Option to Cooperate Increases Women's Competitiveness and Closes the Gender Gap

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Abstract. We advance the hypothesis that women are as competitive as men once the incentive for winning includes factors that matter to women. Allowing winners an opportunity to share some of their winnings with the low performers has gendered consequences for competitive behavior. We ground our work in an evolutionary framework in which winning competitions brings asymmetric benefits and costs to men and women. In the new environment, the potential to share some of the rewards from competition with others may afford women the benefit of reaping competitive gains without incurring some of its potential costs. An experiment ($N = 438$ in an online convenience sample of US adults) supports our hypothesis: a 26% gender gap in performance vanishes once a sharing option is included to an otherwise identical winner-take-all incentive scheme. Besides providing a novel experiment that challenges the paradigm that women are not as motivated to compete as men, our work proposes some suggestions for policy: including socially-oriented rewards to contracts may offer a novel tool to close the persistent labor market gender gap.

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1 Introduction

Economists have advanced the idea that women are less competitive, less risk tolerant, and less ambitious than men. Recent research has found that women underperform relative to men when placed under competitive pressure (Gneezy et al., 2003; Gneezy & Rustichini, 2004; Price, 2008; Shurchkov, 2012; Ors et al., 2013; Backus et al., 2016) and women avoid high-risk, high-return environments, preferring to self-select into pay schemes that offer lower but more predictable returns (Niederle & Vesterlund, 2007; Dohmen & Falk, 2011; Gupta et al., 2013; Flory et al., 2015; Sutter & Glätzle-Rützler, 2015; Saccardo et al., 2018).[1] Yet, research in evolutionary psychology, anthropology, and biology has started to question the less-competitive-female paradigm and have already demonstrated that, at least in certain contexts, females are just as competitive as males, but exhibit it differently (Hrdy, 1981, 1999; Clutton-Brock, 2007; Stockley & Bro-Jorgensen, 2011). This research question is important both for furthering our understanding of female behavior and for its applied consequences. In fact, the hypothesis of women being less competitive than men has been systematically used to explain several societal gender gaps, among them the gender-wage gap (since competitive fields tend to be the most lucrative) and why, in general, there is less representation of women among holders of economic and political power (Goldin, 2014; Blau & Kahn, 2017). Our work shows that competitiveness critically depends on the incentives faced by men and women who may react differently to a change in the rewards structure. Importantly, for women, the inclusion of a sharing option in an otherwise similar environment stimulates higher competitiveness, while leaving men unaffected. This result offers some promising recommendations for policies aimed to close labor markets' various gaps, by suggesting that different incentive schemes could be adopted to encourage more women to compete (for example, team bonuses rather than individual bonuses).

Here, we employ an interdisciplinary approach to investigate the roots of sex differences in competitiveness and propose an experiment to test the predictions of an evolutionary psychology theory of gendered behavior (Buyalskaya et al., 2021). Given the sexes' different roles in reproduction, males and females were subjected to different evolutionary histories with plausible consequences for the ex-

[1] For an extensive overview of the research on both types of being competitive, see Croson & Gneezy (2009) and Niederle & Vesterlund (2011).

pression of a trait, like competitiveness, into different behaviors depending on the specifics of the biological, socioeconomic and cultural context an individual is in. Once one considers the cost-benefit fitness implications of a trait, a behavior found to have been adaptive in males may not have been equally beneficial for females, for whom a different competitive strategy may have been preferable, offering important insights to understand the observed different strategies.

In this paper, we hypothesize that the male-female gap in competitiveness generally found in tournament experiments derives from the one dimensional, money-only payoff structure traditionally implemented. We investigate whether such a protocol is ideally suited to register a trait the way it is typically expressed by males, ignoring its female variation. We test this by introducing an experimental treatment in which the incentive to compete is socially-oriented: when winners can share some of the gains with the low performers, i.e. when the incentive is both a resource and the opportunity to redistribute part of that resource to others. We analyze whether women, in this novel environment, will reveal competitive traits similar to men. Our findings support our hypothesis: socially-oriented incentives increase women's competitiveness and closes the gender gap in competitive performance.

The literature has advanced two different but related ways of *being competitive*. The first is about competitive *performance*, as an indication of motivation to exert effort. The second way is about competitive *attitudes*, i.e. a desire to opt in to a competitive environment. In this paper we focus on the first aspect, the one that contends with performance in an environment where individuals must engage in competition. In related work we explore how our hypothesis relates to competitive attitudes, i.e. preferences to enter competitive situations (Cassar & Rigdon, 2020). Our findings with respect to competitive attitudes is similar to the one reported here with socially-oriented incentives closing the gender gap in choice.[2]

In the next section we provide a motivation for our main hypotheses; in Section 3 we describe the experimental design; in Section 4 we outline the experimental procedures; in Section 5 we discuss the results; and in Section 6 we provide some concluding remarks.

[2]In Cassar & Rigdon (2020) we find that an initial 18% sex difference in choice to compete (p=0.050) reverses to a negative and insignificant gender gap of -7.75% (p=0.424). While men's entry rate into the tournament remains virtually unchanged, around 52% in both conditions, women double their entry rates into the tournament with socially-oriented rewards from 35% in the standard tournament to 60% ($p = 0.002$).

2 Theoretical Framework

Evolutionary psychology offers a theoretical framework for trying to understand some of the observed behavioral differences between men and women (Cosmides & Tooby, 1997). The methodological idea is that a specific trait or behavior, empirically observed, may tell us something about the evolutionary forces that contributed to shape it. Initially employed in evolutionary science to explain anatomical features, this method is embodied in the concept that form follows function: we can infer ancestral selection pressures by looking at the physical traits that selection pressures designed. For example, male traits, like a deep voice and virile facial features, appear to have evolved for male-male competitions, i.e. dominance, rather than for being traits favored by females (Puts et al., 2012; Hill et al., 2013). Evolutionary psychology has then proposed to look at behaviors and preferences through the same lens. Guided by asking similar questions (i.e., which functions such behaviors and strategies were serving in ancestral times), we can investigate the kind of selection pressures that contributed to shaped them (Henrich & Gil-White, 2001; Bernhard et al., 2006; Apicella & Silk, 2019). From this perspective, strategies and behaviors are evaluated based on their contribution to adaptiveness. Adaptations are traits whose properties are explained by the positive effects they had on the reproduction of the individual's ancestors over evolutionary time. As such, by promoting the survival and reproduction of the individual or the group these traits have evolved by natural and sexual selection. Adaptations could then be considered as approximate optimization solutions to complex problems that our ancestors had to face continuously over time.

Given the different roles in reproduction, there is no reason to expect that men and women would benefit equally from the same behaviors and, as a consequence, to be necessarily motivated by the same incentive structures. Successful reproduction requires all mammals to pursue different strategies on the basis of sex, depending on whether it is the female or the male that needs to invest more in her/his offspring. According to parental investment theory, the sex making the greater parental investment is expected to become a resource for which members of the other sex would compete (Trivers, 1972). Among humans, since women are the sex required to invest more (at the very least through gestation and lactation), such a difference would have profound repercussions for the adopted strategy: while males can increase their reproductive success by having numerous partners and increase their number of offspring, females could not, as multiple partners would not necessarily ensure more offspring for them. This idea became crystallized as the Darwin-Bateman paradigm, according to which female behavior was expected to be passive, coy, risk averse, and less competitive than male behavior

(Darwin, 1871; Bateman, 1948; Trivers, 1972).[3] More recently, a substantial amount of evidence is documenting that females' reproductive success is subject to significantly more variation than initially expected (Campbell, 1999; Clutton-Brock, 2009; Stockley & Bro-Jorgensen, 2011), sparking a renewed interest in studies offering evidence of the importance of women's competitiveness and its determinants (Campbell, 2013; Hrdy, 2009; Benenson, 2013). If competitive traits are regarded as the product of evolutionary pressures, then not only men but also women should have evolved competitive traits, although with different manifestations to reflect their different contributions to his/her fitness. For example, focusing on maternal strategies, Cassar et al. (2016) find that mothers opt in to a competitive tournament environment substantially more when the payoff is a book voucher destined to benefit their children than when the payoff is money, closing the choice gap with fathers. In the current paper, we focus on competitive performance – as measured by exerting effort in a real-effort task – to win in a standard winner-take-all tournament compared to that to win in a socially-oriented tournament.

From an evolutionary standpoint, winning competitions and securing high status positions in social groups can bring many benefits. Some benefits are common to both males and females (access to resources, deference, and freedom from harassment) while others are sex-specific. To males, the main benefit of achieving high status is gaining access to more reproductive opportunities, even when it does not necessarily translate into an increased number of offspring (Campbell, 2013; von Rueden et al., 2010; Cheng et al., 2013). Winners of male-male competitions can dominate rivals in directly acquiring females, as females in most species have shown a preference for highly ranked males, affording the opportunity of increased reproductive success (Ellis, 1995; Clutton-Brock & Huchard, 2013). Women from traditional small scale societies to large and economically advanced societies have been shown to be attracted to high-status men (von Rueden et al., 2010; Buss, 1989; Fisher, 2013). In humans, more than by physical strength and force, status is determined by natural abilities, determination, and intelligence, and is measured through the accumulation of wealth, prestige, and power in economic and public organizations (von Rueden et al., 2010; Hill et al., 1993; Henrich & Gil-White, 2001).[4] In addition to good genetic material, a woman's preference may, in fact, be based on a man's resource-holding potential which indicates his ability to provide for the woman and any offspring. A meta analysis of studies of nonindustrial societies with natural fertility provides robust empirical evidence for an association between status and reproductive success for men, independent of subsistence category

[3]For critical reviews, see Scelza (2013) and Mulder (2019).

[4]With respect to primate behavior, Schülke et al. (2010) shows that, contrary to expectations, strong bonds were observed among macaques, and these ties were linked to the formation of coalitions, which in turn influenced future social dominance and, hence, paternity success.

(foraging, horticulture, pastoralism, or agriculture) or how status is measured, although it varies with the marriage system (von Rueden & Jaeggi, 2016).

What about the females? Scientists, looking at primates' behavior, used to hypothesize that females were not interested in competing to achieve high-status, given the rarity of observing status communication via physical fights (de Waal, 1989). Recently, evidence is emerging that high status significantly increases female reproductive success as well, as measured by increased offspring survival rather than fecundity (Majolo et al., 2012). First, it confers a continuous and permanent priority access to quality food, a key to greater reproductive success (Campbell, 1999; Stockley & Bro-Jorgensen, 2011; Campbell, 2013; Amici et al., 2020). Second, dominant females are not subjected to harassment, rather they inflict it on others to induce reproductive suppression (Young et al., 2006). Third, dominant females are more likely to have allies who will support them in a dispute, their infants are less likely to be kidnapped or killed by other adults, and such strong female bonds give them power to contest male control and coercion (Kano, 1992; Silk et al., 2003, 2009; Campbell, 2013). Critical differences with males are that high-ranking females do not necessarily attract more or better quality partners, as males do not seem to show a systematic preference for them. Despite the clear benefits conferred by high-status, physical force is rarely seen used by females as a mother's death has been found more detrimental for offspring than a father's death (Hrdy, 1981, 1999; Kahlenberg et al., 2008; Hrdy, 2009).

For women, fundamental to our hypothesis is that winning competitions involves trade-offs not found for men. Despite the evidence that maternal high status provides substantial benefits to her children's well-being, gaining powerful positions in society has not been shown to increase women's success with mates (Buss, 1989; Fisher, 2013). Studies of men's mating preferences show that women who acquire power and status do not necessarily see these gains directly translated in better quality males (Buss, 1989). Additionally, more socially dominant women are viewed as less attractive as a mate by men (Brown & Lewis, 2004) and women viewed as more ambitious by men are selected significantly less often for a date (Fisman et al., 2006). Evidence has also emerged that women who compete and win get punished: political victories and promotions to high-executive positions significantly increase the divorce rate for women but not for men (Folke & Rickne, 2016) and women who earn more than their partners report lower marital satisfaction and higher divorce rates (Bertrand et al., 2015). As a result, women have been found to strategically downplay their economic aspirations, especially when such aspirations are observed by single male peers (Bursztyn et al., 2017), and when the woman in the household earns more, respondents in the U.S. Census survey are more likely to under-report the

woman's earnings and over-report the man's earnings (Murray-Close & Heggeness, 2018).

For women, in addition to not being a successful mating strategy, being at the top comes at the price of potentially alienating others, crucial allies for allomaternal help and assistance in general, and of losing their support with serious costs to the individual and their children's well-being from group exclusion (Hrdy, 2009; Campbell, 2013). Evidence of such behavioral differences, rooted in biological factors and furthered encultured by society, emerges in childhood when girls seem less interested in overtly competitive games (Strube, 1981), prefer collaborative interchanges to domineering exchanges, and are concerned with group cohesion (Campbell, 2013). Girls display a clear preference toward forming small groups characterized by strong egalitarianism (Campbell, 2013; David-Barrett et al., 2015). Girls dislike others who are egotistical and view themselves as "superior" (Eder, 1990). Young girls and women have been found to show a reluctance to appear superior to friends, avoid bragging about accomplishments, fearing jealousy, hostility, and losing friends (Campbell, 2013; van Vianen & Fischer, 2002). Also, establishing the nature of a female's rank is more difficult because women's preferred form of aggressiveness (indirect, through exclusion, gossiping, etc.) is less visible than men's direct physical and verbal forms (Vaillancourt, 2005, 2013; Giudice, 2015; Vaillancourt & Krems, 2018). So, unlike males, women have been shown to prefer status structures more like webs to vertical hierarchy, striving to be the "center of attention" (rather than the "alpha" on a linear power line) because there, at the center, is where most of the social, material and reproductive benefits are found (Liesen, 2013). One of the few empirical studies designed to test specifically the relationship between reproductive success for women, measured as the number of living offspring, and several measures of network centrality confirms that mothers with greater centrality produced significantly more living offspring (Page et al., 2017). A pathway to explain the link between high status and increased womens' reproductive fitness may be access to greater material resources whose benefits translate into improved health outcomes for their children. Evidence of that, for example, has been recorded for a group of Amazonian horticulturalists for which the children of politically influential women have been found to have higher weight-for-age, height-for-age, weight-for-height and a lower likelihood to be diagnosed with common diseases (Alami et al., 2020).

Against this backdrop, we can see why when we think about incentives, we treat resources (monetary payoffs) as apt for inducing competitiveness. If competition is competition for high status and high status is desirable because it secures resources, then we can measure competitiveness by tracking performance in a real-effort task when there is a winner-take-all monetary prize. But this does not

necessarily include what matters for measuring the competitive performance of women. If high-status for females is equally desirable as for males, but entails social consequences not found for males, then measuring competitiveness by tracking performance in a real-effort task when there is a winner-take-all monetary prize with no social dimension will lead to incorrect estimation. Therefore, instead of concluding that status is less important for women than for men, or that women are less competitive, this raises the need to find better ways to measure how competitiveness is expressed in females (Hrdy, 1981, 1999; Brown & Lewis, 2004).

Our work addresses this issue by incorporating in the traditional experimental protocol examining performance in a competitive setting things that should matter to women according to this view. In particular, we explore the consequences of including in the incentive structure the opportunity to reallocate some of the winnings from the competition to others. Such an option may be regarded as a (likely unconscious) strategy, an adaptation, to prevent post-competition costs: by not being perceived as competitive (i.e. going after highly non-egalitarian alpha positions in which the gains are exclusionary), female winners do not risk ruining their cooperative reputation with consequences for incurring the chance of retaliation, or the loss of potential mates and allies. Consistent with this hypothesis, our experimental results show that, in this new environment of socially-oriented incentives, women are as motivated to compete as men.

This theoretical framework permits us to derive predictions for two important extensions: the type of task and the gender composition of the group one competes against. With respect to the task type, we expect women?s competitiveness in female stereotypical domains to be higher than in male stereotypical domains because the costs to be seen as competing are lower in the former (less backlash from both males — as there is no loss of feminine image — and from other women as social norms regulate such domains fair competition grounds). Evidence that task matters, and in the direction our framework would expect, has been found in experiments about entry in competitive environments by, for example, Apicella & Dreber (2014) Grosse & Riener (2010), and Gunther et al. (2010). With respect to the gender mix of the competitors, we expect women's competitiveness in a female only group to be higher than in mixed group (an absence of men implies lower concerns of losing feminine image important for attracting and retaining male mates and lower fear of retaliation from formidable opponents). Still, if we could measure competitiveness per se', without any opponent at all (for example, as in games where the competition is against self as in Apicella et al. (2017)), our framework would predict women to display high competitiveness, possibly (but not necessarily) even higher than

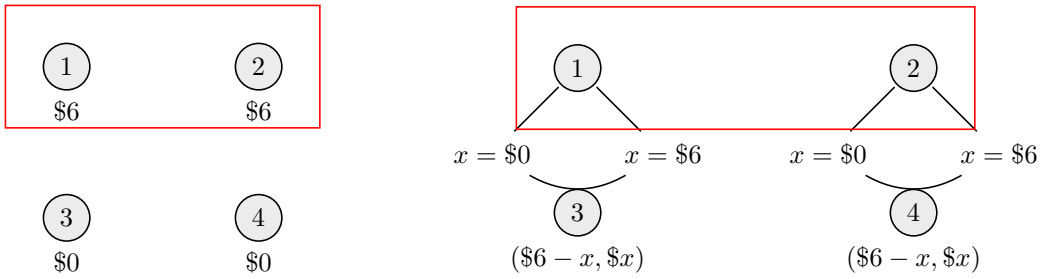
the one shown in female-female contests, given the absence, afforded by the individual environment, of fear to raise retaliation from other women and the alienation of potential allies. The novel treatment presented in our work, by permitting the reparation of some of the cost consequences of competing, would allow women to display more competitiveness also under these two additional extensions.

3 Experimental Design and Hypotheses

Our main hypothesis is that women may value incentives based on more than their monetary value and, in particular, they may value incentives which are *socially-oriented*. *Socially-oriented* incentives, i.e. gains that could be shared, could afford individuals important benefits. According to the theory advanced here, it would be very valuable to women to have the option to compete and gain resources while still, at the same time, acting a bit prosocial to somewhat conceal how competitive one truly is. The typical experiment designed to measure competitive tendencies focuses on the winner-take-all nature of many contests, leaving no room for players to conceal their competitiveness. While this environment may be especially "delightful" to men (Darwin, 1888), it excludes by design features that may matter to female competitiveness: the possibility to still appear prosocial despite competing and winning. Whether sharing some of the spoils is motivated by control over resources, trying to prevent retaliation, to foster allies, to avoid raising jealousy and making enemies, investigating explicitly what happens in the aftermath of a contest may shed light on the behavior that happens during the contest.

To test the hypothesis that adding a socially-oriented option to a winner-take-all environment may encourage women to compete more, we compare behavior under two treatment conditions: a classic competitive environment and one in which a prosociality game is added at the end. Comparing the players' performance between these two environments will allow us to test whether women are indeed motivated to perform better (i.e., compete more) when they can also signal cooperation.

Our experiment employs a real-effort task called the *matrix search task* which we discuss further in Section 4 (Mazar et al., 2008; Gino et al., 2009; Zhong et al., 2010; Rigdon & D'Esterre, 2015, 2017). Our outcome of interest is competitive behavior, which we measure as the participants' performance in this task under the two tournament settings where we vary whether the incentive to win is purely monetary (*Monetary Prize*) or the incentive to win is socially oriented (*Influence Prize*). The *Monetary Prize* treatment is the traditional winner-take-all tournament in which participants individually compete in groups of four: the top two performers in each group are the winners, the bottom two are the low performers. Those who win get a prize ($6) and those who lose do not ($0). See Figure



(a) Money Prize

(b) Influence Prize

Figure 1: Incentive structure for each treatment. Figure 1(a) shows the standard tournament with winner-take-all incentive structure where winners earn $6 and losers earn $0. Figure 1(b) shows the tournament with a dictator game incentive structure, where payoffs are determined by the winner's transfer decision (she selects a value for x between 0 and 6) with the winner earning $6 minus any amount transferred ($x) and the recipient, a low performer in the tournament, earns the amount transferred, $x.

1(a). This treatment replicates previous experimental work on competitiveness and serves as our baseline (Gneezy et al., 2003; Gneezy & Rustichini, 2004). In *Influence Prize* we vary only whether the monetary prize is socially oriented. In this novel setting a sharing option is added at the end of the contest, and this is known to the participants prior to the competition. We do this by embedding the $6 monetary prize in a dictator game. A dictator game is a re-allocation situation: one player, the dictator, is awarded a prize (e.g., $6) and provided the option to re-allocate any amount of it to the other player, the recipient (Forsythe et al., 1994) (see Engel (2011) for an overview of behavior in the dictator game.). In our treatment, each winner earns the right to be a dictator in a $6-pie dictator game played anonymously with one of the low performers in the competition. That is, the incentive to compete is the right to influence how much (if any) of the $6 prize a low performer receives. See Figure 1(b). In summary, the monetary incentives are identical across our two treatments. The only difference is whether participants are competing for a purely monetary prize or whether they are competing to have influence or control over re-allocating that purely monetary prize.

We note three facts about these incentive structures for the real-effort tournament. First, all participants should be incentivized to solve as many matrices as they can in both *Money Prize* and *Influence Prize*. Second, any winning participant who is motivated only by the size of their own monetary prize will not re-distribute any of the $6 in *Influence Prize*. Third, therefore, if people are motivated only by monetary incentives, performance across the two treatments should be identical. This logic allows us to derive the following testable hypotheses: (1) we will observe men competing more than women by solving more matrices in the purely monetary incentive structure, in line with

results in the literature; (2) when winners are awarded a prize *and* the opportunity to divide this resource with a matched low performer following competition, i.e. they earn a property right in a $6 dictator game, women (and not men) will be motivated to increase their performance relative to the baseline treatment; and (3) this will close the gender gap in competitive performance. Specifically:

Hypothesis 1 *In the Money Prize treatment, performance by women is significantly lower than performance by men.*

Hypothesis 2 *In the Influence Prize treatment, when winners are given the opportunity to share part of the gains with the low performers, performance by women increases.*

Hypothesis 3 *The Influence Prize incentive scheme closes the gender gap in competitive performance.*

We now turn to describing our procedures and discussing our results.

4 Procedures

The experiment was conducted on Amazon Mechanical Turk (MTurk) to gather a sample of 438 participants, 261 men and 177 women, who completed 9 sessions between September 2018 and September 2019.[5] Our participants were recruited with the offer of a $1.50 show-up payment plus the opportunity to earn additional money based on the decisions they and others would make in the experiment. Participants began by reading a consent form that was approved by the Rutgers University School of Arts and Sciences Institutional Review Board and by the University of San Francisco Institutional Review Board. All workers offered the opportunity to participate assented. The complete experiment consisted of (1) a real-effort task tournament employing the matrix search task under one of the two incentive structures, (2) a risk preference assessment (Eckel & Grossman, 2008b), and (3) a short survey. Appendix 7.2 reports the survey question participants answered, including a series of standard demographic questions and attitudinal questions on a Likert scale.

At the beginning of each session, participants were given instructions explaining the matrix search task (see Appendix 7.1 for the experimental instructions), the tournament, and the incentive structure

[5]For research on the potential of MTurk for conducting behavioral experiments in the social sciences, see Molnar (2019); Buhrmester et al. (2011); Horton et al. (2011); Rand (2012); Paolacci & Chandler (2014); Arechar et al. (2018). Overall, the results to date suggest that MTurk can be used to obtain high-quality data with results similar to lab experiments with a diverse sample inexpensively and rapidly even in the presence of a likely loss of control relative to the lab.

for their treatment.[6] The structure of the environment and all instructions for the experiment were common knowledge to all participants before the experiment.

Each matrix is a 4×3 array of 12 three-digit two decimal place numbers (e.g., 6.95); see Figure A1 in the Appendix for an example matrix. Participants were told that to solve a matrix they should find the set of two numbers that sum to 10 and were provided a demonstration of how to select the numbers and submit their answer; see Figure A2 in the Appendix. Participants were grouped with three other participants and told that they would see 20 matrices to solve in 2 minutes. Following the 2 minutes, participants were ranked by their score of how many matrices they correctly solved, informed of their rank, and whether they were winners (top 2 score) or not (bottom 2 score). Participants were then paid according to the incentive structure of their treatment. We detail that now.

In *Money Prize*, the top two performers earned \$6 and the bottom two performers earned \$0. Participants were told their earnings immediately after the tournament. In *Influence Prize*, the two top performers earned \$6 and the right to be a dictator in a \$6-pie dictator game, where the recipient was one of the low performers. After completing the real-effort task, participants learned their rank. Then the performer ranked first was a dictator, paired with the performer ranked third as recipient and the performer ranked second was a dictator, paired with the performer ranked fourth as recipient. This matching algorithm was common information to all participants. Dictators were then asked how they would like to "allocate the \$6 between yourself and Person B" by dragging the blue bar to make their allocation decision; see Figure A3 in the Appendix for a screenshot of what the dictators saw. The allocation determined by the dictators' decisions completely determined the earnings for both top performers and bottom performers: e.g., if a dictator selects to re-allocate \$2 to the low performer she is paired with, then her earnings for the tournament are $\$6 - \$2 = \$4$ and the low performer's earnings are \$2.

Next, to be able to correlate behavior in our treatments with risk attitudes, participants then completed an instrument eliciting their risk tolerance (Eckel & Grossman, 2008b). See Figure A4 for the gambles participants saw. Participants chose which of six $\frac{50}{50}$ gambles they wished to play. The gambles included one sure thing; the remaining five increase linearly in expected payoff and risk. Gamble 1 is a sure lottery: choosing it guarantees the participant will earn \$1.40. Gamble 2 is a coin flip lottery with a 50% chance of winning \$1.20 and a 50% chance of winning \$1.80. Gamble 6 is the riskiest option with a 50% chance of winning \$0.10 and a 50% chance of winning \$3.50. One of the gambles

[6] Participants took on average 40 seconds to read the instructions in *Money Prize* and on average 65 seconds to read the slightly more complicated instructions in *Influence Prize*. There were no gender differences in the amount of time.

was chosen at random for payment and a coin was flipped to execute the gamble. These earnings are in addition to any earnings from the real-effort task portion of the experiment. Finally, participants were asked to answer demographic and socio-economic questions as well as a series of questions about their views toward competition. On average, participants earned \$4.79 for a 15-minute session (\$3.05 in the real-effort task and \$1.74 in the gamble task). The average hourly payment in our experiment — $\approx$ \$20/hr — is well above what workers typically earn completing tasks on MTurk. In an analysis of more than 2,676 workers performing 3.8 million tasks Hara et al. (2018) report that workers earn on average $\approx$ \$2/hour with only 4% of workers earning more than \$7.25/hour. Information on our participants' characteristics and a balance check across treatments is provided in the Appendix (Table A1).

5 Results

5.1 Option to Cooperate Increases Women's Performance and Closes the Gender Gap

Figure 2 depicts our main results displaying effort by gender and treatment, while Table 1 reports the statistical tests on the between-treatment gender differences and within-gender treatment differences in average effort. First, women perform significantly worse than men in *Money Prize*: the average score is 2.63 compared to 3.32 for men (t-test $p = 0.017$). Second, the gender gap in effort is closed in *Influence Prize*: the average score is 3.41 for women compared to 3.30 for men (t-test $p = 0.704$). Third, when the incentive to win includes both a prize and an option to divide the prize with a low performer following the competition, women significantly increase their performance from 2.63 to 3.41 (t-test $p = 0.006$) to levels indistinguishable from mens' performance, whose performance remains unchanged (3.32 to 3.30, t-test $p = 0.957$). Our three hypotheses are supported by the data: in *Money Prize*, the condition that replicates the standard tournament used in most laboratory experiments, we observe a significant 26% gender gap in performance; in *Influence Prize*, the gap vanishes to -3% due the increase in performance by women.

A possible confounding factor contributing to our results could be a difference in the subjects' ability levels which, through sampling error, may have drawn a significantly higher proportion of high ability women in the *Influence Prize* condition. While our between-subjects, one-round design does not allow for a direct test of this hypothesis by statistically controlling for each subject's ability, it

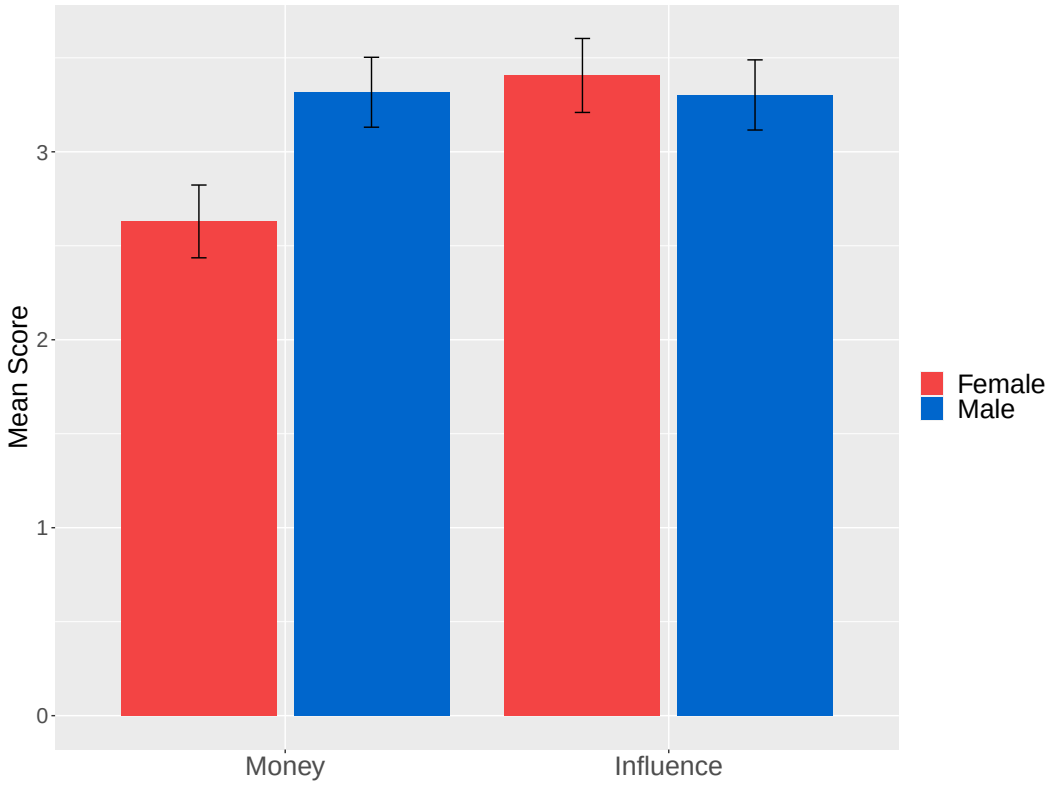


Figure 2: Task performance. Bars represent the average score, the average number of correct matrix problems solved by male (blue) and female (red) participants by treatment. Error bars represent mean +/- standard error. Women, on average, scored significantly lower than men in the *Money Prize* treatment (2.63 vs. 3.32, t-test $p = 0.017$), but indistinguishable from men under *Influence Prize* (3.41 vs. 3.30, t-test $p = 0.704$). Furthermore, while male performance remains unchanged (3.32 vs. 3.30, t-test $p = 0.957$), women's performance significantly increases (2.63 vs. 3.41, t-test $p = 0.006$).

is unlikely that sampling error based on ability has driven our results. First, our experiment had sufficient power, ensured by the large sample utilized ($N = 438$: 261 men, 177 women), a factor that, together with the random treatment assignment, gives us confidence that the likelihood of sampling error having generated our results is extremely low. Second, we gathered additional evidence on performance by running two additional sessions under a \$1.25 piece-rate payment scheme (the incentive system generally utilized to elicit ability) and found that women also perform significantly worse than men under this scheme (men: 3.72 ($N = 71$) vs. women: 2.68 ($N = 47$), t-test $p = 0.007$).[7] This implies that we have some evidence that the matrix search task may be gendered: women tend to do significantly worse than men in the non-competitive piece-rate environment. Our main findings are thus very strong since the specific task we chose biases against being able to close the gender gap. Yet, our result suggests that, even with a gendered task, females significantly increase their performance and close the gender gap when the incentive to compete is socially oriented.

[7] It is worth noting that, in general, it may be misleading to equate performance with ability under a piece-rate payment scheme, as the results are always the product of both a specific task and a particular payment scheme.

Table 1: Score by Treatment and Gender

	Women Mean Score (Std. Dev) $N = 177$	Men Mean Score (Std. Dev.) $N = 261$	Women=Men t-test p-value
Money	2.63 (1.74) $N = 81$	3.32 (2.22) $N = 142$	**0.017**
Influence	3.41 (1.90) $N = 96$	3.30 (2.04) $N = 119$	0.704
	Women	Men	
Money=Influence t-test p-value	**0.006**	0.957	

Table 2 reports our main regression results. The primary OLS regression specification (column (1)) on our dependent variable of interest, Score (i.e., number of correctly solved matrices), is :

$$\mathsf{Score}_i = \beta_0 + \beta_1(\mathsf{Female}_i) + \beta_2(\mathsf{Influence}) + \beta_3(\mathsf{Female}_i \times \mathsf{Influence}) + \epsilon$$

where i is an individual subject, $\mathsf{Female}_i = 1$ if female (0 if male), $\mathsf{Influence} = 1$ if *Influence Prize* (0 if *Money Prize*), and $\mathsf{Female}_i \times \mathsf{Influence}$ is the interaction effect between Female_i and $\mathsf{Influence}$.[8]

The coefficient on Female is negative and highly significant, indicating that females perform worse on the matrix search task than males; more than half a matrix less on average – around 20% of male performance – all else equal ($p = 0.015$). Importantly, the interaction of female and the treatment condition is positive and significant ($p = 0.046$), providing evidence that females increase their com-

[8]Ordered Logit specifications generate nearly identical results to those reported here and are available upon request.

	(1)	(2)	(3)
Female$_i$	-0.69**	-0.61**	-0.62**
	(0.28)	(0.29)	(0.29)
Influence	-0.01	-0.02	-0.03
	(0.25)	(0.25)	(0.26)
Female$_i$ × Influence	0.79**	0.73*	0.69*
	(0.40)	(0.40)	(0.41)
Control I		Yes	Yes
Control II			Yes
Constant	3.32***	3.37***	3.15***
	(0.17)	(0.43)	(0.51)
N	438	437	422
R-squared	0.02	0.04	0.05

Standard errors in parentheses

Control I (2): Risk, Age, White, Parent, Married

Control II (3): Control I, Highschool, Fulltime, Income

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: OLS Estimates Regressed on Score

petitive performance when incentives are socially oriented. These results are robust to a progressive inclusion of controls as we show in the analysis presented in the remaining specifications of Table 2, where a series of robustness checks show that our findings are not due to other factors such as risk preferences, education, income, or marital status. Specifically, columns (2) and (3) report the regression results on Score with a series of socio-demographic and behavioral controls including risk preferences, age, ethnicity, whether or not the participant is a parent, marital status, highest degree obtained, employment status, and income; see Table A3 in the Appendix for the coefficients. Importantly, these specifications indicate that our results are robust when controlling for a wide-variety of participant characteristics, indicating that selection of participants on observables is not the driver of our results.

Next we look at how the gap in performance in *Money Prize*, and the increase in performance in *Influence Prize*, translates to representation of women in top positions. In our sample, given the randomness in subject recruitment, women ended up in different proportions in each of the treatments: in *Money Prize* the percentage of female participants was 36%, whereas in *Influence Prize* the percentage of female participants was 45%. If each gender had an equal probability to reach a top position (rank 1 or rank 2), we would expect women to be represented in top positions consistent with their representation in the sample. Instead, in *Money Prize*, we observe only 30.7% of women reaching the top, a 5% gap. On the other hand, in *Influence Prize*, we observe 46.6% of women reaching the top, virtually indistinguishable from their representation in the sample.

An important confound to competitiveness is risk aversion and we have shown that our results remain unchanged after controlling for it. Figure A6 in the Appendix displays the distribution of gamble choices made by females (red) and males (blue) in the risk elicitation task. Consistent with the majority of the results in the experimental literature, the point estimates indicate that women select safer options significantly more than men do. When the data are pooled together, the risk index – i.e. the lottery chosen by the subject, with higher values indicating higher risk tolerance – averages 3.09 for females and 3.60 for males (t-test $p = 0.004$), although the two distributions are only borderline significantly different (K.S. test $p = 0.076$). Separately by treatment, in *Money Prize*, women and men display similar risk attitudes (women: 3.43 vs. men: 3.75, t-test $p = 0.219$), but in *Influence Prize* women select safer options significantly more than men do (women: 2.80 vs. men:3.42, t-test $p = 0.009$). To control for the possibility that our results are driven by these differences in risk preferences (although they would work against us finding more female competitiveness in *Influence Prize* treatment), we include individual risk parameters in the regressions and find no change in the

main results.

5.2 Signal Cooperation as Female Competitive Strategy

Our study is designed to test whether adding a socially-oriented incentive to an otherwise identical winner-take-all tournament increases the competitive performance of women. The answer is yes. A further question is then: why are women more motivated to compete when they are given the option to share some of the tournament earnings with one of the low performers following the competition? While a thorough investigation of the mechanisms at play will require additional research with a different experimental design, we propose one hypothesis which we test with the dictator game data we have and through a follow-up experiment.

One factor, at the core of our main hypothesis, is that the costs and benefits of competing are not equal across genders. As highlighted earlier in the theoretical framework, there are strong reasons to expect that women may be responsive to an option that may help repair post-competition relationships. Not displaying overt competitiveness by keeping all gains for oneself would help women prevent loser resentment and minimize the risks of retaliation. Concealing ambitions and nurturing allies are fundamentally adaptive strategies for women who have to walk a thin line between competition and cooperation with other members of the group (Benenson & Markovitz, 2014; Moscovice, 2013). Preventing open conflicts over resources by downplaying competitive intentions appears a valuable strategy for a gender who suffers disproportionately more than the other from losing contests (Benenson & Markovitz, 2014). In addition to avoiding retaliations, raising children would not have been possible without the substantial help of allomaternal care (Hrdy, 2009). Given that such help cannot always be monitored, it would be hard to elicit it through coercion and force, as it may result in substandard care at best and harm of one's offspring at worse. At the same time, the benefits to high rank are so tangible that female-female competition has always been intense (Benenson & Markovitz, 2014; Hrdy, 1981, 1999). One way to facilitate cooperation within one's group, to minimize the costs associated with agonist encounters and to create the basis for risk sharing, while still getting the benefit of high rank, is for winners of status competitions not to alienate the losers completely. Thus, sharing some of the gains would foster the cultivation of allies and engender the crucial help they come with. More egalitarianism discourages further contests attempting to renegotiate power, which allows for a certain stability that would be fitness-enhancing for all involved, but especially for women.

In our experiment, we create a scenario that allows for the possibility to repair the potential

prosociality damage of open competition, by letting participants know prior to competing that the top performers could restore some egalitarianism through a dictator game to be played with one of the low performers following the competition. This strategy may be especially valuable to those interested in avoiding retaliation and nurturing cooperation (Benenson et al., 2019). As we show below, women appear to make use of this opportunity more than men, especially among those who score the highest and are ranked first.

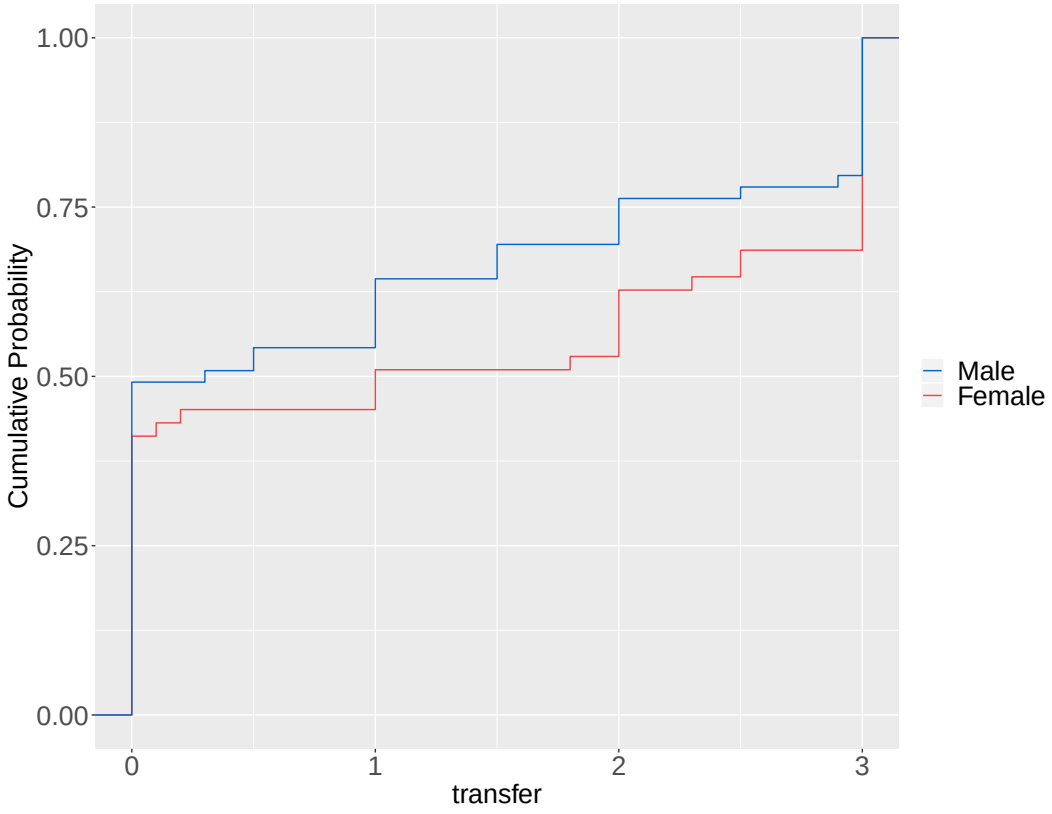


Figure 3: Cumulative distribution of dictator transfer by males (blue) and females (red) in the *Influence Prize* condition.

To properly test for the mechanisms behind our main result, i.e. for the motives responsible for the increased women's competitiveness under *Influence Prize*, we would need dictator giving data for all subjects (since performance from all participants produces the main result). Yet, in our current experiment, by design to properly test the main hypothesis, we collected giving behavior only from the top performers, i.e. the winners of the competition. Specifically, we ask how much they would like to send to a low performer only after the participants know that they actually won. Therefore, we only have a behavioral measure for those participants whose scores were first or second rank. As

a result, we do not know the giving preferences of those who lost (whose data nonetheless is part of the main result).[9] To have data on all participants, we would have needed a different design for the dictator game; one that employed the strategy method, eliciting dictator giving from all participants before they knew if they were winners or losers (i.e., how much they would give in case they won). This design might introduce a bias if dictator giving is higher behind the veil of ignorance than after, once the uncertainty is lifted. Since this latter case is what interests us for this study, we measured giving only after the uncertainty was lifted.

By looking at the amount transferred by winners, aggregating across rank, the results indicate that women do give more than men, but the difference is only marginally statistically significant (men: \$1.03 vs. women: \$1.38; two-tailed t-test $p = 0.122$; one-tailed t-test $p = 0.061$). Figure 3 displays the kernel density plots for the amounts transferred by the winners in *Influence Prize* by gender. Although the difference in population distributions appears distinct, they are not statistically significantly different (K.S. test $p = 0.1851$). Once we disaggregate the results by rank, we detect an interesting pattern: while there are no gender differences in giving among those who ranked second (men: \$1.41 vs. women: \$1.47, t-test $p = 0.870$), there are significant behavioral differences among those who ranked first with first-ranked women giving over 80% more to the low performers than first-ranked men (men: \$0.70 vs. women: \$1.28, two-tailed t-test $p = 0.080$; one-tailed t-test $p = 0.040$). To probe this rank/gender result further, we report a series of regression specifications in which the dependent variable is the amount transferred by the winners and the explanatory variables are dummies for each condition (Female first-rank, Female second-rank, Male second-rank, leaving Male first-rank as the baseline category), plus an increasing set of controls (see Table). Model (1) shows that males ranked first give less than any other winner. Controlling for age and ethnicity (Model 2), parental and marriage status (Model 3) and education (Model 4) does not change the results.

In general, these transfers are quite low. In standard anonymously paired one-shot dictator environments, the distribution of giving tends to be bi-modal with the largest fraction of giving at 0% of the endowment and the second largest fraction of giving at 50% (Forsythe et al., 1994; Camerer, 2003; Engel, 2011). The transfer amounts we observe are instead consistent with the results in property-right treatment games, where dictators earn the right to divide the endowment via several types of mechanisms from administering a knowledge quiz to having the endowment be earned wealth of the dictators (Hoffman et al., 1994, 1996; Cherry et al., 2002; Oxoby & Spraggon, 2008; Schurter & Wilson, 2009).

[9] Additionally we have half the number of observations as we would if we had all participants make dictator decisions resulting in lower power for statistical analysis.

Hoffman et al. (1994) establish property rights in the dictator game by assigning the top performers of a trivia quiz to be the dictators. The dictators recognize their advantage with the modal transfer shifting from 30% of the endowment to 0%. Schurter & Wilson (2009) explore the perceived fairness and justice of the property right mechanism on dictator giving. Transfers by dictators in our experiment are similar to transfers in their Seniority and Quiz treatments with the average percent transferred ranging from 18% to 24%. Interestingly, in these two treatments, Schurter and Wilson report that males transfer significantly less than females, demonstrating a greater responsiveness by males to the property right treatments involving ranking based on merit. They do not find gender differences in transfers when dictators are randomly selected or when a die roll determines who earns the dictator position. In terms of gender differences in giving behavior in the standard one-shot, anonymous setting, several studies have explicitly examined gender differences. Overall, the results are somewhat mixed: from those finding women are more generous (Eckel & Grossman, 1998), especially when the price of giving is expensive (Andreoni & Vesterlund, 2001) to those finding no difference (Bolton & Katok, 1995; Ben-Ner et al., 2004). In a recent meta-analysis Engel (2011) reports that for those articles that test for gender effects, women are more generous than men. One thing that is clear is that the context matters to whether or not gender differences are observed (Eckel & Grossman, 2008a; Croson & Gneezy, 2009; Niederle, 2015).

In conclusion, for women, having the option to share a contested resource is a powerful strategy, as it permits acquiring resources in a competitive setting without necessarily stoking losers' resentment and possible retaliation. Our data show that with the sharing option women do, in fact, significantly increase their competitiveness. Our anonymous setting provides a very strict test for the theory, as women's cooperative preferences are not expected to be rooted in indiscriminate generosity, but on strategic avoidance of creating enemies, hiding competitive motives, and nurturing allies in repeated interactions. Were we to remove anonymity and play subsequent cooperative games, we hypothesize that we would see these motives generate more drastic giving behavior following competition.

5.3 Egalitarianism as Female Competitive Strategy

To investigate further the motives behind the increase in female competitiveness when the incentive is socially oriented, we designed a subsequent experiment with two treatments identical to *Influence Prize* except that the final split of the prize is pre-determined and known to the participants in advance of the competition. Specifically, in one condition *Involuntary Modest*, a winner still earns \$6 but it

is common information that the gains are automatically split $\frac{75}{25}$ with a low performer. Therefore, winners earn \$4.50 for themselves and \$1.50 for the low performers. In a second condition, *Involuntary Equal*, a winner still earns \$6 but it is common information that the gains are automatically split $\frac{50}{50}$ with a low performer. Therefore, winners earn \$3 for themselves and \$3 for the low performers.

These two conditions allow us to test whether the initial sharing observed in *Influence Prize* is motivated by a desire to signal cooperative intentions to the low performer (as our theory would predict) or another type of generosity, like warm glow of giving, that does not appear to have ulterior aims. In *Influence Prize*, the winner that shares does so at a cost to herself (see McCabe et al. (2003) for a similar treatment in the trust game). As a result, this action can be interpreted by the low performer as a truthful (because costly) signal of a benevolent intent from the winner (motivated by wanting to disguise competitiveness and to repair post-contest loser resentment in order to seed the foundation for possible future cooperation). Under this condition, the low performer knows that the winner does not have to share any of the gains, so the recipient can read such action as an intention for peace-making following the competition so, were they to meet again, to enter into a reciprocal cooperative relationship. In this scenario, the winner knows that this signal can be interpreted by the low performer as reconciliation, so her cost of sharing now has a high probability of getting more than compensated by future cooperative interactions. On the contrary, in the two new involuntary-split games where the division of the gains are forced, the low performer cannot read the winner's intentions because the latter has no other choice but to share. Now, the low performer ends up with some share of the gains, but cannot interpret it as a signal of cooperative intentions.

The first involuntary condition, *Involuntary Modest*, replicates the payoff distribution we obtained under *Influence Prize*. If motivations to repair post-competition resentment were not important to the players, we would expect to find similar performance under either condition. Yet, this is not the case, as shown by Figure A7 in the Appendix. Even if the payoffs of winners and losers are roughly the same between the two conditions, the performance of both men and women goes down in the involuntary-split games, meaning that intentions to signal — only possible under *Influence Prize* — matter. For men, the score in *Involuntary Modest* decreases by 28% to 2.38 from 3.30 in *Influence Prize*, a highly significant difference ($p = 0.000$). For women, the score in *Involuntary Modest* declines by an even bigger 40%, from 3.41 to 2.05, another highly significant difference ($p = 0.000$). We interpret this lower competitiveness under *Involuntary Modest* than under the similarly incentivized *Influence Prize*, and the proportionally higher decline for women than for men, as evidence of the importance for winners

to signal cooperative intention to a low performer following the competition.

Our second condition, *Involuntary Equal*, is a test of the male/female difference in the importance of signaling cooperative intentions post-competition through an egalitarian option. Here, where the division of the gains is a $\frac{50}{50}$ split and the winners earn at most \$3, men's performance is indistinguishable from *Involuntary Modest* and significantly lower than that in *Money Prize* and *Influence Prize*. For women we find the opposite result. In line with what our theory would have predicted, this egalitarian option is more highly valued by women, whose score under *Involuntary Equal* is 30% higher than under *Involuntary Modest* (2.67 vs. 2.05, $p = 0.006$) despite the prize for winning being much lower.

Even if the cleanest comparisons are between *Involuntary Modest* and *Influence Prize*, and between *Involuntary Modest* and *Involuntary Equal*, we can still estimate an overall effect of sex across all four conditions and specific gendered reactions to the various treatments. These results are reported in the specifications of Table A4 in the Appendix where we regress the subjects' score on treatment dummies (leaving *Money Prize* as the baseline category) and a series of controls. Model (1) shows that when we constrain sex to not change and react differently in the various treatments, what matters is only the prize amount the winners could earn: under both involuntary-split conditions, all participants display a significantly lower score than under *Money Prize* (and *Influence Prize*), with women scoring lower than men but not significantly so. Once we allow for sex to react differently by treatment, we observe that female behavior comes to focus. Model (2) adds the interaction effects between sex and the various treatments and shows that female competitiveness significantly responds to the conditions that allow signalling of cooperative intentions. Against a backdrop of lower overall scores, females significantly increase their competitiveness in the two conditions that permit signalling cooperation or egalitarian intentions, i.e. under *Influence Prize* and *Involuntary Equal*. Separately by sex, Model (4) shows that for men, performance in *Influence Prize* is indistinguishable from *Money Prize* and both treatments are preferred to the lower paying and more egalitarian involuntary-split conditions. On the contrary, Model (6) shows that *Influence Prize* is the condition that supports the highest female competitiveness, that an equal split is valued as much as the lower valued *Money Prize* despite the lower gains to self, and *Involuntary Modest* has the lowest female competitiveness. Models (3), (5) and (7) confirm that the results are robust to the inclusions of the controls used in the previous analysis.

In conclusion, our experimental results support the hypothesis that women's competitiveness reacts to having the opportunity to signal cooperative intentions. Whether it is for repairing post-competition resentment and not alienating low performers, for nurturing allies by sharing, or for hiding competitive

intentions (even to self!), a cooperative option appears to strengthen women's desire to compete. As in the case of most games played in the lab, our game is stripped from the explicit features that are supposed to matter in real life cost-benefit calculations. By design we keep our interactions anonymous, we play only one-shot, the subjects don't know anything about who are they competing against. In so doing, we are hoping to obtain evidence of the subconscious strategies that are critical determinants of preferences and behavior. Obtaining results consistent with the theory even in this anonymous frameless setting provides a particularly strong test of the theory and speaks to the predictive power of the evolutionary framework. We could think of other ways to test this hypothesis and disentangle even further between confounded motives.

6 Discussion

We posit that having the availability of an option to share may incentivize women to compete, although most of the laboratory experiments prevent it by design. Our work demonstrates that the incentive structure critically affects what level of competitive performance is observed. The theoretical expectation that males are more competitive than females has produced laboratory tools fine-tuned to record a competitiveness trait as it gets expressed in males, but not necessarily in females, whose motivation to compete would get under-estimated when factors that matter to women are not included in the experiment. Most of the experimental literature focuses on winner-take-all contests, as they appear predominant in the economy. Our work suggests that under these remarkably exclusionary environments, women display a lower desire to compete, but, different incentive structures could be put in place to reduce such gaps. Our results demonstrate that women's competitiveness gets expressed in different ways and reacts to different rewards. Furthermore, the classic winner-take-all environments commonly used may not even resemble real life competitive situations necessarily better than the modified design with the sharing option we advance here: CEOs compete for their companies' shareholders (who are getting most of the benefits from the business' success); prime ministers and politicians compete for the well-being of their constituencies and their countries. So many of the leadership positions in the economy would be better represented as competitions on behalf of a group. Experiments that include this component tend to find no gap in competitiveness. Still, we agree that many positions of power are gained mainly for exclusionary gains and, in these environments, women may indeed be turned off by the openly competitive nature and non-egalitarian distribution of the gains. It is in these work environments where we expect to see that a change of the incentives structure may encourage

more women to enter and stay. Some companies (e.g. in Silicon Valley) are already starting to adopt compensation schemes based on teams' performance rather than individual prizes. Such shifts may avoid distortions (by aligning personal incentives with the company's goals) and, in addition, may encourage more women to compete.

A lower female competitiveness has been found in many experiments around the world. Yet, the most recent cross-cultural studies and meta-analysis seem to suggest that such sex differences tend to be more pronounced in individualistic and gender-egalitarian societies rather than in more traditional societies at lower levels of economic development. Once greater availability of material and social resources removes the gender-neutral goal of subsistence, gender-specific ambitions and desires may emerge and more gender-equal access to resources may allow women and men to express preferences independently from each other (Giudice, 2015). Interestingly, gendered differences in preferences such as risk, patience, altruism, positive and negative reciprocity, and trust have also been found to be positively associated with economic development as well as societal gender equality (Falk & Hermle, 2018). If it is confirmed that sex preferences vary even more at higher levels of development, a change in labor market incentives structure appears even more appealing as option.

The gender stereotype that women are less competitive or less economically driven is costly, both to individual women who may be under-placed and under-paid and to society at large, erroneously looking disproportionately to men for leadership (Eagly et al., 1992; Rudman & Glick, 1999). Our work demonstrates that equal-seeming incentives can be structured differently — by being socially-oriented — and women respond by increasing performance. This result has important policy implications, since understanding these differences is key for designing institutional mechanisms and contracts that promote the reduction of inequalities; for example by modifying individual bonuses to include resource to be allocated to team members for reaching communal goals, by integrating salaries with benefits for children (e.g. vouchers for education), by awarding top employees with decision power over a company's charitable contributions, and by focusing on the positive effects of one's work for a desired group or valuable cause.

In conclusion, our study is at the intersection of economics, evolutionary psychology, anthropology, and biology and our findings may be of interest to a broad interdisciplinary scientific audience. Despite Darwin's recognition of the importance of intra-sexual competition, the topic of female competitiveness has been largely ignored, until recently. Economists, looking for why women rarely reach top jobs, have accumulated a large body of experimental evidence pointing to women's lower desire to compete;

hence, the argument is that they self-select into less prominent and lower paying positions. Our experimental findings support the idea that women will compete as much as men once we substitute the winner-take-all incentives with a socially oriented option. Our work contributes a novel result to the much-debated topic of the gender wage gap, offering a different interpretation to the classic results, one for which the alleged gender differences in competitiveness cannot be appealed to.

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7 Appendix

7.1 Experimental Instructions

***Money Prize* Instructions**

This is an experiment in economic decision making. You will be matched with THREE other workers to form a group of FOUR people. You will not be told who they are during or after the experiment, and they will not be told who you are either during or after the experiment.

The matrix search task

In this task each of you will be presented 20 matrices as the one below:

[See Figure A1]

For each matrix you should look for a set of two numbers that sum up to 10. When you find these two numbers, select them as in the example below, then click "Submit":

[See Figure A2]

Your score

You get a score of one point per each matrix you correctly solve, **You will have TWO minutes** to solve as many matrices as you can.

The top half of scorers (top TWO people) will be paid $6 for the task and the bottom half of scorers (bottom TWO people) will be paid $0 for the task.

Please click "Next" to begin the experiment.

***Influence Prize* Instructions**

This is an experiment in economic decision making. You will be matched with THREE other workers to form a group of FOUR people. You will not be told who they are during or after the experiment, and they will not be told who you are either during or after the experiment.

In your group of four people, two of you will be person As, and the other two will be person Bs. Each person A will be paired with a person B. The experimenter has allocated $6 to each pair. An A will decide how to divide the $6 between A and his or her counterpart B.

The positions of A and B will be determined by ranking your scores on a matrix search task. Each of you will be asked to solve the same set of 20 matrices.

The top half of scores will be person As and the bottom half of scorers will be person Bs. So the lower-ranking half will be the Bs, and the higher-ranking half the person As.

The matrix search task

In this task each of you will be presented 20 matrices as the one below:

[See Figure A1]

For each matrix you should look for a set of two numbers that sum up to 10. When you find these two numbers, select them as in the example below, then click "Submit":

[See Figure A2]

Your score

You get a score of one point per each matrix you correctly solve, **You will have TWO minutes** to solve as many matrices as you can.

The top half of scorers (top TWO people) will earn the right to be person As and the bottom half of scorers (bottom TWO people) will be person Bs. Each A will decide how to divide the $6 between A and his or her counterpart B.

Please click "Next" to begin the experiment.

7.2 Survey Instrument

We would like to ask you a few questions about yourself.

- This information will be used to better understand the determinants of behavior.
- Your name will not enter in our dataset. Your information will be identified just by an ID number.
- Only the main researchers in this study will have access to this information.
- Your responses will be kept private and secure.
- The information will not be used for a discriminatory purpose.

If you agree, please respond to the following questions as accurately as possible. You can always select "I prefer not to answer" if you prefer not to answer some of the questions below.

1. How old are you?

   [I prefer not to answer, 18, 19, ... 99]

2. What is your highest level of education?

   [None, Informal schooling, Primary, Secondary/High School, Post-secondary training other than University, University undergraduate degree, Graduate degree or more completed, I prefer not to answer]

3. Please indicate your ethnicity (ethnicity describes feeling of belonging and attachment to a distinct group of a larger population that shares their ancestry, color, language or religion):

   [Caucasian, Latino/Hispanic, Middle Eastern, African, Caribbean, South Asian, East Asian, Mixed, I prefer not to answer]

4. What is your marital status (select ALL that apply)?

   [Single (never married), Single (divorced), Single widow/er (surviving spouse), Single (any above reasons) with partner, Not formally married, but with partner living in separate houses, Not formally married, but with partner living together, Married living together, Married living apart in separate house, I prefer not to answer]

5. Do you have any children?

   [Yes [if yes: 5b. How many children do you have?], No, I prefer not to answer]

6. You are currently working (select all that apply):

   [Full-time, Part-time, Seasonal, Occasional jobs, Homemaker, Not working but looking for a job, Not working and not looking for a job, Other, I prefer not to answer]

7. What would you say your monthly household income (before paying taxes) is?

   [below $500, $500-$1000, $1000-$1500, $1500-$2000, $2000-$2500, $2500-$3000, $3000-$3500, $3500-$4000, $4000-$4500, $4500-$5000, $5000 or above, I prefer not to disclose]

8. Please read the statements below and indicate whether you agree or disagree with them.

   [Strongly disagree, Somewhat disagree, Neutral, Somewhat agree, Strongly agree]

   (a) I believe that if I work hard, I will be successful.

   (b) I believe that money (having resources) is very important for finding a long-term partner.

   (c) If a woman earns more money than her husband, it's almost certain to cause problems.

   (d) Men and women should do the same amount of work in the household.

   (e) Competition brings out the worst in people.

(f) I am good at competing.

(g) I enjoy competing.

9. Please read the statements below and indicate how concerned you are about each of the statements. If you don't have any children, just imagine the situation.
   [1-5; Not concerned at all to Very concerned, I prefer not to answer]

   (a) Your female child might not have a successful marriage.

   (b) Your male child might not have a successful marriage.

   (c) Your female child might not have a steady job.

   (d) Your male child might not have a steady job.

   (e) Your female child might not be able to make enough money on her job.

   (f) Your male child might not be able to make enough money on his job.

10. Overall, how patient would you describe yourself as?
    [Very patient, Patient, Neither patient or impatient, Impatient, Very impatient, I prefer not to answer]

11. How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?
    [Very unwilling to take risks, Somewhat unwilling to take risks, Neither willing or unwilling to take risks, Somewhat willing to take risks, Very willing to take risks, I prefer not to answer]

7.3 Figures

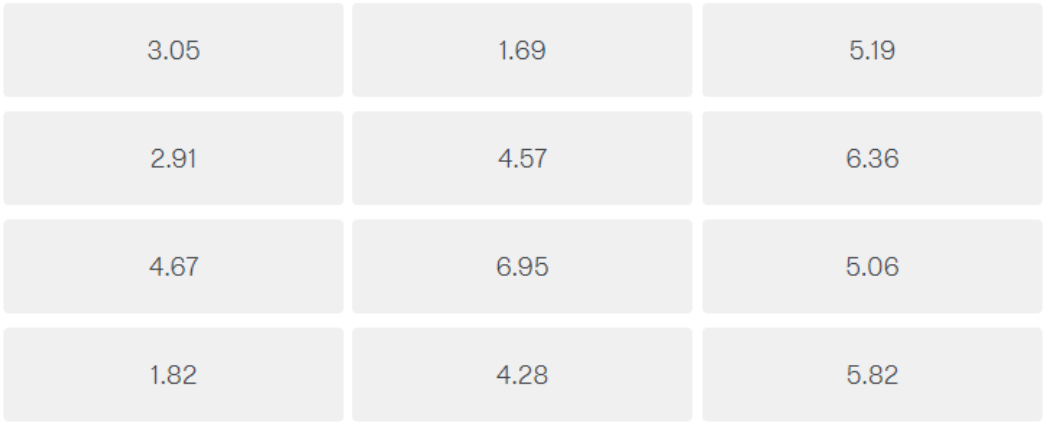

Figure A1: Real-effort matrix search task. Find and select the only 2 numbers that sum to 10

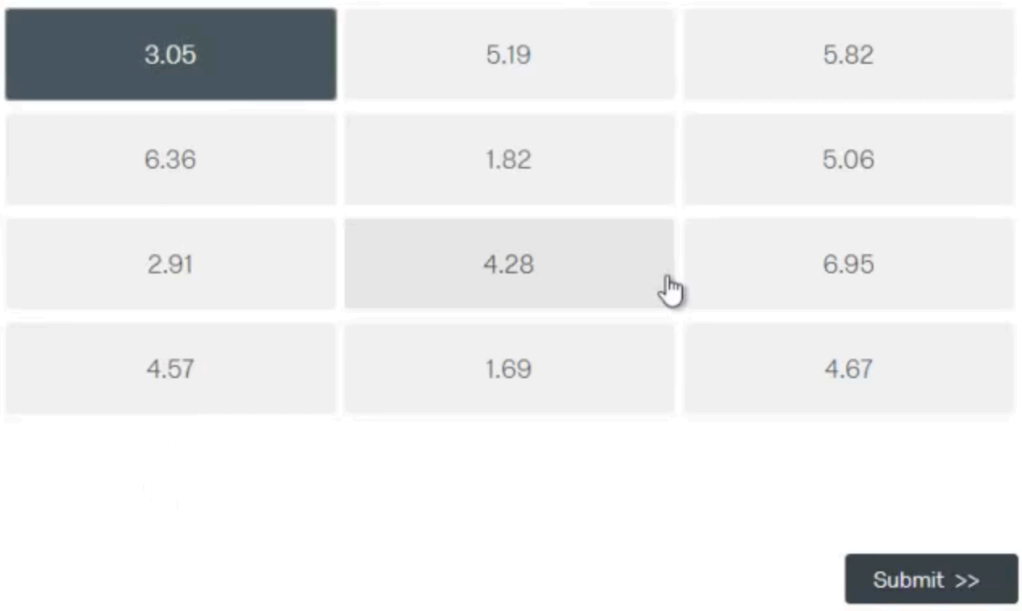

Figure A2: Screenshot of video shown to participants in instructions demonstrating method for selecting correct answers and submitting a completed matrix

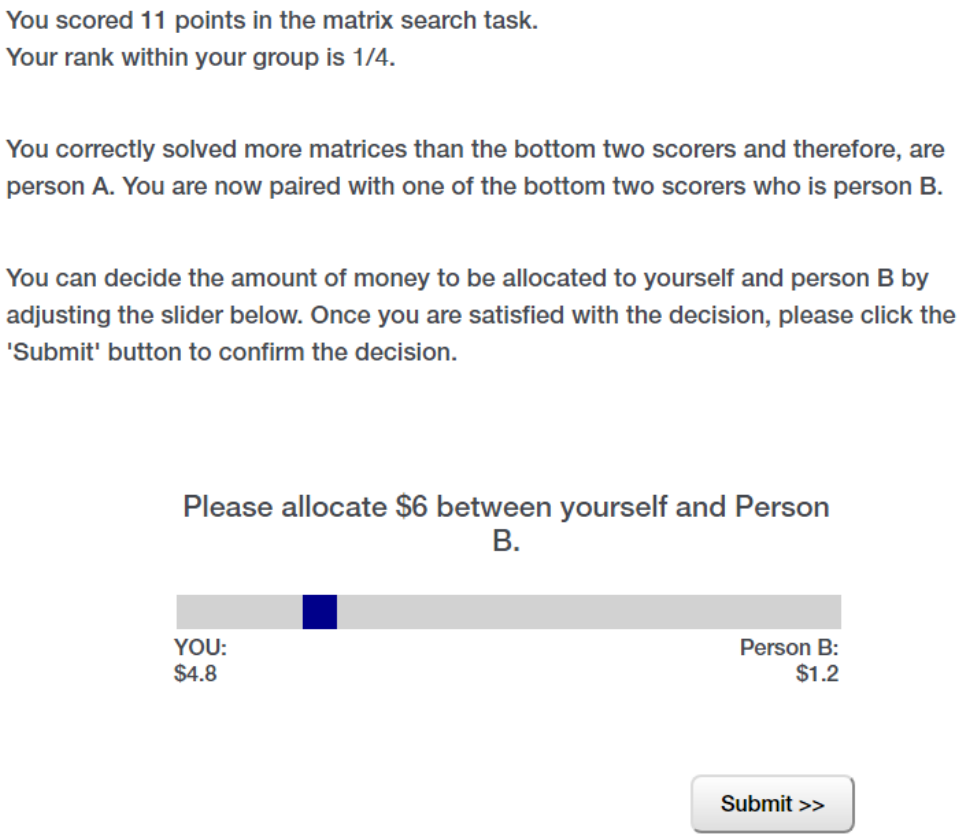

Figure A3: Screen of dictator's allocation decision of $6 prize following the tournament in the *Influence Prize* treatment

You will be paid $1 U.S. dollar for every 10 experimental points you earn in this task.

Please make your choice now in the table below:

Gamble 1

Roll	Payoff	Chances
LOW (1, 2, or 3)	14	50%
HIGH (4, 5, or 6)	14	50%

Gamble 4

Roll	Payoff	Chances
LOW (1, 2, or 3)	8	50%
HIGH (4, 5, or 6)	26	50%

Gamble 2

Roll	Payoff	Chances
LOW (1, 2, or 3)	12	50%
HIGH (4, 5, or 6)	18	50%

Gamble 5

Roll	Payoff	Chances
LOW (1, 2, or 3)	6	50%
HIGH (4, 5, or 6)	30	50%

Gamble 3

Roll	Payoff	Chances
LOW (1, 2, or 3)	10	50%
HIGH (4, 5, or 6)	22	50%

Gamble 6

Roll	Payoff	Chances
LOW (1, 2, or 3)	1	50%
HIGH (4, 5, or 6)	35	50%

Figure A4: Gamble choices presented to participants where Gamble 1 is a sure lottery and Gamble 6 is the most risky. Participants select one gamble and it is played for monetary payment.

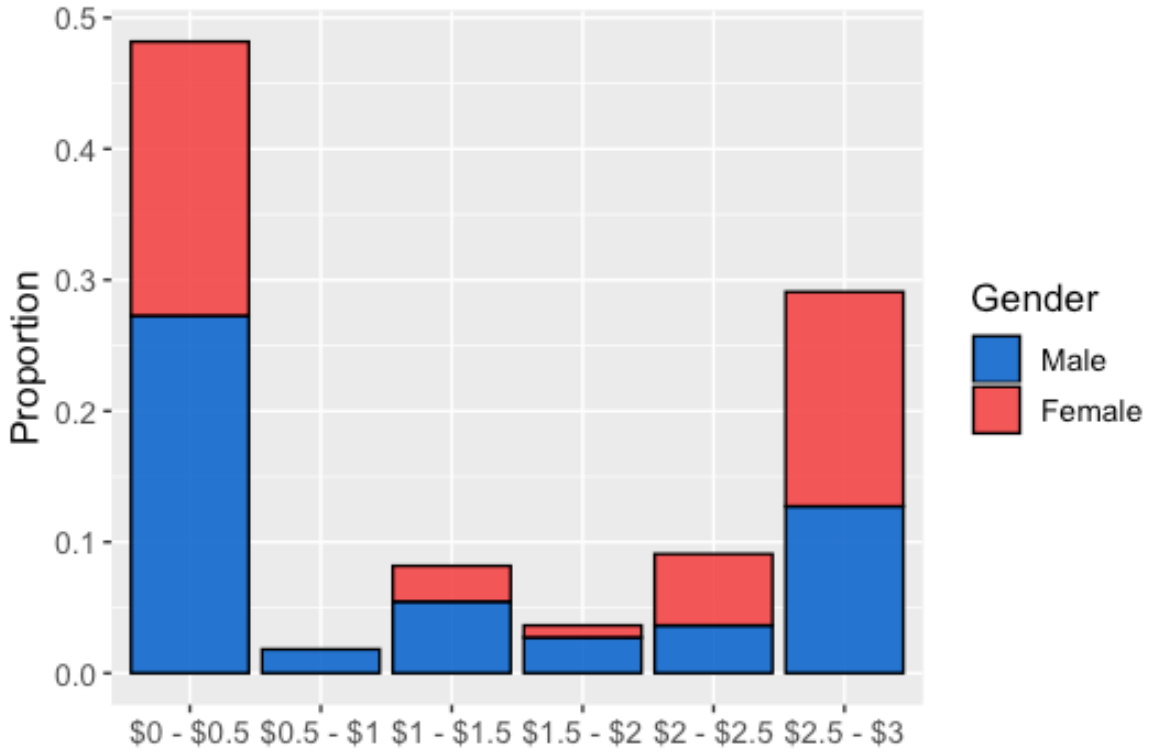

Figure A5: Distribution of transfers made by dictators in *Influence Prize* by gender

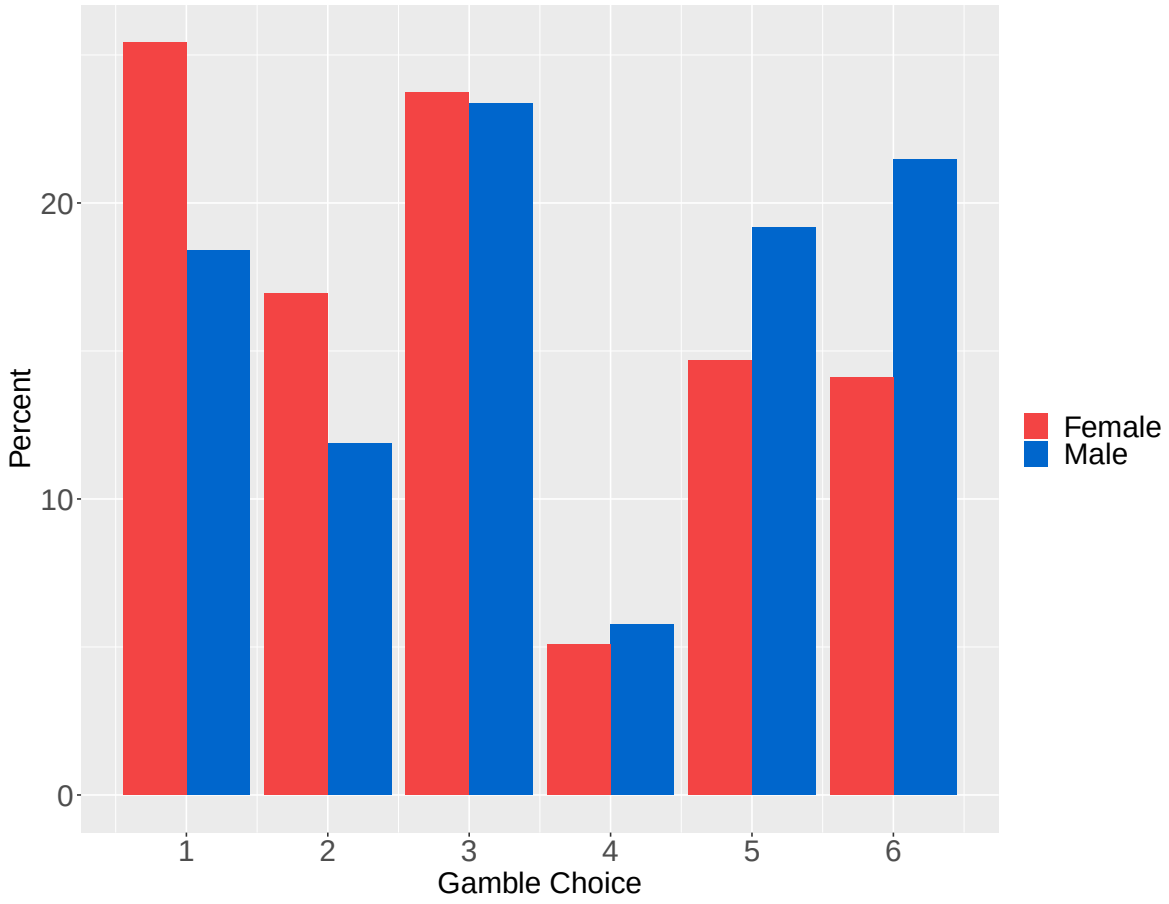

Figure A6: Choices made by gender in the risk elicitation task with higher numbers representing greater risk tolerance. Pooled across treatments, the risk index averages 3.09 for females and 3.60 for males (t-test, $p = 0.004$); the two distributions are borderline significantly different (K.S. test, $p = 0.076$).

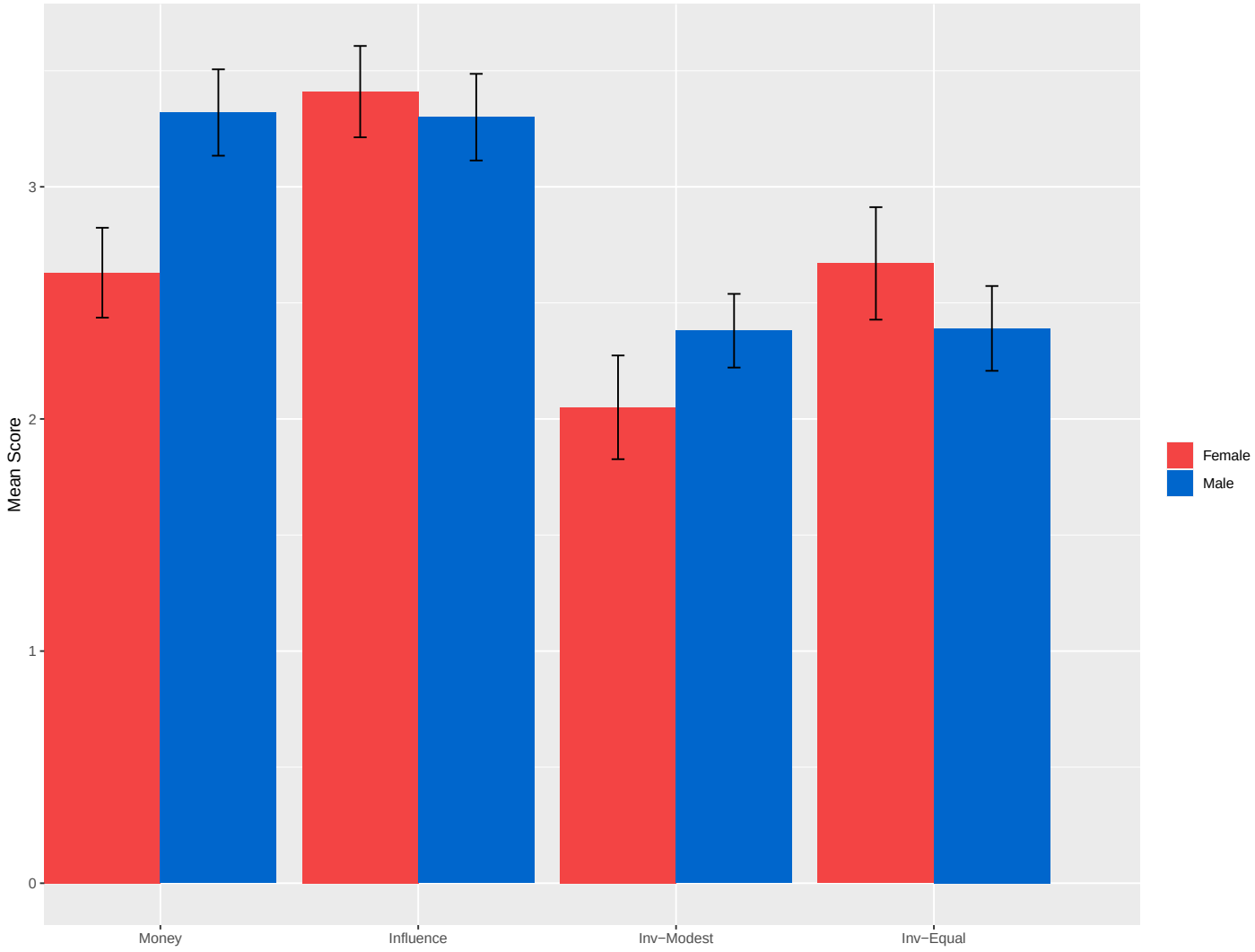

Figure A7: Task performance. Bars represent the average number of correct matrix problems solved by male (blue) and female (red) participants by treatment. Error bars represent mean +/- standard error.

7.4 Tables

Table A1: Summary Statistics of MTurk Sample by Treatment and Balance Check

	All	(1) Money	(2) Influence	t-test
	Mean	Mean	Mean	(1) vs. (2)
	(S.E.)	(S.E.)	(S.E.)	p-value
Female	0.40	0.36	0.45	0.076
	(0.02)	(0.03)	(0.03)	
Age	35.30	35.41	35.18	0.813
	(0.50)	(0.68)	(0.73)	
White	0.76	0.77	0.74	0.44
	(0.02)	(0.03)	(0.03)	
Parent	0.37	0.38	0.37	0.767
	(0.02)	(0.03)	(0.03)	
Married	0.35	0.35	0.35	0.906
	(0.02)	(0.03)	(0.03)	
Education	2.27	2.28	2.27	0.876
	(0.04)	(0.06)	(0.06)	
Income	2984.60	2988.53	2980.39	0.955
	(72.40)	(98.24)	(107.06)	
N	438	223	215	

Notes: Means with standard errors in parentheses. Education is 1-3 index indicating 1=up to secondary, 2=some post-secondary, 3=completed college or more. Income is average monthly household income.

Table A2: Gender Composition of Winners in Money and Influence

	1st Rank		2nd Rank		Total	
	Money	**Influence**	**Money**	**Influence**	**Money**	**Influence**
Male						
N	38	31	41	28	79	59
%	**66.7**	**56.4**	**71.9**	**50.9**	**69.3**	**53.6**
Female						
N	19	24	16	27	35	51
%	**33.3**	**43.6**	**28.1**	**49.1**	**30.7**	**46.4**
Total						
N	57	55	57	55	114	110

Table A3: OLS Estimates Regressed on Score

	(1) All	(2) All	(3) All	(4) Money	(5) Money	(6) Influence	(7) Influence	(8) Men	(9) Men	(10) Women	(11) Women
Female	-0.69**	-0.61**	-0.62**	-0.69**	-0.77**	0.10	-0.02				
	(0.28)	(0.29)	(0.29)	(0.29)	(0.31)	(0.27)	(0.30)				
Influence	-0.01	-0.02	-0.03					-0.01	-0.12	0.78***	0.60*
	(0.25)	(0.25)	(0.26)					(0.27)	(0.28)	(0.28)	(0.28)
Female × Influence	0.79**	0.73*	0.69*								
	(0.40)	(0.40)	(0.41)								
Gamble		-0.03	-0.04		-0.03		-0.07		-0.05		-0.05
		(0.05)	(0.06)		(0.08)		(0.08)		(0.08)		(0.08)
Age		-0.01	-0.01		0.01		-0.03**		0.01		-0.03*
		(0.01)	(0.01)		(0.02)		(0.01)		(0.02)		(0.01)
White		0.65***	0.74***		0.56		0.91***		0.63***		0.80*
		(0.23)	(0.24)		(0.35)		(0.32)		(0.32)		(0.36)
Parent		-0.35	-0.36		-0.12		-0.72*		-0.40		-0.28
		(0.25)	(0.25)		(0.35)		(0.37)		(0.38)		(0.33)
Married		0.07	-0.02		-0.13		0.10		-0.11		0.19
		(0.24)	(0.25)		(0.34)		(0.37)		(0.37)		(0.34)
Secondary Ed.			-0.00		0.61*		-0.62*		0.04		-0.05
			(0.23)		(0.33)		(0.31)		(0.30)		(0.34)
Fulltime			-0.10		0.10		-0.36		-0.67**		0.47
			(0.23)		(0.33)		(0.31)		(0.34)		(0.30)
Income			0.00+		0.00+		0.00		0.00**		-0.00
			(0.00)		(0.00)		(0.00)		(0.00)		(0.00)
Constant	3.32***	3.37***	3.15***	3.32***	2.03***	3.30***	4.26***	3.32***	2.82***	2.63***	3.21***
	(0.17)	(0.43)	(0.51)	(0.17)	(0.73)	(0.18)	(0.68)	(0.18)	(0.69)	(0.21)	(0.72)
N	438	437	422	223	218	215	204	261	249	177	173

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: OLS Estimates Regressed on Score

	(1) All	(2) All	(3) All	(4) Men	(5) Men	(6) Women	(7) Women
Female	-0.16	-0.69**	-0.59**				
	(0.14)	(0.27)	(0.28)				
Influence	0.30	-0.014	-0.068	-0.014	-0.09	0.78**	0.61*
	(0.19)	(0.26)	(0.27)	(0.26)	(0.27)	(0.28)	(0.28)
Inv-Modest	-0.80***	-0.94***	-0.82***	-0.94***	-0.77***	-0.58**	-0.60
	(0.19)	(0.25)	(0.25)	(0.25)	(0.25)	(0.30)	(0.30)
Inv-Equal	-0.58***	-0.93***	-0.75***	-0.93***	-0.73***	0.042	0.010
	(0.20)	(0.26)	(0.27)	(0.26)	(0.27)	(0.31)	(0.33)
Female*Influence		0.79**	0.75				
		(0.38)	(0.39)				
Female*Inv-Modest		0.36	0.35				
		(0.38)	(0.38)				
Female*Inv-Equal		0.97**	0.82**				
		(0.41)	(0.41)				
Risk			-0.05		-0.04		-0.08
			(0.04)		(0.05)		(0.05)
Age			-0.01		-0.007		-0.02
			(0.01)		(0.009)		(0.010)
White			0.58***		0.51***		0.66***
			(0.15)		(0.20)		(0.25)
Parent			-0.35*		-0.50**		-0.12
			(0.18)		(0.25)		(0.26)
Married			-0.28		-0.31		-0.13
			(0.19)		(0.26)		(0.27)
Education			-0.09		-0.17		0.08
			(0.09)		(0.12)		(0.15)
Income			0.13***		0.19***		0.03
			(0.05)		(0.06)		(0.07)
Constant	3.13***	3.32***	3.41***	3.32***	3.40***	2.63***	2.85***
	(0.15)	(0.19)	(0.39)	(0.19)	(0.50)	(0.19)	(0.54)
N	842	842	818	532	513	310	305

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$