad yield.

How much family money [indicate image in the poster] do you have with the insurance in case of bad yield [indicate pink ball in the poster] ?

The family money is composed by:

- 30.000 CFA [indicate amount] that are the savings left after the insurance payment, plus

- 44.000 [indicate] that is the cotton revenue, plus

- 50.000 [indicate] CFA that the insurance gives you since you had a bad yield

Therefore the family money [indicate image] is 124.000 CFA [indicate amount]

- In case of a good yield [indicate orange balls in the poster]

You payed the insurance, your savings left are 30.000 CFA [indicate amount in the poster].The cotton revenue [indicate image in the poster] is 188.000 CFA [indicate amount in the poster]. The insurance [indicate image in the poster] gives you 0 CFA [indicate amount in the poster] since you had a good yield,.

How much family money [indicate image in the poster] do you have with the insurance in case of good yield [indicate orange ball in the poster]?

The family money is composed by:

- 30.000 CFA [indicate amount], that are the savings left after the insurance payment, plus

-188.000 CFA [indicate] that is the cotton revenue, plus

- 0 CFA since the insurance does not give you anything in case of good yield

Therefore the family money [indicate image] is 218.000 CFA [indicate amount]

Insurance presented with ALTERNATIVE FRAME (FrameB)

"An insurance on cotton production is something you buy before you know your yield. The insurance gives you some money after the harvest, but only in case of bad yield.Let me explain how the insurance works.

The amount of your savings is 50.000 CFA . You decide to buy an insurance before you know your yield. The insurance price is 20.000 CFA.You pay the insurance with your savings, BUT only in case of good yield. Therefore you remain with 30.000 CFA in case of good yield and 50.000 CFA in case of bad yield.

- In case of a bad yield [indicate pink ball in the poster]

You do NOT pay the insurance, your savings remain 50.000 CFA [indicate amount in the poster.]The cotton revenue [indicate image in the poster] is 44.000 CFA [indicate amount in the poster]. The insurance [indicate image in the poster] gives you 30.000 CFA [indicate amount in the poster] since you had a bad yield.

How much family money [indicate image in the poster] do you have with the insurance in case of bad yield [indicate pink ball in the poster] ?

The family money is composed by:

- 50.000 CFA [indicate amount], that are all your savings plus

- 44.000 CFA [indicate], that is the cotton revenue plus

- 30.000 [indicate] CFA that the insurance is giving you since you had a bad yield

Therefore the family money [indicate image] is 124.000 CFA [indicate amount]

- in case of a good yield [indicate orange balls in the poster]

You pay the insurance, your savings left are 30.000 CFA [indicate amount in the poster].The cotton revenue [indicate image in the poster] is 188.000 CFA [indicate amount in the poster].The insurance [indicate image in the poster]gives you 0 CFA [indicate amount in the poster] since you had a good yield .

How much family money [indicate image in the poster] do you have with the insurance in case of good yield [indicate orange ball in the poster]?

The family money is composed by:

- 30.000 CFA [indicate amount], that are the savings left after the insurance payment, plus

-188.000 CFA [indicate] that is the cotton revenue, plus

- 0 CFA since the insurance does not give you anything in case of good yield

Therefore the family money [indicate image] is 218.000 CFA [indicate amount]