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Men Too Sometimes Shy Away from Competition: The Case of Team Competition

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Recent results in experimental and personnel economics indicate that women do not like competitive environments as much as men. This paper presents an experimental design that gives participants the opportunity to enter a tournament as part of a team rather than alone. Although a large and significant gender gap in entry in the individual tournament is found, in line with the literature, no gender gap is found in entry in the team tournament. Women do not enter the tournament significantly more often when it is team based, but men enter significantly less when they are part of a team than when alone. The main reason for men's disaffection with team competition appears to be linked to the uncertainty of their teammate's performance in a team tournament. More precisely, high-performing men fear being the victims of the free-riding behavior of their teammate. Women, especially low-performing women, tend to enter the team tournament more often than the individual one when they know they will be matched to a teammate of the same level as their own.

Key words: teams; gender gap; tournament
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1. Introduction

The existence of a gender gap in income and social positions in the American and European labor markets is a well-known fact (see Anker 1998 among the numerous references on the subject). The wage gap increases for highly educated workers as one moves up the distribution, as shown by De la Rica et al. (2008). Using a sample composed of a large group of U.S. firms, Bertrand and Hallock (2001) found that only 2.5% of the executives in their sample were women. Such a well-documented fact has received various explanations (see, for example, Goldin and Rouse 2000, Altonji and Blank 1999).

This paper belongs to a literature interested in one particular explanation for the gender gap: a difference between genders in the taste for performing in competitive environments. For instance, Fox and Lawless (2004) showed that women who share the same personal characteristics and professional qualifications as men express significantly lower levels of political ambition to hold elective office.

Experimental economics has proven to be a useful tool for studying gender differences in the propensity to enter competitive environments, as it enables one to study the competitive behavior of participants in a real-effort exercise while carefully controlling for potential explanations (see Croson and Gneezy 2009 for a review of papers on gender differences in experiments). The core idea is to compare subjects' choices between a remuneration scheme that does not imply competition, i.e., a piece rate, and one that does, i.e., a tournament. Variations in the protocol are used to disentangle the respective explanatory power of alternative explanations. Participants thus have to make successive choices in slightly different environments. An important contribution along this line is the work by Niederle and Vesterlund (2007). Their main result is that women choose to enter a tournament far less often than men, resulting in a male-dominated pool of entrants (on gender differences in competitive performance and willingness to compete, see Gneezy et al. 2003, 2009; Datta Gupta et al. 2012; Booth and Nolen 2012; Niederle et al. 2012; and see Niederle and Vesterlund 2011 for a review of all previously cited papers on the subject and many others). More precisely, low-performing men enter tournaments too often and high-performing women do not enter enough when taking payoff-maximizing choices into consideration. These results show that a substantial gap remains after adding controls for all expected effects, such as overconfidence and risk and ambiguity aversion. This residual gap is attributed to a difference between genders in the taste for performing under the pressure of competition. It is worth wondering whether men are more competitive than women per se or whether that depends on the modalities of competition, in which case one could try to think of changes in institutions that may lead to an equal representation of both genders among competitors.

This paper explores team competition as a way of reducing the gender gap in tournament entry and getting the best performers to self-select into the

competition. Indeed, when given the option, people often choose to engage in competition with a teammate rather than alone. One can think, for instance, of academic publications where papers are often coauthored or of invitations that frequently oppose several teams, each representing a firm. Numerous experimental results suggest that the decision-making process may be more efficient among teams than individuals: teams are faster learners than individuals (Cooper and Kagel 2005, Kocher and Sutter 2005), they take more risks when it enables them to get higher expected earnings (Rockenbach et al. 2007), and they play closer to the predictions of game theory (Luhan et al. 2009, Bornstein and Yaniv 1998). However, other experimental results point toward less efficiency of groups than of individuals (Cason and Mui 1997, Cox and Hayne 2006), so it is not straightforward to predict how team membership will affect subjects' willingness to compete. One of the main questions is whether a team tournament will do a better job of attracting the best candidates than a tournament for individuals. In the present experiment, participants actually make the decision whether to enter the team competition on their own. Although one can think that the competitive decision may be very different when team members decide together whether to enter the competition, it allows us to avoid the confound that men and women may be different in their propensity to being talked into entering a competition.

There are several channels through which the competition being team based rather than individual may differently affect men and women's competitive behavior. Men and women's confidence in their team's ability in comparison to the ability of their opponents' team as well as their risk and ambiguity aversion might be affected in a different way. Men and women may also react differently to the fact that, when they belong to a team, the payoffs are influenced by the performance of the teammate and one's performance influences the teammate's payoffs. Healy and Pate (2011) also conducted an experiment to study the effect of a competition being team based on gender differences in willingness to compete. However, their experimental design does not allow a full understanding of the changes in competitiveness when the tournament goes from being individual to being team based. In particular, their experimental design does not control for the role of the uncertainty of one's teammate's performance, which turns out to be very important in the present experiment.

Finally, men and women may experience modifications in their taste for competition (e.g., women may come to like competition more as part of a team or men may not enjoy it as much). Kuhn and Villeval (2011) show that in a noncompetitive context, women exhibit a greater preference for the team environment than men. Such a result could also hold in a competitive environment.

The notion of team used in the present paper is the most simple one so as not to add more complexity: a team is composed of two teammates who perform separately without knowing the identity of their teammate. Being part of a team to compete may have an effect on one's willingness to enter the competition. This intuition is supported by a growing literature in experimental economics, which shows that group membership greatly affects individual behaviors. Chen and Li (2009) show that their participants behave more altruistically with an in-group match than with an out-group. Charness et al. (2007) show that when group membership is made salient, either by common payoffs or by letting an audience of group members watch the decision maker, decisions tend to favor the payoffs of the whole group more. Sutter (2009) finds that, in an investment experiment, the decisions made individually by one group member are very similar to the decisions taken jointly by all the members of the team.

The present experiment may add to the findings on group membership, as participants have to decide whether to become a member of a team in order to enter a tournament. Comparing the effort of participants who could choose whether to be part of a team with that of participants who were forced to belong to a team, Keser and Montmarquette (2011) found that voluntary teaming significantly increases the level of effort. Having the option to be part of a team may also have an effect on subjects' competitiveness.

The first result of this paper is that no gender gap in entry is observed when the tournament is *team based*, whereas the *individual* tournament produces a significant gender gap in line with Niederle and Vesterlund (2007) and Niederle et al. (2012). It is important to note that women do not compete enough given the payoff-maximizing level of entry. Interestingly, although women enter just as often alone as when part of a team, men—and more precisely, high-performing men—enter significantly less often when they are part of a team. In a field experiment, Flory et al. (2010) also find that men are reluctant to enter team-based competitions.

In the present experiment, almost all men with an above-median performance chose to enter the *individual tournament*, but many of them opted out of the standard *team tournament*. To allow us to find out more clearly what caused the change in competitive behavior when the competition was team based rather than individual, participants had one more choice to make. They had to choose between a piece rate and a specific kind of team tournament; for the latter, the information is added that they will be matched with

a teammate of a level close to their own. This last choice was not included in Healy and Pate (2011) and allows one to understand the reasons behind men's lack of interest in the team competition. Indeed, when men knew they would be matched to an equally able teammate if they entered the team tournament, most high-performing men were back in the tournament.

Another explantion for high-performing men's lack of interest in the team competition may be that they expect their teammate to be of low ability and therefore fear losing the team tournament if they choose to enter. Nevertheless, high-performing men believe their team's average ability is higher than the average ability of their opponents. Notice, however, that there is a difference between one's ability and one's performance, as one may not always exert maximum effort and may therefore not always perform to full ability. High-performing men's reluctance to enter the team tournament may therefore come either from their unwillingness to help a possibly less able teammate get a higher payoff or from their fear of being subjected to their teammate's free-riding behavior. To disentangle these two potential explanations, the decisions to submit a past performance to the team tournament and to enter the team tournament with a teammate of the same level are used. The decision to submit a past performance to the team tournament is identical to the decision to enter the same tournament as far as overconfidence, risk aversion, and the uncertainty about one's teammate's ability are concerned. It differs only in that it does not involve a future performance from either teammate. In particular, when deciding whether to submit a past performance to the team tournament, one knows that one's teammate has performed the task already under an individual remuneration scheme (piece rate). High-performing men are about as likely to submit their past performance to the team tournament and the team tournament with a teammate of the same level. This indicates that the reason why high-performing men are reluctant to enter the team tournament with a teammate of unknown ability is that they do not want to be subjected to the free-riding behavior of their teammate.

Team tournaments help get a gender-balanced pool of entrants, offering women equal chances of winning. Nevertheless, the tournament being team based negatively affects the quality of the pool of candidates, as many high-performing men do not enter. Team competition thus does not allow getting the best performers to self-select into the competition. A way of achieving *both* an equal representation of genders among entrants and a good quality pool of competitors is to assure participants that they will be matched with someone of about the same ability as their own if they choose to enter the team tournament.

The rest of this paper is organized as follows. Section 2 presents the experimental design. The results are given in §3. Section 4 studies the consequences on welfare of the type of tournament. Finally, §5 provides some concluding remarks.

2. Experimental Design

The experimental design builds on that of Niederle and Vesterlund (2007). The basic idea is to let participants choose a remuneration scheme between a piece rate and a tournament before they have to perform the exercise determining their payoffs. The exercise subjects were asked to perform is the same as in Niederle and Vesterlund (2007): additions of five two-digit numbers.

Participants were told that they had to complete eight tasks sequentially,[1] of which two would be randomly chosen for payment at the end of the experiment. The remuneration schemes available (in particular the tournament being individual or team based) changed between tasks, and the switches in the choice to enter the tournament provided information on the reasons behind the competitive behaviors.

Teams are tricky to handle, and one had to be as careful as possible not to introduce more complexity than needed in the matching process. Teams are composed of two teammates who do not know whether they are matched with a man or a woman, as this may have an impact on one's decision to enter the team tournament. Therefore, subjects have to choose whether to be paid according to a piece rate or a team tournament, in which case they will win their tournament if they and their teammate solve more additions than their two randomly chosen opponents.

One major change of the competition being team-based rather than individual is that, in a team tournament, a subject influences her teammate's payoffs and has her teammate influence her own payoffs. To control for this factor, participants also had to make a choice between a piece rate and a team tournament with a teammate of the same level. In this specific kind of team tournament, a participant knew that if she chose to enter, she would be matched with a participant with a past performance close to her own. The switches in competitive behavior arising when the matching process changes provide information about the importance of knowing the level of one's teammate when choosing whether to compete.

[1] The fact that tasks are completed sequentially may obviously have an effect on subjects' decisions to compete, as learning could occur and affect these decisions. However, as this paper focuses on gender effects, the relevant question should be whether men and women are affected in a different way by the tasks being sequential; it is, in my opinion, unlikely.

This section first presents the different effects which needed to be controlled for before detailing the tasks participants had to complete.

2.1. What Needs to Be Controlled For

The experimental design must allow one to disentangle the role played by several factors in explaining the change in the gender gap in entry when the tournament becomes team based. To avoid making the design even more complicated, the notion of the team I selected is the most simple one: two teammates are not aware of the identity of their teammate or of their opponents. This way, the effect of gender of one's teammate or opponents on the decision to enter the tournament need not be taken into account. Every potential effect of the team tournament then had to be listed before an appropriate way to control for it was found.

First, the tournament being team based rather than individual changes one's expected payoff from entering the tournament for each level of performance. Nevertheless, as the probability changes in the exact same way for men or women, conditional on performance, it is unlikely that this change of probability might cause a reduction in the gender gap in tournament entry.

Second, Niederle and Vesterlund (2007) and Niederle et al. (2012) found a significant gender gap in overconfidence. It could be the case that overconfidence about the team's relative ability in the context of a tournament differs from overconfidence about one's own ability. Men and women may differ in how optimistic they are about their teammate's and opponents' ability. Tajfel (1970) discovered that groups formed on the basis of almost any distinction are prone to in-group bias. Within minutes of being divided into groups, people tend to see their own group as superior to other groups. It could be the case that men and women differ in how they are affected by this in-group bias. Women could, for example, be more optimistic than men about their teammate's performance.

Third, being part of a team could have a different effect on men and women's ambiguity, risk, or feedback aversion. Teams and individuals do not have the same risk preferences. Shupp and Williams (2007) found that the variance of risk preferences is generally smaller for groups than for individuals and the average group is more risk averse than the average individual in high-risk situations, but groups tend to be less risk averse in low-risk situations. Rockenbach et al. (2007) showed that compared with individuals, teams accumulate significantly more expected value at a significantly lower total risk. In spite of the fact that this paper is interested in the preferences of individuals, being part of a team may have a different impact on men and women's individual risk preferences. Women could, for example, be less risk averse as part of a team than when alone.

Fourth, in a team competition one's performance influences one's teammate's payoffs, and one's payoffs are influenced by one's teammate's performance. For instance, if my teammate is worse than I am, it will lower both my probability of winning the tournament and my payoff if we do win. Charness and Jackson (2009) explore play between groups where one member of each two-person group dictates the play of that group and is therefore responsible for the payoff of the other group member. They find that a substantial part of the population plays a less-risky strategy when choosing for a group than when playing only for themselves. Again, men and women may react differently to this responsibility issue.

Men and women may also not respond in the same way to the possible free-riding behaviors of their teammate. Regardless of one's beliefs about a teammate's ability, one may fear that she may not perform to the best of her ability when engaged in a team competition.

Last, the taste for competing might change, depending on whether one is part of a team or alone. Niederle and Vesterlund (2007) found that, after controlling for differences in overconfidence, risk, ambiguity, and feedback aversion, the gender gap in tournament entry was not entirely accounted for. They label the residual explanation as a gender difference in the taste for performing in a competitive environment. The fact that the tournament is no longer an individual one could have a different impact on men and women's thrill or fear of competition. Indeed, a literature interested in gender differences in economic decisions (Eckel and Grossman 1998, 2001, 2008; Ortmann and Tichy 1999) finds that women tend to be more socially oriented and less individually oriented than men as well as more cooperative and less selfish. If team competition succeeds in wiping out the gender gap in the taste for competition, it could show that institutional changes could be successful in making men and women equally willing to compete. The following subsection presents the tasks the participants had to go through and explains how they allow one to control for the effects listed in the present subsection.

2.2. The Tasks

The experimental sessions were run in September 2008.[2] Thirty-nine men and thirty-seven women took part in one of six experimental sessions. The average participant earned €15.86, including a €7 show-up fee.

[2] Subjects were recruited through the online recruitment system ORSEE (Greiner 2004). The experiment was computerized using REGATE software (Zeiliger 2000).

At the end of each task, participants were informed of their absolute performance (the number of additions they correctly solved) but were not informed of their relative performance until the end of the experiment. Participants received instructions on a task only immediately before completing it.

Task 1: *Piece rate*. Participants are given the three-minute addition exercise. If Task 1 is randomly chosen for payment, they receive 50 cents per correct answer.

Task 2: *Individual tournament*. Participants are given the three-minute addition exercise. If Task 2 is chosen for payment, the subject receives €1 per correct answer if she solved more additions than her randomly chosen opponent; otherwise, she receives nothing.

Task 3: *Choice between piece rate and individual tournament* (*IT henceforth*). Before they perform their additions, subjects have to choose whether they want to be paid according to the piece rate (50 cents per correct answer) or the individual tournament compensation scheme. A participant who selects the tournament receives €1 per correct answer if her Task 3 performance exceeds the Task 2 performance of a randomly chosen opponent; otherwise, she receives nothing. In the present study, a participant in the individual tournament is the winner if she beats one opponent. In the study in Niederle and Vesterlund (2007), one had to beat the performances of three other participants to be considered the winner of the tournament. Here, I chose to consider a one-to-one competition as a matter of simplicity because I subsequently needed to introduce teams. This one-to-one competition could have an effect on the participants' decision to enter. Subjects are furthermore competing against a competitive performance of their opponent, so the decision to enter the tournament is not affected by beliefs about whether the opponent is going to enter. In addition, it allows one to rule out the possibility that a participant may not enter because she may fear inflicting losses on her opponent.

Task 3′: *Choice between submitting Task* 1 *performance to piece rate or individual tournament*. There are no additions to do here; the performance that will determine the payoff is the Task 1 performance. If a participant chooses to submit her Task 1 performance to the piece rate, she receives 50 cents times her Task 1 performance. If she chooses to submit her Task 1 performance to the individual tournament, she receives €1 per correctly solved addition in Task 1 if she solved more additions than her randomly chosen opponent; otherwise, she receives nothing. Task 3′ is identical to Task 3 (in both cases the tournament is a more risky choice, implying more ambiguity and subjecting the participant to feedback at the end of the experiment concerning whether she beat her opponent) except that it does not involve a future performance. In particular, the participant who chooses to submit her past performance to the tournament does not have to perform under the pressure of competition. As a consequence, any change in behavior between Tasks 3 and 3′ will be attributed to the taste for performing in a competitive environment.

Task 4: *Choice between piece rate and team tournament*. Subjects have to choose whether they want to be paid according to the piece rate or the team tournament. The team tournament is a two-on-two competition. If a participant chooses the team tournament, two opponents are randomly drawn from the other participants present in the room. One teammate is randomly drawn from among the participants who chose the team tournament.[3] This implies that a subject who chooses to enter the team tournament knows that her teammate will have made the same choice, so that both teammates will be competing at the same time against their opponents, facilitating the emergence of a team spirit. If the number of additions solved by one's team during Task 4 exceeds the number of additions solved by the opposing team during Task 2, each teammate receives €1 times the average score of their team. Otherwise, they receive nothing. This choice of remuneration for the team tournament was made to keep incentives as stable as possible across tournaments.

Task 4′: *Choice between submitting Task* 1 *performance to piece rate or team tournament*. There are no additions to do here; the performance that will determine the payoff is the Task 1 performance. If a participant chooses to submit her Task 1 performance to the piece rate, she receives 50 cents times her Task 1 performance. If she chooses to submit her Task 1 performance to the team tournament, two opponents are randomly drawn from among the other participants in the room. One teammate is randomly drawn from among the participants who chose to submit to the team tournament (see Footnote 3). If the number of additions solved by one's team during Task 1 exceeds the number of additions solved by the opposing team during Task 1, each teammate receives €1 times the average score of the team. Otherwise, they receive nothing. Task 4′ is identical to Task 4 (considering overconfidence, risk aversion, and uncertainty about the teammate's ability) except for the fact that it does not involve a future performance from either teammate. In particular, the participant knows that her teammate has already performed the task under an individual remuneration scheme (piece rate) and

[3] In the case where only one participant chose the team tournament, which never happened, the teammate would have been drawn from among participants who chose the piece rate. Also, if an uneven number of participants chose the team tournament, participants were paired and a teammate was randomly chosen among them whose performance was added to the remaining participant's performance to compute the score of her team.

therefore need not fear that her teammate will free-ride on her performance.

Task 5: *Choice between piece rate and team tournament with a teammate of the same level* (*TTid henceforth*). If a participant chooses the team tournament with a teammate of the same level, two opponents are randomly drawn from among the other participants in the room. One teammate is attributed from among the participants who chose the team tournament—the participant whose Task 2 performance was the closest to the participant's own Task 2 performance. If the number of additions solved by one's team during Task 4 exceeds the number of additions solved by the opposing team during Task 2, each teammate receives €1 times the average Task 5 score of their team. Task 5 resembles Task 4 in that the subjects have to choose between a piece rate remuneration and a team tournament, but in Task 5 the uncertainty about one's teammate's ability at solving additions (or at least part of it) is taken away. Then, assuming that learning effects are the same for men and women, if men and women's behavior changes in a different way between Task 4 and Task 5, it will be attributed to a different reaction to the uncertainty about one's teammate's ability.

Task 5′: *Choice between submitting Task* 1 *performance to piece rate or team tournament with a teammate of the same level*. There are no additions to do here; the performance that will determine the payoff is the Task 1 performance. If a participant chooses to submit her Task 1 performance to the piece rate, she receives 50 cents times her Task 1 performance. If she chooses to submit her Task 1 performance to the TTid, two opponents are randomly drawn from among the other participants in the room. One teammate is from among the participants who chose the team tournament—the participant whose Task 2 performance was the closest to the participant's own Task 2 performance. If the number of additions solved by one's team during Task 1 exceeds the number of additions solved by the opposing team during Task 1, each teammate receives €1 times the average score of the team. Otherwise, they receive nothing.

Because these tasks are completed in the same order by all participants, order effects can play a role, but this paper compares men and women's behavior, and it seems reasonable to assume these order effects would be the same for men and women. Indeed, as it turns out, men and women exhibit very different behavioral patterns, allowing one to rule out the possibility that order effects drive the results.

2.2.1. Belief-Assessment Questions. A difference in confidence between men and women may explain a significant part of the gender gap in tournament entry. Niederle and Vesterlund (2007) and Niederle et al. (2012) found that both men and women are overconfident but men are more so. To control for differences in confidence in one's chances of winning the individual tournament and in one's team ability and their chances of winning the tournament, participants had to answer belief-assessment questions at the end of the experiment. Participants had to guess the mean Task 1 and Task 2 performances of the participants in their session.

The participants were reminded that during Task 4 they had to choose between a piece rate and a team tournament, for which two opponents were randomly drawn from among the other participants and a teammate was randomly drawn from among the other participants who had chosen the team tournament. They were also told that the computer had picked two opponents and one teammate in this way *regardless of their Task* 4 *choice* (i.e., even if they had chosen the piece rate at Task 4). They were reminded of their own Task 2 performance and had to guess the Task 2 performances of their teammate and opponents chosen during Task 4.

The participants were reminded that during Task 4′ they had to choose between submitting their Task 1 performance to either a piece rate or a team tournament, for which two opponents were randomly drawn from among the other participants and a teammate was randomly drawn from among the other participants who had chosen to submit to the team tournament. They were also told that the computer had picked two opponents and one teammate in this way, *regardless of their Task* 4′ *choice* (i.e., even if they had chosen the piece rate at Task 4′). They were reminded of their own Task 1 performance and had to guess the Task 1 performances of their teammate and opponents of Task 4′. A participant knew she would earn €1 per correct guess.

3. Results

This section presents the results of this experiment. In the first subsection, the disappearance of the gender gap that occurs when the tournament goes from being individual to being team based is studied. It is furthermore shown that it is mainly caused by men who are a lot less likely to enter the tournament when it is team based. In a second subsection, the reasons behind men's change in competitive behavior are investigated.

3.1. Gender Gap in Entry in the Individual and Team Tournaments

In this subsection, the gender gaps in both the individual and the team tournaments are studied.

3.1.1. Gender Differences in Entry in the Individual Tournament. In line with Niederle and Vesterlund (2007), there is a gender gap in the decision to enter the individual tournament: 51.35% of

women and 84.62% of men chose to enter the individual tournament. This difference is significant with a two-sided exact Fisher's test ($p < 0.01$).

After having gone through the piece rate and tournament remuneration schemes, participants have to choose which one they want to perform under for Task 3. If they choose the tournament, they will be considered the winner if they beat the Task 2 performance of their opponent. Considering the true distribution of Task 2 performances, a payoff-maximizing participant should choose the tournament if her Task 3 performance is at least six (see Figure A.2 in Appendix A: an omniscient participant with a performance above or equal to six has higher expected payoffs from the individual tournament than from the piece rate). If the participant's Task 3 performance is exactly the same as her Task 2 performance, 62% of women and 67% of men have higher expected earnings from the tournament. This predicted gender gap is not significant (a two-sided Fisher's exact test yields $p = 0.81$).

Although significantly more men enter than the proportion whose entry would maximize their expected payoffs, given the distribution of performances ($p < 0.01$), that is not the case for women ($p = 0.65$). Notice, however, that only participants whose performance is above the median *should* enter the tournament. Whereas 95% of high-performing men chose to enter the individual tournament, only 59% of high-performing women made such a choice. In this sense, high-performing men's behavior is more optimal than that of their female counterparts (in contrast, low-performing men make the suboptimal decision to enter the tournament when they should not more often than low-performing women).

This gender gap in competitiveness cannot be explained by a performance gap. Indeed, men's performances were slightly above women's, but not significantly so. In Task 1 (piece rate), men solved 5.9 additions on average and women solved 5.6 additions. In Task 2 (tournament), men solved 7.4 additions on average and women solved 6.3 additions. These differences are not significant with a two-sided Mann-Whitney test. Men perform significantly better under the tournament than under the piece rate (a two-sided Mann-Whitney test yields $p = 0.04$), but that is not the case for women ($p = 0.34$).

This gender gap in tournament entry has several potential explanations: differences in overconfidence between men and women, differences in risk, ambiguity, feedback aversion, and differences in the taste for performing in a competitive environment. First, men are found to be more overconfident than women (Niederle and Vesterlund 2007, Niederle et al. 2012). At the end of the experiment, participants' Task 2 performance was recalled to them and they had to guess the Task 2 performance of their Task 4 teammate and opponents. From their answers, their guessed rank was computed and the guessed ranks conditional on the actual Task 2 performance (four levels were assigned, each corresponding to 25% of participants) were compared.

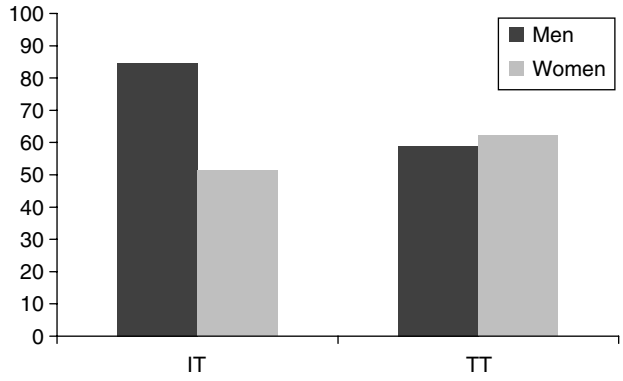
An ordered logit regression of the guessed rank yields a negative and significant ($p < 0.01$) coefficient of Task 2 performance and a positive and significant effect of *Female* ($p = 0.07$). This means that the higher the Task 2 performance, the better the participant thinks she is, whereas, for a given performance, men are more overconfident than women.

To also control for the role of risk, ambiguity, and feedback aversion in the gender gap in tournament entry, the Task 3′ decision to submit the Task 1 performance to either a piece rate or an individual tournament is used. Indeed, Tasks 3 and 3′ decisions are the same except for the fact that only in Task 3 does the participant actually have to perform in a competitive environment. The Task 3′ decision therefore allows one to control one more time for one's confidence in her chances to win and adds a new control for risk, ambiguity, and feedback aversion. When comparing men and women's Task 3′ decision, men are found to submit their past performance to the tournament more often than women (54% versus 43%), but the difference is not significant ($p = 0.36$). Because there is indeed a gender gap in the decision to submit a past performance to the tournament, it seems that men may be somewhat less averse to risk, ambiguity, and feedback than women. However, because the gender gap in the decision to submit to the individual tournament is much smaller than in the decision to enter the tournament, it must mean that most of the gender gap is from men having a greater taste for performing in a competitive environment. These results are in line with Niederle and Vesterlund (2007) and Niederle et al. (2012).

3.1.2. Gender Differences in Entry in the Team Tournament. As with the individual tournament, anyone with higher expected earnings from the team tournament than from the piece rate should enter the team tournament. As can be seen in Figure A.2 of Appendix A, this corresponds to participants with a Task 2 performance equal to or above six. This is the case for 62% of women and 67% of men. The predicted gender gap is not significant ($p = 0.81$).

In line with the predictions, the data do not bring any gender gap to light: 62% of women and 59% of men chose to enter the team tournament ($p = 0.82$). Men enter less than is predicted by payoff-maximizing choices but not significantly so ($p = 0.49$). As can be seen in Figure 1, it appears that although women do not choose to enter the tournament significantly more often when it is team based ($p = 0.48$),

Figure 1 **Proportion of Male and Female Entrants in the Individual Tournament (IT) and Team Tournament (TT)**



men enter significantly less often as part of a team than alone ($p = 0.02$).

A linear probability regression of the decision to enter a tournament (Tasks 3 and 4) on the probability of winning (*Prob*) and a team tournament (*TT*) dummy ($TT = 1$ for the Task 4 decision to enter the team tournament and $TT = 0$ for the Task 3 decision to enter the individual tournament) is reported in Table 1.

Even though the probability of winning is unknown to the participant, including it to the regressors allows one to control for the efficiency of the different tournaments (does a given tournament lead the better participants to self-select into it?). As two observations were used for each participant (Task 3 and Task 4 decisions to enter, respectively, the IT and the TT), a cluster on the participant was used to take into account the fact that the two decisions to enter the tournaments taken by the same individual are not independent. This is the case in all subsequent regressions.

Conditional on the probability of winning, the fact that the tournament is team based decreases men's propensity to enter, although it has no significant effect on women's decision to enter. The probability of winning has no significant effect on either men or women's propensity to enter. The positive and strongly significant marginal effect of *Female* × *TT* shows that when the tournament is team based the gender gap in tournament entry is significantly reduced.

Table 1 **Linear Probability Model of Tournament-Entry Decision (Tasks 3 and 4)**

Regressors	Men	Women	All
Female			−0.32 (<0.01)
Female × *TT*			0.36 (0.01)
TT	−0.25 (0.01)	0.11 (0.37)	−0.25 (0.01)
Prob	0.15 (0.48)	0.12 (0.67)	0.14 (0.42)
Intercept	0.76 (<0.01)	0.45 (0.02)	0.76 (<0.01)
Observations	78	74	152

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

Figure 2 **Proportion of Men Entering the Individual and Team Tournaments Conditional on Performance Level**

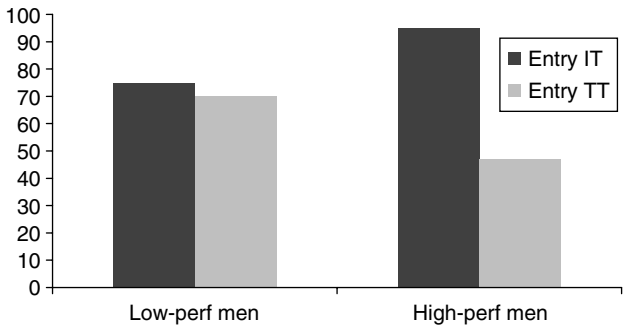
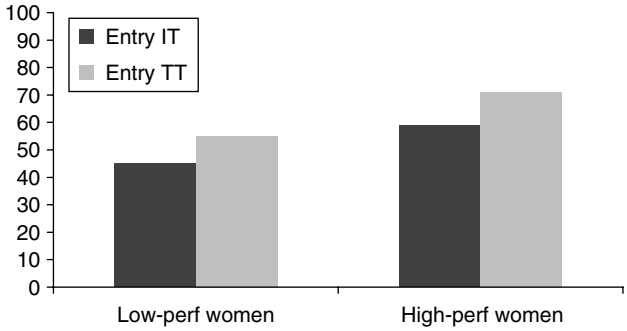


Figure 3 **Proportion of Women Entering the Individual and Team Tournaments Conditional on Performance Level**



Figures 2 and 3 show the percentage of men and women who choose to enter the individual and team tournaments conditional on their Task 2 performance level. There is a negative relationship between performance level and the team tournament entry decision for men, showing that men's disinterest for the team competition is all the more important when they are of a high performance level. The logit regression of men's decision to enter the team tournament on the probability of winning (see the appendix for an explanation of how the probability of winning was computed) provides a negative but only marginally significant coefficient ($p = 0.10$).

Both low-performing and high-performing women[4] are a bit more likely to enter the team tournament

[4] Low-performing participants are those whose Task 2 performance is below or equal to six, which is the median Task 2 performance. There are 20 low-performing women and 20 low-performing men. High-performing participants are those whose Task 2 performance is above six. This is the case for 17 women and 19 men.

than the individual tournament, but the difference is not significant for either subgroup ($p = 0.55$ and $p = 0.49$, respectively, for low-performing and high-performing women). High-performing men, on the other hand, are much less likely to enter the team tournament than the individual tournament ($p < 0.01$); this is not the case for low-performing men ($p = 0.74$).

To sum up this subsection, there is a large and significant gender gap in the decision to enter the individual tournament, but that is no longer the case when the tournament is team based. This result is not driven by women whose competitive behavior is not significantly affected by the nature of the competition. Men, on the other hand, and more precisely high-performing men, are much less likely to enter the competition when it is team based. The next subsection aims at further understanding men's change of competitive behavior.

3.2. Why Do Men Shy Away from the Team Competition?

This subsection is aimed at understanding the reasons behind men's change of competitive behavior when the competition goes from being individual to being team based. In the previous subsection, it was shown that the disappearance of the gender gap occuring when the competition is team based is because of men—more precisely high-performing men—who shy away from the team competition although they massively entered the individual competition. Several explanations could account for this behavior. First, it could be that part of the reason men enjoy working in a competitive environment comes from their hope of being the sole winner. If this is the case, the perspective of sharing the joy of winning with a teammate will diminish the fun of the competition. Second, high-performing men may be pessimistic about the ability of their teammate and therefore about their chance of winning the team tournament. Third, men may not want to help a possibly less-deserving teammate get higher payoffs. Finally, men may fear that their teammate may not perform to the best of her ability when engaged in a team competition.

3.2.1. Do Men Enjoy Competition Less When They Are Part of a Team? To answer this question, the Task 5 decision to enter the team tournament with a teammate of the same level (TTid) is used in addition to Tasks 3 and 4 decisions. The Task 5 decision resembles the Task 4 decision (team tournament) except for the fact that the uncertainty about the level of one's teammate in the addition task (or at least part of it) is removed, because the participant knows that if she enters the tournament, she will be matched with a teammate whose Task 2 performance is close to her own. Therefore, if the reason men do not like the team competition as much as the individual one is that they do not want to share the victory with somebody else, they should also be reluctant to enter the team tournament with a teammate of the same level.

Figure 4 **Proportion of Low-Performing and High-Performing Men Entering Each of the Three Tournaments**

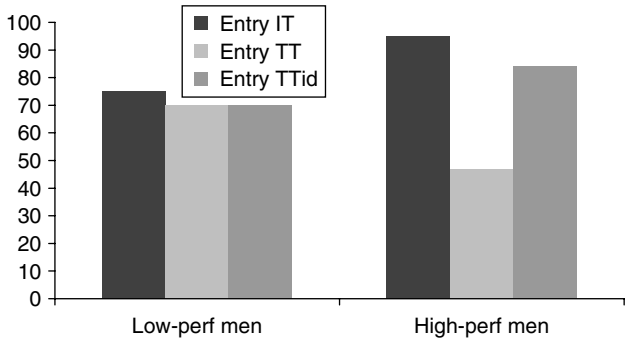


Figure 4 shows the proportion of low-performing and high-performing men who chose to enter each of the three tournaments. Although low-performing men enter the three tournaments in very similar proportions, it is not the case with their high-performing counterparts. Indeed, most high-performing men self-select in the individual tournament (95%) and the team tournament with a teammate of the same level (84%), and the proportion only drops for the team tournament (47%). Furthermore, the proportions of high-performing men choosing to enter the individual tournament and the team tournament with a teammate of the same level are not significantly different ($p = 0.32$), whereas high-performing men enter significantly more often both the individual tournament and the team tournament with a teammate of the same level than the team tournament ($p = 0.00$ and 0.02 respectively). This indicates that men's disaffection for the team tournament is not caused by their not wanting to share the victory with a teammate, but rather has to do with the uncertainty surrounding their teammate's ability.

A linear probability regression of the decision to enter a tournament on the probability of winning (*Prob*), a *TT* dummy ($TT = 1$ for the Task 4 decision to enter the team tournament and $TT = 0$ for Tasks 3 and 5 decisions to enter the individual tournament and team tournament with an equal teammate), and the interaction term between *TT* and *Prob* is reported in Table 2. Then a *TTid* dummy ($TTid = 1$ for the Task 5 decision to enter the team tournament with an equal teammate and $TT = 0$ for Tasks 3 and 5 decisions to enter the IT and TT) and the interaction term between *TTid* and *Prob* are added.

In the first regression, the coefficient of $TT \times Prob$ is negative and significant, showing that high-performing men enter less in the team tournament than in the individual tournament. When *TTid* and

Table 2 Linear Probability Model for Men's Tournament-Entry Decision (Tasks 3 and 4 [Regression 1] and 3, 4, and 5 [Regression 2])

Regressors	(1)	(2)
Intercept	0.52 (<0.01)	0.52 (<0.01)
TT	0.46 (0.10)	0.46 (0.10)
Prob	0.55 (0.02)	0.55 (0.02)
TT × *Prob*	−1.22 (0.01)	−1.22 (0.01)
TTid		0.06 (0.71)
TTid × *Prob*		−0.20 (0.41)
Observations	78	117

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

TTid × *Prob* are added to the regressors, neither of those two coefficients is significant, proving that men and in particular high-performing men react in the same way to the IT and TTid. The test of equality of the coefficients of *TT* and *TTid* yields $p < 0.10$, whereas the equality of *TT* × *Prob* and *TTid* × *Prob* is strongly rejected ($p < 0.01$), highlighting the different competitive behaviors displayed by high-performing men in the TT and TTid.

Therefore, the reason for men's unwillingness to enter the TT does not seem to be that they do not enjoy competition as much when being part of a team, as they have no reluctance to enter the TTid. The remaining possible explanations are that high-performing men think they are likely to lose the team tournament because of the bad performance of their teammate, that they do not want to help a possibly less-deserving teammate get higher payoffs, or that they fear the free-riding behavior of their teammate. The following subsections will help us disentangle these alternative explanations.

3.2.2. Are High-Performing Men Pessimistic About Their Team's Ability? One explanation for high-performing men's reluctance to enter the team tournament unless they know their teammate will also be high performing could be that they are pessimistic about the ability level of the possible teammate. Here, we measure ability as the individual and competitive Task 2 performance. If high-performing men indeed think they are a lot less likely to win the TT than the two other kinds of tournaments, it would make perfect sense for them to stay away from it.

Indeed, men do think that they are significantly better than their teammate in the regular team tournament. A two-sided Mann-Whitney test for the equality of participants' own Task 2 performance and their guess of their TT teammate's Task 2 performance yields $p < 0.01$ ($p < 0.01$ as well when only looking at high-performing men, i.e., men whose Task 2 performance was above the median Task 2 performance). However, and perhaps more important, men, and to a greater extent high-performing men, are still slightly more confident of their chances of winning the team tournament than they are of their chances of winning the individual tournament, given their own performance and their beliefs about their teammate and opponents' ability, although not significantly so (a two-sided Mann-Whitney test of equality between the "individual confidence"[5] and the "team confidence"[6] yields $p = 0.92$ for all men and $p = 0.24$ for high-performing men). This result comes from the fact that if high-performing men do think that their teammate is of lower ability than they are, they also think that their teammate is still better than both of their two randomly chosen opponents (the two two-sided Mann-Whitney tests comparing high-performing men's guesses of their teammate's performance to their guesses of both their opponents' performances yield $p < 0.01$).[7] This tends to show that the reason for high-performing men's disinterest for the team competition cannot lie in their fear of their team being of lesser ability than their opponents' team.

To further assess the potential explanatory power of beliefs on the change of men's competitive behavior, the dummy *Guesswin* is used in Table 3's regression. *Guesswin* equals 1 if the participant's beliefs are consistent with winning the tournament and 0 otherwise. Remember that a participant knows his absolute performance at each task. For the individual tournament, *Guesswin* equals 1 if the participant thinks his Task 2 performance is above average and 0 otherwise. For the team tournament, *Guesswin* equals 1 if the participant thinks the sum of his Task 2 performance and his teammate's Task 2 performance exceeds the sum of their opponents' Task 2 performances.

The fact that the addition of *Guesswin* to the regressors leaves the coefficient of *TT* × *Prob* (even more) negative and significant suggests that the reason men shy away from the team competition is not that they believe they have a lower chance of winning.

[5] The individual confidence is computed as the difference between one's Task 2 performance and one's guess of the average Task 2 performance.

[6] Team confidence is computed as the difference between the sum of one's Task 2 performance and one's guess of her teammate's performance and the sum of one's guesses of her two opponents' Task 2 performances.

[7] Notice that this is not the case with low-performing men and low-performing or high-performing women, for whom the guess of their teammate's performance is not significantly different from their guess of their opponents' performances.

Table 3 **Linear Probability Model for Men's Tournament-Entry Decision (Tasks 3 and 4 [Regressions 1 and 2] and 3, 4, and 5 [Regression 3])**

Regressors	(1)	(2)	(3)
Intercept	0.52	0.24	0.24
	(<0.01)	(0.13)	(0.10)
TT	0.46	0.62	0.62
	(0.10)	(0.03)	(0.03)
Prob	0.55	0.27	0.28
	(0.02)	(0.17)	(0.18)
TT × *Prob*	−1.22	−1.49	−1.49
	(0.01)	(<0.01)	(<0.01)
Guesswin		0.53	0.52
		(<0.01)	(<0.01)
TTid			0.07
			(0.65)
TTid × *Prob*			−0.25
			(0.33)
Observations	78	78	117

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

To make this point clearer, I ran separate regressions for high-performing men and low-performing men, which are reported in Table 4.

When controlling for beliefs, the coefficient of *TT* is negative and significant; the coefficient of *TTid* is far from reaching significance as far as high-performing men are concerned, showing that high-performing men are driven away from team competition unless they are matched with an equally able teammate. Low-performing men are found to be as likely to enter each of the three tournaments.

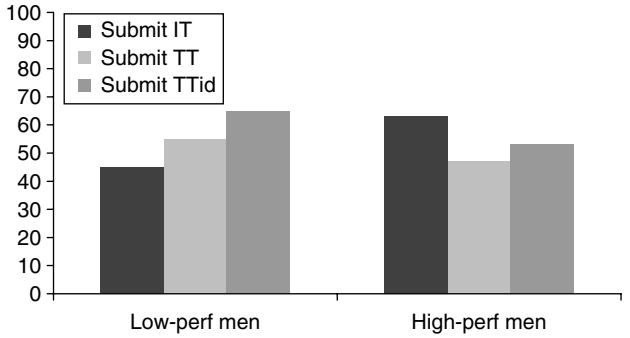
This subsection has shown that the reason for high-performing men's disinterest for the team competition does not seem to lie in their lack of confidence in their teammate's ability.

Table 4 **Linear Probability Model for High-Performing (HP) and Low-Performing (LP) Men's Decision to Enter the Tournaments (Tasks 3 and 4 [Regressions 1 and 3] and 3, 4, and 5 [Regressions 2 and 4])**

Regressors	(HP1)	(HP2)	(LP1)	(LP2)
Intercept	1.00	1.00	0.33	0.34
	(<0.01)	(<0.01)	(0.02)	(0.01)
TT	−0.47	−0.47	0.01	<0.01
	(<0.01)	(<0.01)	(0.96)	(0.97)
Guesswin	−0.06	−0.06	0.56	0.57
	(0.34)	(0.34)	(<0.01)	(<0.01)
TTid		−0.10		−0.02
		(0.36)		(0.81)
Observations	38	57	40	60

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

Figure 5 **Proportion of Low-Performing and High-Performing Men Submitting a Past Performance to Each of the Three Tournaments**



3.2.3. Are High-Performing Men Unwilling to Help a Less Able Participant Get Higher Payoffs? According to the previous results, high-performing men's reluctance to enter the team tournament may either come from their unwillingness to help a possibly less able teammate get a higher payoff or from their fear of being subjected to their teammate's free-riding behavior. To disentangle these two potential explanations, Tasks 3′, 4′, and 5′ decisions to submit a past performance to, respectively, the individual tournament, the team tournament, and the team tournament with a teammate of the same level are used.

Respectively, 63.2%, 47.4%, and 52.6% of high-performing men chose to submit their Task 1 performance to the IT (Task 3′), the TT (Task 4′), and the TTid (Task 5′). These percentages are not significantly different from one another (the two-sided Fisher's test of equality between the proportion of high-performing men submitting to the IT and the TT yields $p = 0.51$).

Figures 4 and 5 show that if high-performing men are more likely to enter the team tournament with a teammate of the same level than the team tournament ($p = 0.02$), they are as likely to submit their past performance to the team tournament and the team tournament with a teammate of the same level ($p = 0.76$).[8] Remember that the decision to submit a past performance to a tournament is identical to the decision to enter a tournament as far as overconfidence, risk aversion, and the uncertainty about one's teammate's ability are concerned. It only differs in the fact that it does not involve a future performance. In particular, when deciding whether to submit a past performance to the team tournament, he knows his teammate has performed the task already under an individual remuneration scheme (piece rate).

[8] The proportions of low-performing and high-performing women, respectively, entering and submitting a past performance to each of the three tournaments can be found in Figures 6 and 7.

Table 5 Linear Probability Model for Men's Tournament-Entry Decision (Tasks 3 and 4 [Regressions 1 and 2] and 3, 4, and 5 [Regression 3])

Regressors	(1)	(2)	(3)
Intercept	0.24	0.20	0.20
	(0.13)	(0.12)	(0.08)
TT	0.62	0.44	0.43
	(0.03)	(0.08)	(0.06)
Prob	0.27	0.21	0.21
	(0.17)	(0.26)	(0.26)
TT × *Prob*	−1.49	−1.17	−1.16
	(<0.01)	(<0.01)	(<0.01)
Guesswin	0.53	0.41	0.41
	(<0.01)	(<0.01)	(<0.01)
Submit		0.33	0.33
		(<0.01)	(<0.01)
TTid			−0.05
			(0.71)
TTid × *Prob*			−0.06
			(0.81)
Observations	78	78	117

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

When the dummy *Submit* (*Submit* = 1 if the participant chose to submit his performance to a given tournament and 0 otherwise) is added to the regressors in the regressions reported in Table 5, the coefficient of *TT* × *Prob* decreases a bit but remains negative and highly significant, suggesting that high-performing men's disaffection for the team tournament is not primarily driven by overconfidence and aversion to risk and ambiguity. The fact that *TTid* and *TTid* × *Prob* are far from reaching significance shows that men do not react differently to the IT and TTid.

To further understand men's decision to submit their performance to each of the three tournaments, Table 6 reports separate regressions for high-performing and low-performing men's decisions to submit to the tournaments. Here, *Guesswin* equals 1 if the participant's beliefs are consistent with winning the tournament he has submitted his Task 1 performance and 0 otherwise.[9]

High-performing men are found to be about as likely to submit their past performance to either of the three tournaments (the coefficients of both *TT* and *TTid* are insignificant), suggesting that their reluctance to enter the TT was linked to the fact that it required a future performance from a teammate of unknown ability. As far as low-performing men are concerned,

[9] For the individual tournament, *Guesswin* equals 1 if the participant thinks his Task 1 performance is above average and 0 otherwise. For the team tournament, *Guesswin* equals 1 if the participant thinks the sum of his Task 1 performance and his teammate's Task 1 performance exceeds the sum of their opponents' Task 1 performances.

Table 6 Linear Probability Model for High-Performing (HP) and Low-Performing (LP) Men's Decision to Submit to the Tournaments (Tasks 3′ and 4′ [Regressions 1 and 3] and 3′, 4′, and 5′ [Regressions 2 and 4])

Regressors	(HP1)	(HP2)	(LP1)	(LP2)
Intercept	0.25	0.37	0.34	0.36
	(0.29)	(0.06)	(0.03)	(0.03)
TT	−0.26	−0.23	0.10	0.10
	(0.10)	(0.18)	(0.46)	(0.45)
Guesswin	0.48	0.32	0.20	0.17
	(0.08)	(0.17)	(0.30)	(0.36)
TTid		−0.14		0.23
		(0.30)		(0.08)
Observations	38	57	40	60

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

surprisingly, they tend to submit a past performance a bit more often to the TTid than to the IT. This might suggest that low-performing men have an intrinsic taste for team competition. The coefficients of *TT* and *TTid* are nevertheless not significantly different from one another ($p = 0.41$).

High-performing men thus do not seem to mind being matched to a probably less-efficient teammate as long as the task has been performed prior to this decision. Therefore, it cannot be the case that the reason behind men's behavior is their unwillingness to help such a teammate get higher payoffs. The hypothesis that high-performing men do not want to be subjected to the free-riding behavior of their teammate must be favored.

3.3. Women's Competitive Behavior

Women's competitive behavior is not as clear and easy to interpret from the data collected in this experiment as that of men, but some results are still worthy of being reported.

High-performing women think that they are significantly better than their matched partner of the team tournament, as is the case for their male counterparts. A two-sided Mann-Whitney test for the equality of high-performing women's own Task 2 performance and their guess of the performance of their teammate yields $p < 0.01$. The fact that women enter as much in the team tournament as in the individual one cannot therefore be because of high confidence in their teammate's ability. Notice, however, that high-performing men think to a larger extent than women that their matched partner is less able than they are (the difference-in-differences test comparing the differences between the Task 2 performance and the guessed performance of their teammate for high-performing men and high-performing women yields $p = 0.07$).

Table 7 Linear Probability Model of Tournament-Entry Decision (Tasks 3 and 5)

Regressors	Men	Women	All
Female			−0.31 (<0.01)
Female × TTid			0.27 (0.02)
TTid	−0.06 (0.43)	0.19 (0.04)	−0.06 (0.37)
Prob	0.43 (0.02)	0.06 (0.82)	0.27 (0.08)
Intercept	0.59 (<0.01)	0.48 (<0.01)	0.68 (<0.01)
Observations	78	74	152

Notes. Linear-probability model with standard errors clustered at the individual level. The table presents marginal effects computed at a man in the individual tournament with a 50% chance of winning the tournament. *p*-values are in parentheses.

At first glance, women seem to enter each of the three tournaments in similar proportions. Fisher's exact tests comparing the proportions of women entering the IT and TT ($p = 0.48$), the TT and TTid ($p = 0.62$), and the IT and TTid ($p = 0.15$) do not turn out to be significant.

Table 7 reports the results of regressions aimed at studying the entrance in the IT and TTid.

The positive and significant coefficient of *TTid* in the women's regression shows that women are more likely to enter the TTid than the IT, when controlling for the probability of winning each tournament; this is not the case for men. Furthermore, the gender gap in competitiveness is significantly reduced in the TTid, in comparison with the IT, as shown by the positive and significant coefficient of *Female × TTid* in the third regression.

It can be seen from Figures 6 and 7 that women exhibit competitive behaviors very different from men's. In particular, the exact same proportion (70.6%) of high-performing women enter in the TT and TTid, showing that high-performing women are not reluctant to enter the team competition with a

Figure 6 Proportion of Low-Performing and High-Performing Women Entering Each of the Three Tournaments

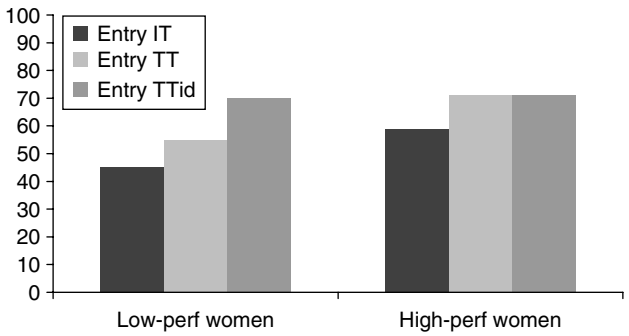
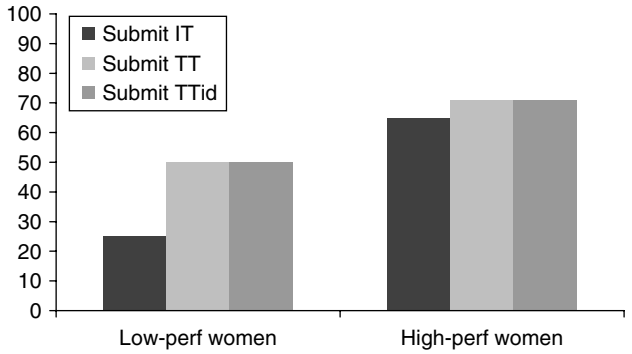


Figure 7 Proportion of Low-Performing and High-Performing Women Submitting a Past Performance to Each of the Three Tournaments



less able teammate. The patterns of behavior of high-performing women for the decisions to submit a past performance to the tournaments are furthermore extremely similar to those of the decisions to enter the tournaments.

Both low-performing and high-performing women enter more often in the TTid than in the IT but not significantly so (the two-sided Fisher's tests, respectively, yield $p = 0.20$ and $p = 0.72$). The absence of significance of the results might be because of too few data available to us when we split our sample according to both gender and performance level.

The regressions in Table 8 show that although high-performing women enter each of the three tournaments in the same proportions (the coefficients of *TT* and *TTid* are insignificant in the first two regressions), low-performing women enter more often in the TTid than in the other two tournaments, suggesting a taste for competing with a teammate when one cannot hurt her performance.

Finally, women's decision to submit a past performance to a given tournament is not very different from their decision to enter the same tournament. The

Table 8 Linear Probability Model for High-Performing (HP) and Low-Performing (LP) Women's Decision to Enter the Tournaments (Tasks 3 and 4 [Regressions 1 and 3] and 3, 4, and 5 [Regressions 2 and 4])

Regressors	(HP1)	(HP2)	(LP1)	(LP2)
Intercept	0.36 (0.24)	0.37 (0.24)	0.39 (0.04)	0.26 (0.09)
TT	0.10 (0.50)	0.10 (0.50)	0.11 (0.50)	0.14 (0.42)
Guesswin	0.28 (0.36)	0.26 (0.39)	0.08 (0.72)	0.25 (0.11)
TTid		0.10 (0.49)		0.32 (<0.01)
Observations	34	51	40	60

Note. Linear-probability model with standard errors clustered at the individual level; *p*-values are in parentheses.

three two-sided Fisher's tests comparing the proportion of women entering and submitting their performance to each of the three tournaments yield $p = 1.00$.

4. Consequences of the Type of Competition on Efficiency

The introduction of the team tournament was successful in wiping out the gender gap in tournament entry. It is obviously essential to closely study the consequences of the team tournament on other aspects in order to weigh up the pros and cons. This section studies the consequences of the type of tournament on the pool of entrants and its quality, as well as on participants' payoffs. Indeed, as we saw that high-performing men stay out of the TT for fear of being subjected to the free-riding behavior of their teammate, it makes sense to see whether they were right and what the consequences of their beliefs are in terms of payoffs.

4.1. Are Entrants to the Team Tournament Actually Free-Riding?

One of the main reasons for high-performing men's reluctance to enter the TT is that they fear the free-riding behavior of their teammate, so it is important to find out whether they are right and what the consequences of holding such beliefs are.

The answer is that they are not right. The Task 4 performance of participants who chose to enter the team tournament is far from significantly different from their Task 2 performance (the Task 4 and Task 2 performances of entrants to the TT are, respectively, 6.48 and 6.52; a Mann-Whitney test yields $p = 0.94$). Furthermore, the Task 2 performance of participants who chose to enter the team tournament (6.52 on average) is not significantly different from that of participants who chose to stay out (7.37) of the team competition ($p = 0.30$). It therefore appears that participants do not free-ride in the team tournament.

Ten high-performing men whose Task 2 performance was between 7 and 13 chose to go for the piece rate rather than the team tournament. Their choice is costly, as their expected payoff would have been higher had they chosen to enter the team tournament. To compute how much they forgo by choosing the piece rate instead of the TT, 1,000,000 pairs of opponents' performances were drawn by sampling with replacement from the Task 2 performances of the 76 participants. One million teammate performances were drawn from the Task 2 performances of the potential teammates, i.e., participants who chose to enter the team tournament. For each level of performance, the probability of winning the individual tournament was computed by calculating the number of times out of 1,000,000 this given performance exceeded the first opponent's performance. Similarly, for each level of performance, the probability of winning the team tournament was computed by calculating the number of times out of 1,000,000 this given performance plus the partner's performance exceeded the sum of both opponents' performances. It is then possible to compare, for each performance level, the payoff from choosing the piece rate to what would have been the expected payoff from choosing the team tournament. For instance, a participant who chooses the piece rate and solves 7 additions correctly earns €3.50, when his expected payoff from choosing the team tournament would have been €4.30. Similarly, a participant who solves 13 additions correctly forgoes €2.43 when choosing the piece rate (€6.50) rather than the team tournament (€8.93 expected).

4.2. Influence of the Type of Tournament on the Pool of Entrants

How the type of tournament influences the gender composition and the quality of the pool of entrants is an important question. First, although there is a large and significant gender gap in the choice to enter the IT (51.35% of women and 84.62% of men, $p < 0.01$), this is the case neither for the choice to enter the TT (62.16% of women and 58.97% of men, $p = 0.82$) nor the TTid (70.27% of women and 76.92% of men, $p = 0.61$). Figure 8 represents the percentage of participants who chose to enter each of the three tournaments conditional on Task 2 performance level. Compared with the individual tournament, more low-performing and fewer high-performing participants choose to enter the team tournament. This obviously affects the average performance of the entrants. On the other hand, the proportion of entrants of each performance level in the TTid is similar to the proportion of entrants in the individual tournament.

Figure 9 shows the average performances of male and female entrants in the three kinds of tournament. Each time, men perform slightly better than women, but not significantly so. We can observe a decrease of men's performance when the tournament becomes

Figure 8 Proportion of Entrants in the Tournaments Conditional on Performance Level

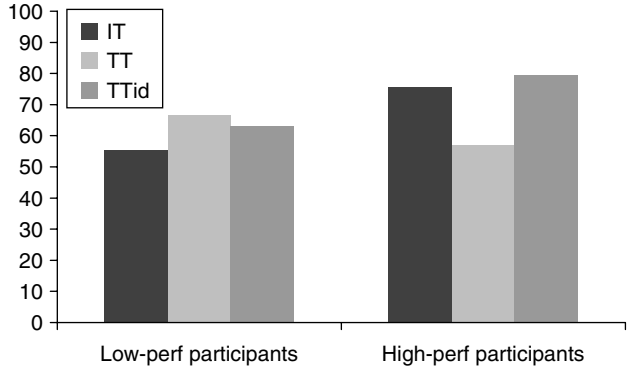
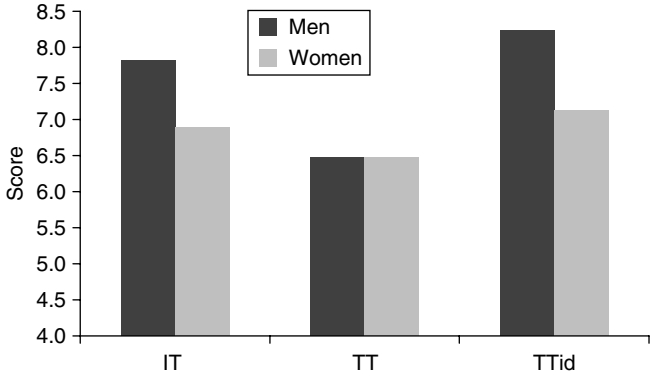


Figure 9 **Performance of Male and Female Entrants in the Three Tournaments**



team based that is, however, not significant. As shown in the previous subsection, participants do not shirk in the team tournament, so it is mainly caused by the crowding-out effect of high-performing men in the team tournament. The performance of female entrants, in contrast, is very stable across tournaments. As a consequence, the fact that the tournament is team based does not negatively affect women's performance. Still, the average performance of entrants is somewhat lower under the team tournament than under the individual tournament (6.48 versus 7.48, a two-sided Mann Whitney test $p = 0.18$). There is no significant difference of performance between participants choosing to enter the IT and those choosing to enter the TTid (7.48 versus 7.71, a two-sided Mann-Whitney test yields $p = 0.74$).

Team competition seems to be the solution to getting a gender-balanced pool of tournament entrants. Nevertheless, the uncertainty about their teammate has a crowding-out effect on high-performing men, whereas low-performing men are prompted to enter. Matching teammates of similar ability seems to be the condition that makes the gender gap in tournament entry disappear without decreasing the average ability of entrants.

5. Conclusion

This paper studies the effect of a tournament being team based rather than individual on the gender gap in tournament entry. The results allow a better understanding of the gender gap in competitiveness and provide a way to obtain a gender-balanced pool of entrants. Although a large and significant gender gap in entry in the individual tournament is found, in line with Niederle and Vesterlund (2007) and Niederle et al. (2012), no gender gap is found in entry in the team tournament. Women do not choose to enter the tournament significantly more often when it is team based, but men enter significantly less as part of a team than alone. A first potential explanation for men's change in competitive behavior could be that high-performing men do not enjoy competition as much when the victory is shared with a teammate. As high-performing men are found to be willing to enter a team competition provided they know their teammate will be of a level close to their own, one can rule out this first possibility. A second reason for high-performing men's reluctance to enter the team tournament could simply be that they are pessismistic about the quality of participants who choose to enter the team tournament and therefore fear that being matched to one of them will not allow them to win the team tournament. This does not appear to be the case, as high-performing men are as confident (and actually even a little more confident) of their chances of winning the team tournament as the individual tournament. Another explanation could be that men are reluctant to help a less able teammate get higher payoffs. However, this does not seem to be the main driving force behind men's behavior, as high-performing men do not seem to mind submitting a past performance to a team competition even when they have no information on their teammate's performance level. Because the main difference between entering a team tournament and submitting a past performance to the same tournament is that in the latter both teammates' performances have already been completed, high-performing men seem to fear being subjected to the free-riding behavior of a probably less able teammate. However, they do not mind being matched to a less-efficient teammate as long as her performance has been completed prior to her decision to submit it to a team competition.

This experiment provides a way of wiping out the gender gap in tournament entry, as men and women are equally likely to enter the team competition. However, when looking more closely at the consequences on welfare aspects of the tournament being team based, it appears that it negatively affects the quality of the pool of entrants by crowding out the high-performing men from tournament entry.

There is, nevertheless, a way of getting a gender-balanced pool of entrants without driving high-performing men away from competition—i.e., by providing contestants with information about their teammate's ability or telling them they will be matched with a teammate of a level close to their own. Indeed, women tend to enter the team tournament more often than the individual one when they know they will be matched to a teammate of the same level as their own, and high-performing men do not shy away from the team tournament when they know they will be matched with a teammate of ability close to their own.

In the present paper, I chose not to consider the impact of one's teammate and opponents' gender on her decision to enter competitions. However, it is very

likely that this has an impact. Indeed, Niederle et al. (2012) showed that a reason affirmative action was successful in enticing women to enter competition was because women are more comfortable competing against other women. Furthermore, Ivanova-Stenzel and Kübler (2011)'s results suggest that competitive performances are affected by teammates' gender, and Delfgaauw et al. (2009) show in a field experiment that sales competitions have a large effect on sales growth, but only in stores where the store's manager and a large fraction of the employees have the same gender. Future research may therefore focus on the impact of one's teammate and opponents' gender on one's willingness to enter a team competition.

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Appendix A. Consequences of the Type of Tournament on the Probability of Winning and Expected Payoffs

The consequences of the tournament being team based on the quality of the pool of entrants and their payoffs will partly depend on the change in the probability of winning and expected payoffs. Remember that, when entering the team tournament, a participant knows that she will be matched with a teammate who also chose to enter the team tournament. Hence, the level of other participants who chose to enter has an impact on a participant's probability of winning if she enters, as well as on her payoffs if she enters and wins (as each teammate of the winning team earns €1 times the average performance of the team). First, let us look at Figures A.1 and A.2, which represent, respectively, the probability of winning[10] and the expected payoffs[11] for each of the three tournaments conditional on performance.

Figure A.1 Probability of Winning the Tournaments Conditional on Performance

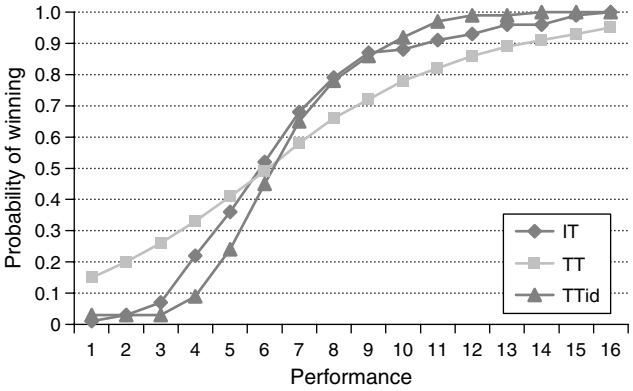
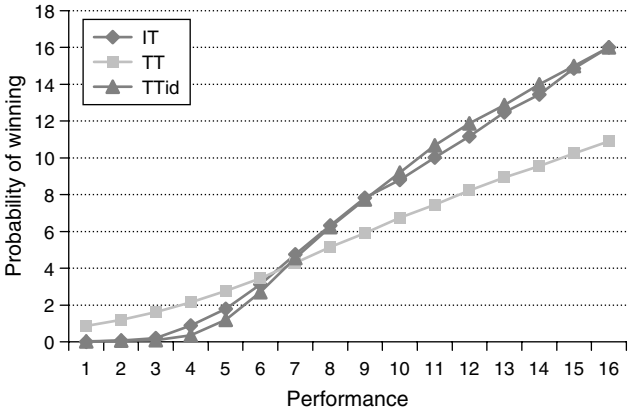


Figure A.2 Expected Payoffs of the Tournaments Conditional on Performance



It can be seen that although for the individual and the team tournament with a teammate of the same level the

[10] One million pairs of opponents' performances were drawn by sampling with replacement from the Task 2 performances of the 76 participants. The same number of teammate performances were drawn from the Task 2 performances of the potential teammates, i.e., of the participants who chose to enter the team tournament. For each level of performance, the probability of winning the individual tournament was computed by calculating the number of times out of 1,000,000 this given performance exceeded the first opponent's performance. Similarly, for each level of performance, the probability of winning the team tournament was computed by calculating the number of times out of 1,000,000 this given performance plus the partner's performance exceeded the sum of both opponent's performances. Finally, the probability of winning the team tournament with a teammate of the same level was found by computing how many times the double of a given performance exceeded the sum of the two opponents' performances.

[11] One million pairs of opponents'performances and the same number of teammate's performances were drawn by sampling with replacement from the Task 2 performances of the 76 participants. For each level of performance, the expected payoff from entering the individual tournament was computed in the following way. For each given performance, the payoff corresponding to each of the one million first opponent's performances was computed and averaged. Similarly, for each level of performance, the expected payoff from entering the team tournament was computed by calculating the payoff corresponding to each of the one million different sets of one teammate's and two opponents' performances and averaging it.

probabilities of winning and the expected payoffs are close, such is not the case for the team tournament. Indeed, the team tournament provides higher expected payoffs than the two other tournaments for low-performing participants and lower expected payoffs for high-performing participants.

The average Task 2 performance of the team tournament entrants (6.52) is lower than the average Task 2 performance of the whole group (6.86), but it is far from being significant. Nevertheless, this is not unexpected, as the difference of performance between those who did choose to enter and those who did not is not significant (a two-sided Mann Whitney test yields $p = 0.30$), implying all the more that the difference of performance between the entrants and the whole group is not significant either.

Appendix B. Instructions

The experiment is composed of eight tasks. Before each task, the experimenter will carefully explain what the task is about and you will have the opportunity to ask as many questions as you need. Please remember that you are not allowed to communicate in any way with one another. At the end of the experiment two of the eight tasks you will have completed will be randomly chosen to determine your payoffs.

Task 1: *Piece rate*. In Task 1, you will have three minutes to solve as many additions of five two-digit numbers as you can. You are allowed to use the scratch paper you have been given. If Task 1 is one of the two tasks randomly chosen for payment, you will receive 50 cents per correctly solved addition. At the end of Task 1, a screen will indicate you how many additions you solved correctly.

Task 2: *Individual tournament*. You will have three minutes to solve as many additions of five two-digit numbers as you can. If Task 2 is chosen for payment, you will receive €1 per correct answer if you solved more additions than a randomly chosen opponent present in the room; otherwise, you will receive nothing. You will earn 50 cents per correctly solved addition in case of a tie.

At the end of Task 2, a screen will indicate how many additions you solved correctly, but you will only find out whether you won your tournament at the end of the experiment.

Task 3: *Choice between piece rate and individual tournament*. Before performing your three minutes of additions, you will have to choose whether you want to be paid according to the piece rate (50 cents per correct answer) or the individual tournament compensation scheme.

If you choose the piece rate, you will receive 50 cents per addition correctly solved during Task 3.

If you select the tournament, you will receive €1 per correct answer if your Task 3 performance exceeds the Task 2 performance of a randomly chosen opponent; otherwise, you will receive nothing. You will earn 50 cents per correctly solved addition during Task 3 in case of a tie.

At the end of Task 3, a screen will indicate how many additions you solved correctly, but you will only find out whether you won your tournament if you choose to engage in it at the end of the experiment.

Task 4:[12] *Choice between submitting Task* 1 *performance to piece rate or individual tournament*. There are no additions to do here; the performance that will determine your payoff is your Task 1 performance.

If you choose to submit your Task 1 performance to the piece rate, you will receive 50 cents times your Task 1 performance.

If you choose to submit your Task 1 performance to the individual tournament, you will receive €1 per addition correctly solved in Task 1 if you solved more additions in Task 1 than your randomly chosen opponent; otherwise, you will receive nothing. You will earn 50 cents per addition correctly solved during Task 1 in case of a tie.

You will only find out whether you won your tournament, if you choose to submit your Task 1 performance to the tournament, at the end of the experiment.

Task 5:[13] *Choice between piece rate and team tournament*. You have to choose whether you want to be paid according to the piece rate or the team tournament. The team tournament is a two-on-two competition.

If you choose the piece rate, you will receive 50 cents per addition correctly solved during Task 4.

If you choose the team tournament, two opponents will be randomly drawn among the other participants present in the room. One teammate will be randomly drawn from among the participants who chose the team tournament. If the number of additions your team solves during Task 4 exceeds the number of additions solved by the opposing team during Task 2, each member of your team will receive €1 times the average score of the team. Otherwise, you will receive nothing. You and your teammate will each earn 50 cents times the average score of the team during Task 4 in case of a tie.

At the end of Task 4, a screen will indicate how many additions you solved correctly, but you will only find out whether you won your tournament, if you choose to engage in it, at the end of the experiment. You will not know your teammate's performance either, until the end of the experiment.

Task 6:[14] *Choice between submitting Task* 1 *performance to piece rate or team tournament*. There are no additions to do here; the performance that will determine your payoff is your Task 1 performance.

If you choose to submit your Task 1 performance to the piece rate, you will receive 50 cents times your Task 1 performance.

If you choose to submit your Task 1 performance to the team tournament, two opponents are randomly drawn from among the other participants in the room. One teammate is randomly drawn among the participants who chose to submit to the team tournament. If the number of additions your team solves during Task 1 exceeds the number of additions solved by the opposing team during Task 1, you and

[12] The task that was presented as Task 4 to the participants is labeled "Task 3′ ″ in the core of the paper.

[13] The task that was presented as Task 5 to the participants is labeled "Task 4″ in the core of the paper.

[14] The task that was presented as Task 6 to the participants is labeled "Task 4′ ″ in the core of the paper.

your teammate will each receive €1 times the average score of the team. Otherwise, you will receive nothing. You and your teammate will each earn 50 cents times the average score of the team during Task 1 in case of a tie.

Task 7:[15] *Choice between piece rate and team tournament with a teammate of the same level* (*TTid henceforth*). If you choose the piece rate, you will receive 50 cents per addition correctly solved during Task 5.

If you choose the team tournament with a teammate of the same level, two opponents will be randomly drawn from among the other participants present in the room. Your teammate will be the participant who chose the team tournament with a teammate of the same level, whose Task 2 performance was the closest to your own Task 2 performance. If the number of additions your team solved during Task 5 exceeds the number of additions solved by the opposing team during Task 2, you and your teammate will each receive €1 times the average Task 5 score of your team. Otherwise, you and your teammate will receive nothing. You and your teammate will each earn 50 cents times the average score of the team during Task 5 in case of a tie.

At the end of Task 5, a screen will indicate how many additions you solved correctly, but you will only find out whether you won your tournament, if you choose to engage in it, at the end of the experiment. You will not know your teammate's performance either until the end of the experiment.

Task 8:[16] *Choice between submitting Task* 1 *performance to piece rate or team tournament with a teammate of the same level*. There are no additions to do here; the performance that will determine your payoff is your Task 1 performance.

If you choose to submit your Task 1 performance to the piece rate, you will receive 50 cents times your Task 1 performance. If you choose to submit your Task 1 performance to the team tournament with a teammate of the same level, two opponents will be randomly drawn from among the other participants in the room. Your teammate will be the participant who chose to submit to the team tournament with a teammate of the same level, whose Task 2 performance was the closest to your own Task 2 performance. If the number of additions solved by your team during Task 1 exceeds the number of additions solved by the opposing team during Task 1, you and your teammate will each receive €1 times the average score of their team. Otherwise, you and your teammate will receive nothing. You and your teammate will each earn 50 cents times the average score of the team during Task 1 in case of a tie.

Belief-Assessment Questions

The experiment is now almost over. You just have to answer a few questions about the experiment. For each correct answer, you will earn one additional euro.

At Task 4, whether you chose to enter the team tournament or not, two opponents were randomly drawn from among the other participants present in the room. One teammate was randomly drawn among the participants who chose the team tournament. Knowing that your own Task 2 performance will be recalled to you on the next screen, please guess the Task 2 performances of your two opponents and your teammate. Also guess the Task 2 performance of the average participant in the room.

At Task 4′, whether you chose to enter the team tournament or not, two opponents were randomly drawn from among the other participants in the room. One teammate was randomly drawn from among the participants who chose the to submit their Task 1 performance to the team tournament. Knowing that your own Task 1 performance will be recalled to you on the next screen, please guess the Task 1 performances of your two opponents and your teammate. Also guess the Task 1 performance of the average participant present in the room.

[15] The task that was presented as Task 7 to the participants is labeled "Task 5" in the core of the paper.

[16] The task that was presented as Task 8 to the participants is labeled "Task 5′" in the core of the paper.

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CORRECTION

In this article, "Men Too Sometimes Shy Away from Competition: The Case of Team Competition" by Marie-Pierre Dargnies (first published in *Articles in Advance* July 18, 2012, *Management Science*, DOI:10.1287/mnsc.1120.1542), Booth and Nolen 2012, Croson and Gneezy 2009, Gneezy et al. 2003, and Gneezy et al. 2009 have been added to the references list and cited in the introduction.