Distributional Preferences and Competitive Behavior*

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Abstract

We study experimentally the relationship between distributional preferences and competitive behavior. We find that spiteful subjects react strongest to competitive pressure and win in a tournament significantly more often than efficiency-minded and inequality averse subjects. However, when given the choice between a tournament and a piece rate scheme, efficiency-minded subjects choose the tournament most often, while spiteful and inequality averse subjects avoid it. When controlling for distributional preferences, risk attitudes and past performance, the gender gap in the willingness to compete is no longer significant, indicating that gender-related variables explain why twice as many men as women self-select into competition.

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1. Introduction

Often labor market outcomes (e.g., hiring or promotions) involve tournaments, for instance, when a new position is advertised or a promotion is opened within an organization. Thus, workers' attitudes toward competition and their performance in competitive environments often have a strong influence on success in labor markets. In particular, chances of success in labor markets are greater for individuals with higher propensity to self-select into competitive environments and the ability to perform well under competitive pressure. After all, people typically don't have jobs for which they have not applied.

The importance of understanding how the willingness to compete, the response to competitive pressure and the performance in competitive environments affect labor market outcomes has recently been highlighted in the large and still growing number of papers on gender differences in competitiveness. This literature has provided strong evidence that men are more willing to compete and react more strongly to competitive pressure than women, suggesting that these gender differences in competitiveness can help to explain both the observed gender wage gap and the gap in chances for promotion (see, e.g., Gneezy, Niederle and Rustichini, 2003; Niederle and Vesterlund, 2007, 2010; Sutter and Rützler, 2010; Wozniak, Harbaugh and Mayr, 2010; Datta Gupta, Poulsen and Villeval, 2011). In addition to identifying gender as an important factor affecting competitive behavior, recent studies have also linked competitive behavior to hormonal factors (Apicella, Dreber, Campbell, Gray, Hoffman, Little, 2008; Buser, 2009; Wozniak *et al*., 2010) and cultural upbringing (Booth and Nolen, 2009; Dreber, von Essen and Ranehill, 2009; Gneezy, Leonard and List, 2009), and have examined whether competitiveness might depend on the type of task in which individuals compete (Dreber *et al*., 2009; Günther, Ekinci, Schwieren and Strobel, 2010). Finally, given differences in competitiveness, a series of recent studies has shown that affirmative action programs can help to close the gap between men and women – or, more generally, between advantaged and disadvantaged subjects – with respect to their willingness to compete (Niederle, Segal and Vesterlund, 2010; Calsamiglia, Franke and Rey-Biel, 2010; Balafoutas and Sutter, 2010).

This paper contributes to this large literature on competitive behavior by highlighting and analyzing the impact of another important factor, namely distributional preferences, on competitiveness. Distributional preferences is a term used by experimental economists to describe a world where decision makers have a genuine concern for the (material) welfare of others in the sense that their well-being and behavior does not only depend on their own material payoff but also on the (material) payoffs of other agents.[1] Depending on how exactly the material payoff of others enter a decision maker's utility function, economists distinguish between different archetypes of distributional concerns, the most prominent ones being altruism and surplus maximization (in both cases the material payoffs of others enter positively in the decision maker's utility function), inequality aversion and egalitarian motives (where the payoffs of those who have less income enter positively in the utility function while the payoffs of those who have more enter negatively), as well as spiteful preferences and concerns for relative income (where the payoffs of others enter negatively in the decision maker's utility function). Since competition necessarily entails (at least the chance of) unequal *ex post* allocations – if the *ex post* allocation is egalitarian independently of the outcome of the competition then there is nothing to compete for *ex ante* – the shape and intensity of subjects' distributional preferences may affect their willingness to compete and their performance under competition. For instance, inequality averse subjects who incur a disutility when other agents have either higher or lower payoffs (as in the model by Fehr and Schmidt, 1999) or when their payoff differs from the average payoff of other agents (as in Bolton and Ockenfels, 2000) might be less inclined to compete than spiteful types who enjoy increased well-being when others are worse off (as in Levine, 1998). Consequently, we are going to study how a subject's distributional preferences are linked to her competitive behavior.[2] We consider this an important addition to the insights that have been gained in previous studies about gender differences in competitiveness or the influence of hormones or cultural upbringing.

Specifically, we report the findings from a laboratory experiment consisting of two parts. In Part 1 subjects are exposed to a number-adding task under three different remuneration regimes, in Part 2 we elicit risk attitudes using a price list-technique based on Dohmen *et al*. (2010, 2011) and distributional preferences using a non-parametric elicitation procedure. The latter is based on Kerschbamer (2010) and allows classifying subjects into four different – and mutually exclusive – distributional preference types. These are inequality averters, efficiency seekers, inequality lovers and spiteful agents.

Part 1 of the experiment consists of three stages. In Stage 1 subjects perform the number-adding task under an exogenously imposed piece-rate payment scheme, meaning that

[1] The fact that only the own material payoff and the material payoff of other agents affect an agent's well being distinguishes distributional preference models from other models of other-regarding concerns, where arguments such as others' intentions (as in reciprocity models), others' expectations (as in guilt aversion models), or others' other-regarding concerns (as in type based models) enter an agent's utility function.

[2] Here and throughout the paper the terms "competitive behavior" and "competitiveness" are used interchangeably as hyponyms subsuming the dimensions "response to competitive pressure", "performance in competitive environments" and "willingness to compete".

their earnings depend exclusively on their individual performances. In Stage 2 they perform the task under an exogenously imposed tournament payment scheme that splits participants into groups of six (three men and three women) and pays the two best performers (the winners of the tournament) per correct answer three times the amount that was paid in Stage 1. Finally, in Stage 3 subjects are asked to choose (endogenously) between the piece-rate and the tournament payment scheme.

With this design, we can examine three dimensions of competitiveness. First, we use the difference in performance between Stage 1 and Stage 2 as our measure of how different archetypes of distributional concerns respond to competitive pressure. Second, the absolute performance and the winning probability in the tournament of Stage 2 are used as a measure of performance in competitive environments. Third, the tournament entry choices of Stage 3 are our measure of willingness to compete.

Regarding the *response to competitive pressure* we find that the increase in performance from Stage 1 (piece-rate) to Stage 2 (tournament) is significantly higher and almost double for spiteful than for efficiency-minded and inequality averse subjects.[3] This result makes intuitively sense: Spiteful subjects have an aversion against lagging behind and simultaneously they love to be ahead. This gives strong incentives to increase performance when moving from a non-competitive to a competitive payment scheme. Inequality averse subjects share spiteful agents' aversion against lagging behind, but in contrast to them they also have an aversion against being ahead. Their incentives to perform better in a competitive (as compared to a non-competitive) environment are therefore less pronounced than for spiteful subjects. Efficiency minded subjects have neither an aversion against lagging behind nor do they love to be ahead, so their incentives to increase performance are less strong, too.

A mirror image of our finding in the dimension response to competitive pressure is our result on the *performance in competitive environments*: Spiteful agents win in about 71% of cases in Stage 2, while the corresponding frequencies for inequality averse and efficiency-minded subjects are 29% and 47%, respectively. Hence, spiteful subjects do not only increase their performance the most when moving from a non-competitive to a competitive situation, they also win in a competitive environment most often.

Our central finding regarding the dimension *willingness to compete* is that efficiency-minded subjects choose the tournament in Stage 3 (with 51%) significantly more often than inequality averse subjects (29%) and spiteful ones (29%). This finding can be interpreted as showing that those types that exhibit an aversion against lagging behind (inequality averse

[3] We don't find any inequality lovers in our sample, and hence we concentrate on the other three types.

subjects and spiteful ones) shy away from competition, while those types that do not exhibit such an aversion (efficiency-minded subjects) are more willing to compete.

Regarding gender differences in the willingness to compete we find that men choose the tournament payment scheme almost twice as often as women (59% versus 31%), confirming the large gender gap in the willingness to compete found in earlier studies (by Niederle and Vesterlund, 2007, 2010, for instance). Interestingly, though, this gap is no longer significant once we control for the effects of risk attitudes and distributional preferences, as well as for previous performance and overconfidence. Consistent with earlier findings showing that risk attitudes (Croson and Gneezy, 2009), confidence (Barber and Odean, 2001) and distributional preferences (Andreoni and Vesterlund, 2001; Güth, Schmidt and Sutter, 2007) differ significantly between men and women, this result indicates that the gender gap in competitiveness is largely driven by differences in those mediating – and gender-related – factors, but not by gender *per se*. This is an important finding because some of those mediating factors are – at least in principle – accessible to policy intervention. For instance, confidence might be related to stereotypes ("women perform worse than men in competitive environments"; or "women perform worse than men in number adding tasks"; or whatsoever) and stereotypes can be influenced by nurture or education (Steele, 1997).

The rest of the paper is organized as follows: The next section describes the experimental design. Section 3 presents the results and Section 4 concludes the paper.

2. Experimental Design

Our experiment consisted of two parts. In Part 1 subjects were exposed to a number-adding task in three stages with different remuneration regimes. In Part 2 we elicited risk attitudes and distributional preferences.

Part 1 was motivated by the design of Niederle *et al*. (2010). Subjects were randomly assigned into groups of six persons with three men and three women each, and all groups went through three stages. While subjects knew from the beginning the number of stages, each stage was only introduced and explained after the previous one had been finished. The experimental task in each stage was adding as many sets of five two-digit numbers as possible within a limit of three minutes. Subjects were not allowed to use calculators but could use scratch paper to perform their calculations. After each calculation a subject was informed whether the solution was correct or not, and the next task was shown. The details of the three stages were as follows:

- **Stage 1 – Exogenous Piece-Rate Payment Scheme**: Each subject received €0.50 for each correct calculation. This payment was independent of the other group members' performance.
- **Stage 2 – Exogenous Tournament Payment Scheme**: Here group members had to compete against each other. The two members with the largest number of correct calculations were paid €1.50 for each correct answer, with ties being broken randomly. The other four group members received nothing. A consequence of this protocol is that – for a given non-degenerate distribution of performances – total rewards to subjects were higher under the tournament payment scheme than under the piece-rate payment scheme.[4]
- **Stage 3 – Endogenous Choice of Payment Scheme**: Every group member could choose whether (s)he wanted to solve the calculations under a piece-rate scheme (as in Stage 1) or a tournament scheme (as in Stage 2). If the tournament was chosen, then a subject's performance was compared to the other group members' performances in Stage 2. A consequence of this design feature is that tournament entry decisions in Stage 3 were essentially an individual decision making task and not a game, while at the same time preserving the feature that subjects competed against others who had also been exposed to a competitive payment scheme.[5]

At the end of Stage 3 we elicited the beliefs of all subjects regarding their relative performance in Stage 2.[6] Subjects had to indicate their expected rank within their group of six members. Correct guesses were rewarded with €1 each, and the feedback (on the accuracy of

[4] This is simply a consequence of the fact that under the piece-rate payment schedule total rewards for a group of 6 subjects are calculated as (average performance in the group * 6 * piece-rate) while under the tournament payment schedule they are calculated as (average performance of the two best performing subjects in the group * 2 * 3 * piece-rate).

[5] Isolating subjects from strategic considerations has several advantages over alternative protocols, the most important ones being that (i) a subject's tournament entry decision does not depend on her expectations about the other members' entry decisions but only her beliefs about her own future performance (in Stage 3) and the past performances of the peers (in Stage 2); and that (ii) entering competition does not impose externalities on others. This latter property means that our design minimizes the chances to find an effect of distributional preferences on the willingness to enter competition. Hence, we are biasing the results against our main research focus, i.e., the question whether distributional preferences have an impact on competitive behavior. Still, our design does not preclude such an impact, it could work through the cake size, for instance (see previous footnote).

[6] In the experiment there was a fourth stage identical to Stage 1 (piece-rate) after Stage 3. We inserted that stage in order to have a task with deterministic individual-performance-based rewards before Part 2 started. Our only interest in this fourth stage was to separate the first three stages a bit more from Part 2 and hence we do not focus on behavior in this stage. Nevertheless, it is worth noting that, similar to Stage 1, there were no significant differences in Stage 4 performance across distributional types ($p > 0.7$, Kruskal-Wallis test; $p > 0.25$, pairwise Mann-Whitney tests). This is important for the interpretation of our main results regarding the influence of distributional preferences on competitive behavior (reported in Section 3 below) since it means that they are not driven by differences in learning between different distributional preference-types.

beliefs as well as the actual outcome of Stages 2 and 3) was given only at the end of the experiment.

In **Part 2** of the experiment we elicited risk attitudes (based on the single-price-list technique in Dohmen *et al*., 2010 and 2011) and distributional preferences (based on the double-price-list technique developed in Kerschbamer, 2010). Both procedures are non-parametric and rely only on minimal assumptions regarding the "rationality" of subjects. In terms of axioms on preferences the assumptions are ordering (completeness and transitivity) and strict (own-money) monotonicity. In the following description of the two procedures subjects whose preferences satisfy those two basic axioms are referred to as "rational".

- **Elicitation of Risk Attitudes:** Each subject was exposed to a series of ten binary choices between a cash gamble and a safe payoff, as shown in Table 1. While the cash gamble remained the same in all 10 binary choices – it always gave either 5 Euros or 0 Euros, each with 50 percent probability – the safe payoff increased in steps of 50 cents from 0.5 Euros in the first choice to 5 Euros in the last one. Given this design a rational decision maker either switches exactly once from the cash gamble to the safe payoff or (when extremely risk averse) chooses the safe payoff from the start. Thus, for a rational subject the task number where the safe payoff is chosen for the first time is well defined and we use this number in constructing an index of risk attitude. Specifically, our *risk*-index divides the task number in which the subject chooses the safe payoff for the first time by 10. For rational subjects this index ranges from 0.1 (if a subject always chooses the safe payoff) to 1.0 (for someone who chooses the safe payment only in the last decision problem where the cash gamble is first order stochastically dominated by the safe alternative), with a higher value of the index corresponding to a lower degree of risk aversion.

Table 1 and Table 2 about here

- **Elicitation of Distributional Preferences:** Each subject was exposed to a series of ten binary choices between allocations that both involved an own payoff for the decision maker and a payoff for a randomly matched anonymous second subject, the passive person.[7] In each of the ten binary decision problems one of the two allocations was

[7] We employed a double role assignment protocol similar to the one used by Andreoni and Vesterlund (2001) or Andreoni and Miller (2002) in their dictator games. This means that in our protocol each subject makes distributional choices, and each subject gets two payoffs, one as an active decision maker and one as a passive person.

symmetric – i.e., egalitarian, giving 2 Euros to each person – while the other one was asymmetric (involving unequal payoffs for the two subjects). In 5 of the 10 binary choices – labeled in Table 2 (but not in the experimental instructions) as disadvantageous inequality block – the payoff of the passive person in the asymmetric allocation was 2.60 Euros while the payoff of the decision maker increased from one choice to the next in steps of 20 Euro-cents from 1.60 Euros in the first choice to 2.40 Euros in the last one. In the other 5 binary choices – the advantageous inequality block – the payoff of the passive person in the asymmetric allocation was 1.40 Euros while the payoff of the decision maker in the asymmetric allocation increased again from one choice to the next in steps of 20 cents from 1.60 Euros to 2.40 Euros. Given this design, in each of the two blocks a rational decision maker switches at most once from the symmetric to the asymmetric allocation (and never in the other direction). Furthermore, the choice patterns on the two lists are informative about the subject's distributional preferences. When faced with the binary decisions in the disadvantageous inequality block, a rational subject who is (at least weakly) benevolent in the domain of disadvantageous inequality decides for the asymmetric allocation for the first time in the third choice or earlier, while switching later (or choosing the egalitarian allocation from the start) is inconsistent with weak benevolence (and therefore counted as malevolence) in this domain. Similarly, when faced with the binary decisions in the advantageous inequality block, a rational subject who is (at least weakly) benevolent in the domain of advantageous inequality decides for the asymmetric allocation for the first time in the fourth choice or later, while switching earlier (or favoring the asymmetric allocation all the time) is inconsistent with weak benevolence (and therefore counted as malevolence) in this domain. Below we refer to a decision maker who is benevolent in both domains as efficiency loving (**EFF**), a decision maker who is benevolent when ahead, but malevolent when behind, as inequality averse (**IAV**), a decision maker who is malevolent in both domains as spiteful (**SPI**), and a decision maker who is benevolent in the domain of disadvantageous, but malevolent in the domain of advantageous inequality, as inequality loving (**ILO**).[8]

[8] The category ILO is introduced for completeness only, we do not expect to find many of them. Note that in the literature spiteful subjects are sometimes called "competitive" or "status seeking", while inequality averse subjects are sometimes called "egalitarian". Also note that subjects who reveal benevolence in both domains could be labeled "altruistic" instead of "efficiency loving". See Kerschbamer (2010) for a discussion and for references.

Note that according to this classification selfish subjects are assigned to one of the four distributional preference types according to their 'impartial view' expressed in their choice behavior in the third row of the two decision blocks in Table 2 (where a subject decides between two allocations that differ only in the payoff of the passive person). For instance, a subject who chooses LEFT in the third row of the disadvantageous inequality block and RIGHT in the third row of the advantageous inequality block reveals (at least weakly) benevolent preferences in both domains and is therefore classified as EFF. By contrast, a subject who chooses RIGHT in the third row of both blocks reveals (at least weakly) malevolent preferences in the domain of disadvantageous inequality and (at least weakly) benevolent preferences in the domain of advantageous inequality and is therefore classified as IAV. Similarly, a decision for RIGHT in the third row of the disadvantageous inequality block and LEFT in the third row of the advantageous inequality block reveals malevolence in both domains (justifying classification as SPI), while a decision for LEFT in the third row of both blocks reveals benevolence in the domain of disadvantageous inequality and malevolence in the domain of advantageous inequality (justifying classification as ILO).[9]

In both elicitation procedures the ten binary choices were not presented in the described order as rows in tables but rather one-at-the-time in random order (that is, each of the ten binary choices in each of the two procedures was presented on an own screen). While this procedure might make consistent choices harder to achieve, observing consistency with this procedure seems to indicate more robust preferences than when the choices are neatly ordered as in Tables 1 and 2.

The experiment was run computerized with z-tree (Fischbacher, 2007) at the University of Innsbruck in April and May 2010. Using ORSEE (Greiner, 2004) we recruited 144 students from various academic backgrounds. We ran eight sessions with 18 subjects (i.e., three groups of six) in each session, which yields a total of 24 groups. To minimize the impact of wealth effects only one randomly selected stage of Part 1 of the experiment was relevant for cash payments to subjects. They also were paid for accurate beliefs on their performance in Stage 2. In addition each subject got a cash payment from a randomly selected risk elicitation task and two cash payments (one as an active person and one as a passive person)

[9] The results that will be presented in the following section remain qualitatively the same when we run all the regressions using 5 categories (defining potentially selfish subjects as an own category and including in the four classes EFF, IAV, SPI and ILO only subjects revealing a willingness to give up strictly positive amounts of money to implement their distributional attitudes).

from the elicitation of distributional preferences in Part 2. A session typically lasted about 60 minutes and the average cash earnings per subject were 13 Euros.

3. Results

3.1. Descriptive Statistics

From the 144 subjects who participated in the experiment, four made inconsistent choices in the risk-attitude elicitation task, six made inconsistent choices in the distributional preferences elicitation task and two made inconsistent choices in both tasks. This leaves 132 subjects (92%) with consistent choices in both tasks. The following analysis is based on these 132 subjects.[10]

Table 3 presents the main descriptive data, including average performance in Part 1 in Panel A of the table, subjects' beliefs about their performance in Panel B, and risk attitudes and the absolute frequency of distributional preference types in Panel C. From Panel A we see that the average number of correctly solved exercises was 5.64 in Stage 1 (Piece-Rate), 6.48 in Stage 2 (Tournament) and 6.62 in Stage 3 (Choice). While men performed slightly better on average in all stages, these gender differences are never statistically significant. As regards the willingness to enter the competition in Stage 3, however, we note that 59% of men (38 out of 65), but only 31% of women (21 out of 67) opted for the tournament payment scheme (p = 0.002; Chi²-test). This significant gender difference is well in line with earlier studies (see Niederle and Vesterlund, 2007, 2010).

Table 3 about here

Panel B of Table 3 reports the relative frequency of subjects (in percent) who indicate an expected rank of "1" or "2" within their group in the belief elicitation task (covering performance in Stage 2). Hence, these are the subjects who expected to win in the tournament when we elicited their beliefs at the end of Part 1 (variable *guesswin* in the following). In the aggregate, 34% of subjects expected to win, which is fully consistent with the actual winning frequency of 33.3%. However, we see that men expected significantly more often to win than women (49% versus 19%; p < 0.001, Chi²-test), although in terms of actual winning probabilities in Stage 2 men and women were very similar to each other (47.7% of men and

[10] Results based on the full sample are very similar. Since any method to "correct" for inconsistencies (like switching more than once, switching in the wrong direction or choosing the gamble when it is first order stochastically dominated) is arbitrary, we decided to present in the results section only data based on consistent choices.

46.3% of women actually had a rank of “1” or “2” in Stage 2).[11] In order to quantify this gender difference in confidence from a different angle, the final row in Panel B of Table 3 shows the relative frequency of subjects who expected a better rank than they actually had. This is a binary measure of overconfidence (variable *overconf* in the following), and it shows that men are on aggregate significantly more (often) overconfident than women. We then look at the difference (in ranks) between reported and actual rank and find that women’s perceived relative performance is not significantly different from their actual relative performance (p > 0.20, Wilcoxon signed-ranks test), while men are consistently overconfident (p < 0.02, Wilcoxon signed-ranks test). However, a further interesting result is that the better-performing women, i.e., those with a rank of 1 or 2 in the tournament of Stage 2, are strongly underconfident (p < 0.01, Wilcoxon signed ranks test). This finding can explain the large gender difference (49% vs. 19%) in the share of subjects who report that they expect to have won the tournament in Stage 2.

Panel C of Table 3 shows, first, the mean value of our index of risk attitudes (called *risk*). It is 0.46, meaning that, on average, subjects in our sample are risk averse. Consistent with the literature (Croson and Gneezy, 2009) we find that men are significantly less risk averse than women (mean *risk* = 0.49 vs. 0.43, p < 0.01, Mann-Whitney test). Second, Panel C shows the breakdown of subjects by distributional preference type (and gender). We can see that the decisions of the majority of subjects (71%) are consistent with efficiency concerns (EFF), while inequality averse (IAV) and spiteful (SPI) types account for smaller proportions of the population (16% and 13%, respectively). We did not find any inequality lovers (ILO) in our sample, this category is therefore missing in Table 3 and in the regressions reported below. Comparing distributional preferences across gender we find no significant differences in the distribution of types.

3.2. Performance in a Non-Competitive Environment (Stage 1: Piece Rate)

Table 4 relates a subject’s distributional preferences to the average performance in the different stages of Part 1. In the first row we see that spiteful and efficiency minded subjects perform (with 5.78 and 5.76 correct answers) on average equally well, while inequality averse subjects perform (with 4.95 correct answers) a bit worse. None of the pairwise differences is significant at any reasonable level, however (p = 0.46, Kruskal-Wallis test; p > 0.20 for all

[11] Note that for the cash payments to subjects for Part 1 of the experiment ties were broken randomly, meaning that in Part 1 we had 33.33% of subjects winning. The percentages reported here (and in Table 3) are somewhat higher because here all subjects who tied for rank 2 are counted as having a rank of 2, and therefore are counted as winners. This was done to avoid that our index of overconfidence (*overconf*) and subjects' cash payments for the belief elicitation part of the experiment depend on the outcome of a (tie-breaking) random draw.

pairwise Mann-Whitney tests). We therefore conclude that there are no significant differences across distributional preference types with respect to their performance in a non-competitive environment.

Table 4 about here

3.3. Response to Competitive Pressure (Stage 2 vs. Stage 1) and Success in a Competitive Environment (Stage 2: Tournament)

Stage 2 exposes subjects to competitive pressure and, hence, we can examine how distributional preferences are related to two interesting aspects of competitive behavior: first, the response to competitive pressure by comparing Stages 1 and 2, and, second, the performance in a competitive environment, here operationalized by the probability of winning the tournament in Stage 2. Figure 1 presents the average increase in the number of solved calculations from Stage 1 (*correct1*) to Stage 2 (*correct2*). Spiteful subjects solve almost two tasks more, while inequality averse subjects increase their performance roughly by one task, and efficiency-minded subjects by only about 0.6 tasks.

Figure 1 and Table 5 about here

Column (1) of Table 5 illustrates the influence of distributional preferences on performance in Stage 2 in an OLS-regression. The number of correctly solved tasks (*correct2*) is the dependent variable, while *female, risk* (as a measure of risk attitudes), *correct1* (as a proxy for individual ability in a non-competitive environment) and dummies for inequality averse (IAV) and spiteful subjects (SPI) serve as independent variables. Note that efficiency-minded subjects (EFF) constitute the benchmark. The regression reveals a highly significant influence of a subject's individual ability (*correct1*) and a strong effect of spitefulness (SPI). Spiteful subjects are estimated to solve roughly 1.3 tasks more than efficiency-minded ones ($p < 0.05$) and 1.2 tasks more than inequality averse subjects ($p < 0.1$; Wald-test). There is no significant difference in performance between efficiency-minded and inequality averse subjects. We also see no significant gender difference in the performance in Stage 2, and no influence of risk attitudes.

The bottom row of Table 4 looks at performance in Stage 2 from a different angle by presenting the fraction of subjects of a given distributional type who won the tournament.[12] This is our straightforward measure of success in a competitive environment. We see that 71% of spiteful subjects won the tournament, while only 29% of inequality averse subjects and 47% of efficiency-minded ones won ($p < 0.05$ when comparing spiteful types to the other two types; Chi²-test). Hence, spiteful subjects do not only increase their performance the most when moving from a non-competitive to a competitive situation, they also win in a competitive situation most often.

3.4. Distributional Preferences and the Willingness to Compete (Stage 3)

Turning to the willingness to compete we find that those distributional types that exhibit an aversion against lagging behind, namely inequality averse subjects and spiteful ones, shy away from competition. More specifically, inequality averse and spiteful subjects enter competition in Stage 3 in 28.6% and 29.4% of the cases respectively. By contrast, subjects who do not exhibit such an aversion (efficiency-minded subjects) are (with 51%) significantly more often willing to compete than the rest ($p = 0.02$, Chi²-test).

Column (2) in Table 5 shows the results of a probit regression of *choice* (one if a subject chose the tournament in Stage 3, zero otherwise) on gender and on performance in Stage 2,[13] establishing a large and highly significant gender gap in the willingness to compete: women are on average 26.1% less likely than men to enter the tournament in Stage 3. In column (3), we add to the list of explanatory variables a subject's distributional type (IAV and SPI, again taking EFF as the reference group)[14] and a number of further controls. Interestingly, the female dummy turns out to be insignificant, meaning that the gender gap in the willingness to enter competition that was established in Table 3 and in column (2) of Table 5 is not robust to including risk attitudes, distributional preferences and actual and perceived performance. Subjects who are more risk averse (lower index of *risk*) shy away from competition more often. Not surprisingly, a subject's expectation to have won in Stage 2 (*guesswin* = 1) yields a higher likelihood of entering competition in Stage 3. Our key finding with respect to the influence of distributional preferences is that both spiteful (SPI) and

[12] Again, in order to eliminate the influence of the random draw on our results, we classify here (and in Table 4) as winners of the tournament in Stage 2 all subjects who had a rank of 1 or 2 in the tournament, including those who tied for rank 2.
[13] We use *correct2* to control for performance, and not *correct1*, because *correct2* is the most recent performance and it is achieved in a competitive environment similar to the one in Stage 3. All our results are qualitatively the same if we use *correct1* as a control in specifications (2) and (3).
[14] The results in both regressions remain qualitatively the same if we take either IAV or SPI (instead of EFF) as the reference group.

inequality averse types (IAV) are significantly less likely to enter competition than efficiency-minded subjects. There is no significant difference between SPI and IAV, however.

The fact that spiteful types avoid competition (in Stage 3) even though they are on average much more likely than other subjects to win (in Stage 2) is somewhat striking. In order to exclude the possibility that not selecting into competition is a result of optimization given biased beliefs – rather than a result of preferences – we tested whether spiteful types are systematically more (often) underconfident than the rest of the subject population. We find that the beliefs of spiteful types are not systematically biased ($p > 0.7$, Wilcoxon signed-ranks test on the difference between actual and perceived ranks) and also that those subjects are not significantly more likely to be under- or overconfident compared to the other two distributional preference types ($p > 0.5$, Chi²-test). Hence, avoidance of competition seems to be a deliberate choice by spiteful subjects, based on their preferences and on correct beliefs, and not a mistake due to biased expectations.

4. Conclusion

In this paper we have studied the relationship between distributional preferences and competitive behavior. While the influence of gender, hormonal factors and cultural upbringing on the willingness to compete and performance under competitive pressure has received lots of attention in recent years (starting with Gneezy *et al.*, 2003; see Niederle and Vesterlund, 2010, for a first summary), the importance of distributional preferences has been largely ignored so far. Since competition necessarily entails distributional consequences for competitors – with some of them losing and others winning – examining the influence of distributional preferences on competitiveness can provide another mosaic-stone for a better understanding of the determinants of competitive behavior on labor markets.

Overall, our results on the link between distributional preferences, response to competitive pressure and performance in a competitive environment provide a coherent story. Spiteful subjects have an aversion against lagging behind and simultaneously they love to be ahead. This gives them strong incentives to increase their performance when moving from a non-competitive to a competitive payment scheme. Inequality averse subjects share spiteful agents' aversion against lagging behind, but in contrast to them they also have an aversion against being ahead. Their incentives to perform better in a competitive (as compared to a non-competitive) environment are therefore less pronounced than for spiteful subjects. Efficiency minded subjects have neither an aversion against lagging behind nor do they love to be ahead, so their incentives to increase performance are weakest. Consequently, we observe the strongest reaction to competitive pressure for spiteful subjects, and they are most likely to win the competition of Stage 2. These are the main results for a situation when competition is forced upon subjects exogenously.

Interestingly, when given the choice to compete in a tournament or self-select into a piece-rate scheme, spiteful subjects are less likely to compete than efficiency-minded subjects – despite spiteful subjects' better performance under forced competition. We also find that inequality averse subjects choose competition less often than efficiency-minded subjects. These findings can be interpreted as showing that those types that exhibit an aversion against lagging behind (inequality averse subjects and spiteful ones) shy away from competition, while those types that do not exhibit such an aversion (efficiency-minded subjects) are significantly more (often) willing to compete.

Another important finding of our paper is the replication of a strong gender gap in the willingness to compete – men choose competition in 59% of cases, while women do so in only 31% of cases. However, the variable "gender" is no longer significant once we control for risk attitudes and distributional preferences, as well as for expected and actual (previous) performance. Consistent with earlier findings showing that risk attitudes (Croson and Gneezy, 2009), overconfidence (Barber and Odean, 2001) and distributional preferences (Andreoni and Vesterlund, 2001; Güth *et al.*, 2007) differ significantly between men and women, this result indicates that the gender gap in competitiveness reported in the literature is largely driven by important traits that correlate with gender. Such traits play the role of mediating variables that drive the observed differences in competitive behavior between men and women. This means that gender does not have a strong direct effect on selecting into competition, but that it works more through indirect ("mediated") effects, such as risk aversion, overconfidence and distributional preferences. This is an important insight because some of those indirect cannels might be accessible to policy interventions.

We are aware of two recent papers that to some extent address similar questions to the ones that we have dealt with in this paper. One is the otherwise only very loosely related paper by Erkal, Gangadharan and Nikiforakis (2011). This study finds that effort and performance in a real-effort task are lower for individuals who display other-regarding preferences than for the rest of the subject population. In contrast to our approach with four different types of distributional preferences, Erkal *et al*. (2011) use a binary measure of social preferences, classifying those subjects who make a non-zero transfer in a dictator-like game as having other-regarding preferences. Their finding that those subjects perform worse in a competitive environment is somewhat a mirror image of our result on performance in a competitive environment, in the sense that in our sample performance under competition is highest for spiteful types.

A paper that is closer to ours in terms of research interest – it addresses the link between willingness to compete and distributional preferences – is Bartling, Fehr, Marechal and Schunk (2009). A sample of 117 mothers of preschool children was classified into aheadness averse (averse against advantageous inequality) and behindness averse (averse against disadvantageous inequality). Then, they were given the chance to self-select into either a two-person tournament or a piece rate payment scheme for adding up three two-digit numbers. The winner of the two-person tournament received three times (instead of two times) the amount per correct answer paid in the piece rate scheme, yielding strong incentives to enter the tournament. Bartling *et al*. (2009) find that aheadness averse mothers are less likely to compete, while they fail to establish a significant relationship between behindness aversion and competition entry decisions. They note that they are "somewhat surprised by the fact that behindness aversion plays no role, while aheadness aversion has a big effect; future research will have to show how general this result is" (p. 97). Interpreting our four distributional preference types in terms of aheadness and behindness aversion we indeed obtain a different result, namely that aversion to *disadvantageous* – and not *advantageous* – inequality is the more important dimension of distributional preferences regarding the impact on willingness to compete. The differences in results between Bartling *et al.* (2009) and our paper might be ascribed to several differences in experimental design, such as the substantially different subject pools, the non-trivial differences in aggregate payoffs under the tournament rewarding scheme, or the fact that in our study competition entry choices are made by experienced subjects while in theirs inexperienced subjects make this decision.[15] While those differences in design can possibly account for the differences in findings, the latter certainly call for more work on the relationship between competitive behavior and distributional preferences in order to see which design choices are important for the results and to get a feeling of how robust the results are.

[15] Here note that Bartling *et al.* (2009) do not have what is called Stage 1 (obligatory piece rate) and Stage 2 (obligatory tournament) in our experiment. This implies that their design is not suited (nor intended) to study the impact of distributional preferences on the dimensions (i) response to competitive pressure and (ii) performance in competitive environments. Since competition cannot always be avoided, it seems important to analyze also the impact of distributional preferences on those dimensions of competitiveness.

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Tables and Figures

Table 1: Choices in the Risk-Attitude Elicitation Task (Part 2) ‡

LEFT	Your Choice (please mark)	RIGHT
you get		**you get**
0.50 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
1.00 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
1.50 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
2.00 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
2.50 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
3.00 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
3.50 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
4.00 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
4.50 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**
5.00 Euros for sure	LEFT ○ ○ RIGHT	50% Chance of ***5 Euros*** and 50% Chance of ***0* Euros**

‡ This table was not shown to the subjects; the 10 binary decision tasks were rather shown in random order, each choice on a separate screen..

Table 2: Choices in the Distributional-Preferences Elicitation Task (Part 2)

Disadvantageous Inequality Block‡

LEFT		Your Choice (please mark)	RIGHT	
you get	**passive person gets**		**you get**	**passive person gets**
1.60 Euros	**2.60 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
1.80 Euros	**2.60 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.00 Euros	**2.60 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.20 Euros	**2.60 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.40 Euros	**2.60 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**

Advantageous Inequality Block‡

LEFT		Your Choice	RIGHT	
you get	**passive person gets**		**you get**	**passive person gets**
1.60 Euros	**1.40 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
1.80 Euros	**1.40 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.00 Euros	**1.40 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.20 Euros	**1.40 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**
2.40 Euros	**1.40 Euros**	LEFT ◯ ◯ RIGHT	**2.00 Euros**	**2.00 Euros**

‡ This table was not shown to the subjects; the 10 binary decision tasks were rather shown in random order, each choice on a separate screen.

Table 3: Descriptive Statistics

Panel A: Performance in Stages 1 to 3	All	Men	Women
# of correct answers (average)			
Stage 1	5.64	5.71	5.58
	(2.26)	(2.38)	(2.14)
Stage 2	6.48	6.74	6.24
	(2.39)	(2.69)	(2.05)
Stage 3	6.62	7.00	6.25
	(2.53)	(2.87)	(2.1)
% of subjects choosing the tournament in Stage 3	44.7	58.5 ***	31.3
Panel B: Belief Elicitation about Performance in Stage 2			
% of subjects expecting to win (*guesswin* = 1)	34.1	49.2 ***	19.4
% of subjects actually ranked 1st or 2nd #	47.0	47.7	46.3
% of subjects where expected rank is better than actual rank (*overconf* = 1)	41.7	49.2 *	34.3
Panel C: Risk and Distributional Preferences in Part 2			
Index for Risk Preference	0.461	0.488 ***	0.434
	(0.123)	(0.125)	(0.117)
Distributional Types (# of subjects in each group)			
EFF (efficiency-minded)	94	49	45
IAV (inequality averse)	21	9	12
SPI (spiteful)	17	7	10

N=132. Standard deviations in brackets.
Note that ties were broken randomly so that only one third of subjects won.
*, **, *** indicates a significant gender difference in a given row at the 10%, 5%, 1% level respectively.

Table 4: Distributional Preferences and Performance

Average Performance in Task and Distributional Preference Type			
	EFF	IAV	SPI
Stage 1	5.78	4.95	5.76
Stage 2	6.38	6.00	7.65
Stage 3	6.64	6.00	7.29
Stage 3 & Choice of Piece Rate	6.07	6.20	6.67
Stage 3 & Choice of Tournament	7.19	6.50	8.80
Winning in Stage 2 and Distributional Preference Types			
% of subjects ranked 1st or 2nd in Stage 2 [#]	46.81	28.57	70.59

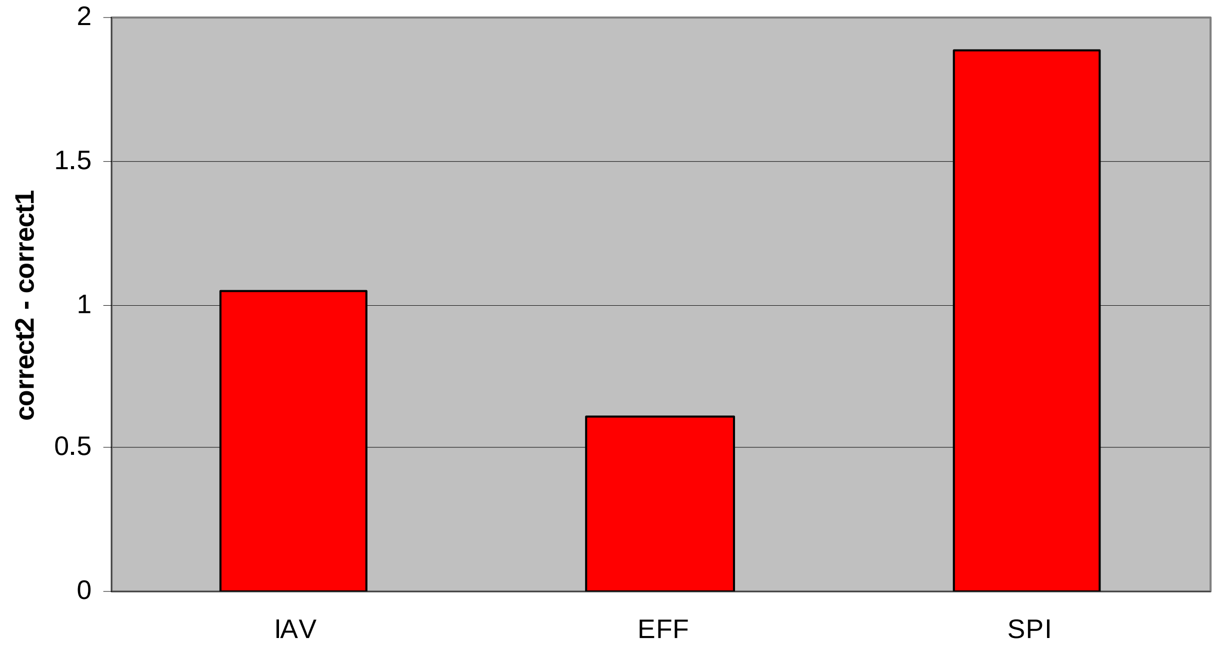
N=132.
[#] Note that ties were broken randomly so that only one third of subjects actually won.

Table 5: Performance under Competition and Willingness to Compete

	(1)	(2)	(3)
	Number of correct answers in Stage 2 (correct2). OLS regression	*Choice of competition in Stage 3 (choice). Probit regression*	*Choice of competition in Stage 3 (choice). Probit regression*
female	-0.466 (0.341)	-0.261 *** (0.085)	-0.116 (0.099)
risk	0.372 (1.410)		0.939 ** (0.412)
correct1	0.614 *** (0.078)		
correct2		0.038 ** (0.018)	0.030 (0.024)
guesswin			0.339 *** (0.105)
overconf			0.106 (0.115)
IAV	0.180 (0.484)		-0.232 * (0.121)
SPI	1.346 ** (0.576)		-0.252 ** (0.111)
Obs	132	132	132
(Pseudo) R^2	0.383	0.076	0.203
prob > chi^2	0.000	0.001	0.000

Robust standard errors in brackets.
*, **, *** indicates significance at the 10%, 5%, 1% level respectively. The table reports marginal effects.

Figure 1. Increase in Performance from Stage 1 to Stage 2 Conditional on Distributional Preferences



Appendix *(not intended for publication)*

Experimental Instructions (translated from German)

[General instructions, at start of session]

Welcome to an experiment on decision making. We thank you for your participation!

During the experiment, you and the other participants will be asked to make a series of decisions. Your own decisions as well as the decisions of the other participants will determine your payment from the experiment, according to the rules that will be described in what follows.

The experiment will be conducted on the computer. You make your decisions on the screen. All decisions and answers will remain confidential and anonymous.

The experiment consists of three parts, Part A, Part B, and Part C. The three parts are completely independent from each other. First we will describe and conduct Part A, parts B and C will follow. Your total earnings from the experiment will be the sum of your payments in parts A, B and C.

Please do not talk to each other during the experiment. If you have any questions, please raise your hand.

[Instructions for Part 1 of the Experiment]

Part A

Part A of the experiment consists of 4 stages. One of these four stages will be randomly selected for cash payment: The payment-relavent stage is the same for all subjects and will be determined at the end of the experiment.

Part A, Stage 1- Piece Rate

Your task in stage 1 is to solve correctly as many addition exercises as possible. To be more precise, you will have 3 minutes time in order to solve as many additions of five randomly selected two-digit numbers as possible, by entering the sum of the five numbers. You are not allowed to use calculators but you can use the provided scribbling paper for your calculations. You enter an answer by clicking with the mouse on the “Confirm” button. When you enter an answer, you immediately find out on the screen whether it was correct or not.

If Stage 1 is the stage selected for payment in Part A, then you will receive **€0.50 (i.e., 50 cent) for each correct answer** that you entered within the 3 minutes. Your payment is not reduced when you enter a wrong answer. From now on, we call this method of payment the **Piece-Rate Mode**.

Directly before the start of this stage you will be given one minute in order to familiarize yourselves with the screen: During this time you can solve exercises, which do not count for the experiment. Then Stage 1 will begin.

Part A, Stage 2 - Tournament

As in Stage 1, you will have 3 minutes’ time in order to solve correctly as many addition exercises as possible. However, your payment in this stage depends on your performance relative to the performance of a group of participants.

<u>Allocation in groups:</u> Each group consists of 6 participants, 3 of whom are men and 3 are women. Groups are randomly formed at the beginning of this stage and **each participant stays in the same group for stages 2 and 3 of Part A of the experiment**.

You will not find out the identity of the other participants in your group neither during nor after the experiment, so that all decisions remain anonymous.

If Stage 2 is the payoff-relevant stage in part A, then your payment depends on how many additions you have solved correctly in comparison with the other five participants in your group. The two group members who have entered the most correct answers are the two winners of the tournament. The two winners receive **€1.50 per correct answer** each, while the other four members **do not receive any payment**. In case of a tie, the ranking among the members with equal performances is determined randomly. From now on, we call this method of payment the **Tournament Mode**.

You will not be informed about the outcome of the tournament until the end of the experiment.

<u>Part A, Stage 3 - Choice</u>

As in stages 1 and 2, you will have 3 minutes' time in order to solve correctly as many addition exercises as possible. However, you can now **choose your preferred payment method for your performance in Stage 3**. You can either choose the Piece-Rate Mode (as in Stage 1) or the Tournament Mode (similar to the one in Stage 2).

If Stage 3 is the payoff relevant stage in part A, then your payment is determined as follows:

- If you choose the **Piece-Rate Mode**, then you will receive **€0.50 per correct answer**
- If you choose the **Tournament Mode**, then your performance in Stage 3 will be evaluated in comparison to the performance of the other five group members **in Stage 2 (Tournament)**. As a reminder: That is the stage that you have just completed. If you enter more correct answers in Stage 3 than four of your group members did in Stage 2, then you will receive **€1.50 per correct answer** (i.e., 3 times the Piece-Rate payment). If you do NOT enter more correct answers in Stage 3 than four of your group members did in Stage 2 then you receive **no payment** for this stage. In case of a tie, the ranking among the members with equal performances is again determined randomly.

The group composition (with 3 men and 3 women) is as in Stage 2. If you choose the Tournament mode, you will not be informed about the outcome of the tournament until the end of the experiment.

On the next screen you will be asked whether you want to choose the Piece-Rate Mode or the Tournament Mode for your payment in Stage 3. Afterwards you will have 3 minutes in order to calculate the sums of the two-digit numbers.

<u>Part A, Stage 4 - Piece Rate</u>

Stage 4 is identical to Stage 1. You will have 3 minutes time in order to solve as many additions of five randomly selected two-digit numbers as possible.

If Stage 4 is the stage selected for payment in Part A, then you will receive **€0.50 for each correct answer** that you entered within the 3 minutes. Your payment is not reduced when you enter a wrong answer.

[Instructions for Part 2: Elicitation of Risk Preferences]

This part of the experiment consists of **10 decisions**. Each of your decisions is a **choice between the alternatives LEFT and RIGHT**. Each alternative **has consequences only for your own payment**, but not for the payment of other participants.

In each of the 10 decisions the alternative LEFT gives a sure payment. By contrast, your payment for the alternative RIGHT depends on chance.

Example:
*You might be asked whether you prefer to choose alternative LEFT, in which you get **3.5 Euros for sure**, or alternative RIGHT, in which you have a **50% chance of getting 5 Euros** and a **50% chance of getting 0 Euros**. You have then to decide for one of the two alternatives. This decision problem would look like this on the computer screen:*

Alternative LEFT	**Your Choice**	**Alternative RIGHT**
you receive	select here	you receive
3.50 **Euros** for sure	LEFT ◯ ◯ RIGHT	with 50% chance ***5 Euros*** and with 50% chance ***0*** **Euros**

In this part of the experiment you will make **a total of 10 such decisions**. Your total payoff from this part of the experiment is determined as follows:

At the end of the experiment, **one of the 10 decision tasks** will be randomly chosen (separately for each participant) and the alternative chosen in this decision task will be **actually carried out and paid out**. If, for example, the randomly chosen decision task was the one shown above, and if in this task you had chosen alternative RIGHT, then you would receive *5 Euros* with a probability of 50% and *0* Euros with a probability of 50%. Whether you actually receive *5 Euros* or *0* Euros is determined through a random draw by the computer.

[Instructions for Part 2: Elicitation of Distributional Preferences]

This part of the experiment consists of **10 decisions**. In each of these 10 decisions you are matched with another participant who remains anonymous to you. We call this other participant **"your passive person"**. You will see below, why we call this person a "passive person". **Your passive person is randomly determined by the computer and changes from one decision to the next**.

Each of your decisions is a **choice between the alternatives LEFT and RIGHT**. Each alternative **has consequences for you and for your passive person.**

Example:
*You may be asked whether you prefer to choose alternative LEFT, in which **you get 2 Euros** and your **passive person gets 3.25 Euros**, or alternative RIGHT, in which **you get 2.50 Euros** and your **passive person gets 2.50 Euros**. You have then to decide for one of the two alternatives. This decision problem would look like this on the computer screen:*

Alternative LEFT		**Your Choice**	**Alternative RIGHT**	
you get	passive person gets	select here	you get	passive person gets
***2.00* Euros**	***3.25* Euros**	LEFT ○ ○ RIGHT	***2.50* Euros**	***2.50* Euros**

In this part of the experiment you will make **a total of 10 such decisions**. Your total payoff from this part of the experiment is determined as follows:

Payment as Active Person: At the end of the experiment, **one of the 10 decision tasks** will be randomly chosen (separately for each participant) and the alternative chosen in this decision task will be actually paid out. If, for example, the randomly chosen decision task was the one shown above, and if in this task you had chosen alternative RIGHT, then you would receive 2.50 Euros as an active person, while your passive person would receive 2.50 Euros as a passive person.

Payment as Passive Person: In the exact same manner that your passive person receives a payment from your decision, without having taken any action, you receive a payment from another participant without doing anything, i.e., you are the passive person of this other participant. We make sure that you are not matched twice with the same participant as active and as passive person. This means that, if participant X is your passive person, then we make sure that you are not the passive person of participant X.