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Abstract

The present paper contributes to the controversy regarding gender differences in risk taking by investigating the impact of social comparison. Social comparison is formalized by integrating a social reference point into the model of Köszegi and Rabin. Drawing on previous results from evolutionary biology, we hypothesize that men (women) focus more on relative (absolute) income, i.e., the relative weight of social gain-loss utility is higher for men than for women. Our model predicts that risk taking is higher for correlated than for uncorrelated risks and that this effect is stronger for men than for women. These predictions are confirmed by a simple classroom experiment. We conclude that social comparison and the correlation of risks play an important role in the discussion of gender differences in risk taking.

Key words: risk taking; gender differences, correlation of risks, social reference point

JEL classifications: C91, D81, J16

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1 Introduction

The existence and magnitude of gender differences in risk taking remain intensively discussed issues in the economics literature. While some studies find rather robust evidence that women display higher degrees of risk aversion than men (Charness and Gneezy, 2012; Croson and Gneezy, 2009), others argue that gender differences are small and context-specific (Schubert et al., 1999; Fillipin and Crosetto, 2014). The present paper analyzes the impact of social comparison as one factor that may have contributed to the conflicting results of previous studies. We develop and test a theory that postulates that the effect of social comparison on risk taking is gender-specific and that, accordingly, the concern for social ranking may lead men to make riskier decisions.

The motivation for our theory is founded in evolutionary biology. As ancestral men had a higher exposure to sexual selection and less parental investment than women, their fitness payoff in mating effort was higher (Bateman 1948, Trivers, 1972). Women typically needed to invest more time and energy into reproduction and therefore became a valuable asset and source of competition for the members of the opposite sex (Clutton-Brock & Vincent, 1991). Thus, male fitness depended to a higher degree on relative social standing than did female fitness (Buss, 1989). Given this evolutionary psychological perspective, there is a selectionist rationale for gender differences in the utility function as well as in the willingness to accept risk (Daly and Wilson, 2001; Mishra, 2014). Because it was more important for men to be relatively better off than their peers, while women, due to their higher parental investment, were more concerned with the absolute outcome, we argue that the influence of social comparison on a risky decision should be higher for men than for women. Thus, we hypothesize that concern with relative position will lead to riskier decisions for men, while women will be less influenced by social comparison.

Although the impact of social comparison on sex differences in risk preferences seems evident from an evolutionary perspective, it has been widely ignored in the literature (Ermer et al. 2008). There are, however, some studies that are related to ours. Daly and Wilson (2001) found gender differences with respect to announcement effects in an experiment wherein men took riskier bets when decisions where announced in public than when they were kept private, but such a difference was not found for women. Ermer et al. (2008), investigating the role of relative status on risky decisions, found that men become more risk-seeking when being observed by others of similar status, while no replicable effect was found for women.

While several recent studies have analyzed the impact of social comparison on risk preferences, they have not focused on gender differences. Hill and Buss (2010) demonstrated that concern for relative position leads to increased risk taking when there is the potential to be better off than a peer for decisions in the gain domain. In our view, however, it is not clear what causes this influence. This is because a theoretical background is missing, and in all stimuli, the choice of a subject not only influences the subject's payoff but also the payoff of the peer. Hence, it must be recognized that considerations other than social comparison may influence the observed choice behavior. Rohde and Rohde (2011), in contrast, found only a limited impact of social comparison on risk taking when analyzing whether people will opt to change their individually chosen lottery if a social context is introduced. The fact that they observed only a few switches that may actually be caused by a type of status-quo bias motivated us to use a between-subject design in our study. Using a between-subject design, Schwerter (2013) found that decision makers are willing to take more risks if they are able to surpass a peer than to stay ahead of a peer. As only men participated in the experiment, no conclusions can be drawn as to whether this phenomenon is universal or holds true only for men.

The goal of the present study is to obtain a clearer picture of the effect social comparison has on risk taking and, more specifically, whether this effect is gender-specific. We first develop a model of decision making under risk that depends both on the consumption value of outcomes as well as on social comparison. For this purpose, we build upon the model of Köszegi and Rabin (2006, 2007) and introduce a social reference point that depends on the payoffs of peers. According to the selectionist rationale presented above, women should place relatively more weight on the consumption value of outcomes due to their necessary parental investments. In contrast, men should put more weight on social comparison, as this determines their reproductive success. We present a simple experiment that tests the implications of our model. In the experiment, subjects receive a monetary endowment that they can (partly) use to invest in a risky activity. In one treatment, the risks are uncorrelated, while in the other treatment, the risks are perfectly correlated such that all participants are hit by the same "fate" and direct social comparison is possible. Our model implies that risk taking should be higher for correlated risks than for uncorrelated risks and that this effect will be stronger for men than for women.

We believe that the mixed evidence regarding gender differences in risk taking found by previous studies may be at least partially explained by the salience of social comparison in single experiments as well as by the differences in the correlation structure of risks. While experimental instructions alone are often not sufficient for comparing the salience of social comparison between experiments, they usually specify whether payments to subjects were correlated or uncorrelated. When analyzing the literature, we found many studies employed uncorrelated payments that did not observe gender differences in risk taking (Lange et al., 2007; Charness and Gneezy, 2010; Evans et al., 2009). In contrast, in all experiments with correlated risks of which we are aware (Haigh and List, 2005; Charness and Genicot, 2009; Fillipin and Crosetto, 2013), women were significantly more risk averse than men. Our experiment aims to investigate the impact of the correlation of risks more systematically, i.e., in a design where the salience of social comparison is identical for different correlation structures. Thereby, we attempt to determine whether the correlation structure of risks can explain gender differences in risk taking.

The paper is organized as follows. The next section develops our theoretical framework and derives the hypotheses being tested. Section 3 presents our experimental method. The results and discussion follow in Sections 4 and 5, respectively.

2 Theory

2.1 Reference-dependent Preferences and Social Reference Points

While there exist several models of reference-dependent preferences in the literature, the most prominent seem to be the (cumulative) prospect theory (Kahneman and Tversky, 1979;

Tversky and Kahneman, 1992) and the model of Köszegi and Rabin (2006, 2007). For convenience, herein, we restrict our attention to prospects with only two monetary outcomes. These can be analyzed by considering two states of the world, state 1 occurring with probability p and state 2 occurring with probability 1 – p. Suppose the reference point of the decision maker equals r and final wealth is given by $x_1 > r$ in state 1 and by $x_2 < r$ in state 2. An outcome exceeding r is referred to a gain in the sequel, whereas an outcome less than r is called a loss. In cumulative prospect theory, utility is given by

(1) $V = w^+(p)v(x_1 - r) + w^-(1 - p)v(x_2 - r)$,

where w^+ and w^- are probability weighting functions for respective gains and losses and v is a strictly increasing value function with $v(0) = 0$. It is usually assumed that v exhibits loss aversion and diminishing sensitivity. Loss aversion means that a given loss has a greater impact on overall utility than a gain of equal size and can be formalized by $v(x) < -v(-x)$. Diminishing sensitivity means that marginal utility decreases as one moves away from the reference point, thus implying that the value function is concave in the gain domain and convex in the loss domain. In addition to abundant experimental evidence for both humans and animals (see, e.g., Kahneman and Tversky, 1979; Chen et al., 2006; Glöckner and Pachur, 2012), neurobiological studies report evidence in favor of loss aversion and diminishing sensitivity (e.g., Tom et al., 2007; Zhong et al., 2009)

The reference point is usually assumed to equal the initial wealth of the decision maker. In many applications, such as insurance demand, initial wealth is a random variable. Building on the work of Sugden (2003), Schmidt et al. (2008) generalized cumulative prospect theory to allow for state-dependent reference points. If the reference point takes on the value r_1 in state 1 and r_2 in state 2, utility in their model is given by

(2) $V = w^+(p)v(x_1 - r_1) + w^-(1 - p)v(x_2 - r_2)$.

An alternative model of reference-dependent preferences with a state-dependent reference point was proposed by Köszegi and Rabin. An important innovation with respect to their model is an endogenous determination of the reference point shaped by the expectations of the decision maker. For our purposes and our formulation with a state-dependent preference structure, we first consider a variant of the Köszegi-Rabin model that was proposed by De Georgi and Post (2011) and restrict attention to a given reference point. Similar to Köszegi and Rabin, De Georgi and Post distinguish between consumption utility u and gain-loss utility v. The value of a prospect is given by

(3) $V = \eta[pu(x_1) + (1 - p)u(x_2)] + \psi[pv(u(x_1) - u(r_1)) + (1 - p)v(u(x_2) - u(r_2))]$

where the constants η and ψ are the weights the decision maker attaches to consumption and gain-loss utility, respectively. If $\eta = 0$ and $u(x) = x$ for all outcomes x, then this model is equivalent to the prospect theory in the absence of probability weighting. The fact that the gain-loss utility v depends on the utility difference between x_i and r_i allows for analyzing non-monetary consequences.

In the original model of Köszegi and Rabin, there is no state-dependent preference structure, which means that final outcomes and the reference point are determined by independent lotteries. That is, final wealth may equal x_1, while the reference point is r_2. Suppose that both

x_1 and r_1 occur with probability p, while x_2 and r_2 occur with probability (1 – p). Then, with the independent determination of x and r, the utility in the original model is given by

$$(4)\ V = \eta[pu(x_1) + (1 - p)u(x_2)] + \psi[p^2v(u(x_1\ - u(r_1)) + (1 - p)^2v(u(x_2) - u(r_2)) +$$
$$p(1 - p)v(u(x_1) - u(r_2)) + (1 - p)pv((x_2) - u(r_1))]$$

Considering the evidence obtained according to the prospect theory, the gain-loss utility v can be hypothesized to exhibit loss aversion and diminishing sensitivity.

While traditionally it is assumed that the reference point is determined only by (expectations about) the wealth of the decision maker, recent experimental studies have stressed the importance of the social context for decision making under risk and empirically analyzed the social reference points according to the prospect theory and the Köszegi-Rabin model. Linde and Sonnemans (2012) conducted experiments where participants had to choose between lotteries, while a peer was facing a fixed payoff. Participants were more risk averse in the loss domain (possibility to earn at most as much as the peer) than in the gain domain (at least as much as the peer). Accordingly, they concluded that diminishing sensitivity does not hold for social reference points. Vendrik and Woltjer (2007) investigated whether utility derived from relative income displays diminishing sensitivity. They estimated a utility function with respect to the relative income from a large German panel and found that it was concave in the loss and gain domain. While both the studies of Linde and Sonnemans (2012) and Vendrik and Woltjer (2007) rejected diminishing sensitivity in the presence of social reference points, they reported evidence in favor of loss aversion. Additionally, Lahno and Serra-Garcia (2012) found evidence for loss aversion in the presence of social comparison. In contrast, Bault et al. (2008) found the opposite with respect to loss aversion (i.e., gain seeking) in the presence of social reference points. Their result relies, however, on the rating of emotions by subjects. While all of these studies are related to ours by considering the impact of social comparison on risk taking, they differ with respect to the theoretical basis and do not explicitly consider gender differences.

We analyze risk taking in the model developed above where the reference point is given by the state-dependent wealth of a peer. If the wealth of the decision maker and the peer depend on the same state-structure, preferences are represented by (3). Otherwise, if the wealth of the decision maker and the peer are determined by independent lotteries, preferences are represented by (4).

2.2 Risk Taking and Social Comparison

We analyze risk taking in terms of an investment in a risky activity. For this purpose, we consider an asset that costs c and pays out y with probability p and zero with probability 1 – p. We assume that an investment in the asset has a positive expected value, i.e., $py > c$. Obviously, for a given y and p, the asset becomes more attractive with decreasing c. We characterize risk taking by the switching point c for which the decision maker switches from investing to not investing. Higher risk taking then corresponds to a higher switching point c.

First, consider a decision maker whose decisions are not influenced by social comparison, i.e., $\psi = 0$. In this case, our model is equivalent to the expected utility (EU), and the decision maker with initial wealth x will buy the asset if

$$(5)\ EU^{I} = \eta[pu(x + y - c) + (1 - p)u(x - c)] > EU^{NI} = \eta u(x),$$

where the superscript I (NI) denotes investing (not investing).

As usual, we assume that u is strictly increasing to ensure consistency with first-order stochastic dominance. Suppose $\psi > 0$ and consider the decision of an individual A to buy the asset in the presence of another individual B who also has initial wealth x and the opportunity to buy the asset. The reference point of A depends on her expectations about whether B will buy the asset or not. We assume that A expects that B will buy the asset with probability $\beta > 0$ and analyze two possible correlation structures – perfect positive correlation and uncorrelated risks. If A does not buy the asset, her final wealth is deterministic and, therefore, the correlation structure is irrelevant. In all cases, the consumption utility of A equals u(x), while her final wealth equals that of B with probability $1 - \beta$, it falls below B by $y - c$ with probability βp, and it exceeds the final wealth of B by c with probability $\beta(1 - p)$. Consequently, the total social utility, SU^{NI}, of A if she does not invest in the asset is given by

$$(6)\ SU^{NI} = EU^{NI} + \psi\beta[pv(u(x) - u(x + y - c)) + (1 - p)v(u(x) - u(x - c))].$$

If A buys the asset, her social utility depends on the correlation structure.

Case (i): Perfect Positive Correlation

If risks are perfectly positively correlated, the assets of both A and B always have the same outcome. In other words, the final wealth of A and B is identical if B also buys the asset and the gain-loss utility reduces to zero. If B does not buy the asset, the wealth of A either exceeds that of B by $y - c$ or falls short of B by c. Consequently, A´s social utility, SU^{I}_{pc},from investing in the asset is given by

$$(7)\ SU^{I}_{pc} = EU^{I} + \psi(1 - \beta)[pv(u(x + y - c) - u(x)) + (1 - p)v(u(x - c) - u(x))].$$

Case (ii): Uncorrelated Risks

Now, suppose that the risks of the assets of A and B are uncorrelated. In principle, this means that if B also buys the asset, there are four states of the world – both win, both lose, A wins and B loses, or A loses and B wins. As both assets win with probability p, A´s social utility from investing in the asset, SU^{I}_{uc}, is given by

$$\begin{aligned}(8)\ SU^{I}_{uc} = EU^{I} &+ \psi\beta[p^{2}v(0) + (1 - p)^{2}v(0) + p(1 - p)v(u(x + y - c) - u(x - c)) + \\ &(1 - p)pv(u(x - c) - u(x + y - c))] + \\ &\psi(1 - \beta)[pv(u(x + y - c) - u(x)) + (1 - p)v(u(x - c) - u(x))].\end{aligned}$$

Comparing Correlation Structures

Comparing perfectly correlated with uncorrelated risks, we obtain

$$(9)\ SU^{I}_{uc} - SU^{I}_{pc} = \psi\beta[p^2v(0) + (1-p)^2v(0) + p(1-p)v(u(x+y-c) - u(x-c)) + (1-p)pv(u(x-c) - u(x+y-c))].$$

Since v(0) = 0 and v(z) + v(-z) < 0 for all z in the case of loss aversion we get immediately $SU^{I}_{pc} > SU^{I}_{uc}$.

Because the social utility of non-investing is independent of the correlation structure, we derive the following proposition.

Proposition 1:

With a social comparison, risk taking of loss averse subjects is higher for correlated risks than for uncorrelated risks. The opposite holds for gain-seeking subjects.

For proof that the proposition also holds for less than perfect positive correlation, see Appendix A.

Comparing Weights Attached to Gain-Loss Utility

The weight attached to gain-loss utility need not be the same for all individuals. In the introduction, we argued that this weight should be higher for men than for women. From (9), it is easy to see that the difference between SU^{I}_{pc} and SU^{I}_{uc} is increasing in ψ. This leads immediately to the following result.

Proposition 2:

With increasing weight attached to the gain-loss utility, i.e., the increasing influence of social comparison on utility, the influence of the correlation structure on risk taking – as characterized in Proposition 1 – becomes stronger.

Propositions 1 and 2 form the hypotheses for the experiment presented in the next section. We compare risk-taking decisions for uncorrelated and correlated risks. According to Proposition 1, correlated risks should lead to higher risk taking, and according to Proposition 2, in conjunction with the selectionist rationale, this effect should be stronger for men than for women.

3 Experimental Design

3.1 Participants

Participants in the experiment included 271 undergraduate students from Kiel University. Because eleven subjects had multiple switching points, we excluded them from the data and were left with 260 observations. The average age was 22 years, and 132 were women. The experiment consisted of eight sessions, four for the uncorrelated treatment, in which 131 subjects participated, and four for the correlated treatment, in which 140 subjects participated. The experiment lasted approximately 20 minutes, and the average payment was roughly €6.50. Subjects made their decisions simultaneously and had no information about the other treatment.

3.2 Materials and Procedure

According to our model, we hypothesize that the correlation structure of risks between subjects plays a role in their risk taking decisions and that this difference varies between men and women. To test this hypothesis, we used a between-subject design with two treatments. In the uncorrelated treatment (T_Uncorrelated), subjects faced risks that were uncorrelated with the risks faced by their peers. This treatment was compared to a situation where risks were perfectly positively correlated (T_Correlated). To measure risk aversion, we endowed participants with €6 and elicited the willingness to pay (WTP) for a lottery where they could either win €10 or receive nothing. The probability was 0.5 for each alternative. Subjects had to indicate on a choice list with increasing prices ranging from €3.55 to €5.80, whether they would buy the lottery ticket.

At the end of each experimental session, one price was randomly selected and became relevant for all subjects. Subjects who did not buy the lottery ticket for the relevant price kept their initial endowment of €6. Those who bought the lottery ticket for the relevant price received their €6 endowment minus the purchase price of the lottery ticket. In addition, they participated in the lottery. Treatments differed in the way the outcome of the lottery was determined. In the T_Uncorrelated, the experimenter rolled a six-sided die individually for each subject, where the numbers “4”, “5” and “6“ meant a gain of €10 and the numbers “1”, “2”, and “3” indicated a gain of €0. In the T_Correlated, the same die was rolled only once with the same rules such that either all subjects gained €10 or €0. As the expected value of the lottery is €5, a risk neutral subject would switch from buying the lottery ticket to not buying it at a price of €5. Risk averse (seeking) subjects were expected to switch sooner (later) and, as usual, we take the switching point as a measure of the WTP.

In the absence of social comparison, we would expect that the risk correlation structure has no influence on the subject’s decision. Thus, to allow social comparison to work, we violated some of the basic procedures of experimental economics, namely, anonymity and private payment. We conducted the experiment with students in classroom settings during tutorials. These tutorials normally have a group size of approximately 30 students who voluntarily sign up for these classes. The experiment was conducted close to the end of the semester, so students had most likely seen each other over the course of several tutorial sessions. Therefore, we expected that students considered at least some of their fellow students as their peers. We further announced that payments would be made in front of all participants so a comparison among participants was possible. After making decisions about the risky lottery ticket, we asked subjects to state their WTP for an ambiguous ticket. The results will be analyzed in a separate paper.

Following the elicitation of the WTP, we administered a brief survey with questions regarding participant demographic information (gender, age, hours worked in part time jobs, years living in Germany if not native born, presence of siblings), their subjective assessment of relative financial resources and their attitude towards luck and misfortune (see Appendix B for details).

4 Results

4.1 Descriptive Analysis

Overall, as 90% of the subjects are willing to pay less than €5 for the lottery, they could be considered risk averse, whereas 10% are willing to pay more than €5. Considering the two treatments separately shows that the correlation structure has a strong impact on WTP. That is, while only 5% are willing to pay more than €5 when risks are uncorrelated, this number increases to 14% when they are correlated. Figure 1 illustrates the distribution of WTP in both treatments, and it is apparent from the histograms and confirmed by a Wilcoxon rank-sum test that the average switching point is significantly higher for correlated risks at the 1% level ($z = -2.701$, $p = 0.0069$).

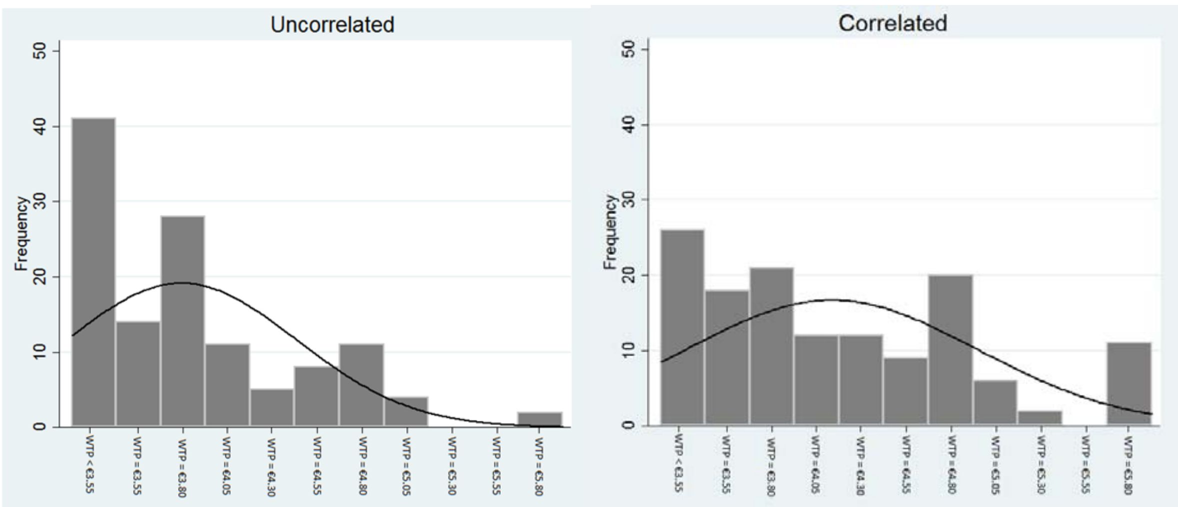

Figure 1: Distribution of Willingness to Pay by Treatments

Examining the data separately for male and female participants (see Table 1) indicates that the difference between treatments seems to be driven by the choices of men. While the percentage of risk averse women changes only slightly between the treatments (89% for T_Uncorrelated and 85% for T_Correlated), this difference is much more pronounced for men (84% for T_Uncorrelated and 61% for T_Correlated.

Treatment	Women		Men	
	WTP < €5	WTP ≥ €5	WTP < €5	WTP ≥ €5
T_Uncorrelated	94.12%	5.88%	96.43%	3.57%
T_Correlated	96.55%	3.45%	78.48%	21.52%
Total	95.24%	4.67%	85.93%	14.07%

Table 1: Distribution of WTP by Gender

The mean WTP further illustrates our finding (see Figure 2). While for women, it amounts to €3.86 (SD €0.57) for uncorrelated risks and €3.93 (SD €0.49) for correlated risks, the mean WTP for men increases from €3.86 (SD €0.61) for uncorrelated risks to €4.34 (SD €0.84) for correlated risks. This means that men are, on average, willing to pay €0.48 more for the lottery when risks are correlated, which is almost 10% of the lottery's expected value (the increase for women is €0.07).

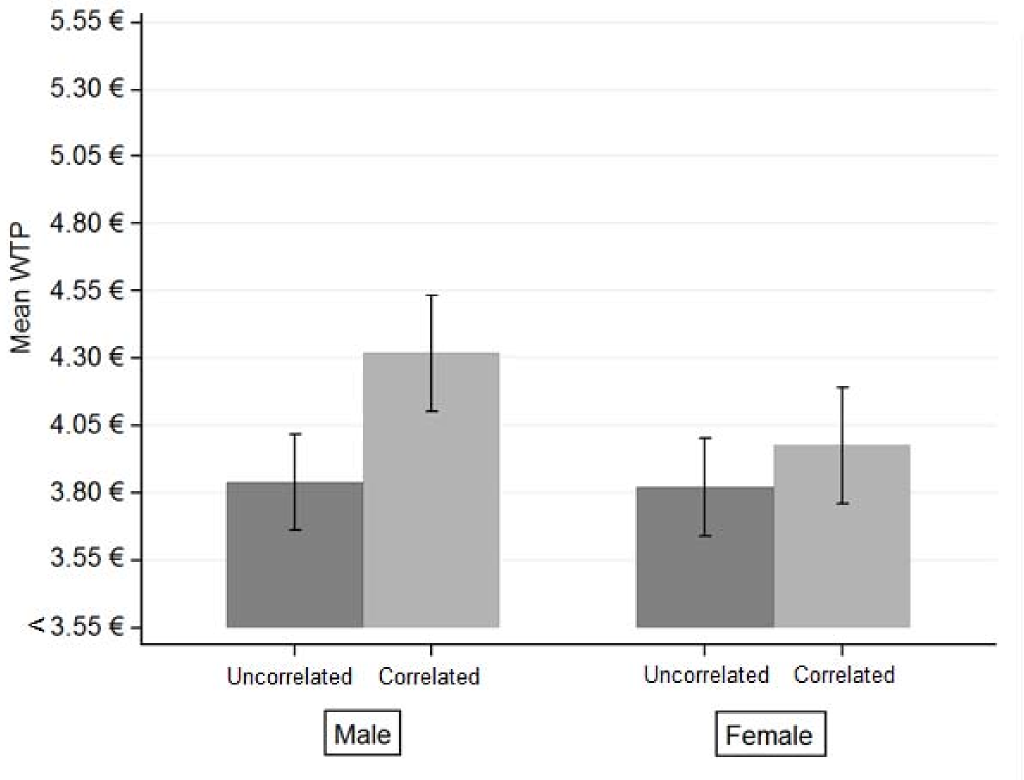

Figure 2: Mean WTP by Gender and Treatment

A Wilcoxon rank-sum test confirms that the mean WTP for men statistically differs between the two treatments (z = -3.315, p = 0.0009), while the difference is not significant for women (z = -1.283, p = 0.1995). Thus, male participants are significantly more risk seeking in the correlated treatment than in the uncorrelated treatment. Furthermore, a Wilcoxon rank-sum test confirms that in the correlated treatment men take significantly more risks than women (z = -2.528, p = 0.0115), while no significant difference is observed for the uncorrelated treatment (z = 0.232, p = 0.8166).

4.2 Regression Analysis

To account for possible confounding effects, we run some regressions with the switching point as our dependent variable and include various controls (see Table 2). The variable *correlated* is a dummy that is one for the treatment with correlated risks (T_Correlated) and zero for the uncorrelated treatment. We further include gender, age, hours worked (*hour_work*) in a part time job and relative wealth (*rel_wealth*) as additional explanatory variables. The initial finding that the WTP increases when risks become correlated is supported (see first column of Table 1). To confirm our hypothesis that women and men react differently to social comparison, we run an additional regression that includes an interaction term (*corr X male*) as well as individual regressions for men and women. These clearly support that there are gender differences in the treatment effect. Whereas the treatment effect is statistically insignificant for female participants, it is highly significant for male ones. The significant interaction term points to the conclusion that male participants drive the differences between the two treatments. According to our theory, this suggests that men are more sensitive to their relative position, while women are more concerned with their absolute payoff than their relative position.

	OLS	OLS interaction	Tobit	Tobit interaction	only females	only males
correlated	1.127***	0.228	1.641***	0.461	0.281	1.987***
	(0.335)	(0.481)	(0.625)	(0.546)	(0.688)	(0.534)
male	0.781**	-0.153	0.800*	-0.461	—	—
	(0.342)	(0.495)	(0.565)	(0.661)		
age	0.003	0.032	0.019	0.056	-0.005	-0.075
	(0.073)	(0.074)	(0.180)	(0.126)	(0.177)	(0.122)
hour_work	0.041	0.042*	0.069*	0.069**	0.040*	0.045
	(0.025)	(0.025)	(0.050)	(0.037)	(0.050)	(0.039)
rel_wealth	-0.057	-0.039	-0.174	-0.157	-0.110	0.000
	(0.192)	(0.190)	(0.380)	(0.318)	(0.523)	(0.271)
corr X male	—	1.738***	—	2.294**	—	—
		(0.671)		(0.921)		
Constant	2.798	2.523	1.864	1.548	3.548	1.237
	N = 260	N = 260	N = 260	N = 260	N = 125	N = 135

Table Note. Numbers in parenthesis are robust standard errors. One, two, and three asterisks indicate a significance level of 10%, 5% and 1% respectively.

Table 2: Regression results

5 Conclusion

The current study examined the influence of social comparison on decision making under risk and its implications for gender difference in risk taking. Examining the question from an evolutionary psychological perspective and drawing on theory and research on decision making under risk and social comparison, we hypothesized that men will be more sensitive to social status concerns than women, thus leading men to make riskier decisions than women when subject to social comparison.

We presented a theoretical model that accounts for gender differences in risk preferences with social comparison. The implications of the model were tested in a classroom experiment using a between-subject experimental design. To measure risk aversion, we elicited the WTP in a lottery where the participant could either win €10 or €0 in two separate treatments. In one treatment, the risks were uncorrelated, while in the other, the risks were perfectly correlated such that all participants were hit by the same “fate” and direct social comparison was possible. The experiment confirmed the implications of the model, showing that risk taking increases when risks are correlated. As expected, this pattern was found for male participants who were significantly less risk averse in the correlated than in the uncorrelated treatment, while no significant differences were observed for female participants. This suggests that men react to, and are more sensitive about, their relative position, while women are more concerned with their absolute outcome than with their relative outcome. While this seems irrational from the perspective of traditional economic theory, it does follow an evolutionary rationale and could be rooted in the average fitness payoffs associated with alternative courses of action. Because male fitness depends on relative social standing to a higher degree than does female fitness (Buss, 1989), the evolutionary rationale predicts that men should be more sensitive to social comparison than women.

Our findings are consistent with those of Hill and Buss (2010), who concluded that the concern for relative position leads to increased risk taking under certain conditions, and with those of Ermer et al. (2008), who found that relative status regulates the motivation for risk in men but not in women. We also believe that the conflicting results of previous studies on gender differences in risk taking may be at least partly due to differences in the correlation structure or the salience of social comparison in the execution of experiments. While we do not claim that social comparison is the only source of gender differences in risk taking, our results indicate that the salience of social comparison and the correlation of risk are rather important factors that must be controlled in future studies.

References

Bateman, A. J. 1948. "Intra-sexual selection in Drosophila." *Heredity* 2: 349-368.

Bault, N., Coricelli, G. & Rustichini, A. 2008. "Interdependent utilities: How social ranking affects choice behavior." *PloS one* 3: e3477.

Buss, D. M. 1989. "Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures." *Behavioral and Brain Sciences* 12: 1-14.

Caraco, T. & Lima, S. L. 1985. "Foraging juncos: Interaction of reward mean and variability." *Animal Behaviour* 33: 216-224.

Caraco, T., Martindale, S. & Whittam, T. S. 1980. "An empirical demonstration of risk-sensitive foraging preferences." *Animal Behaviour* 28: 820-830

Charness, G., & Genicot, G. 2009. "Informal Risk Sharing in an Infinite-Horizon Experiment." *The Economic Journal*, 119(537): 796-825.

Charness, G. & Gneezy, U. 2010. "Portfolio choice and risk attitudes: an experiment." *Economic Inquiry* 48 (1): 133–146.

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

Chen M. K., Lakshminarayanan V. & Santos L.R. 2006. "How basic are behavioral biases? Evidence from capuchin monkey trading behavior." *Journal of Political Economy* 114: 517–537.

Clutton-Brock, T. H. & Vincent, A. C. 1991. "Sexual selection and the potential reproductive rates of males and females." *Nature* 351(6321): 58-60.

Croson, R. & Gneezy, U. 2009. "Gender differences in preferences." *Journal of Economic literature*: 448-474.

Daly, M. & Wilson, M. 2001. "Risk-taking, intrasexual competition, and homicide." *Symposium on Motivation* 47: 1-36.

De Giorgi, E. G. & Post, T. 2011. "Loss aversion with a state-dependent reference point." *Management Science* 57: 1094-1110.

Ermer, E., Cosmides, L. & Tooby, J. 2008. "Relative status regulates risky decision making about resources in men: Evidence for the co-evolution of motivation and cognition." *Evolution and Human Behavior* 29: 106-118.

Evans, M. F., Vossler, C. A., Flores, N. E. 2009. "Hybrid allocation mechanisms for publicly provided goods." *Journal of Public Economics* 93 (1-2): 311 – 325.

Filippin, A. & Crosetto, P. 2014. "A reconsideration of gender differences in risk attitudes." *Grenoble Applied Economics Laboratory Working Papers* No.1

Glöckner, A. & Pachur, T. 2012. "Cognitive models of risky choice: Parameter stability and predictive accuracy of Prospect Theory." *Cognition* 123: 21-23.

Haigh, M. & List, J. A. 2005. "Do professional traders exhibit myopic loss aversion? An experimental analysis." *Journal of Finance* 60: 523–534.

Hill, S. E. & Buss, D. M. 2010. "Risk and relative social rank: positional concerns and risky shifts in probabilistic decision-making." *Evolution and Human Behavior* 31: 219-226.

Kahneman, D. & Tversky, A. 1979. "Prospect theory: An analysis of decision under risk." *Econometrica* 47: 263-291.

Kőszegi, B. & Rabin, M. 2006. "A model of reference-dependent preferences." *Quarterly Journal of Economics* 121: 1133-1165.

Koszegi, B. & Rabin, M. 2007. "Reference-dependent risk attitudes." *The American Economic Review* 97: 1047-1073.

Lahno, A. M. & Serra-Garcia, M. 2012. "Peer effects in risk taking." *CESifo Working Paper* No. 4057.

Lange, A., List, J. A., Price, M. K. 2007. "Using lotteries to finance public goods: Theory and experimental evidence." *International Economic Review* 48 (3): 901–927.

Linde, J. & Sonnemans, J. 2012. "Social comparison and risky choices." *Journal of Risk and Uncertainty* 44: 45-72.

Mishra, Sandeep. 2014. "Decision-Making Under Risk: Integrating Perspectives From Biology, Economics, and Psychology." *Personality and Social Psychology Review* 18: 280-307.

Rohde, I. & Rohde, K. 2011. "Risk Attitudes in a Social Context." *Journal of Risk and Uncertainty* 43: 205-225.

Schmidt, U., Starmer, C. & Sugden, R. 2008. "Third-generation prospect theory." *Journal of Risk and Uncertainty* 36: 203-223.

Schubert, R., Brown, M., Gysler, M. & Brachinger, H. W. 1999. "Financial decision-making: are women really more risk-averse?" *American Economic Review* 89: 381-385.

Schwerter, F. 2013. "Social reference points and risk taking" *Bonn Econ Discussion Papers* No. 11

Sugden, R. 2003. "Reference-dependent subjective expected utility." *Journal of Economic Theory* 111: 172-191.

Tom, S.M., Fox, C.R., Trepel, C. & Poldrack, R.A. 2007. "The neural basis of loss aversion in decision-making under risk." *Science* 315: 515-518.

Trivers, R. L. 1972. "Parental investment and sexual selection." In: *Sexual Selection and the Descent of Man 1871-1971*, edited by Campbell, B., 136-197. Aldine Publishing Company.

Tversky, A. & Kahneman, D. 1992. "Advances in prospect theory: Cumulative representation of uncertainty." *Journal of Risk and Uncertainty* 5: 297-323.

Vendrik, M. & Woltjer, G. B. 2007. "Happiness and loss aversion: Is utility concave or convex in relative income?" *Journal of Public Economics* 91: 1423-1448.

Zhong, S., Israel, S., Xue, H., Sham, P.C., Ebstein, R.P. & Chew, S.H. 2009. "A neurochemical approach to valuation sensitivity over gains and losses." *Proceedings of the Royal Society B: Biological Sciences* 276: 4181-4188

Appendix A

Proof of Proposition 1:

We have shown in the text that $SU^I_{pc} > SU^I_{id} > SU^I_{nc}$ while utility of not investing is identical in all three cases. Note that social utility of not investing is increasing in c while social utility of investing is in all three cases decreasing in c. Hence the critical value of c where the subject switches from investing to not investing is highest for positive and lowest for negative correlation. In the following we will show that this result also holds for less than perfect correlation.

We can assume in our model with two possible outcomes without loss of generality that risks are perfectly correlated with a certain probability α while they are uncorrelated with the residual probability 1 – α. As the utility of not investing is independent of the correlation structure we just need to reconsider the utility of investing. Let us denote social utility with imperfect positive (negative) correlation by SU^I_{ipc} (SU^I_{inc}). Then we obviously have $SU^I_{ipc} = \alpha SU^I_{pc} + (1 - \alpha)\, SU^I_{id}$ and $SU^I_{inc} = \alpha SU^I_{nc} + (1 - \alpha)\, SU^I_{id}$. This yields $SU^I_{ipc} > SU^I_{id} > SU^I_{inc}$ such that the same argument as above is applicable.

Appendix B

Further items of the questionnaire:

Question 1: How would you estimate your monthly financial resources relative to other students in Kiel?:

1 - much less; 2 - a little less; 3 - about the same, 4 - a bit more, 5 - more

Question 2: What reason applies to your opinion, if a person is rich?:

A = much effort, B = good luck and other circumstances beyond their control

Question 3: What reason applies to your opinion, if a person is poor?:

A = lack of effort, B = bad luck and other circumstances beyond their control