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Higher-order Risk Preferences in Social Settings

An Experimental Analysis

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Timo Heinrich and Thomas Mayrhofer[1]

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Abstract

We study higher-order risk preferences, i.e. prudence and temperance, next to risk aversion in social settings. Previous experimental studies have shown that higher-order risk preferences affect the choices of individuals deciding privately on lotteries that only affect their own pay-off. Yet, most risky and financially relevant decisions in the field are made in the social settings of households or organizations. We aim to narrow the gap between laboratory and field evidence by creating a more realistic decision making environment in the laboratory that allows us to identify the influence of different social settings under controlled conditions. We elicit higher-order risk preferences of individuals and systematically vary how an individual's decision is made (alone or while communicating with a partner) and who is affected by the decision (only the individual or the partner as well). In doing so, we can isolate the effects of other-regarding concerns and communication on choices. We observe that individuals become more risk-averse when the partner is able to communicate with the decision maker. However, we do not observe an influence of social settings on prudence and temperance. Our results reveal that the majority of choices are risk-averse, prudent, and temperate across social settings.

JEL Classification: C91, C92, D70, D81

Keywords: Experiment; individual decisions; group decisions; risk aversion; prudence; temperance

October 2014

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1 Introduction

Much of economic research on behavior under uncertainty has focused on risk aversion. In the framework of expected utility theory, this behavioral tendency is captured by a negative second derivative of the utility function. More recently, higher-order risk preferences, namely prudence and temperance, have also moved into the focus of economists. Prudence refers to a positive third derivative of the utility function (Kimball, 1990), and temperance to a negative fourth derivative of the utility function (Kimball, 1992). Most of the commonly used utility functions (e.g. ln(x) and $x^{0.5}$) imply mixed risk aversion, which means that the derivatives of the utility functions exhibit alternating signs (see Brocket and Golden, 1987, as well as Caballé and Pomansky, 1996). These utility functions imply not only risk-averse, but also prudent and temperate behavior. In typical life-cycle models of consumption, prudence implies that an individual saves more if the risk of future income increases (also called precautionary saving that leads to more precautionary wealth) while temperance is a necessary condition for an independent unfair background risk to reduce the investment in risky assets.[1]

However, empirical estimates for the fraction of saving that is precautionary are extremely diverse, ranging from close to zero to greater than 50% (see Geyer, 2011, for a comprehensive overview of the literature).[2] In their critical review of the topic, Carrol and Kimball (2008) conclude that estimates of precautionary wealth are sensitive to elicitation procedures and subject to problems from unobserved heterogeneity.

Therefore, recent studies have analyzed higher-order risk preferences more directly via laboratory experiments (see Tarazona-Gómez, 2004; Deck and Schlesinger, 2010 and 2012; Ebert and Wiesen, 2011 and 2014; Maier and Rüger, 2012; as well as Krieger and Mayrhofer, 2012). Most of these experiments are based on the model-independent and non-parametric definition of higher-order risk preferences introduced by Eeckhoudt and Schlesinger (2006).[3] In the Eeckhoudt and Schlesinger lotteries, prudence is characterized by a preference for disaggregating a sure loss and the addition of a zero-mean background risk. In a sense, an individual is more willing to accept an extra risk when wealth is greater, i.e. the "pain" of an extra

[1] Higher-order risk preferences are not only important for saving (e.g. Leland, 1968, Sandmo, 1970, and Eeckhoudt et al., 2005) but affect behavior in various fields like auctions (e.g. Eso and White, 2004), prevention (e.g. Eeckhoudt and Gollier, 2005), bargaining (e.g. White, 2008), insurance demand (e.g. Fei and Schlesinger, 2008), public good provision (e.g. Bramoullé and Treich, 2009), risk sharing (Gollier, 1996), or medical decision making (e.g. Felder and Mayrhofer, 2011, 2014).

[2] Some field evidence in line with temperate behavior is presented by Dittmar (2002) and Guiso et al. (1996).

[3] Exceptions are the experiments by Tarazona-Gómez (2004) and by Krieger and Mayrhofer (2012) who use approaches based on expected utility theory to elicit second- and third-order risk preferences. Both studies, however, find results similar to those obtained by the studies that rely on the definition by Eeckhoudt and Schlesinger (2006).

risk decreases with an increase in wealth. Temperance implies a preference for disaggregating two independent zero-mean background risks, i.e. an individual facing an unavoidable background risk will reduce the exposure to another (independent) background risk. All studies observe that a majority of choices are risk-averse and prudent. Four of these studies also considered temperate behavior: While Deck and Schlesinger (2010) find (weakly) intemperate behavior to dominate, Ebert and Wiesen (2014), Maier and Rüger (2012), and Deck and Schlesinger (2012) find a majority of choices to be temperate.

In a recent study, Noussair et al. (2014) go two important steps further. First, they experimentally elicit higher-order risk preferences from a representative sample of the Dutch population and observe most choices to be risk-averse, prudent and temperate. Second, they correlate individual lottery choices with individual field behavior. Interestingly, Noussair et al. do not observe any correlation of risk aversion with financial decisions in the field. However, in line with theoretical results, they observe more prudent individuals to have less credit card debt and more temperate individuals to have less risky investment portfolios.

Previous experimental studies on higher-order risk preferences elicit the choices of individuals deciding *privately* on lotteries that only affect their *own payoff*. Yet, most risky and financially relevant decisions in the field are made in the social settings of households or organizations. Almost exclusively, they affect more than one person or are made after consulting with others. In this respect, they differ fundamentally from the decisions that have been studied experimentally thus far.

A large literature in economics provides empirical evidence for the importance of what can be subsumed as the social setting. For example, people consider the payoff of others when making decisions and do not always behave strictly selfishly (see Fehr and Schmidt, 2006, and Cooper and Kagel, 2009, for surveys). This observation has lead to the development of theories of other-regarding preferences (see, e.g., Fehr and Schmidt, 1999, and Bolton and Ockenfels, 2000). Furthermore, people's decisions are influenced by communicating with others even if messages are cheap talk (see Farrell and Rabin, 1996, Crawford, 1998, and Brosig, 2006, for surveys). Theories on guilt aversion or costs of lying are inspired by this observation (see, e.g., Charness and Dufwenberg, 2006, and Kartik, 2009).

We aim to narrow the gap between laboratory and field evidence on higher-order risk preferences by creating a more realistic decision environment in the laboratory that allows us to identify the influence of other-regarding concerns and communication. We elicit higher-order risk preferences of individuals and systematically vary how an individual's decision is made (alone or while communicating anonymously with a partner) and who is affected by the decision (only the individual or the partner as well). From a standard theoretical viewpoint, none of our treatment variations should change the behavior of a rational individual maximizing his or her own payoff. Note that we do not focus on risky decisions made by households (see, e.g., Mazzocco, 2004, Bateman and Munro, 2005) or group decision making (see, e.g., Charness and Sutter, 2012, Ambrus et al., 2013).[4]

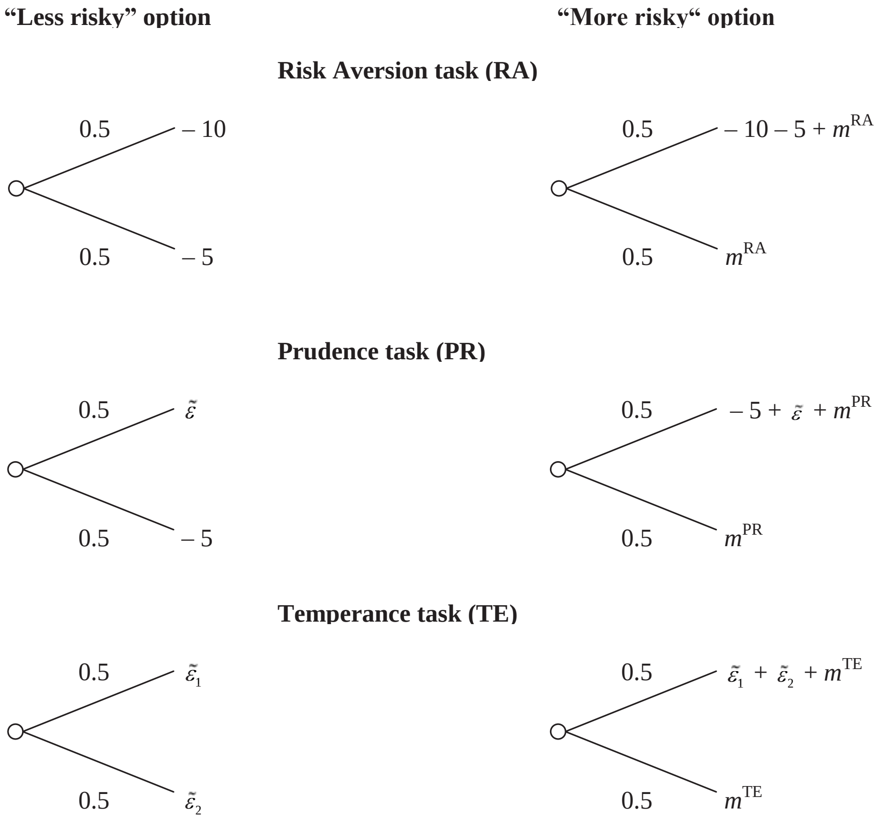
2 Experimental design

2.1 Lotteries

The aim of this study is to compare higher-order risk preferences of individuals in different settings. Therefore, it is more informative to measure the intensity rather than the mere direction of these preferences. The only experiment measuring intensities so far is the study by Ebert and Wiesen (2014). They base their elicitation method on the risk apportioning lotteries introduced by Eeckhoudt and Schlesinger (2006) and on the compensation premia introduced by Crainich and Eeckhoudt (2008). The elicitation method of Ebert and Wiesen (2014) follows a multiple price list approach as it is known from Holt and Laury (2002). However, in contrast to Holt and Laury (2002) who vary probabilities (while holding outcomes constant), Ebert and Wiesen vary outcomes (while holding probabilities constant). Ebert's and Wiesen's approach is thus also model-independent and non-parametric. We apply their elicitation method in our experimental design.

Subjects face pairwise lotteries in three different tasks: a risk aversion task (RA), a prudence task (PR), and a temperance task (TE), consisting of one, three and two stages, respectively. In general, subjects face two lotteries, one "less risky" and one "more risky" as displayed in Figure 1.

[4] There is an extensive literature in psychology on the risk attitudes of groups starting with Stoner (1961). More recently, this field of research has also moved into focus of economists who concentrate on risk aversion (see, e.g. Shupp and Williams, 2008, Baker et al., 2008, Masclet et al., 2009, Harrison et al., 2012, and Zhang and Casari, 2012). See also Trautmann and Vieider (2012) for a survey of related results. To our knowledge no study has experimentally elicited higher-order risk preferences of groups or of individuals in social settings so far.



The different stage-dependent zero-mean risks are denoted by $\tilde{\varepsilon}$ and the potential compensation premia by *m*.

Figure 1: Lottery pairs for risk aversion, prudence, and temperance tasks

Following Ebert and Wiesen (2014), outcomes in the lotteries are framed as losses.[5] However, each subject receives an endowment that depends on the task. In the risk aversion task the endowment is € 25, while in the prudence and temperance tasks the endowments are € 20 and € 17.50, respectively (for each stage within a task). In the prudence and temperance tasks also zero-mean risks $\tilde{\varepsilon}$ matter. Depending on the stage, $\tilde{\varepsilon}$ takes the values $\tilde{\varepsilon}$ = [0.5, 7; 0.5, -7], $\tilde{\varepsilon}$ = [0.8, 3.5; 0.2, -14], and $\tilde{\varepsilon}$ = [0.8, -3.5; 0.2, 14] in the prudence task.[6] In the temperance task subjects face two zero-mean risks, $\tilde{\varepsilon}_1$ and $\tilde{\varepsilon}_2$. Depending on the stage, these risks take the

[5] Note that Deck and Schlesinger (2010) and Maier and Rüger (2012) find no evidence of framing on the prevalence of higher-order risk preferences. Still, framing might influence the strength of higher-order risk preferences. We leave this question for future research.

[6] Note that the background risk in the second and third stage of the prudence task is skewed. A left-skewed (right-skewed) background risk decreases (increases) the difference in kurtosis of the overall lotteries. See Ebert and Wiesen (2014) for the statistical features of the lottery pairs (Table B.1).

values $\tilde{\varepsilon}_1$ = [0.5, 7; 0.5, -7] and $\tilde{\varepsilon}_2$ = [0.5, 3.5; 0.5, -3.5] or $\tilde{\varepsilon}_1$ = [0.8, -2.8; 0.2, 11.1] and $\tilde{\varepsilon}_2$ = [0.8, 2.8; 0.2, -11.1].

In each of the six stages subjects face 20 decisions in which the compensation premia *m* varies between € -0.50 and € 4.25 in steps of € 0.25.[7] The 'risk neutral' compensation is € 0.00 leading to an expected value of € 17.5 for each stage. Choosing a compensation premium of less than zero reveals (2nd-, 3rd-, or 4th-order) risk-loving behavior while choosing a compensation premium above zero reveals (2nd-, 3rd-, or 4th-order) risk-averse behavior.

2.2 Eliciting (higher-order) risk preferences

In this section, we will give a brief description of how (higher-order) risk preferences are elicited in our experiment. To do so, we will follow the example screen given in Figure 2, which shows the stage of the prudence task with $\tilde{\varepsilon}$ = [0.8, 3.5; 0.2, -14] and includes 20 decision situations.

In each decision situation, subjects decide which of the two risky events, one more and one less risky (in Figure 2: "Option A" and "Option B", respectively), they prefer. Both risky events comprise a random draw that is depicted as an urn with balls "Up" and "Down", where both balls can be drawn with equal probability.

We will start with Option B on the right-hand side of Figure 2: If the ball "Up" is drawn, the subject faces a second random draw which is also shown as an urn. In the second random draw, the subject receives € 3.5 with a probability of 80% and loses € 14 with a probability of 20% (the urn contains 8 balls with a payoff of € 3.5 and 2 balls with a payoff of € -14). If the ball "Down" is drawn, the subject loses a fixed amount of € 5 from his endowment of € 20.

In Option A: If the ball "Up" is drawn, the subject loses € 5 and faces the second random draw. Since option A is the risky event, a compensation amount is added to both situations "Up" and "Down" displayed within the blue box. The amount depends on the decision situation which is selected on the right-hand side of the screen in Figure 2. In this example, the amount takes the value of € 3. The subject now has to decide which of the two options he prefers for each of the 20 amounts shown on the right-hand side. However, subjects do not need

[7] Ebert and Wiesen (2014) vary the range of the risk premium (€ -0.50 to € 4.25 and € -2.50 to € 2.25) and its grid size (€ 0.25 and € 0.50). They observe that the former factor has an influence on choices while the latter has not. We selected the range of € -0.50 to € 4.25 for the risk premium as we feared that the range € -2.50 to € 2.25 might induce more risk neutral choices simply because € 0.00 is the central option and thereby more salient for subjects. Because we also select a grid size of € 0.25 our design corresponds to "fine grid" and "shifted grid" in their terminology.

to stick to a certain order of their decisions. After finishing all 20 decisions a button labeled "next" appears and subjects can leave the stage by clicking on it. Before the next stage starts, however, subjects have to confirm their decisions.

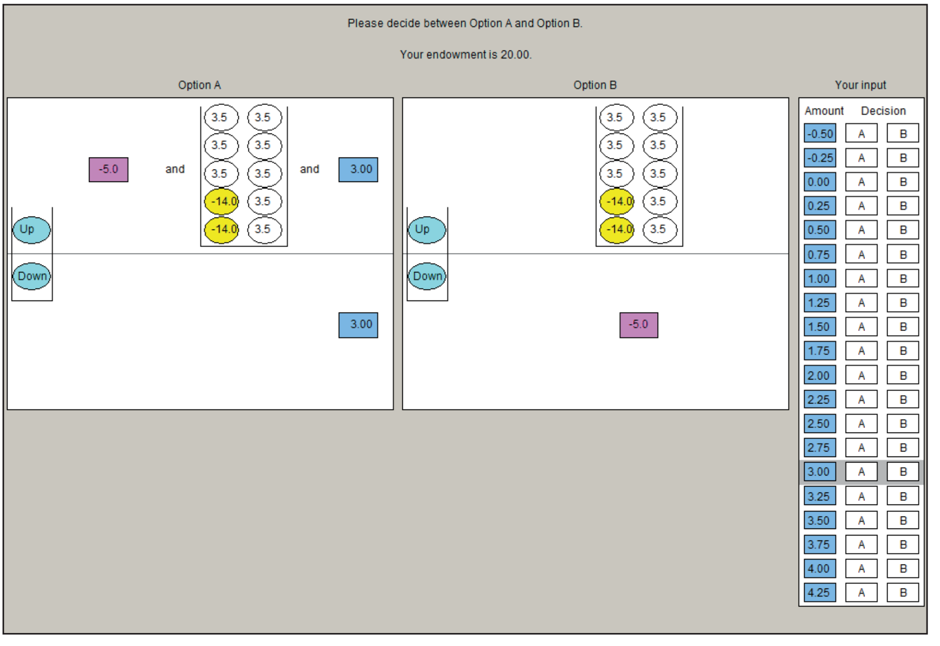


Figure 2: Screenshot of a decision screen in the prudence task

2.3 Treatments

The private elicitation of individual preferences as described in the previous section serves as our **Baseline** treatment. We vary the social setting in a simple 2x2 design yielding three additional treatments. In each of these three treatments, the *individual* is paired with another subject referred to as the *partner*. The role of the partner varies across treatments. In the communication treatment **C**, individuals can chat (using anonymous text-messages on their computer screens) with their partner while both face the same decisions. These choices are only payoff-relevant for themselves individually. This way decisions can be influenced by communication but not by other-regarding concerns.[8] In the other-regarding concerns treatment **O**, individuals

[8] We used free-form chat messages that subjects exchanged on a computer screen. This allows studying the content of the messages while avoiding (uncontrollable) confounding effects, e.g. due to reputation. See, e.g., Brosig (2006) on a discussion about the influence of different communication channels on behavior in experiments.

make decisions that not only determine their own payoff but also the payoff of the partner who does not make any payoff-related decisions. Neither can communicate, but other-regarding considerations can influence behavior. Finally, in the **CO** treatment, individuals make decisions that determine their own payoff and also the payoff of the partnering subject. However, in this treatment, they can also chat with the otherwise passive partner allowing for communication and other-regarding concerns to influence decisions. Table 1 summarizes the four treatments and the number of subjects within each treatment.[9]

Table 1: Treatments

	No other-regarding concerns	Other-regarding concerns
No communication	**Baseline** (*N* = 24)	**O** (*N* = 48)
Communication	**C** (*N* = 48)	**CO** (*N* = 42)

In the three additional treatments, the elicitation method follows the elicitation method of the **Baseline** treatment. That is, structure and payoff are the same. In the two treatments that allow for other-regarding concerns, both subjects receive the same payoff.

The experiment is split in two parts. In Part I, we elicit the preferences for all subjects individually (i.e., using the same procedure as in the **Baseline** treatment). In Part II, subjects are randomly distributed across the four treatments and the two roles (*individual* and *partner*). This way, we can control for individual preferences when comparing behavior across treatments. Behavior of the subjects in the **Baseline** treatment allows us to assess the effect of repeating the decision task. Note that we ran all four treatments within each session. This minimizes the potential influence of session-level effects on our results.[10]

What kind of behavior can be expected? Any rational and selfish individual who considers only his or her own payoff will make the same decisions in both parts of the experiment and across treatments. His or her preferences do not include the lottery payments to the partner in the **O** or **CO** treatment. These preferences are not based on any information that could be communicated by the partnering subject in the **C** or **CO** treatment. These simple predictions allow for a clean comparison of our **Baseline** treatment with the remaining treatments. Of

[9] We had to exclude six subjects (three pairs) that participated in the **CO** treatment of the first session due to a display error.
[10] See Appendix A for the order of events. Instructions for Part I are given in Appendix B and instructions for Part II in Appendix C.

course, other hypotheses can be derived from theories that are not based on the assumptions rationality and strictly selfish behavior. For example, people with other-regarding concerns may consider the risk imposed on their partner or people may try to adhere to some behavioral norm established through communication.

2.4 Experimental procedure

The experiment was conducted at the Essen Laboratory for Experimental Economics (elfe) at the University of Duisburg-Essen, Germany. Altogether, 162 subjects[11] participated in seven sessions that lasted 90 minutes each. Subjects were recruited using the software ORSEE (Greiner, 2004). The experiment was programmed with z-Tree (Fischbacher, 2007), while communication between individuals and their partners was facilitated by EasyChat[12] software.

Subjects entered the laboratory one after another and were randomly allocated (by the draw of a ball from an urn) to a workspace where they found the instructions for Part I. Questions were answered in private at the subject's workspace by the experimenter. Communication between subjects was – at this stage – not permitted. Part I started only after subjects had successfully answered two comprehension questions about the instructions on their computer. In these questions the subjects were asked to calculate the payoffs of potential lottery outcomes in two decision situations.

In Part I subjects first made their decisions in the risk aversion task. Subsequently they answered the prudence task with three stages and the temperance task with two stages.[13] The order of the stages within the prudence or the temperance task was randomly determined for each subject. After finishing all 120 decisions of the first tasks, subjects were randomly allocated to one of the four treatments and received the respective instructions. In a last step, subjects' payoff was determined randomly. To avoid wealth and averaging effects, we used the

[11] We only consider the behavior of male subjects (interacting with males). As several studies suggest that women behave more risk aversely than men (see Eckel and Grossman, 2008, and Croson and Gneezy, 2009, for surveys), the gender make up of participants could influence behavior in social settings. The results on higher-order risk preferences are mixed (see Ebert and Wiesen, 2014). We decided against interactions between participants of different gender. Due to our focus on individual decision making, this would have required several additional treatments. However, the interaction of couples would be an interesting extension with respect to the study of household behavior (see also Bateman and Munro, 2005, de Palma et al., 2011, and He et al., 2012).

[12] See http://www.ec3hp.de for more information. Unnecessary components of EasyChat's user interface were hidden using Zorro, see http://www.gabrieleponti.com/software.

[13] Ebert and Wiesen (2014) do not find evidence for order effects when varying these stages. We therefore only ran one order of tasks. We started with the elicitation of risk aversion because the respective lotteries are somewhat simpler than the prudence and temperance lotteries that follow. We think this makes it easier for subjects to get used to the decision environment. See Noussair et al. (2014) for a similar reasoning. Note that this is also an argument for eliciting individual preferences in Part I before assigning subjects to the more complex treatments **C**, **O** and **CO** in Part II.

random payment technique. Therefore, only one of the 240 decisions was paid out after it was randomly chosen for each subject at the end of experiment.[14] Subjects earned € 18.56 on average (minimum € 6.00, maximum € 32.40). Finally, subjects were paid in private and left the laboratory one after another.

3 Results

3.1 Individual higher-order risk preferences

The results from Part I of our experiment can be compared to the findings presented by Ebert and Wiesen (2014). We follow their procedures in our data analysis and exclude subjects that switched more than two times in more than one of the six stages. Therefore, 21 out of 162 subjects (13%) are excluded which is a higher percentage than the 6% reported by Ebert and Wiesen, but similar to studies using a multiple price list format (cf. 13% in Holt and Laury, 2002, and 12% in Krieger and Mayrhofer, 2012). In this section we consider all subjects independent of the role they will take in Part II (i.e., we consider *individuals* and *partners*).

We calculate an individual's risk premium as the average m selected within the respective task. Averaging the risk premium (hereafter RP) across subjects yields € 1.67 in the risk aversion task, € 2.00 in the prudence task, and € 1.41 in the temperance task as displayed on the left side of Figure 3. All results are significantly different from zero, the neutral switch point ($p < 0.001$, two-sided Wilcoxon signed-rank tests), revealing a tendency towards risk-averse, prudent, and temperate behavior. Furthermore, the risk premia differ significantly between tasks ($p \leq 0.044$). In their sessions with the same range of potential risk premia ("shift" in their terminology), Ebert and Wiesen observe smaller risk premia in the risk aversion task (€ 1.50) and the temperance task (€ 1.12), but the same risk premium in the prudence task (€ 2.00).

[14] For a discussion of the random payment technique see, among others, Starmer and Sugden (1991), Cubitt et al. (1998), Laury (2006), and Baltussen et al. (2010).

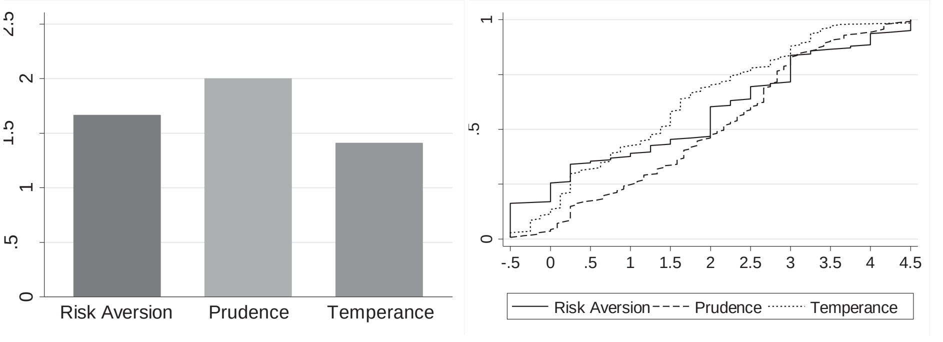


Figure 3: Means and cumulative distributions of risk premia in Part I

The right side of Figure 3 shows the cumulative distribution of the risk premium for all three tasks. Overall, 16% of our subjects are risk-loving (RP < 0), 9% are risk-neutral (RP = 0), and 75% are risk-averse (RP > 0). Regarding prudence, we find 3% of our subjects in Part I to be imprudent, 1% to be prudent-neutral, and 96% of our subjects to be prudent. In the temperance task, 11% of the subjects are intemperate, 3% are temperate-neutral, and 87% are temperate.[15]

3.2 Higher-order risk preferences in social settings

In Part II we introduce a social setting based on the respective treatment. In the following analysis we ignore the *partners* but focus on the decision making *individuals*. Applying the same consistency check in Part II led to the exclusion of one additional subject.

Analogous to Part I, the average risk premia in all four treatments in Part II are significantly different from zero ($p \leq 0.016$, two-sided Wilcoxon signed-rank tests). Thus, our experiment reveals that the main finding of Ebert and Wiesen (2014) on individual decisions that are made privately with respect to one's own payoff applies more broadly: Based on the risk premia, the majority of subjects are also classified as risk-averse, prudent, and temperate in settings that allow for communication and other-regarding concerns to affect decisions (see Table 2).

[15] In comparison to Ebert and Wiesen, we observe more subjects to be risk-averse, prudent and temperate. In their experiment, 66% of subjects are risk-averse, 88% are prudent and 75% are temperate. However, these numbers refer to the aggregate of the two different ranges of risk premia used in their experiment.

Table 2: Subject classification by treatment in Part II

	Risk-averse	Prudent	Temperate
Baseline	63%	100%	94%
Treatment **C**	65%	88%	79%
Treatment **O**	79%	91%	65%
Treatment **CO**	85%	95%	80%

Our experiment also allows for quantification of the change of individual risk preferences associated with decisions in social settings. In order to identify the influence of the social setting on risk attitudes, we ran three panel regressions (one for each task) over all stages of Part I and Part II with the risk premium as the dependent variable. Per subject, this yields two observations from the stages of the risk aversion task RA, six observations from the stages of the prudence task PR, and four observations of the stages in the temperance task TE – one half from Part I, the other from Part II. This estimation approach allows us to assess the influence of the treatments **C**, **O**, or **CO** on behavior while controlling for individual differences in risk attitudes (via the observations in Part I) and any potential repetition effects (via the **Baseline** treatment).

Since our data is censored (the lower bound of the risk premium is -0.5 while the upper bound is 4.5), we use a random effects Tobit estimation on individual *i*'s risk premium m_{ij},

$$m_{ij} = \beta_0 + \beta_1 \cdot c_i + \beta_2 \cdot o_i + \beta_3 \cdot co_i \;\; + \beta_4 \cdot r_{ij} + \eta_i + \varepsilon_{ij},$$

where *j* refers to stage of the respective task (RA, PR or TE). The treatment **C**, **O**, or **CO** is indicated by the dummies c_i, o_i and co_i. We assume independent and normally distributed error terms denoted by η_i and ε_{ij} that capture differences between individuals and idiosyncratic effects within stages. The repetition of a stage in Part II is indicated by the dummy r_{ij}.

The resulting average marginal effects, coefficients and standard errors are presented in Table 3. As they show, changing the social setting does not influence prudence and temperance significantly in comparison to the **Baseline** treatment in which decisions are made privately and are only payoff-relevant for the decision maker. Neither do we observe a repetition effect. With respect to risk aversion, however, the social setting matters: The regression reveals no significant effect of other-regarding concerns but a weakly significant positive effect of communication on the risk premium. Calculating average marginal effects reveals that the **C** treatment increases the expected risk premium by € 0.73 relative to the **Baseline** treatment (p = 0.051). Also choices in the **CO** treatment are significantly more risk-averse than in the

Baseline treatment. Decision makers ask for an expected additional premium of € 1.09 (p = 0.004). Overall, choices in Part II are more risk seeking than in Part I (p = 0.039).

In addition, Table 4 presents the results of Wald tests comparing the coefficients between the treatments **C**, **O**, and **CO**. It shows that decisions in the **CO** treatment are not only more risk-averse than in the **Baseline** treatment but also significantly more risk-averse than in the **O** treatment (p = 0.019). The difference between **CO** and **C** is not significant (p = 0.302), thus, there is no significant evidence for a complimentary effect of other-regarding concerns and communication. However, Table 4 reveals a weakly significant treatment effect with respect to prudence. Even though decisions do not differ significantly at conventional levels from the **Baseline** treatment in any of the treatments, decision makers appear to be somewhat more prudent in the **CO** treatment than in the **O** treatment (p = 0.090). There is no additional treatment effect with respect to temperance.

Table 3: Random effects Tobit regressions on risk premia

	Risk aversion RA		Prudence PR		Temperance TE	
	M. E.	Coeff.	M. E.	Coeff.	M. E.	Coeff.
Treatment **C**	0.733*	0.896*	-0.206	-0.247	0.218	-0.265
	(0.375)	(0.460)	(0.282)	(0.337)	(0.282)	(0.343)
Treatment **O**	0.264	0.323	-0.456	-0.546	0.202	-0.246
	(0.382)	(0.468)	(0.283)	(0.340)	(0.290)	(0.352)
Treatment **CO**	1.091***	1.335***	-0.001	-0.001	-0.074	-0.090
	(0.383)	(0.474)	(0.293)	(0.351)	(0.291)	(0.354)
Repetition	-0.613**	-0.750**	-0.003	-0.004	0.043	0.052
	(0.297)	(0.365)	(0.222)	(0.265)	(0.221)	(0.268)
Constant		2.382***		2.021***		1.273***
		(0.451)		(0.331)		(0.339)
N	166		498		332	
Log likelihood	-286.473		-880.989		-547.202	

Marginal effects (M. E.) are calculated as the average marginal effect on the observed risk premia. The Tobit coefficients (Coeff.) give the marginal effect on the latent variable. Standard errors are given in parentheses.
* $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 4: Coefficient comparisons (*p*-values of Wald tests)

	Risk aversion RA	Prudence PR	Temperance TE
Treatments **C** vs **O**	0.173	0.330	0.952
Treatments **C** vs **CO**	0.302	0.441	0.588
Treatments **O** vs **CO**	0.019	0.090	0.637

3.3 Heterogeneity of pairs

In the previous section, we observed more risk-averse choices in treatments **C** and **CO** that both allow for communication. While the former analysis focused on the aggregate treatment effects, we now turn to the potential heterogeneity between individuals and their partners in the risk aversion stages RA.

Our experimental design allows for a within-subject comparison between subjects' behavior in Part I and Part II. Since we elicit (individual) risk preferences for all subjects in Part I, we are able to identify different make ups of pairs in Part II. For the analysis, we restrict the sample to pairs where both, the individual and his partner, decided consistently. Figure 4 displays the individuals' changes of *m* due to treatments **C** and **CO** as well as the span of *m*, i.e. the difference between individual's and partner's compensation premium in Part I. Individuals' decisions in Part I are standardized to zero on the y-axis while the end of the line (span) represents the partner's decision. A negative difference means that the partner was less risk-averse than the individual in Part I while a positive difference means that the partner was more risk-averse. The circles and triangles represent the individuals' changes of *m* from Part I to Part II. A circle indicates that the individual's choice in Part I was farther away from the risk-neutral position than the choice of the partner in Part I. A triangle indicates that the partner's decision was farther away.

Due to the repetition effect observed in the **Baseline** treatment, we would expect the changes of *m* between both parts to be negative on average. However, on average, decisions in Part II follow the positions further away from risk-neutrality in Part I (and since most of these positions are risk-averse also choices in Part II become more risk-averse). Individuals exhibit a tendency to follow their partners more often in the **CO** treatment than in the **C** treatment. 38% of the individuals in the **C** treatment and 53% of the individuals in the **CO** treatment are matched with a more risk-averse partner. Of these, 33% in **C** and 70% in **CO** become more risk-averse in Part II. 50% of the individuals in the **C** treatment and 42% of the individuals in the **CO** treatment are matched with a less risk-averse partner. Of these, 25% in **C** and 50% in

CO become more risk-loving in Part II. This difference between treatments is weakly significant (two-sided Fisher's exact test, $p = 0.087$).

Even though we consider individual decision making, we can relate these findings to the literature on group decision making. Even though subjects do not decide jointly, it could be argued that the ability to chat is sufficient to create a group identity within pairs in our experiment.[16] The work on risky decisions made by groups has been pioneered by Stoner (1961). Since then, many studies have found that group decisions move to the more extreme points. These moves are called "risky shifts" if the most extreme group member is more risk-loving than the rest of the group or "cautious shifts" if the most extreme group member is more risk-averse (Isenberg, 1986). If we interpret choices further away from risk neutrality as "more extreme", this result is in line with our findings presented above. More recent experiments using real monetary outcomes find (at least partly) a movement towards more extreme positions in group decisions – although more in favor of the cautious shift (see for instance Bateman and Munro, 2005, Shupp and Williams, 2008, Masclet et al., 2009, and Harrison et al., 2012).

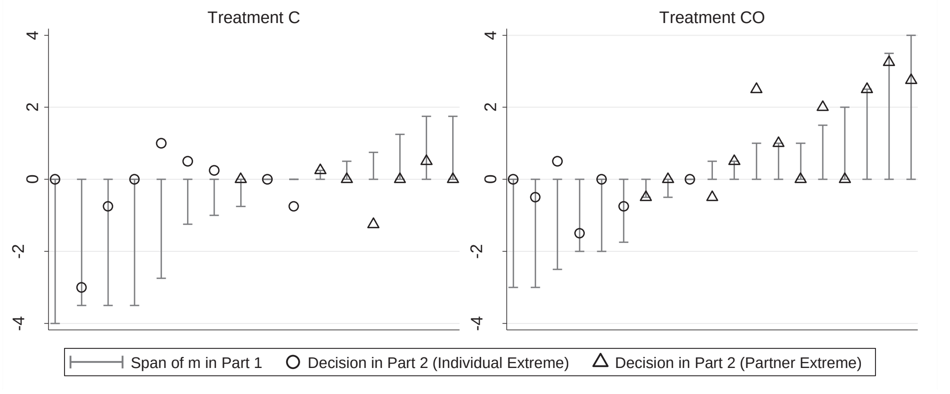


Figure 4: Individual behavior in RA

3.4 Communication content

As the treatment differences that we observe suggest, communication influences individual decisions under uncertainty. On average, the subjects in the two communication treatments **C** and **CO** exchange 35 messages with an average of 29 characters in length over the course of

[16] See Chen and Lee (2009) for a review of different approaches to create group identities in experiments.

the six stages of Part II. A pair of subjects writes around six more messages in the **CO** treatment than in the **C** treatment (p = 0.029, two-sided Mann-Whitney-U test), but the sum of characters written does not differ significantly (p = 0.195). In neither treatment does the number of messages nor the number of characters differ between roles, i.e. between individuals and partners ($p \geq 0.217$, two-sided Wilcoxon tests).

In order to gain some first insights on the role of communication, we classify the messages sent by individuals and their partners based on content. Two research assistants independently coded all messages according to a simple classification scheme.[17] We present brief results on the two following content categories:

(i) Does the subject mention his preferred strategy?

(ii) Does the subject express agreement with the other's preferred strategy?

Both were coded as binary variables ("yes" or "no") message by message and classified consistently (Krippendorf's Alpha ≥ 0.728).

First, we compare the message content between the pairs of the two treatments. The number of messages and the number of characters that cover the sender's preferred strategy does not differ significantly between the two treatments ($p \geq 0.106$, two-sided Mann-Whitney-U tests). Agreement with the other subject's preferred strategy is more extensively voiced in the **CO** treatment than in the **C** treatment ($p \leq 0.002$). This is not surprising, as there is only one decision being made in the former treatment but two decisions in the latter.

Second, we compare the message content across roles within the two treatments. As one might expect, there are no differences between roles in the **C** treatment as both roles are symmetric ($p \geq 0.262$, two-sided Wilcoxon tests). In the **CO** treatment, we do not find any differences with respect to the number characters used to cover the two topics ($p \geq 0.323$). However, the passive partners send on average two more messages mentioning their own preferred strategy than do the decision making individuals (p = 0.013). They also send two and a half messages more expressing their agreement with the other's preferred strategy (p = 0.001).

From a game-theoretic perspective, talk is cheap if the interests of the agents are opposed but can be used as a coordination device if interests are similar as summarized by Crawford (1998). Recently, different explanations have been put forward to explain an influence of

[17] In a first meeting the research assistants met with one of the authors who explained the data set and the classification scheme to them. Then they classified a training sample based on the observations excluded from the **CO** treatment (see Footnote 9). In a second meeting classification discrepancies and remaining questions were discussed. After that the research assistants coded the complete data set independently. Any questions arising during the classification process were answered over a shared mailing list by one of the authors.

communication in the cases where talk is cheap. For instance, one explanation is guilt aversion. “A guilt-averse player suffers from guilt to the extent he believes he hurts others relative to what they believe they will get. Therefore, he is motivated by his beliefs about others’ beliefs.” (Charness & Dufwenberg, 2006, p. 1583). Another explanation is that individuals have noisy preferences, i.e. they are uncertain about their expected utility-maximization. In this case, “observing others’ choices may provide information on possible errors in their private decision.” (Viscusi et al., 2011, p. 83). With respect to our experiment, the former explanation suggests an influence of guilt aversion for the **CO** treatment but not for the **C** treatment. Only in the **CO** treatment does the decision making individual influence the payoff of the partner directly. The latter explanation can influence behavior in both treatments because subjects can exchange information about the decision task in **C** and **CO**. This reasoning can explain the different effect sizes of the two treatments we observe on aggregate. It can also explain the more active communication in the **CO** treatment.

4 Conclusion

One focus of this research on higher-order risk preferences has been the study of household portfolios. Based on field data, numerous studies have provided evidence of precautionary wealth that increases with background risks as suggested by prudent preferences. Yet, the estimates of prudent behavior vary widely (see, e.g., Carrol and Kimball, 2008, and Geyer, 2011). The use of laboratory experiments has provided a more direct measure of prudence as well as risk preferences of even higher orders such as temperance. The results suggest that a majority of people are not only risk-averse but also prudent and temperate (see, e.g., Noussair et al., 2014).

Previous experiments have focused on eliciting individual decisions that are made in isolation and only affect the decision maker’s payoff. In this paper, we extend this line of research by studying the social dimension of higher-order risk preferences. We believe this aspect of higher-order risk preferences is of particular importance as most risky decisions are made in social settings. Couples buying a house or board members considering building a plant will take into account background risks when making their decisions. However, none of them will decide in isolation and their choice affects the payoff of more than one person.

This study covers two aspects of social settings that have been found to influence behavior in various experiments (often contrary to standard economic theory): Communication and concerns about the payoff of others. For this purpose, we build on the study by Ebert and Wiesen (2014) who introduced the first method for eliciting the strength of higher-order risk preferences. We apply their method in a novel experimental design and systematically vary how communication and other-regarding concerns can influence decisions. The results of the present study reveal a shift towards more risk-averse behavior that appears to be driven by the ability to communicate with others. However, we do not observe social setting influencing higher-order risk preferences, i.e. prudence and temperance. Yet, we find that the majority of subjects are risk-averse, prudent and temperate across social settings.

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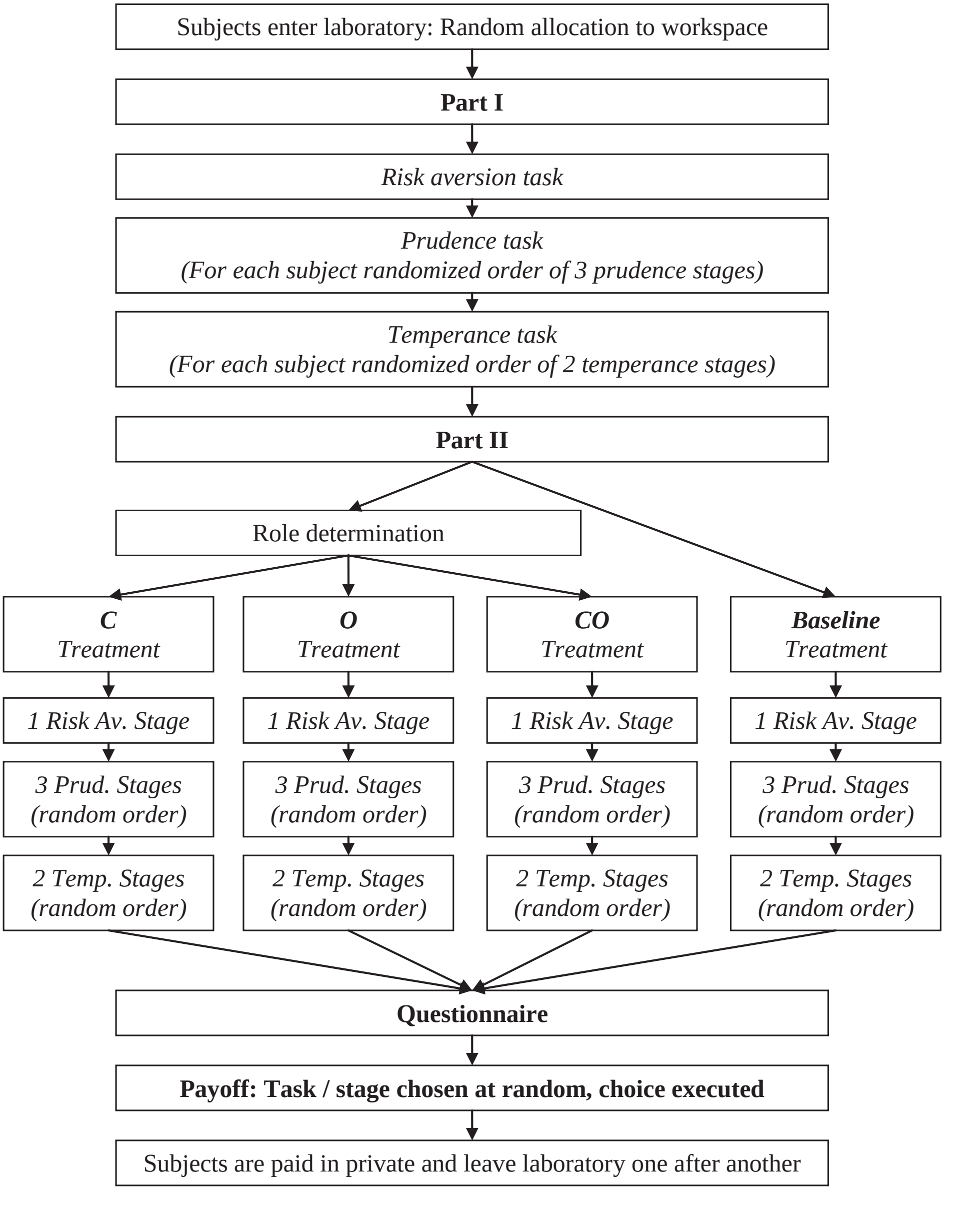
Appendix

A. Order of events



B. Instructions Part I

[*Translated from German; Instructions of Part I follow Ebert and Wiesen (2014)*]

General Information

In the following experiment, you will make several decisions. By following the instructions you can earn money. Your earnings depend on your choices and on chance. It is therefore very important that you read the instructions carefully. Decisions will be made using a computer. During the experiment you are not allowed to talk to the other participants. Whenever you have a question, please raise your hand or open your cabin door. The experimenter will answer your question in private at your place. If you disregard these rules, you can be excluded from the experiment. Then you will receive no payment.

In the experiment **all amounts are stated in Euro**. At the end of the experiment, you will be paid your earnings in cash.

The experiment consists of two different parts. Before each part starts, you will receive detailed instructions. Please notice that neither your decisions from the first part of the experiment nor your decisions from the second part of the experiment will influence the other part of the experiment.

At the end of the experiment one of the two parts is chosen randomly for your payoff. The drawing of one of the both parts occurs with equal probability.

Structure of the experiment

This part of the experiment is divided into six stages. Note that all stages are equally relevant for your payoff. The six stages comprise decision problems where risky events play a role. In each of the decision problems, you decide which of two risky events you prefer. In a risky event, the outcome is uncertain. The form of the risky events will be described when explaining the stages in-depth.

Payoff in the experiment

If this part of the experiment is chosen for payoff, one out of 120 decisions of this part will be randomly selected. The selection will take place at the end of the experiment. For this, a random generator decides which decision will determine your payoff. The draw of each of the

120 decisions occurs with equal probability. Afterwards, the outcome of the chosen risky event will be determined using a random draw which considers the given probabilities. These random draws will be explained in-depth in the descriptions of the particular stages of the experiments.

Note that only one of the 120 decisions determines your payoff in the experiment and that each of the 120 decisions can determine your entire payoff in the experiment.

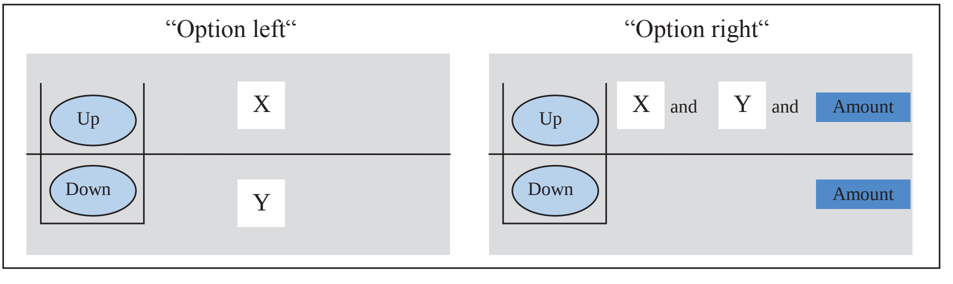
Also note that the risky events can comprise negative outcomes. However, you receive an endowment which can differ between stages. Hence, your payoff is made up of the two components

Endowment and **Outcome of the risky event**

At the end of the experiment each participant will determine his or her relevant decision as well as the outcome of the risky event of this decision by using a random generator on his computer.

Decision situation

The risky events displayed in the following figure describe the decision situation you face in the six stages of the experiment in an abstract way. In each decision situation, you decide which of the two risky events (here: "Option left" and "Option right") you prefer.



Both risky events, "Option left" and "Option right", comprise a random draw (here RANDOM DRAW 1) that is depicted as an urn with balls marked "Up" and "Down". Both Balls in RANDOM DRAW 1 can be drawn with equal probability. That means, with 50% probability you are in situation "Up" or with 50% probability in situation "Down."

We now look at the risky event "**Option left**": If the ball "Up" is drawn, the outcome is X. X can either be a FIXED AMOUNT or another RANDOM DRAW (RANDOM DRAW X). If ball "Down" is drawn, the outcome is Y. Likewise, Y can either be a FIXED AMOUNT or another RANDOM DRAW (RANDOM DRAW Y).

In risky event "**Option right**", X <u>and</u> Y follow if the ball "Up" is drawn. In addition, an AMOUNT (blue bank note) is added to both situations "Up" and "Down." If the ball "Down" is drawn, you receive the AMOUNT indicated on the bank note. If the ball "Up" is drawn, X <u>and</u> Y follow and the AMOUNT (blue bank note) is added. The AMOUNT on the blue bank note can take the following values:

-0.50; -0.25; 0.00; ... ; 3.75; 4.00; 4.25

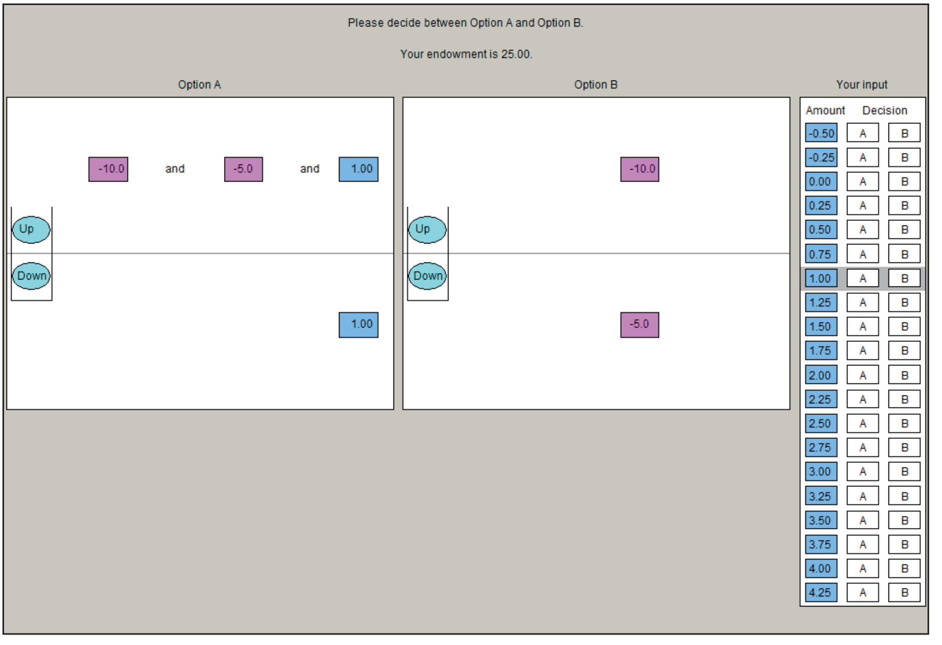
Hence, for <u>each</u> of these 20 AMOUNTS, one decision situation with two risky events follows. The AMOUNT on the blue bank note is always added to both situations "Up" and "Down" of the risky event where both X and Y occur in situation "Up" (here: "Option right"). Note that on your decision screens, the risky event where the AMOUNT (blue bank note) is added can either be the right or the left option.

First Stage

In the first stage of the experiment, you make <u>20</u> decisions. You choose on one decision screen at a time which of the two different risky events—Option A or Option B—you prefer.

The risky events can comprise negative outcomes. For each decision in the first stage, you receive an endowment of <u>25.00</u>. An example of a decision situation in the first stage is provided in the following figure. In this example, the AMOUNT (blue bank note) is added to Option A. The size of the added AMOUNT can be found in the column "**Amount**" on the right-hand side of the screen. For <u>each</u> AMOUNT you decide whether you prefer Option A or Option B.

After activating an AMOUNT in the column "**Amount**", you decide by clicking on "**A**" or "**B**" whether you prefer Option A or Option B. A grey frame marks the current decision situation. You do not need to stick to a certain order of your decisions. Before you leave the stage, you will have the opportunity to change your decisions.



How is the outcome of the chosen risky event determined in the first stage? For Random draw 1, there are two balls in an urn – one with the label "Up" and one with the label "Down". Both balls can be drawn with equal probability.

Please look again at the example in the previous figure! Suppose this decision has been randomly chosen to determine your payoff.

In **Option A**, *the outcome is* -10.00 *plus* -5.00 *plus* 1.00 (Amount on blue bank note), *i.e. in total* -14.00, *if in* Random draw 1 *the ball* "Up" *is drawn. If ball* "Down" *is drawn, the outcome is* 1.00 (Amount on blue bank note). *Under consideration of your* Endowment *of 25.00, your payoff in Option A is* 11.00 *in situation* "Up" *and* 26.00 *in the situation* "Down".

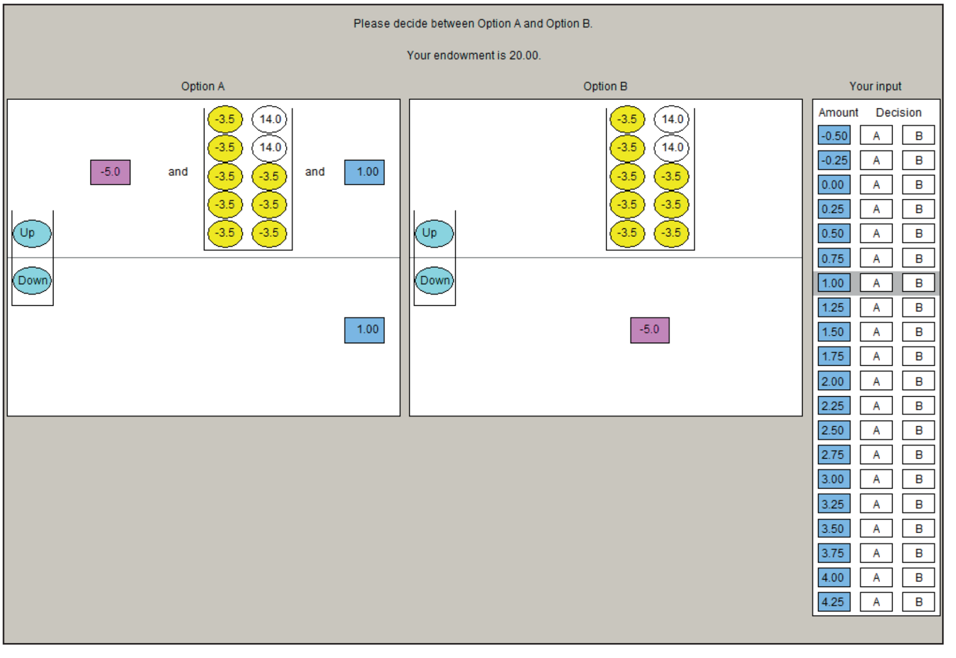
In **Option B**, *the outcome is* -10.00 *if in* Random draw 1 *the ball "Up" is drawn. If the ball "Down" is drawn, the outcome is* -5.00. *Under consideration of your* Endowment *of* 25.00, *your payoff in Option B is* 15.00 *in situation* "Up" *and* 20.00 *in situation* "Down".

Second to Fourth Stage

In the second to fourth stage you make 60 decisions in total. You choose in three stages, each with 20 decision situations, which of the two different risky events – Option A or Option B – you prefer.

The outcomes of the risky events can be negative. You receive an Endowment of 20.00. An example of a decision situation in the second to fourth stage is provided in the following figure. In this example, the Amount (blue bank note) is added to Option A. The size of the added Amount can be found in the column "**Amount**" on the right-hand side of the screen. For each Amount, you decide whether you prefer Option A or Option B.

After activating an Amount in the column "**Amount**", you decide whether you prefer Option A or Option B by clicking on "**A**" or "**B**." A grey frame marks the current decision situation. You do not need to stick to a certain order of your decisions.



How is the outcome of the chosen risky event determined in the second to fourth stage? For Random draw 1, there are two balls in an urn – one with label "Up" an one with label "Down." Both balls can be drawn with the same probability (analogous to the first stage). As shown in the example in the previous figure, in the second to fourth stage a second random draw (Random draw X) can be necessary to determine your payoff.

In Random draw X, a ball is drawn from an urn containing 10 balls. This ball can either be white or yellow. Note that the composition of white and yellow balls can change between stages two to fourth. This urn always contains 10 balls, and within a stage (with 20 decisions) the composition of white and yellow balls is identical.

Please look again at the example in the previous figure! Suppose this decision has been randomly chosen to determine your payoff.

If in **Option A** *in* RANDOM DRAW 1 *ball* "Up" *is drawn, the outcome is* -5.00*, followed by* RANDOM DRAW X *and an* AMOUNT *of* 1.00 *(blue bank note).*

- *If in* RANDOM DRAW X *a <u>yellow</u> ball is drawn, you lose* 3.50*. Under consideration of your* ENDOWMENT *of* 20.00*, you receive* 12.50 (= 20.00 − 5.00 − 3.50 + 1.00).
- *If in* RANDOM DRAW X *a <u>white</u> ball is drawn, you receive* 14.00*. Under consideration of your* ENDOWMENT*, you receive* 30.00 (= 20.00 − 5.00 + 14.00 + 1.00).

If in **Option A** *in* RANDOM DRAW 1 *the ball* "Down" *is drawn, the outcome is* 1.00 *(*AMOUNT *on the blue bank note). Under consideration of your* ENDOWMENT*,* 21.00 *result.*

If in **Option B** *in* RANDOM DRAW 1 *the ball* "Up" *is drawn,* RANDOM DRAW X *follows.*

- *If in* RANDOM DRAW X *a <u>yellow</u> ball is drawn, you lose* 3.50*. Under consideration of your* ENDOWMENT *of* 20.00*, you receive* 16.50*.*
- *If in* RANDOM DRAW X *a <u>white</u> ball is drawn, you receive* 14.00*. Under consideration of your* ENDOWMENT*, you receive* 34.00*.*

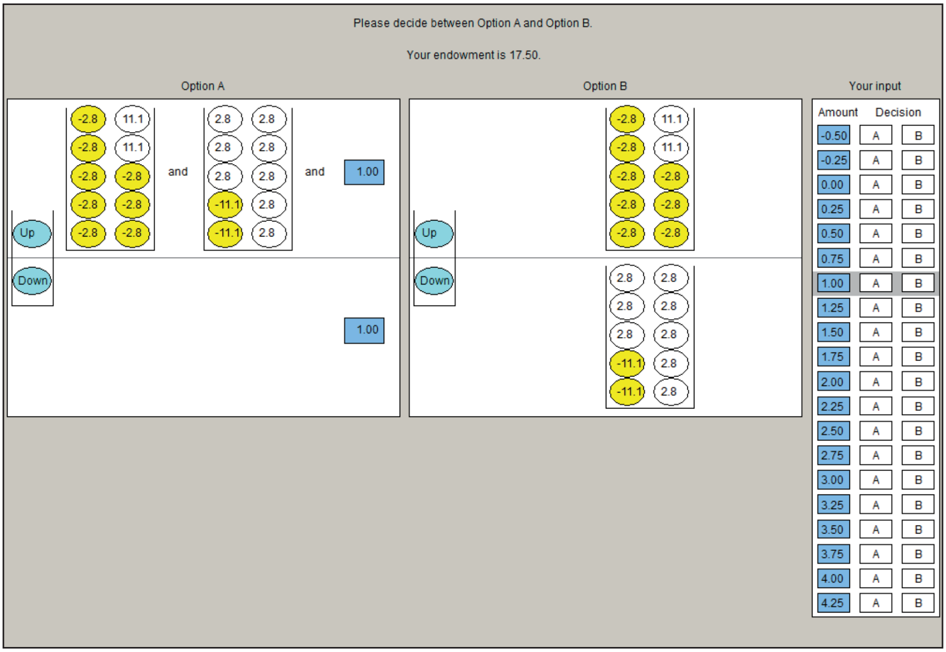
If in **Option B** *in* RANDOM DRAW 1 *the ball* "Down" *is drawn, the outcome is* -5.00*. Under consideration of your* ENDOWMENT*,* 15.00 *result.*

Fifth and Sixth Stage

In the fifth and sixth stage you make <u>40</u> decisions altogether. You choose in both stages, each with 20 decision situations, which of the two different risky events – Option A or Option B – you prefer.

The outcomes of the risky events can be negative. You receive an ENDOWMENT of <u>17.50</u>. An example of a decision situation in the fifth and sixth stage is provided in the following figure. In this example, the AMOUNT (blue bank note) is added to Option A. The size of the added AMOUNT can be found in the column "**Amount**" on the right-hand side of the screen. For <u>each</u> AMOUNT you decide whether you prefer Option A or Option B.

After activating an AMOUNT in the column "**Amount**" you decide by clicking on "**A**" or "**B**" whether you prefer Option A or Option B. A grey frame marks the current decision situation. You do not need to stick to a certain order of your decisions.



How is the outcome of the chosen risky event determined in the fifth and sixth stage? For RANDOM DRAW 1, there are two balls in an urn – one with label "Up" and one with label "Down." Both balls can be drawn with equal probability (analogous to the first four stages). As shown in the example in the following figure, in the fifth and sixth stage a second random draw (RANDOM DRAW X) and / or a third random draw (RANDOM DRAW Y) can be necessary to determine your payoff.

In RANDOM DRAW X, a ball is drawn from an urn containing 10 balls. This ball can be either white or yellow. Note that the composition of white and yellow balls can change between the two stages. The urn always contains 10 balls, and within a stage (with 20 decisions) the composition of white and yellow balls is identical. This holds analogously for RANDOM DRAW Y. Notice, however, that the composition of yellow and white balls across RANDOM DRAW X and RANDOM DRAW Y can differ (see figure).

Please look again at the example in the previous figure! Suppose this decision has been randomly chosen to determine your payoff.

If in **Option A** *in* RANDOM DRAW 1 *the ball* "Up" *is drawn,* RANDOM DRAW Y *<u>and</u>* RANDOM DRAW X *follow. Moreover, the* AMOUNT *of* 1.00 *(blue bank note) is added.*

- *If in* RANDOM DRAW X *and in* RANDOM DRAW Y *a yellow ball is drawn, you lose* 2.80 *(from* RANDOM DRAW X*) and* 11.10 *(from* RANDOM DRAW Y*). Under consideration of your* ENDOWMENT *of* 17.50*, you receive* 4.60 (= 17.50 − 11.10 −2.80 + 1.00).
- *If in* RANDOM DRAW X *and in* RANDOM DRAW Y *a white ball is drawn, you receive* 11.10 *(from* RANDOM DRAW X*) and* 2.80 *(from* RANDOM DRAW Y*). Under consideration of your* ENDOWMENT *of* 17.50*, you receive* 32.40 (= 17.50 + 11.10 +2.80 + 1.00).
- *If in* RANDOM DRAW X *a white ball and in* RANDOM DRAW Y *a yellow ball is drawn, you receive* 11.10 *(from* RANDOM DRAW X*), and you lose* 11.10 *(from* RANDOM DRAW Y*). Under consideration of your* ENDOWMENT*, you receive* 18.50 (= 17.50 + 11.10 − 11.10 + 1.00).
- *If in* RANDOM DRAW X *a yellow ball and in* RANDOM DRAW Y *a white ball is drawn, you lose* 2.80 *(from* RANDOM DRAW X*) and you receive* 2.80 *(from* RANDOM DRAW Y*). Under consideration of your* ENDOWMENT*, you receive* 18.50 (= 17.50 − 2.80 + 2.80 + 1.00).

If in **Option A** *in* RANDOM DRAW 1 *the ball* "Down" *is drawn, the outcome is* 1.00 *(*AMOUNT *on the blue bank note). Under consideration of your* ENDOWMENT *you receive* 18.50.

If in **Option B** *in* RANDOM DRAW 1 *the ball "*Up*" is drawn,* RANDOM DRAW X *follows.*

- *If in* RANDOM DRAW X *a yellow ball is drawn, you lose* 2.80*. Under consideration of your* ENDOWMENT *of* 17.50*, you receive* 14.70.
- *If in* RANDOM DRAW X *a white ball is drawn, you receive* 11.10*. Under consideration of your* ENDOWMENT*, you receive* 28.60.

If in **Option B** *in* RANDOM DRAW 1 *the ball* "Down" *is drawn,* RANDOM DRAW Y *follows.*

- *If in* RANDOM DRAW Y *a yellow ball is drawn, you lose* 11.10*. Under consideration of your* ENDOWMENT *of* 17.50*, you receive* 6.40.
- *If in* RANDOM DRAW Y *a white ball is drawn, you receive* 2.80*. Under consideration of your* ENDOWMENT*, you receive* 20.30.

Before we will start the first part of the experiment, we like to ask you to fill out a comprehension test. For this, please look at the figure on the following page.

Figure A

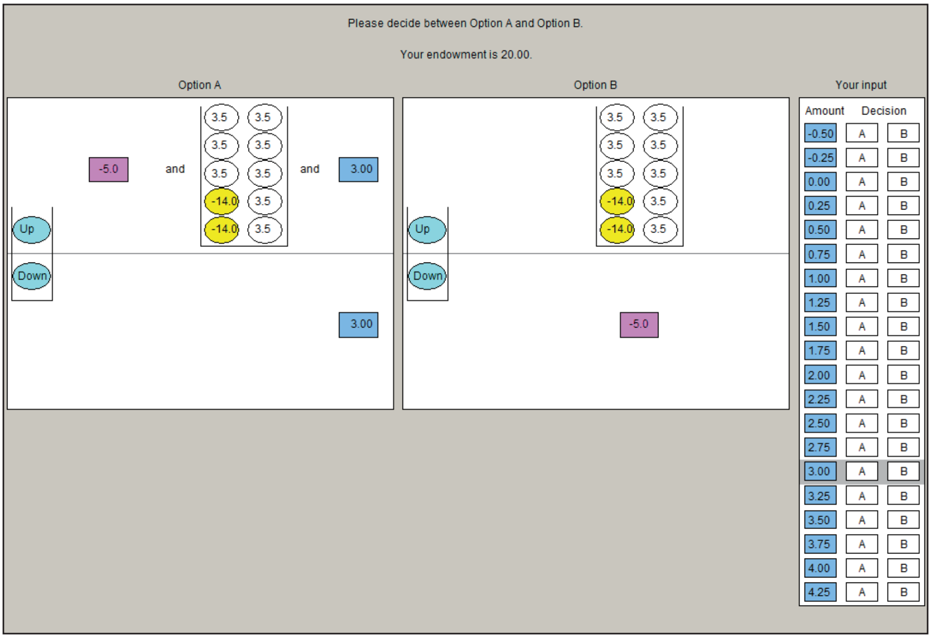
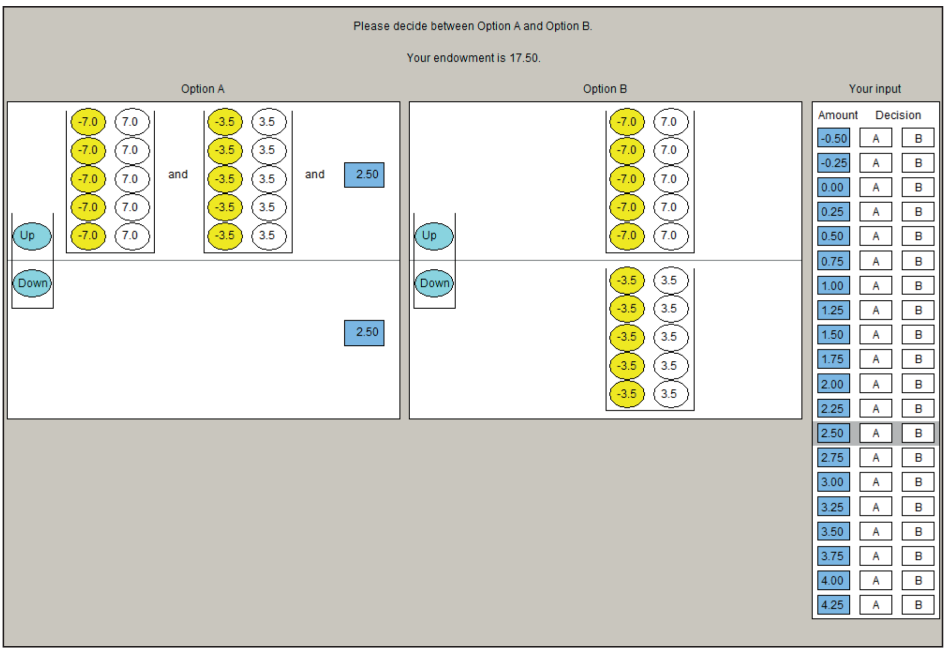


Figure B



[Comprehension questions were asked on the computer screen and the experiment continued after all questions were successfully answered]

C. Instructions Part II

Baseline Treatment

Structure and pay off of the second experimental part are consistent with the first part. The second part is also organized in six stages, where the stages of the second part equal the stages of the first part.

Note that only one of the 120 decisions determines your payoff in this part and that each of the 120 decisions can determine your entire payoff in the experiment.

CO Treatment

Structure and pay off of the second experimental part are consistent with the first part. The second part is also organized in six stages, where the stages of the second part equal the stages of the first part.

In contrast to part 1, decisions are made for a team of two players in part 2. This means that the choices taken determine the payoff of both players

Decisions will be entered only from one team member (player 1). The other team member (player 2), however, will see the decisions on the computer screen. You will see on the decision screen which player you are.

You will have the opportunity to exchange messages with the other player via chat. The chat will be shown on the computer screen to your right which will be switched on for this purpose. The content of the chat is – in principle – of your choice. It is not permitted, however, to share personal information like name, age, address, subject of study (this includes references to teachers, courses or course contents that enables the identification of the subject of study), or similar. Violations of the communication rules will lead to the exclusion from the experiment and to no payment.

Note that only one of the 120 decisions determines your payoff in this part and that each of the 120 decisions can determine your entire payoff in the experiment.

O Treatment

Structure and pay off of the second experimental part are consistent with the first part. The second part is also organized in six stages, where the stages of the second part equal the stages of the first part.

In contrast to part 1, decisions are made for a team of two players in part 2. This means that the choices taken determine the payoff of <u>both</u> players

Decisions will be entered only from one team member (player 1). Meanwhile, Player 2 enters the decisions he expects player 1 is making (however, the entered expectations from player 2 will have no impact on the pay offs of both players). You will see on the decision screen which player you are.

Note that only <u>one</u> of the 120 decisions determines your payoff in this part and that <u>each</u> of the 120 decisions can determine your entire payoff in the experiment.

C Treatment

Structure and payoff of the second experimental part are consistent with the first part. The second part is also organized in six stages, where the stages of the second part equal the stages of the first part.

In contrast to part 1 you will have the opportunity to exchange messages with another player via chat. However, your will still decide for yourself. Choices of your chat partner will not impact your own pay offs.

The chat will be shown on the computer screen to your right which will be switched on for this purpose. The content of the chat is – in principle – of your choice. It is not permitted, however, to share personal information like name, age, address, subject of study (this includes references to teachers, courses or course contents that enables the identification of the subject of study), or similar. Violations of the communication rules will lead to the exclusion from the experiment and to no payment.

Please note that subsequent stages will be activated after your chat partner completed his choices in the current stage. The „Next“-button will appear not till then.

Note that only <u>one</u> of the 120 decisions determines your payoff in this part and that <u>each</u> of the 120 decisions can determine your entire payoff in the experiment.