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Sharing or gambling? On risk attitudes in social contexts

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Sharing or gambling?

On risk attitudes in social contexts

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Abstract: This paper investigates experimentally whether risk attitudes are stable across social contexts. In particular, it focuses on situations where some resource (for instance, a position, decision power, a bonus) has to be allocated between two parties: the decision maker can either opt for sharing the resource or for using a random device that allocates the entire prize to one of the two parties. By varying the relative situation of the decision maker with respect to the other party, we show that risk attitude is strongly affected by social contexts: participants in the experiment seem to be relatively risk seeking when they possess a relatively weaker position than the other party and risk averse when the opposite is true. Our main average results seem to be driven by the behavior of around a quarter of subjects whose choices appear to be fully determined by social comparisons. Various interpretations of the behavior are provided linking our results to preferences under risk with a social reference point and on status-seeking preferences.

Keywords: risk attitudes, risk preferences in social context, social reference point, status-seeking preferences, social preferences under risk
JEL classification: A13, C65, C72, D63, D03.

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1 Introduction

Executives, and as a result corporations, are sometimes described as undertaking inappropriate levels of risks March and Shapira (1987), often in the direction of excessive risk taking. Prominent recent examples, especially in the banking industry, are painfully easy to retrieve. Many explanations have been proposed to account for this observation, but very few have explored the role of the mere fact that decisions by managers are (by the very nature of corporations) taking place in a social context. Indeed, models of decision making under risk abstract from the social environment in which decisions are made: the typical situation studied by decision theory is one where the individual makes a choice with neither any influence on others nor any information on others' situations. The empirical and experimental evidence on decision under risk involving a social component is sparse at best until now (exceptions include Bault, Coricelli, and Rustichini, 2008; Bolton and Ockenfels, 2010; Cooper and Rege, 2011; Lahno and Serra-Garcia, 2012; and Linde and Sonnemans, 2012b).[1] Hence, it may very well be that decisions under risk in social environments differ from the equivalent decisions taken in purely individual contexts. At least two phenomena suggest an important role of the social context in risky decisions: first, broadly speaking, it has been shown that preferences depend heavily on theoretically 'irrelevant' aspects of the environment or context (Tversky and Simonson, 1993); second, there is ample evidence that individuals are sensitive in many ways to others' situations (Fehr and Schmidt, 1999; Frank, 2005).

Social influence on decision under risk is likely to be relevant in many economic and organizational contexts. The most obvious examples are provided by tightly knit social structures such as corporations or families. It is even difficult to find social-context-free risky decisions: decisions under risk taken by managers have consequences for other organizational members; financial decisions in a family impact on all family members; peers' attitudes or decisions might influence decision makers; even at the roulette table or when playing lotteries social influences have an impact on decisions. More specifically, in an organizational context, a manager lagging behind her peers in terms of performance will not necessarily make the same choice as her counterpart in the opposite situation. In companies, social context may play a particularly important role where individual performance-based payment is prevalent (Lemieux, MacLeod, and Parent, 2009), since it generates additional opportunities for social comparison. This might be especially relevant

[1] An overview is provided in Trautmann and Vieider (2012).

for professional traders who hardly ever work in isolation: trading rooms tend to be crowded workplaces, overloaded with information about others' performance, and vibrant with intensive social exchange about market trends, relative success of colleagues, individual bonuses and so on (Cetina and Preda, 2006). As a consequence, the standard individualistic approach in decision theory requires to be complemented by social aspects.

Despite its potential relevance the effect of social context in risk taking has only received limited attention in the experimental literature on decision under risk: Following the burgeoning of studies on other-regarding preferences that focused on deterministic outcomes, empirical research has started to explore the issue of the interaction of risk and social concerns (Bolton, Brandts, and Ockenfels, 2005; Brennan, Güth, Gonzalez, and Levati, 2008; Krawczyk and Le Lec, 2010). Some of the relevant studies explicitly focus on peer effects in decision making under risk (Cooper and Rege, 2011; Cai, 2012; Bursztyn, Ederer, Ferman, and Yuchtman, 2012; Lahno and Serra-Garcia, 2012), but very few studies have focused on the effects of social comparison on risk attitudes. The existing evidence seems rather mixed: Linde and Sonnemans (2012a) provide evidence that decision makers are more risk averse when in a socially unfavorable situation than in a socially favorable one. In contrast, Bault, Coricelli, and Rustichini (2008) and Bolton and Ockenfels (2010) come to the opposite conclusion, *i.e.*, that decision makers are less risk averse when the situation is unfavorable and vice versa.

Our main focus here is on resource allocation. Consider a decision maker who can either implement a certain allocation of the resource between herself and a second individual (henceforth denoted 'receiver') or use a random device to allocate the entire resource to either herself or to the receiver. More precisely, the choice is between either splitting the resource (dividing the pie into shares of x % and $100 - x$ % for the decision maker and the receiver, respectively) or using a random draw to allocate it (whereby the chances to get the entire pie are x % and $100 - x$ %, respectively). Importantly, x is fixed for a given decision. Such a setup reproduces, in a simplified manner, important aspects of many situations that involve risk: a decision maker can either go for a given allocation (of financial resources, of power, or of positions) or gamble for the entire pie. For instance, a manager can accept the proposed split of available funding between her and another's project or argue that the company should focus on just one of them; a political leader may have a choice between accommodating the current division of power within her party between herself and a rival or go for a shootout that will leave just one of the two standing; a poker player can decide between accepting the current bets or go all in for the pot. In short, we capture a competitive situation for a resource, and by systematically varying the given x, it is possible to analyze risk attitudes depending on the status quo of the deterministic division of the resource. Socially favorable situations are defined as those where x is greater than 50 %: for instance with $x = 70$, the decision maker has to choose between (OPTION A) a deterministic division giving 70 % of the resource for herself and 30 % of the resource for the receiver and (OPTION B) the gamble involving a 70 % chance of receiving the entire resource for herself and the remaining 30 % of losing the entire resource to the receiver. Consequently, unfavorable situations are those in which x is smaller than 50 %.

It is worth noticing already at this stage that risk averse decision makers would always go for the deterministic option for a given x. Predictions for outcome-based other-regarding preferences depend on the specification. Ex ante, the two options are equal implying indifference; ex post, the gamble option is always creating the maximum inequality (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), indicating that inequity aversion should lead to a preference for the deterministic option, whereas efficiency concerns have no bearing on decisions because efficiency is constant (Charness and Rabin, 2002). Purely intention-based models of other-regarding preferences (Rabin, 1993) are not applicable because the receiver has no influence on the outcome. Procedural or process fairness could be relevant for the decision, but in contrast to Machina's 1989 mom example the resource is not indivisible in our case (Trautmann, 2009; Trautmann and Wakker, 2010). Here, if procedural concerns are based on expected payoff, a rather natural assumption, they should be neutral in the decision: in all cases, both options provide the same expected payoff to both individuals. Hence, all outcome-based approaches tend towards indifference or a preference for the deterministic option, whereas procedural concerns can be expected to play little role.

Since the size of the pie or the exact controlled situation of the choice between the two options can hardly be observed within companies in a way that would allow for a rigorous empirical assessment, we ran laboratory experiments. The main findings from these experiments can be summarized as follows: although we find that in most cases a majority of subjects prefer the deterministic division of the resource, we observe that elicited risk attitude is substantially affected by social context. More specifically, subjects seem to be clearly more risk-seeking when the deterministic option involves unfavorable inequity and, more surprisingly, also when the deterministic option implies perfect equality of payoffs, in comparison with an equivalent task in a purely individual context. In contrast, a favorable social context (when the deterministic option corresponds to *favorable* inequity) seems to *reduce* the willingness to take risks. The analysis at the individual level suggests that most of this asymmetry is driven by about one fourth of subjects who strongly exhibit this pattern of choices. The behavior of many participants seem to be driven by a social reference point: if the deterministic situation is favorable or at least equal, procedural concerns may have the strongest impact on behavior. If the deterministic situation is unfavorable, many participants seem to be guided by a strong aversion against disadvantageous inequality. More generally, the main features of prospect theory - risk aversion in the gain domain and risk seeking in the loss domain - seems to carry over to social decision making with a social reference point.

The remainder of the paper is organized as follows: the next section presents the experimental design, the third one exposes the results, while the last part discusses the results in the light of existing literature and concludes.

2 Design and procedures

The experiment was divided into three parts: a series of risky choices in social context, two dictator games, and a series of individual decisions under risk. The first part is the core of the study and aims at measuring how risk attitude is affected by social contexts, whereas the latter two provide a control for social concerns and risk attitude in a purely individual context.

2.1 Part 1: risk attitude in varying social contexts

In the first part of the experiment, subjects faced tasks where fifty euros have to be allocated (either deterministically or randomly) between the decision maker and the receiver. Two options were available: the deterministic division of the 50 euros, i.e. $(x, 50-x)$ for a given x (OPTION A) and a social lottery where the decision maker has a probability of $x/50$ of getting the 50 euros, and the receiver has a probability of $(50-x)/50$ of getting them, with the same x (OPTION B). These chances were mutually exclusive, so that either the decision maker or the receiver would obtain the entire amount. The social lottery corresponding to this second option can hence be written as: $\left(\frac{x}{50}, (50, 0); \frac{50-x}{50}, (0, 50)\right)$. The options were systematically varied to obtain nine different tasks, with x ranging from 5 to 45 euros in steps of 5 euros. Table 1 displays all tasks subjects faced. Participants were asked whether they preferred Option A (henceforth also referred to as 'the safe option') or Option B (henceforth also 'the risky option'). They could also indicate indifference. In that case they knew that Option A or Option B would be implemented randomly with equal probability. Each subject was asked to make a choice in each row. Order effects were controlled for by presenting the choices in ascending orders to half the subjects and in descending order to the other half.

Task	Safe option (in euros)	Risky option (chances of winning the 50 euros)
T5	5 for chooser, 45 for receiver	p=10% for chooser, 1-p=90% for receiver
T10	10 for chooser, 40 for receiver	p=20% for chooser, 1-p=80% for receiver
T15	15 for chooser, 35 for receiver	p=30% for chooser, 1-p=70% for receiver
T20	20 for chooser, 30 for receiver	p=40% for chooser, 1-p=60% for receiver
T25	25 for chooser, 25 for receiver	p=50% for chooser, 1-p=50% for receiver
T30	30 for chooser, 20 for receiver	p=60% for chooser, 1-p=40% for receiver
T35	35 for chooser, 15 for receiver	p=70% for chooser, 1-p=30% for receiver
T40	40 for chooser, 10 for receiver	p=80% for chooser, 1-p=20% for receiver
T45	45 for chooser, 5 for receiver	p=90% for chooser, 1-p=10% for receiver

Table 1: *Part 1: Social tasks*

By keeping expected payoff constant in each row, we do not allow for a purely selfish choice. Given that in the standard dictator game (Forsythe, Horowitz, Savin, and Sefton, 1994) only a fraction of people transfer money to the receiver and that the distribution of transfers is usually very skewed, we would have been left with a small number of observations for only a subset of the action space, had we allowed to choose x freely. Furthermore, our empirical analysis is simplified, because we do not have to take selfishness as a motive into account. Choices are simple and binary, involving no competition nor interaction between the decision maker and the receiver. As a consequence, the choice and the relative *ex post* payoff cannot be interpreted as signals of underlying abilities of subjects (*e.g.* intelligence or effort). In a similar vein, using repeated tasks with observation of the other's choice or performance can have some effects not because of social comparison *per se* but because of social learning. All that is precluded by our design.

2.2 Parts 2 and 3: controls for individual risk preferences and risk-free social preferences

The remaining parts of the experiment aim at measuring both risk preference in an individual setting (without social context) and social preferences (in a risk-free environment).

More precisely, in the second part of the experiment, subjects had to play two dictator games (Forsythe, Horowitz, Savin, and Sefton, 1994; Bolton, Zwick, and Katok, 1998): The first one was a regular dictator game with 50 euros to be divided between the decision maker (the dictator) and the receiver. The second game consisted of dividing chances to win 50 euros (that is the 'competitive probabilistic dictator game' of Krawczyk and Le Lec 2010). Finally, participants had to indicate which of the two games they preferred. The two dictator games provide us with controls for outcome-based (first game) and procedural social concerns (second game). Thus, we have a measure of subjects' concerns for others to potentially identify the role they may have played in the main part of the experiment.

The final part of the experiment consists of a series of nine binary decisions under risk. The first three were a truncated and adapted Holt and Laury (2002) procedure to estimate subjects' risk attitudes with stakes comparable to the one used in the main part of our experiment. The next three tasks were aimed at measuring loss aversion, and the last three ones were risky binary choices that were exactly equivalent to T15, T25 and T35 in Table 1, but without any social component (denoted T15i, T25i, and T35i, henceforth). They allow for a direct comparison between risk attitudes with and without social context. Finally, subjects were asked to provide some socio-demographic characteristics.

2.3 Experimental procedures

The design described above was implemented as a classroom experiment with 82 undergraduates in economics at the University of Munich. All of them were asked to take all the choices described above. Their role - either decision maker or receiver - was determined after the experiment, using the so-called *strategy method*. Decision sheets and instructions were first distributed for parts 1 and 2 together, and upon finishing, also for part 3, and subjects knew that there were exactly three parts of the experiments right from the start of it. Four randomly selected decision makers were matched with four randomly selected receivers. For each pair one of the 'social' tasks (parts one and two, including the question regarding their preference for the regular dictator game or the probabilistic one) was randomly selected for payment. In addition, four participants were randomly picked for payment in the individual lottery part, where one task was once again randomly picked to be implemented. Random devices were run by the selected participants.

Payments were provided individually and confidentially. All design details and the procedural details were common knowledge among participants.

3 Results

3.1 Aggregated results

An overview of the results in the social decisions under risk (part 1 of the experiment) is shown in Table 2.

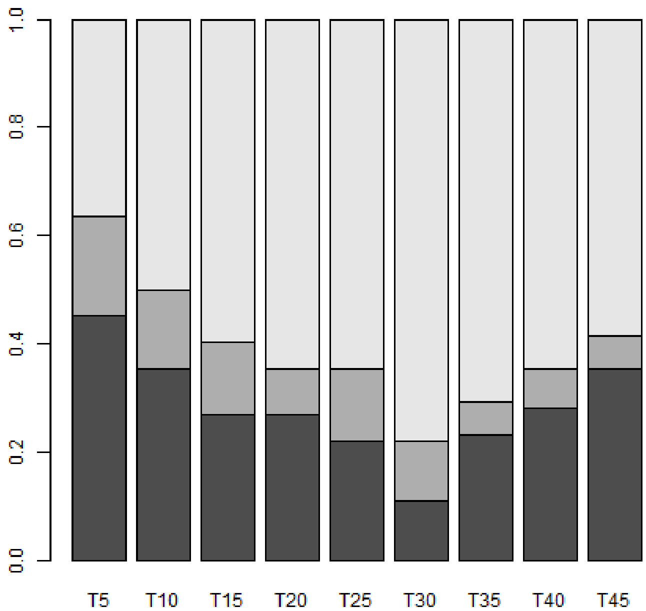
Task	Safe option	Indifference	Risky option
T5	36.59	18.29	45.12
T10	50.00	14.63	35.37
T15	59.76	13.41	26.83
T20	64.63	8.54	26.83
T25	64.63	13.41	21.95
T30	78.05	10.98	10.98
T35	70.73	6.10	23.17
T40	64.63	7.32	28.05
T45	58.54	6.10	35.37

Table 2: *Percentage of participants choosing each option in the risky social tasks*

The overall picture is perhaps easier to see by looking at Figure 1. The aggregate pattern is U-shaped, with subjects seemingly willing to take more risk in unequal tasks both in very favorable and very unfavorable situations.[2] The level of risk taking reaches its lowest value just above the equal split.

The U-shape of the safe choice contingent on the task is at first sight a somewhat surprising finding: the relative level of risk aversion seems to decrease with the extent of favorable inequity. When inequity is large but favorable, some decision makers seem to prefer to give some chance to the

[2] The U-shaped form is confirmed by a very simple quadratic regression model ($n = 9$) with overall frequency of the risky option as dependent variable and own payoff in the safe option (straight and squared) as independent variables. Both variables turn out to be highly significant, the model has adjusted R^2 of .88, and the predicted function smoothly follows the data. It is worth noting that the residuals for T25 and T30 are by far the largest, their squares accounting for 86% of sum of squared errors, suggesting some discontinuity there (see below). In contrast, if the squared term is omitted, adjusted R^2 drops to .19, and the regression does not reach conventional levels of significance.



Black: safe option. Light grey: risky option. Grey: Indifference.

Figure 1: *Distribution of choices*

receiver, even so small, rather than to give 'alms'. This cannot be explained by standard probability weighting functions of Prospect Theory Tversky and Kahneman (1992), since high probabilities should generally be underweighted, nor by straightforward inequity aversion on outcomes only, since in the risky option, *ex post* inequity is always maximal. Hence, under standard assumptions regarding risk preferences, including the probability weighting function, and inequity aversion, risk attitude should move towards higher levels of risk aversion when the level of favorable inequity rises. This is clearly not reflected in the data: the proportion of subjects taking the risky option in T30 is significantly lower than in T45 ($p < .001$ for both Maxwell-Suart's marginal homogeneity test and Bhapkar's W), although conventional levels of significance are not reached with T40 and T35 vs. T45.

Notably, the U-shaped pattern seems to be asymmetric: the amount of risky decisions appears higher in the case of unfavorable inequity for the decision maker than in the case of favorable inequity. Leaving the case of the equal split aside for the moment, all comparisons between tasks corresponding to sure payoffs adding up to 50 (T5 vs. T45, T10 vs. T40, T15 vs. T35, and T20 vs. T30) suggest that the risky option is relatively more appealing when the sure option implies unfavorable inequity: The differences are significant according to Maxwell-Stuart and Bhapkar's W at the .05-level. By the same token, comparing the number of times decision makers have chosen the risky option in the four favorable situations against the same number in the four unfavorable situations yields a significant difference (using a two-sided Wilcoxon signed ranks test for matched observations: $V = 1299.5, p = .02$).

The apparent asymmetry between favorable and unfavorable situations in risk attitude may be consistent with various aspects of individual attitudes towards risk. For instance, the difference may in part be explained within generalized expected utility models by probability weighting functions known to be inverted S-shaped, in particular for T5/T45. In this case, the comparison of choices in a social context and equivalent individual choices should be identical. Remember that, in the second part of the experiment, three tasks (T15i, T25i, T35i) were the exact counterparts of T15, T25 and T35 in terms of payoffs and probabilities for the decision maker, but stripped from the social context. Comparisons are displayed in figure 2, and they suggest indeed systematic differences between decisions in social and individual contexts.

In T15 vs. T15i, where the social situation is unfavorable to the decision maker, individuals take significantly more risk than in the equivalent individual lottery and this difference is strongly significant ($p < .001$ for both Maxwell-Stuart's and Bhapkar's W). More surprisingly perhaps, the same holds for the equal situation (T25 vs. T25i), where subjects take more risk in the social lottery than in the individual one ($p < .01$ for both tests).[3] However, in case of a favorable social context (T35 vs. T35i) the difference is only weakly significant (Bhapkar's W $p < .10$). This means that decision maker not only takes more risks on average in an unfavorable situation than in a favorable one, but that they also take more risk in an unfavorable social situation than they would in the equivalent task without social implications. To put it differently, decision makers seem to be affected by social context when making a risky decision, but not in an homogeneous way: they take more risk when the situation is unfavorable or equal, but less when it is

[3]Note though that this is mostly due to the larger number of indifference rather than a shift to the risky option.

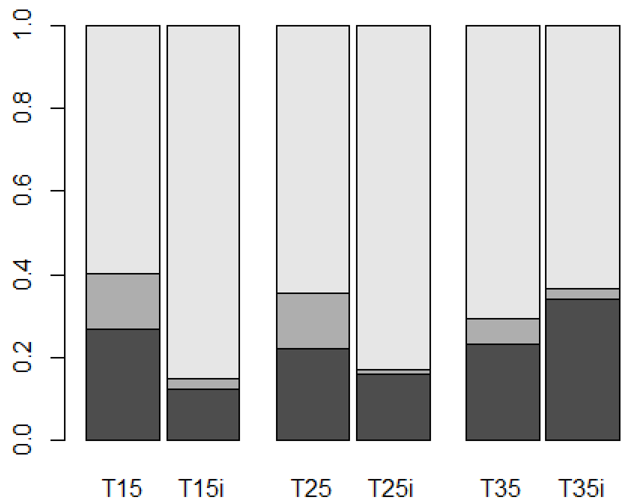


Figure 2: *Risky choices in social vs. individual contexts*

favorable to them.

In order to test the robustness of these results, we ran an ordered logit model with individual fixed effects on choices made in the nine social lotteries (that is, the safe option, indifference or the risky one) and the three equivalent individual tasks, using as independent variables the expected payoff of the lottery and its squared root (in order to account for non-linearities), and three dummy variables accounting for the context (equal, favorable, unfavorable), the reference being being the individual tasks. The results are displayed in Table 3. They confirm the earlier findings: decision makers take more risks in unfavorable social situations and - although to a lesser extent so in equal social situations than they take in purely individual decisions under risk, whereas in favorable social situations they seem either not to be affected by the social environment or to take slightly less risk.

To the extent that some of the findings reported above are surprising, one could wonder whether perhaps the fact that only a fraction of subjects were selected for real payment made the situation akin to a hypothetical

Choice	Coef.	SE	Wald Z
Constant (≥ 0.5)	1.2748†	.7734	1.65
Constant (≥ 1)	.7302	.7725	.95
EP	-.14***	.0328	-4.40
EP^2	.003***	.0006	5.60
dummyequal	0.74**	.3000	2.48
dummyfavourable	-.35	.2789	-1.28
dummyunfavourable	1.16***	.2719	4.29

† =significant at the .10 level, *= significant at the .05 level, **= significant at the .01 level, ***= significant at the .001 level. $Pseudo-R^2 = 0.34$, L.R. $\chi^2 = 313.68$ (df 86), $p < .001$

Table 3: *Ordered logit with individual fixed effects*

game and reduced subjects' effort to choose carefully. However, the dictator games (where behavior is supposedly strongly affected by the presence of real incentives) gave findings very similar to those in the literature, especially those of Krawczyk and Le Lec (2010): a substantive share of people give a little, be it in money or in probability, and they give less in the latter than in the former in terms of expected payoffs (means of 10.02 euros in money and 15.11 percent in chance (i.e., 7.55 expected euros); a two-sided Wilcoxon signed-rank test comparing the two suggest a significant difference ($p < .01$). As the summary statistics of the dictator decisions are similar to those in the existing literature, we conclude that our main results are not driven by the random lottery mechanism applied in the experiment.

3.2 Individual patterns

One of the limitations of our analysis so far is that these apparent findings concern aggregate data, and as such may be driven by individual heterogeneity of subjects, which may explain a rather surprising overall picture. One aspect in which subjects might differ a lot is whether they are socially oriented, i.e., other-regarding (inequity averse, altruistic, etc.). Categorizing selfish and pro-social subjects on the basis of a median split on their offer in the dictator game can shed some light on the data. Interestingly, the apparent risk seeking behavior in the unfavorable social situations seems to be driven by subjects who behaved selfishly in the dictator game: the difference between T15 and T15i is significant there, with $p < .01$ for Maxwell-Stuart and Bhapkar's W, whereas it is not for relatively pro-social subjects. Yet, no such effect can be found for the other possible comparisons: T25 and T25i are different for both the selfish and the pro-social subjects ($p < .10$ for both tests), and the difference between T35 and T35i is not significant for either group. Overall, this suggests that the more risk-seeking behavior in the unfavorable social situation may be mostly driven by 'selfish' subjects. Notice however that 'selfish' may be a misnomer; a fraction of apparently selfish subjects may in fact be competitive, both types being confounded in the dictator game.

In order to check for heterogeneity and to get a more precise picture of individual patterns, we ran a k-medians cluster analysis on all social lotteries dividing the subjects into three clusters. This leads to the following characterization: the first class of types is composed of 20 individuals who exhibit a very dichotomous pattern of risk attitude in the social context (strongly risk-seeking in the unfavorable case, and risk-averse in the favorable one), the second one (41 subjects) is rather overall risk-averse, and the final one (21 individuals) show a relatively stable attitude towards risk, except in the case of high probabilities of winning (T35, T40, T45). The data by types are shown in Fig. 3.

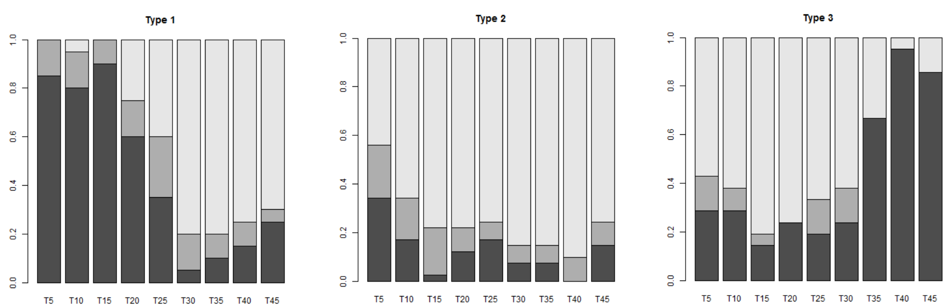


Figure 3: *Choices in social lotteries by types*

This categorization of subjects helps explain the aggregate pattern: the overall asymmetry in risky behavior across favorable and unfavorable situations seems to be mostly (but not only) driven by type-1 individuals. Furthermore, the puzzling surge in risk-seeking behavior when the situation becomes more and more socially favorable can almost entirely be accounted for by type-3 participants. In other words, the clear U-shape trend does not seem to correspond to a particular individual pattern. However, whereas the asymmetry in risk attitude between advantageous and disadvantageous inequity could be explained by social reference points (and so can the behavior of type 1 subjects), the more risky choices in extremely favorable situations for type 3 participants are not easy to explain, especially since no correlation was found between being of type 3 and other experimental variables (such as the order of the tasks, the level of risk aversion, etc.) or socio-demographic variables. A possible explanation is that there may be some individuals who tend to systematically overestimate high probabilities. It is well known that probability weighting functions exhibit substantial variance at the individual level and that the usual inverted S-shape corresponds only to the median or average decision maker. In favor of this interpretation, we find that as many as 57% of type-3 subjects choose the risky option in T35i, to be compared with 67% in T35, a non-significant difference. It seems that the increase in risk taking observed for type-3 subjects is likely not to be linked to a specific effect of the social context, but more to a general attitude towards risk in this range of probabilities.

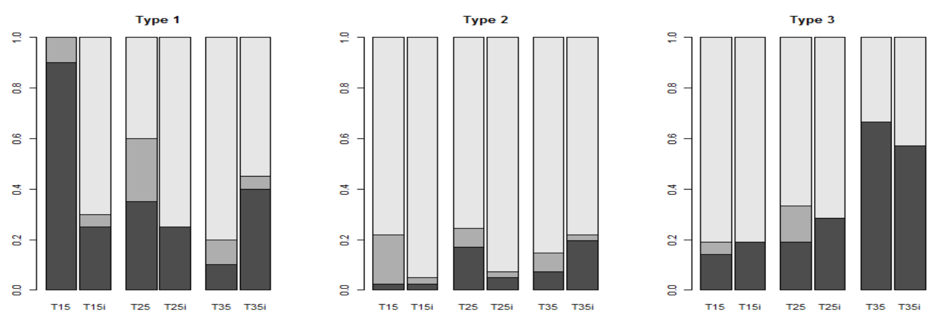


Figure 4: *Choices in social/individual lotteries by type*

The strong effect of social context on risk taking in type-1 subjects as is suggested by Fig. 4 is confirmed by statistical tests: T15 and T15i differ strongly ($p < .001$ for Maxwell-Stuart and Bhapkar's W), giving weight to the idea that these subjects take more risk in socially unfavorable situations. Conversely, T35 turns out to be significantly smaller than T35i ($p < .05$ in both tests), a change in behavior under risk when the situation is favorable. It also seems that T25 and T25i differ ($p < .10$ for Maxwell-Stuart and $p < .05$ for Bhapkar's W), and that in equal situations, type-1 subjects do take more risk.

Interestingly, though weaker, these results seem to hold for type-2 subjects too: choices are different for T15 and T15i ($p < .05$ for Maxwell-Stuart, $p < .01$ for Bhapkar's W), and for T25 and T25i ($p < .05$ for both tests), although the picture is less clear for T35 and T35i ($p = .20$ for Maxwell-Stuart and $p = .12$ for Bhapkar's W). It looks as if the same pattern prevails in both types but that it is more intense for the first type. When merging the two types, the three differences discussed above are strongly significant ($p < .01$ for all tests but Maxwell-Stuart between T35 and T35i, where $p < .01$ and for T15 and its individual equivalent where $p < .001$).

To sum up, it seems that many subjects exhibit the following pattern: they tend to take more risks in both *unfavorable and in equal situations* than in equivalent individual contexts, and they are more risk-averse in socially favorable situations. This pattern is particularly strong for a substantive share (a quarter) of our subjects. They choose the uncertain option when in an unfavorable situation, and they choose the safe one in a favorable one. In other words, this share of our subjects exhibit risk attitudes that are very much affected by social context, and they seem to be the extreme case of a rather frequent behavior (types 1 and 2, or equivalently three quarters of all subjects).

4 Discussion

Overall, our results suggest that individuals' attitude towards risk is strongly affected by the social context: We observe systematic deviations in social situation from what decision makers decide in similar situations without any possibility for social comparisons. In particular, they take more risk when the other participant is ahead, and less when the other is behind. Our data pattern is consistent with findings in Bolton and Ockenfels (2010), and it would also be in line with an extended version of Prospect Theory to social contexts, where the other's payoff would play the role of the reference point, as developed by Linde and Sonnemans (2012a). Such a reasoning could also help explain the data by Haisley, Mostafa, and Loewenstein (2008), who showed that when reminded of their low status, low income individuals were more likely to engage in risky purchase such as lottery tickets.

One of the, at first sight, counter-intuitive results in our paper is that subjects seem to take more risk in an equal social context (T25) than in a purely individual one (T25i). A possible explanation may be found in the results of Bault, Coricelli, and Rustichini (2008), who put forth the fact that gloating, *i.e. the utility of being ahead of the other*, is in absolute value stronger than envy, *i.e. the disutility of being behind*. According to the authors, attitudes to gain and losses reverse in a social context: Whereas in its standard version, the theory implies that losses are valued more in absolute terms than gains, it may be that the opposite holds in social contexts; that is, relative gains may be subjectively valued more strongly than relative losses. Such an interpretation would straightforwardly explain why subjects are more risk seeking in a socially equal situation than in the payoff-equivalent individual one.[4]

Attitudes to gains and losses reversing in a social context may in part explain the discrepancy between, on the one hand, our results and those of Bolton and Ockenfels (2010) and, on the other hand, the findings in Linde and Sonnemans (2012a). In the latter paper, the authors did not use social lotteries that gave the decision maker the opportunity to switch relative positions with the receiver (from being behind to being ahead), but at best the possibility to reach the same level of payoffs. If being ahead is what is really prized by subjects, there is little motivation in Linde and Sonnemanns's tasks to take risks, since it is impossible to overtake the other participant by choosing the risky option. An alternative version of this interpretation is that 'winning' – that is, earning more than the counterpart, independently of the absolute payoff difference – generates a psychological bonus: What is prized is not really the favorable difference between the decision maker and the receiver, but simply whether the decision maker has 'won' the bet. In this case, there is no reason anymore to take risks in favorable tasks, and such an explanation is consistent with the general pattern we observe.[5]

Another explanation needs two ingredients: First, individuals could have a tendency to take more risk in general in social contexts than in individual ones[6], and, second, individuals are more risk-seeking in socially unfavorable

[4]To see that, consider a very simple version with $u(x, y) = \lambda v(x-y)$ in the relative gain domain, and $u(x, y) = -v(y-x)$ in the relative loss domain, v being concave on $\mathbb{R}_+$, $\lambda \geq 1$. When considering decisions in task T25, the utility of both options are the following: for the safe one it is $v(25-25) = 0$, whereas for the risky one we get $\lambda \frac{1}{2} v(50) - \frac{1}{2} v(50)$, which is positive for any $\lambda > 1$.

[5]Such a reasoning can be seen as a social version of aspiration level theory, developed by Diecidue and van de Ven (2008).

[6]This might also be a consequence of our design: The risky option may look more appealing to some subjects in the social case than in the individual case, simply because in the social lottery, the bad outcome may not, from a social preference point of view, be seen as equally bad as in the individual one. Altruistic or efficiency-driven considerations in this case could explain why gambling in the social case is slightly more attractive than

situations, not affected in socially equal situations, and more risk-averse in socially favorable contexts. The two effects, once combined, would imply a pattern consistent with our findings: in unfavorable situations where the two effects point in the same direction, individuals become strongly more risk-seeking, as we observe it; in equal ones, they would become mildly more risk-seeking because of the first effect (and the second one is neutral); and eventually the effect would be mixed for the favorable lotteries or slightly in the direction of more risk aversion, the second effect being stronger than the first, as we observe in our results.

5 Conclusion

Our data suggest that elicited risk attitude is influenced by the relative social situation of the decision maker: More risk is taken in unfavorable situations, and (slightly) less in favorable situations. A substantive share of our subjects (a quarter) exhibit this pattern in an extreme way: they almost always choose the risky option when in an unfavorable situation, and almost always choose the safe option in a favorable context. We also find evidence of additional risk seeking in socially equal contexts. In addition, it seems that such a pattern of behavior also holds for a majority of subjects, yet in a less extreme way.

The finding that on average people take more risk in social contexts than in individual ones sheds light on the social dynamics of excessive risk taking, especially in organizations. Consider for instance a principal-agent-situations with one principal and several agents, *e.g.* a single employer and several employees, a shareholder and several executives, etc. Then, a divergence in risky behavior between the principal and the agents who are, in contrast to the principal, embedded in a social context is possible according to our results. Such a divergence is not the consequence of different risk attitudes but purely a consequence of the social context. Given our results, the social effect on average clearly goes in the direction of excessive risk taking. More specifically, take a bank or in an investment fund: within the group of agents some are going to fare better than others, especially if the former have taken more risks than the latter. The resulting socially unfavorable situation for the latter may lead them to take more risks, establishing an even higher reference level that makes others also take excessive risks, leading to a vicious

in the individual one. Furthermore, it could also be the mere fact of being observed by another participant who by design would see the other's choice that is affecting the results. In contrast, the choice in individual lotteries is by design not affected by such peer effects.

circle with probably higher returns but, eventually, unacceptable risks and, finally, potentially spectacular bankruptcies.

Our experimental results suggest that the role of social context may be critical in understanding organizational and financial excesses in risk taking. We are able to provide a first idea of the important forces behind potentially excessive risk taking as a consequence of the social context. Future studies could test specific theoretical models of excessive risk taking that embed the risky situation into a social environment. More comprehensive tests of individual risk attitudes could allow to also address the underlying reasons for potentially excessive risk taking in the social. For instance, estimating individual probability weighting would allow for addressing the influence of this channel on decision making under risk in a social situation. Further, the social situation could be varied in different dimensions (such as the level of competition, the size of the references group, etc.), not only along the outcome dimension. Without doubt, there is more research required, but it is important to know - following our results - that the social context matters and that there are certain aspects (such as the relative position within a reference group) that seem to play a crucial role in shaping elicited risk attitudes in social situations.

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APPENDIX: EXPERIMENTAL INSTRUCTIONS

In this experiment you can earn money. It consists of two completely independent parts. You will find the instructions and decison sheets for part 1 attached (pages 2-4) and receive part 2 after completion of part 1. To keep your decisions anonymous, you receive an identification number, which is indicated in the upper right part of this page. Please tear off this number and keep it in a safe place. Please do not talk to your neighbors from now on and fill in the following sheets. Please read the instructions carefully! Raise your hand if you have any questions.

1. Part 1

Please imagine you have received 50 euros and you have to give a share of it to another anonymous person in the room. Between the three options A, B and C, please choose the option that you personally find best by ticking one of the three grey boxes below "Your choice" for each of the 10 scenarios! Please read the text below the scenarios BEFORE you decide! Note that scenario 10 is structurally different from scenarios 1-9.

(1) Scenario: Choose between A, B and C:
   (a) I give 5 euros to the anonymous person and keep 45 euros.
   (b) I give the other person a 10% chance of receiving the 50 euros. With a probability of 90% I will keep the 50 euros.
   (c) I don't care. (Option A or B are chosen randomly.)

(2) Scenario: Choose between A, B and C:

   (a) I give 10 euros to the anonymous person and keep 40 euros.
   (b) I give the other person a 20% chance of receiving the 50 euros. With a probability of 80% I will keep the 50 euros.
   (c) I don't care. (Option A or B are chosen randomly.)

(3) Scenario: Choose between A, B and C:

   (a) I give 15 euros to the anonymous person and keep 35 euros.
   (b) I give the other person a 30% chance of receiving the 50 euros. With a probability of 70% I will keep the 50 euros.
   (c) I don't care. (Option A or B are chosen randomly.)

(4) Scenario: Choose between A, B and C:

   (a) I give 20 euros to the anonymous person and keep 30 euros.
   (b) I give the other person a 40% chance of receiving the 50 euros. With a probability of 60% I will keep the 50 euros.
   (c) I don't care. (Option A or B are chosen randomly.)

(5) Scenario: Choose between A, B and C:

(a) I give 25 euros to the anonymous person and keep 25 euros.
(b) I give the other person a 50% chance of receiving the 50 euros. With a probability of 50% I will keep the 50 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(6) Scenario: Choose between A, B and C:

(a) I give 30 euros to the anonymous person and keep 20 euros.
(b) I give the other person a 60% chance of receiving the 50 euros. With a probability of 40% I will keep the 50 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(7) Scenario: Choose between A, B and C:

(a) I give 35 euros to the anonymous person and keep 15 euros.
(b) I give the other person a 70% chance of receiving the 50 euros. With a probability of 30% I will keep the 50 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(8) Scenario: Choose between A, B and C:

(a) I give 40 euros to the anonymous person and keep 10 euros.
(b) I give the other person a 80% chance of receiving the 50 euros. With a probability of 20% I will keep the 50 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(9) Scenario: Choose between A, B and C:

(a) I give 45 euros to the anonymous person and keep 5 euros.
(b) I give the other person a 90% chance of receiving the 50 euros. With a probability of 10% I will keep the 50 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(10) Scenario: Decide for A, B AND C:

(a) I do not have to give away anything of my 50 euros. However, I can give a share to the anonymous person in the room voluntarily. The anonymous person has NOT received 50 euros. What amount (in euros between 0 and 50) would you voluntarily give to the anonymous person?
(b) I do not have to give away anything of my 50 euros. However, I can give a share to the anonymous person in the room voluntarily. The anonymous person has NOT received 50 euros. What chance (in % probability between 0 and 100) would you voluntarily give the anonymous person to receive the 50 euros?
(c) Which of the two options, A or B, would you prefer? Please tick a box.

At the end of the lecture we will choose 8 persons randomly from all the persons in the room (with help of the random generator on the computer). The first 4 persons are randomly assigned to the role of the one that received 50 euros (decider). The other 4 persons are then in the role of the receiver. Decider 1 decides what amount receiver 1 receives, decider 2 decides, what amount receiver 2 receives etc. For each pair" we will choose randomly one of the 10 upper scenarios (by rolling a 10-sided die). This scenario determines then the gain of the two persons (if option C is chosen, the die will be rolled again - for the numbers 1-5, A is chosen; for the numbers 6-10, B is chosen).

Let's assume you have been drawn as "decider" and the 2nd scenario is randomly chosen to be paid. If you have chosen A, you will receive 40 euros and the other person will receive 10 euros. If you have chosen B, you will roll a 10-sided die in front of our eyes. If you throw a 1 or a 2 (20% probability) the other person will receive the entire 50 euros. If you throw a number from 3 to 10 you will receive the entire 50 euros. Analogue for the other options.

If scenario 10 is chosen, a random mechanism (the random generator of the computer) will first choose between A, B and C. Then the amount, that the decider has chosen, is directly transferred to the receiver (if option A was chosen) or the die is rolled corresponding to the chosen probability, respectively (if option B is chosen). If the random decision yields option C, the indicated option - A or B - is valid. As you don't know whether you will be chosen, which role you will be assigned if so and which scenario will be paid, it makes sense to think carefully about each decision. The payment will be conducted separately and anonymously at the end of the lecture. I.e., you will not know with which decider/receiver you were paired afterwards. PLEASE DECIDE NOW FOR THE SCENARIOS 1 TO 10. Raise your hand if you have any questions.

2. Part 2 [handed out after completion of Part 1]

Again you have to choose between different scenarios. This time, there are 9 scenarios. Please choose from the three options A, B or C the one that you personally find best by ticking one of the three grey boxes beneath "Your choice" for each of the 9 scenarios! Please read the text below the scenarios BEFORE you make your decision!

(1) Scenario: Choose between A, B and C:
  (a) A 50% chance of receiving 25 euros and a 50% chance of receiving 20 euros.
  (b) A 50% chance of receiving 47.5 euros and a 50% chance of receiving 1.25 euros.
  (c) I don't care. (Option A or B are chosen randomly.)

(2) Scenario: Choose between A, B and C:
  (a) A 60% chance of receiving 25 euros and a 40% chance of receiving 20 euros.
  (b) A 60% chance of receiving 47.5 euros and a 40% chance of receiving 1.25 euros.
  (c) I don't care. (Option A or B are chosen randomly.)

(3) Scenario: Choose between A, B and C:
  (a) A 70% chance of receiving 25 euros and a 30% chance of receiving 20 euros.
  (b) A 70% chance of receiving 47.5 euros and a 30% chance of receiving 1.25 euros.
  (c) I don't care. (Option A or B are chosen randomly.)

(4) Scenario: Choose between A, B and C:
  (a) 0 euros for sure.
  (b) A 30% chance of losing 12.5 euros and a 70% chance of receiving 12.5 euros.
  (c) I don't care. (Option A or B are chosen randomly.)

(5) Scenario: Choose between A, B and C:
  (a) 0 euros for sure.
  (b) A 40% chance of losing 12.5 euros and a 60% chance of receiving 12.5 euros.
  (c) I don't care. (Option A or B are chosen randomly.)

(6) Scenario: Choose between A, B and C:
  (a) 0 euros for sure.

(b) A 50% chance of losing 12.5 euros and a 50% chance of receiving 12.5 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(7) Scenario: Choose between A, B and C:

(a) 15 euros for sure.
(b) A 30% chance of receiving 50 euros and a 70% chance of receiving 0 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(8) Scenario: Choose between A, B and C:

(a) 25 euros for sure.
(b) A 50% chance of receiving 50 euros and a 50% chance of receiving 0 euros.
(c) I don't care. (Option A or B are chosen randomly.)

(9) Scenario: Choose between A, B and C:

(a) 35 euros for sure.
(b) A 70% chance of receiving 50 euros and a 30% chance of receiving 0 euros.
(c) I don't care. (Option A or B are chosen randomly.)

At the end of the lecture we will choose 4 persons in the room randomly (with the help of the random generator on the computer.) Those will be different 4 persons than the ones chosen for part 1. For each of the 4 persons we will choose one of the 9 upper scenarios randomly (with the random generator of the computer). This is then relevant for the gain of the person concerned (if C has been chosen the die is rolled again - if a number from 1 to 5 is thrown, A is valid; if a number from 6-10 is thrown, B is valid).

Let's assume for example that you have been chosen randomly to be paid for the second scenario. If you have chosen A you will roll a 10 sided die in front of our eyes. If you throw a number from 1 to 6 (60% probability) you receive 25 euros. If you throw a number from 7 to 10, you receive 20 euros. Analogue for the other options. As you don't know whether you will be chosen, which role you will be assigned if so and which scenario will be paid, it makes sense to think carefully about each decision. The payment will be conducted separately and anonymously at the end of the lecture. I.e., you will not know with which decider/receiver you were paired afterwards.

PLEASE NOTE: Possible losses have to be covered out of your own pocket.

PLEASE DECIDE NOW FOR THE SCENARIOS 1 TO 9. AS SOON AS YOU ARE DONE, YOU CAN START FILLING IN THE QUESTIONNAIRE. AFTER

THIS THE EXPERIMENT ENDS.

Raise your hand if you have any questions.

3. QUESTIONNAIRE

Thank you for your participation!

We ask you to fill in this short questionnaire truthfully.

Age: ____

Gender: m f

Major: ______________________

On a scale from 1 (very risk averse) to 7 (very risk loving), how would you describe yourself? ____ (1 to 7)

Nationality: ______________________

Do you smoke regularly (more than one packet per week)? yes no
Do you play the lottery regularly (more than once a month)? yes no

Do you gamble on the internet (Poker, . . .)? yes no

List your three favorite sports (ranked in order) that you practice regularly

(1) ______________________
(2) ______________________
(3) ______________________

(if you practice less than 3 sports leave the fields blank)

Thank you very much again for your participation!