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Insurance Demand and Social Comparison: An Experimental Analysis

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Abstract:
This paper analyzes whether social comparison can explain the low take up of disaster insurance usually reported in field studies. We argue that risks in the case of disasters are highly correlated between subjects whereas risks for which high insurance take up can be observed (e.g. extended warranties or cell phone insurance) are typically idiosyncratic. We set up a simple model with social reference points and show that in the presence of inequality aversion social comparison makes insurance indeed less attractive if risks are correlated. In addition we conducted a simple experiment which confirms these theoretical results. The average willingness to pay for insurance is significantly higher for idiosyncratic than for correlated risks.

Keywords: : disaster insurance, social reference points, loss aversion, inequality aversion

JEL classification: C91, D03, D14, D81, G22

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1 Introduction

A major puzzle in insurance economics is the fact that people underinsure low-probability events with high losses. It is well documented that many people do not take up disaster insurance even though premiums are often subsidized (Kunreuther et al. 1978; Kunreuther and Pauly 2004). A very prominent example for this type of behavior is flood insurance in the USA. At the same time, many people insure modest risks at highly loaded premiums, e.g. extended warranties, cell phone insurance or low deductibles for home insurance. Sydnor (2010) for example analyzes a sample of 50,000 home insurance policies with either a $500 deductible or a $1000 deductible. The average extra premium for the low deductible policy was $100. Given a claim rate of 5%, the average extra value of the low deductible policy was only $25. Interestingly, the majority of homeowners preferred the low deductible policy. Fitting the demand for low deductibles to expected utility leads to implausible high degrees of risk aversion (Sydnor 2010), which shows that expected utility theory cannot explain the observed choice patterns.

Apart from theses field studies also experimental evidence shows that insurance take-up increases with the probability of a loss (Slovic et al. 1977; McClelland et al. 1993; Ganderton et al.,2000). In an attempt to explain the observed behavior, Slovic et al. (1977) propose that there is a probability threshold below which an individual considers the probability to be zero. Similarly, Camerer and Kunreuther (1989) argue that low probability events are not well perceived; subjects either dismiss low probabilities or overestimate them. In two experiments on insurance demand McClelland et al. (1993) observe a bimodal distribution with some subjects bidding zero and others bidding much more than the expected value. However, Laury et al. (2009) argue that results of previous experiments may be due to confounds in the experimental design, in particular the lack of monetary incentives. Fixing these design issues, they observe precisely the opposite evidence, i.e. insurance take-up is actually decreasing with the probability of losses. This conflicting evidence raises doubt whether the misperception of low probabilities plays a key role in the observed choice patterns.

An alternative explanation for the low take-up of disaster insurance is an expected government bailout in case of disasters, which creates a type of samaritan's dilemma situation. Homeowners that believe they will be helped by disaster assistance *ex post*, will be less likely to take up insurance against the risk *ex ante*. Yet, the postulated negative relationship between disaster insurance and disaster assistance has empirically not been found valid (Kunreuther et al. 1978). Browne and Hoyt (2000), using data from the United States' National Flood Insurance Program, even find a positive relationship between insurance take-up and disaster assistance in the USA.

This paper provides and tests a new explanation for the low take-up of disaster insurance based on social comparison. One fact mostly overlooked until now is that the two situations, disaster insurance and e.g. cell phone insurance, do not only differ in the probability of losses but also in the correlation of risks. A flood (and also other natural disasters) will most likely not only affect you, but also your neighbors and peers. It can be considered to have highly correlated risks. Events that entitle to compensation for cell phone insurance are hardly correlated with neighbors or peers. Hence, they can be considered as idiosyncratic risks. The same seems to hold for extended warranties or home insurance. While nearly everybody incurs a loss in the case of correlated risks, an unlucky person is typically the only one losing in the case of idiosyncratic risks. It has been shown in many studies (e.g.

Fehr and Schmidt 2006) that the social context can serve as a reference for our subjective wellbeing. If we do not only care for absolute wealth but also for our wealth relative to peers, the correlation of risks may have a strong impact on insurance decisions.

Having in mind that the social context may play a vital role for decisions under risk we examine both theoretically and experimentally how the correlation of risks influences insurance decisions. We claim that insurance is less attractive for correlated than for idiosyncratic risks. This is theoretically shown in a simple model with a social reference point. Furthermore, we conduct an experiment, which shows that the willingness to pay for insurance is significantly lower for correlated than for idiosyncratic risks.

The rest of the paper is organized as follows. In Section 2 we set up the empirical and theoretical background. Section 3 analyzes in a simple insurance demand model how insurance take-up is influenced by the correlation of risks among subjects. We consider inequality aversion and also allow for strategic interaction between subjects. Our experimental design is presented in Section 4. In order to observe decisions under risk in situations where risks are either idiosyncratic or correlated, participants were presented with the choice to take up insurance against a possible loss. While in one treatment the risk to lose was idiosyncratic, it was perfectly correlated among participants in the other treatment. In Section 5 we describe our main experimental findings and Section 6 concludes.

2 Empirical and Theoretical Background

Under expected utility theory a risk averse subject will buy full insurance if and only if premiums are fair, i.e. equal expected losses. This excludes not taking up subsidized disaster insurance or full cellular phone insurance at highly loaded premiums. Also, fitting the demand for low deductibles to expected utility leads to implausible high degrees of risk aversion (Sydnor 2010). The standard theory of decision making under risk, is thus not able to explain the observed choice pattern of high insurance take-up for modest risks and low take-up for small risks. This is just one of a variety of observed choice patterns that contradict expected utility theory, which have induced the development of alternative theories that attempt to explain these deviations (Starmer 2000). Some of these theories imply that either full insurance is demanded also at unfair premiums or less than full insurance at fair premiums (see e.g. Schlesinger 1997). However, they are not able to explain diverging behavior for correlated and uncorrelated risks.

Experiments have shown that choices vary depending on whether outcomes are coded as gains or losses. It is empirically well established that people are significantly more averse to lose a certain amount than they are attracted to winning that same amount (e.g. Loewenstein and Adler 1995; Gneezy and Potters 1997). This phenomenon is referred to as loss aversion and was first introduced by Kahneman and Tversky (1979). In prospect theory loss aversion is captured by imposing that the utility function is steeper for losses than for gains. A second manifestation of reference dependence in prospect theory is diminishing sensitivity. Diminishing sensitivity demands that marginal utility is decreasing as one moves away from the reference point which implies that the utility function is concave (convex) for gains (losses).

For application of reference dependent theories the determination of an appropriate reference point is crucial. In most cases, the reference point is assumed to be the status quo, like current income or wealth (e.g. Rabin 2000; Samuelson and Zeckhauser 1988) or the price of an asset (Odean 1998). Some models derive the reference point endogenously by modeling expectations-based reference points (e.g. Köszegi and Rabin 2006; Gill and Prowse 2012). Also theories with state dependent reference points have been proposed (e.g. Sugden 2003; Köszegi and Rabin 2006; Schmidt et al. 2008; Trautmann et al. 2011). This allows to analyze situations where a fixed (i.e. state independent) reference point is implausible since the status quo is state dependent. In particular when buying insurance, initial wealth is state dependent and hence modeling the status quo as reference point requires state dependence (Schmidt 2012).

In the discussion so far the social context was omitted. Most economic decisions are not made in isolation. Tversky and Kahneman (1992) suggest that a reference point may not solely depend on the decision maker's status quo but may also be influenced by social comparison which generates social reference points. In social comparison loss aversion could be observed in the sense that people are more affected by being worse off than others than being better off than others. While there is clear evidence that disadvantageous inequality (being worse off) decreases utility (e.g. Shamay-Tsoory et al. 2007) there is contradicting evidence on how utility is influenced by advantageous inequality (being better off). Some empirical findings suggest that comparison to less fortunate subjects enhances subjective well-being (Buunk 2007; Wills 1981). However, there is also evidence that people dislike this kind of inequality and care about the equality of the payoff distribution (e.g. Camerer and Thaler 1995). Fehr and Schmidt (1999) for example model a simple utility function where disadvantageous inequality has a strong and advantageous inequality a relatively weaker negative effect on a subject's utility.

While there is ample research on social comparison and decision making in a social context, applications to risky situations are still rare (see Trautmann and Vieider 2012 for an overview of the recent literature). Linde and Sonnemans (2012) find that individual decision making is influenced by social comparison in a way that contradicts diminishing sensitivity. They 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). Vendrik and Woltjer (2007) investigate whether utility derived from relative income displays diminishing sensitivity. They estimate a utility function with respect to relative income from a large German panel and find that it is concave in the loss and gain domain. They explain the concavity in the loss domain, by increasing marginal costs for subjects to participate in social activities of their peer group. While both, the studies of Linde and Sonnemans (2012) and Vendrik and Woltjer (2007) reject diminishing sensitivity in the presence of social reference points, they report evidence in favor of loss aversion. In contrast, Bault et al. (2008) find the opposite of loss aversion (i.e. gain seeking) in the presence of social reference points. Their result relies however on rating of emotions by subjects and a model that does not precisely resemble prospect theory. Another related experimental study was done by Rhode and Rhode (2011) examining how participants' decisions for lotteries were affected by the risk a peer group faced. They find that people prefer risks to be distributed idiosyncratically rather than correlated.

Altogether, these studies show that social comparison can have a strong impact on decisions under risk. Since the social reference point for insurance problems differs considerably for correlated and idiosyncratic risks insurance demand may be significantly influenced by correlation. The next section shows within a simple model with inequality aversion that insurance is indeed less attractive for correlated risks, which could explain the low take up of disaster insurance. Given the rejecting evidence concerning diminishing sensitivity in the social context we consider a piecewise-linear utility function and analyze the impact of inequality aversion.

3 The Model

The goal of this section is not to provide a general and comprehensive analysis of insurance demand in the presence of social comparison. Instead, we want to show in a rather simple model that social reference points may decrease the attractiveness of insurance for correlated risks and thereby motivate the experimental study presented in the subsequent sections. We consider a model with two individuals and two states of the world, in one of which a loss occurs. The two individuals maximize their utility taking the other persons' wealth as a reference point and are inequality averse. We allow this social reference point to vary depending on the state the other individual is in. There is the possibility to buy full insurance against the loss at an actuarially fair premium. We consider two cases. In case 1 risks are uncorrelated among subjects. A loss can thus occur to both subjects, to one only or to none. This would be the case of theft insurance or extended warranties for example. In case 2 risks are perfectly correlated and therefore, either both or none is affected by a loss. This would mirror natural disasters, like floods or storms, which affects many people in one region.

We start with a basic model, where we consider the utility of one subject only. Her utility depends on her own income and that of a peer. Afterwards, we relax this assumption and allow for strategic interaction between the two individuals.

3.1 The Basic Model

Individuals are denoted by A and B both with initial wealth y. With probability *p* a loss *L* occurs. In the absence of an insurance contract final wealth for A and B is therefore given by *y* with probability *1-p* and *y-L* with probability *p*. We analyze the decision of individual A who has the possibility to take up full insurance at the actuarially fair insurance premium *pL*. Buying insurance results in a final wealth of *y-pL* independent of which state of the world occurs. A's social reference point is the final wealth of B and therefore depends on A´s expectations whether B takes up insurance or not. If B is fully insured the correlation of risks is immaterial, as B does not face any risk in this case. Therefore, in this section we assume that A expects B to be uninsured. This assumption will be relaxed in the next subsection.

In order to focus on inequality aversion and in view of the evidence reported in the preceding section we take the utility function of Fehr and Schmidt (1999) where disadvantageous inequality (being worse off than a peer) has a strong and advantageous inequality (being better off) a relatively weaker negative effect. In the two-player case the utility function for A is given by

$$U^A (x^A, x^B) = x^A - \alpha^A \max\{x^B - x^A; 0\} - \beta^A \max\{x^A - x^B; 0\} \quad (1)$$

where x^j is the final wealth of individual j and with $\beta<\alpha$ and $0 \leq \beta < 1$. We now consider the utility derived from insurance take-up in the two cases – idiosyncratic and correlated risks.

3.1.1 Case 1 - Idiosyncratic risks

In case of idiosyncratic risks a loss can occur to A only, to B only, to none or to both. A's utility is therefore given by

$$U_I^A = (1\text{-}p)^2\, u^A(x_1^A, x_1^B) + (1\text{-}p)p\, u^A(x_1^A, x_2^B) + p(1\text{-}p)\, u^A(x_2^A, x_1^B) + p^2\, u^A(x_2^A, x_2^B), \quad (2)$$

where x_i^j reflects the final wealth of individual j in state i. If A takes up insurance, final wealth of A is given by y-pL independent of the state. Final wealth of B is state dependent and given by y with probability 1-p and y-L with probability p. A's utility is then given by

$$U_I^{A,Ins} = y - pL\,(1 + \alpha + \beta - p\alpha - p\beta). \quad (3)$$

On the other hand if A does not take up insurance, her wealth is state dependent as well. A's utility then amounts to $U^A = (1\text{-}p)^2y + (1\text{-}p)p(y\text{-}\beta L) + p(1\text{-}p)(y\text{-}L\text{-}\alpha L) + p^2(y\text{-}L)$ which reduces to

$$U_I^{A,No} = y - pL\,(1 + \alpha + \beta - p\alpha - p\beta). \quad (4)$$

Comparing (3) and (4) reveals that buying insurance (3) or not results in the same utility level for A. Therefore, she is indifferent between taking up insurance or not if risks are uncorrelated.

3.1.2 Case 2 - Correlated risks

If risks are correlated, there are two states of the world, which affect both subjects. A loss can occur to both, A and B, or to none and A's utility is therefore given by

$$U_C^A = (1\text{-}p)\, u^A(x_1^A, x_1^B) + p\, u^A(x_2^A, x_2^B). \quad (5)$$

If A takes up insurance her utility yields $U^A=(1\text{-}p)(y\text{-}pL\text{-}\alpha^A pL)+p(y\text{-}pL\text{-}\beta^A(1\text{-}p)L)$ which reduces to

$$U_C^{A,Ins} = y - pL\,(1 + \alpha + \beta - p\alpha - p\beta). \quad (6)$$

If A does not take up insurance, wealth of A and B equals *y* in state 1 and *y-L* in state 2. Therefore, if A refrains from taking up insurance her utility amounts to

$$U_C^{A,No} = y - pL. \quad (7)$$

A's utility level is now lower with insurance than without. Thus, it is rational for A not to take up insurance if risks are correlated.

Comparing idiosyncratic and correlated risks, this simple insurance demand model shows that insurance becomes less attractive when risks are correlated among subjects. Subjects are indifferent between taking up insurance or not if risks are uncorrelated, while they do not buy insurance if risks are correlated.

3.2 Strategic interaction

So far, there was no strategic interaction between subjects, as we assumed that subject A bases her decision on the expectation that B is uninsured. This assumption can easily be relaxed to a setting where A and B strategically interact. A and B derive their utility relative to a social reference point, namely the other subject's state dependent wealth. In analogy to A, B's utility function is given by

$$U^B(x^B, x^A) = x^B - \alpha^B \max\{x^A - x^B; 0\} - \beta^B \max\{x^B - x^A; 0\}, \quad (8)$$

with $\beta^B<\alpha^B$ and $0 \le \beta^B < 1$.

3.2.1 Case 1 - Idiosyncratic risks

Again, we first consider the idiosyncratic case. When faced with the decision of taking up full insurance, A and B take the other subject's insurance decision into account. Utility levels of A and B resulting from the four possible cases – both insured, one insured, both not insured – are displayed in Table 1. It is rational for both subjects to take up insurance and (Insured, Insured) therefore constitutes a Nash equilibrium.

Table 1: Strategic interaction and idiosyncratic risks

A \ B	Insured	Not insured
Insured	$U^A = y - pL$, $U^B = y - pL$	$U^A = y - pL\,(1 + \alpha^A + \beta^A - p\alpha^A - p\beta^A)$, $U^B = y - pL\,(1 + \alpha^B + \beta^B - p\alpha^B - p\beta^B)$
Not insured	$U^A = y - pL\,(1 + \alpha^A + \beta^A - p\alpha^A - p\beta^A)$ $U^B = y - pL\,(1 + \alpha^B + \beta^B - p\alpha^B - p\beta^B)$	$U^A = y - pL\,(1 + \alpha^A + \beta^A - p\alpha^A - p\beta^A)$ $U^B = y - pL\,(1 + \alpha^B + \beta^B - p\alpha^B - p\beta^B)$

3.2.2 Case 2 - Correlated risks

We now turn to the case of correlated risks in Table 2. This situation exhibits two equilibria (Insured, Insured) and (Not insured, Not insured). The optimal strategy now depends on the expected behavior of the other subject. Compared to the idiosyncratic case, where (Insured, Insured) was the unique equilibrium, insurance becomes less attractive in the case of correlated risks. Thus, our results from the basic model also hold with strategic interaction.

Table 2: Strategic Interaction and correlated risks

A \ B	Insured	Not insured
Insured	$U^A = y - pL$, $U^B = y - pL$	$U^A = y - pL\,(1 + \alpha^A + \beta^A - p\alpha^A - p\beta^A)$, $U^B = y - pL\,(1 + \alpha^B + \beta^B - p\alpha^B - p\beta^B)$
Not insured	$U^A = y - pL\,(1 + \alpha^A + \beta^A - p\alpha^A - p\beta^A)$, $U^B = y - pL\,(1 + \alpha^B + \beta^B - p\alpha^B - p\beta^B)$	$U^A = y - pL$, $U^B = y - pL$

The rationale for our theoretical results is rather simple: In the case of idiosyncratic risks full insurance of both subjects is the only way to avoid utility reducing inequality. In contrast, for correlated risks inequality can also be ruled out if both subjects are uninsured.

3.3 Generalizations

Our simple model could be generalized at least in two aspects. First, risks may not be perfectly correlated but only correlated to a certain degree. Second, in contrast to the model of Fehr and Schmidt, deviations from the income of the other subject may be evaluated in a non-linear way. With respect to the first point, note that in our setup with only two subjects and two possible outcomes less than perfect correlation can be modeled in a way that risks are perfectly correlated with a certain probability μ and otherwise uncorrelated. The payoff matrix in this case could then be easily constructed by taking the convex combination of outcomes in Table 1 and 2 for each cell for the given value of μ. This would result in two Nash equilibria, (Insured, Insured) and (Uninsured,

Uninsured) where the first equilibrium with payoffs (y-pL, y-pL) Pareto-dominates the second one. Nevertheless, taking up insurance for one subject is unattractive if the other subject is uninsured since $y-pL-pL(1-p)(\alpha+\beta) < y-pL-(1-\mu)pL(1-p)(\alpha+\beta)$. This shows that both subjects not taking up insurance is a stable equilibrium.

As shown by Schmidt (2012), the second point is rather complex. Schmidt analyzes insurance demand under prospect theory for different reference points. As the state-dependent incomes of the other player form a kind of reference point in the present model, the mathematical structure is rather similar. According to Schmidt (2012) insurance demand under prospect theory is very sensitive to the functional form of the value function and characterized by corner solutions if the standard value function of Tversky and Kahneman (1992) is employed. Given these complexities, we will refrain from analyzing non-linear utilities here.

4 Experimental Design

Our experiment is designed to observe insurance take-up in situations where risks are either idiosyncratic or correlated. All experimental sessions were conducted in Kiel with a total of 149 students participating. The experiment was paper-based and performed in classroom with altogether eight groups. Each session lasted about 15 to 20 minutes. Students usually knew each other in advance as they had spent a reasonable amount of time studying together. By having the chance to win more or less than their peers, subjects were likely to feel more or less satisfied with their individual outcome when comparing themselves to the others. Consequently, social comparison may influence behavior in our setting.

Subjects received an initial endowment of €10. This endowment could be lost with probability p=0.5 and it was possible to buy full insurance at varying premiums for this potential loss. There were two treatments. In treatment I the individual risk to lose the endowment was independent from that of the other subjects. In treatment C the risk to lose was correlated among the group, i.e. either there was a loss for everyone or no one. Four groups participated in treatment I and another four in treatment C. The groups were not aware that there existed other treatments or other groups. Since subjects decide simultaneously without any information about behavior of other subjects, each individual decision can be regarded as an independent observation. After reading out aloud the instructions, sheets were handed to the participant including the instructions and choice lists.

In order to elicit the individual willingness to pay (WTP), each participant was asked to indicate whether they would buy full insurance in a choice list consisting of ten different prices. They were told that only one of these prices was relevant for payment. This price was identical for all subjects and determined by drawing a ball from an urn. As subjects did not know which one was relevant in advance they should decide for each price as if it was relevant. The WTP in this case reflects that premium which makes a subject indifferent between taking up full insurance and no insurance at all. It equals the expected loss (i.e. €5 in our experiment) for risk neutral subjects, while it is higher (lower) than the expected loss for risk averse (seeking) subjects. Also, the higher the degree of risk aversion the higher the WTP.

The price range was between €4.00 and €6.25, see Table 5. This means that buying insurance would result, depending on the price relevant for payoff, in a sure payoff between €6.00 and €3.75, while not buying insurance for the relevant price results in either keeping the €10 or losing them. Since the price became more expensive with each step, insurance became less attractive and individuals should switch from buying insurance to not buying insurance at some point according to their risk preferences. The switching point indicates the WTP in order to be insured against the loss. Table 5 gives an overview of the experiment. The experiment involved a second choice problem identical to the one explained above. The only difference was that the loss probability is ambiguous. Details are explained in Section 5.2. A coin flip determined whether the risky or the ambiguous situation was relevant for the payoff.

Table 5: Overview of the Experiment

<table>
<tr><th></th><th colspan="4">Treatment I</th><th colspan="2">Treatment C</th></tr>
<tr><td rowspan="2">Instructions</td><td colspan="4">Initial endowment y = €10
Individual loss with probability p = 0.5</td><td colspan="2">Initial endowment y = €10
Loss for entire group with probability p = 0.5</td></tr>
<tr><td colspan="6">Possibility to buy full insurance for price c(i), i=1,….,10</td></tr>
<tr><td rowspan="12">Private Decision Making</td><td rowspan="2">Ball no.</td><td rowspan="2">Price of insurance</td><td colspan="4">Will you buy insurance?</td></tr>
<tr><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td>1</td><td>4.00</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>2</td><td>4.25</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>3</td><td>4.50</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>4</td><td>4.75</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>5</td><td>5.00</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>6</td><td>5.25</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>7</td><td>5.50</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>8</td><td>5.75</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>9</td><td>6.00</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>10</td><td>6.25</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td rowspan="2">Payoff</td><td colspan="6">Random determination insurance price relevant for all subjects</td></tr>
<tr><td colspan="4">Individual determination of the state (loss or not)
Individual payoff according to state and relevant insurance decision i</td><td colspan="2">Determination of the state (loss or not) for the entire group
Individual payoff according to state and relevant insurance decision i</td></tr>
<tr><td>No. of participants</td><td colspan="4">78</td><td colspan="2">71</td></tr>
</table>

5 Results

5.1 Comparison between correlated and idiosyncratic risks

Out of the 149 participants 61 have a WTP of €5. Another 36 subjects are willing to pay more than this and are considered to be risk averse, while 52 are willing to pay only less and are considered to be risk seeking. Most participants switch from buying insurance to not doing so, but some do not switch at all. At one extreme, there are 22 individuals, who take up insurance for all given prices and are therefore considered to be very risk averse. At the other extreme, there are 20 participants that are not willing to buy insurance for the lowest price offered and thus do not buy insurance at all. These have a very low WTP and are considered to be risk lovers. In treatment I 73% of the participants take up insurance at the fair premium (€5), while only 56% do so in treatment C. This makes a difference of 17 percentage points in insurance take-up between idiosyncratic and correlated risks. It is approximately of the same magnitude as the difference in insurance take-up if the probability of losing switches from 0.1 to 0.01 (with same expected loss) reported by Laury et al. (2009).

Table 6: Insurance take-up

WTP	Overall	Treatment C	Treatment I
< €5	34.9%	43.7%	26.9%
= €5 (fair premium)	40.9%	40.8%	41.0%
> €5	24.2%	15.5%	32.1%

The average switching points from buying insurance to not buying insurance on a scale from 0 to 10 amounts to 5.38 for idiosyncratic risks and 4.14 for correlated risks. This corresponds to an average WTP of €5.35 for full insurance in case of uncorrelated risks, whereas subjects are only willing to pay €5.04 if risks are correlated. The difference in the WTP is therefore €0.31 which amounts to 6.2% of the expected loss. A Wilcoxon rank-sum test confirms that the average switching points for treatment I and C are indeed significantly different at the 1% level (z-stat = -2.638, p = 0.0083). To account for possible confounding effects, we additionally run Tobit regressions with the switching point from buying to not buying insurance as our dependent variable, and treatment as the main independent variable, see Table 7.

Table 7: Tobit regressions

Variable	Model 1	Model 2
Treatment (1 if risks are uncorrelated)	**1.620**** (0.676)	**2.673***** (1.018)
Gender (1 for females)	**0.016** (0.671)	**1.21** (0.896)
Peer group size (1 if peer group is larger than 12)	**-0.128** (0.682)	**-0.361** (0.683)
Culture (1 if foreign, i.e. not born in Germany)	**-1.137** (1.092)	**-1.442** (1.102)
Interaction (treatment x gender)		**-2.225*** (1.264)

Constant	**5.141**	**4.782**

Numbers in parenthesis are robust standard errors.
One, two, and three stars stand for 10%, 5% and 1% significance levels.

The variable treatment is a dummy that is one for subjects that play under correlated risks. We further include gender, peer group size, and culture as additional explanatory variables. No statistically significant effects can be found for these variables and the initial findings are supported. We further check if males and females respond equally to social comparison. Individual regressions for men and women point into the direction of gender differences in the treatment effects. To test if the treatment effect is actually different for men and women we run an additional regression that includes an interaction term - treatment x gender. Indeed the treatment effect seems to be stronger for men but is still significant for women.

Our results suggest that participants are willing to pay less for insurance if the loss occurs for the entire group than if the risk is distributed independently. This indicates that the distribution of risks is taken into account for individual insurance decisions.

5.2 Comparison between risk and ambiguity

In addition to the risky situation, where a loss occurred according to the outcome of throwing a dice, we also considered an ambiguous situation where a loss occurred when drawing a red card from a deck with an unknown proportion of red and black cards. Since the seminal work of Ellsberg (1961), it is well known that people usually prefer to bet on risky rather than ambiguous lotteries (see Camerer and Weber 1992 for an overview of the literature). In our experiment subjects were faced with the risky situation first and were then asked to decide on the ambiguous situation, i.e. every subject had to make two choices. Concerning the outcome of the difference between treatments I and C the findings are similar to the risky situation and show the robustness of the previous findings (average switching points are 5.25 for treatment C and 6.37 for treatment I, a Wilcoxon rank-sum test confirms the difference (z-stat = -1.866, p = 0.0621)).

Our decision to present the ambiguous situation after the risky one is motivated by the comparative ignorance hypothesis of Fox and Tversky (1995). According to this hypothesis, ambiguity aversion is most pronounced, if subjects can compare risky and ambiguous alternatives. We conducted a Wilcoxon signed-rank test to see whether we find a difference in the WTP between the risky and the ambiguous situations, but a statistical difference was found neither for treatment I nor for treatment C. On the one hand this comes as a surprise as participants in our experiment are faced with the risky situation first and due to the comparative ignorance hypothesis our order makes a difference between risk and ambiguity most likely. On the other hand our findings are in line with other studies which show that, in contrast to the gain domain, ambiguity aversion is not as pronounced or not present at all in the loss domain (e.g. Trautmann and van de Kuilen 2013).

6 Conclusions

A major puzzle in insurance economics is the low take-up of disaster insurance, even at subsidized premiums. Evidence for existing explanations of this puzzle is contradictory and so far, there is no convincing theory for this phenomenon. In this paper we analyzed whether social comparison can serve as an alternative explanation. An emerging literature shows how social reference points influence decisions under risk. Linde and Sonnemans (2012) for example find that individual decision making is strongly influenced by social comparison in a way that stands in contradiction to the hypothesis of diminishing sensitivity proposed in prospect theory. Social reference points may thus influence risk taking in general and insurance take-up in particular. We examine the influence of social comparison on insurance decisions both theoretically and experimentally. More specifically, we analyze how the correlation of risks among subjects influences insurance decisions and find that in theory the presence of a social reference point makes insurance less attractive for correlated than for idiosyncratic risks if inequality aversion holds. This result is clearly confirmed by our experiment. In this sense our evidence is consistent with social preferences as modeled by Fehr and Schmidt (1999).

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