frontiers | Frontiers in Behavioral Economics

TYPE Brief Research Report
PUBLISHED 27 November 2024
DOI 10.3389/frbhe.2024.1455686

OPEN ACCESS

EDITED BY
Giorgia Romagnoli,
University of Amsterdam, Netherlands

REVIEWED BY
Alexander K. Koch,
Aarhus University, Denmark
Florian H. Schneider,
University of Zurich, Switzerland

*CORRESPONDENCE
Marcus Giamattei
✉ marcus.giamattei@uni-passau.de

RECEIVED 27 June 2024
ACCEPTED 28 October 2024
PUBLISHED 27 November 2024

CITATION
Giamattei M and Werner K (2024) Gender differences in post-competition honesty—An experimental analysis.
Front. Behav. Econ. 3:1455686.
doi: 10.3389/frbhe.2024.1455686

Gender differences in post-competition honesty—An experimental analysis

Marcus Giamattei[1,2]* and Katharina Werner[2,3]

[1]Frankfurt School of Finance and Management gGmbH, Frankfurt, Germany, [2]School of Business, Economics and Information Systems, University of Passau, Passau, Germany, [3]Faculty of Management, Economics and Social Sciences, University of Cologne, Cologne, Germany

While competition is an inherent element of most market activities and immanent in many organizations, competitive incentives may bring about negative externalities, such as unethical behavior. This study examines whether competition affects subsequent honesty in an unrelated task, focusing on gender differences. Our experiment, which includes a real effort task under piece rate and competitive compensation schemes, reveals no overall treatment effects on honesty. However, competition affects men and women differently: women become more honest, while men become (insignificantly) more dishonest. This results in a gender gap in post-competition honesty and, therefore, in payoffs, highlighting the importance of carefully designing incentive schemes that consider gender-specific responses.

KEYWORDS

spillover, competition, incentives, honesty, experiment

1 Introduction

Competitive components often characterize market interactions. Companies and individual market participants compete in exchanging goods and services, and companies and job applicants compete in labor markets. Within organizations, introducing competition among employees, such as for a bonus, is a strategy employed by designers of organizational reward systems to boost productivity. Even when not expressly mandated, competition is inherently present in most workplaces. For instance, advancements within company hierarchies can be viewed as a form of competitive rivalry among employees. Numerous past studies have demonstrated the effectiveness of competitive incentives in motivating effort (Condly et al., 2008; Bracha and Fershtman, 2013; DellaVigna and Pope, 2018; Erkal et al., 2018).

However, a drawback of competitive incentives is the possibility that people will resort to unethical behavior to secure victory. The literature extensively discusses whether competition undermines or fosters ethical conduct (see, for instance, a recent large-scale study by Huber et al., 2023, or Bartling et al., 2015, 2023 for a focus on markets). Some research suggests that competition may erode ethical standards (Shleifer, 2004; see also Sandel, 2012; Falk and Szech, 2013, or Ziegler et al., 2024 for market competition). For instance, studies have revealed that competition can heighten tendencies toward sabotage (Harbring and Irlenbusch, 2011; Balafoutas et al., 2012) or dishonesty *within* competitive scenarios (Schwieren and Weichselbaumer, 2010; Conrads et al., 2014). Nonetheless, the spillover effects of competition on *subsequent* behavior in an unrelated domain remain largely unexplored [see Dolan and Galizzi (2015) for a discussion of the importance of understanding behavioral spillovers and a conceptualization of such spillovers]. Empirical research on spillovers thus far has widely documented spillovers from *ethical behavior* in

one scenario on *ethical behavior* in another scenario (e.g., Brañas-Garza et al., 2013; Gneezy et al., 2014; see Dolan and Galizzi, 2015 for an overview), but there is little evidence on spillovers of *competition* on *ethical behavior* (i.e. spillovers in unrelated domains). Hence, this article addresses the following question: Does exposure to a competitive environment influence subsequent honesty in an unrelated task or domain?

Besides ethical concerns, discussions surrounding competition often touch on gender equality issues and the persistent gap in (labor) market outcomes. A large body of research demonstrates that competition affects men and women differently (e.g., Niederle and Vesterlund, 2007; Croson and Gneezy, 2009; Gneezy et al., 2003; Dato and Nieken, 2014; Nieken and Dato, 2016), which may shed light on the factors contributing to gender inequality. Women have been found, on the one hand, to be less willing to enter into competition than men (e.g., Niederle and Vesterlund, 2007, 2011; Datta Gupta et al., 2013; Sutter and Glätzle-Rützler, 2015; van Dolder et al., 2020). On the other hand, some studies also show that a performance gap between men and women arises or increases under competition (e.g., Gneezy et al., 2003; Gneezy and Rustichini, 2004). Further, it has been shown that men are more likely to sabotage in a competition than women (Dato and Nieken, 2014).

In addition to the well-established immediate impacts of competition, a competitive environment could trigger further gender-related effects beyond the initial competition. If competition influences behavior in subsequent tasks unrelated to the original competition, it could differently affect men and women in these unrelated domains. If, for example, men become more dishonest or women become more honest after having been exposed to a competitive environment, this could potentially exacerbate gender differences beyond what has been previously assumed. Our second research question thus addresses whether competition leads to divergent spillover effects on the honesty of men and women.

We implement a pre-registered experiment consisting of two parts. In the first part, subjects perform a real effort task: counting the number of zeros in 3×4 matrices of ones and zeros. In two treatments, we vary whether subjects perform this real effort task under piece rate or competitive compensation. A subject earns a fixed piece rate per correctly solved matrix in the piece rate treatment. In competition, a subject competes against another subject, and the winner receives a substantially higher piece rate than the loser. We then measure spillover effects on honesty in part 2, where subjects are incentivized to lie to increase their own payoff. At the same time, lying reduces another person's payoff.

We find no aggregate treatment effects; our subjects are as honest after the competition as after the piece rate or competition treatment. However, in line with our preregistered hypotheses, we find that the competitive incentive scheme has different spillover effects on women and men: Women become more honest after exposure to competition, while men become (insignificantly) more dishonest. This leads to a significant gender gap in post-competition honesty and, consequently, to significantly higher payoffs for male than female participants.

Our study contributes to the literature on the effects of competition on ethical behavior. It demonstrates that even a brief competitive interaction can have spillover effects on a subsequent, unrelated task. Our results confirm findings from the gender and competition literature that men and women may respond differently to competition. For the literature on the effects of competition on ethical behavior, it is important to consider such different responses when evaluating the effects of competition. While no treatment effects were found from an aggregate perspective, competition did induce a gender gap in honesty and, consequently, a gender pay gap. This implies that incentive schemes must be carefully designed and that organizations should be aware of the diverging impact of competition on men's and women's ethical behavior.

2 Method

The experiment consisted of two parts, A and B: Part A encompassed working on a real-effort task, and part B consisted of a moral decision task. The real-effort task in part A was performed under different incentive schemes depending on the treatment. Subjects received instructions on each task only before the respective task. Subjects were informed that the computer would randomly determine whether part A or B would be payoff-relevant. We randomly selected one part to avoid hedging. The payoff-relevant part was the same for the entire session to ensure that subjects could not justify cheating by assuming the other part would be selected for the other participant. We calibrated the payoffs so that the expected payoffs of both parts were equal. The full instructions can be found in Supplementary Section 8.

In part A, subjects were matched in pairs and performed a real-effort task. In the real effort task, subjects were asked to count the number of 0s in 3×4 matrices consisting of 0 s and 1 s for 60 s. We used this task because, in a pilot study, we found little difference in performance between genders and also between stereotypes of male and female performance (see also Charness et al., 2022). As a measure of performance, subjects earned points for each correct matrix, which determined their payoffs. At the beginning of part B, subjects were rematched, so they had not previously interacted with their counterpart. This was done to avoid any retaliation or compensation for losses.

In part B, we used an innovative lying task to measure both the willingness to lie and the extent of lying. We opted for a design in which individual lying was observable but not overtly so. This design ensures a high statistical power to detect lying while preserving some moral wiggle room to lie.

Figure 1 shows an example screen of the lying task. The screen contained 16 boxes, all of which were closed. The boxes contained combinations of payoffs that would become visible when subjects hovered over them. These payoff combinations for oneself and the other participant would always add up to 200 so that a higher payoff for oneself would reduce the other participant's payoff. We displayed a fixed set of 16 payoff combinations in four different orders, one of which was randomly selected for each subject. The payoff combinations ranged from 2 for oneself and 198 for the other to the reverse. The full set of available payoff combinations can be found in the Supplementary Section 1. Subjects were explicitly asked to select a box, hover over that box, and remember the payoff

to themselves from that first box. This would be the outcome they were asked to report. They were also instructed to hover over as many boxes as they wanted. The only constraint (which subjects were also informed of) was that the computer would check whether the reported payoff was present in any of the boxes.

We introduced role uncertainty by having all subjects perform the lying task, after which the computer randomly decided whose decision would be implemented to determine the payoffs for a pair of subjects. Before performing the lying task, subjects could familiarize themselves with the interface in a test task, where they saw the sixteen boxes (but without payoffs) and could try hovering.

While part B (the lying task) was identical for all subjects, we varied part A according to our two treatments—piece rate and competition. This article does not report the results of a third treatment involving team incentives.

Each subject received 6 points for each correctly solved matrix in the treatment piece rate. This was our baseline, with no competition. Subjects were also instructed that they would only be informed about their own performance on the task and their resulting payoff. To make our treatments comparable, we told subjects that another participant was doing the same task but that we would not inform them about the other participant's performance on the task and the resulting payoff, and vice versa. We chose this design feature to avoid social comparison between participants, which could have induced competitive elements.

In the treatment competition, subjects were informed that the number of matrices they solved would be compared to the number solved by the other participant. The subject who solved more matrices correctly received 11 points per matrix, while the other received only 1 point per correctly solved matrix. In this way, we introduced competition in the widely-used Niederle and Vesterlund (2007) style, but with only two players per group and without leaving the loser with no payoff.[1] To make the competition more salient and to create a sense of interactivity, we added a real-time feature to the screen that indicated (after each matrix submission) whether a subject currently had solved more or fewer matrices than the other participant. In the case of a tie, we applied a two-step procedure. If there was a tie in the number of correctly solved matrices, we compared the number of attempts to determine the winner, such that the participant who made fewer mistakes won. A random draw determined the winner if there was also a tie in the number of attempts. This was also known to our subjects.

1 One might conjecture that this form of stochastic and unequal payment may induce differences in behavior that are unrelated to competition. We do not consider this an issue. First, this form of payment is widely used in the literature, because inequality and payoff uncertainty are deemed inherent elements of competition. Second, Heursen (2023) shows that participants perceive a situation as equally competitive and respond similarly to the situation no matter whether there is only relative performance feedback or additional relative pay, which speaks against the concern of inequality aversion playing a major role. Third, Greiff and Giamattei (2024) compare a treatment with a stochastic payment, in which a participant randomly receives the high or low payment, to the piece rate treatment and find no behavioral differences. This suggests that the stochastic element does not play a major role.

At the end of the experiment, subjects completed a short post-experimental questionnaire with demographic questions and questions on their self-reported willingness to take risks, competitiveness, ambitiousness, and how well they believed to have performed in comparison to other participants in the counting zeros task. We use these as controls in our regressions. After completing the questionnaire, subjects were informed of which part was randomly selected to determine the payoff and about their earnings.

We conducted the experiment online using LIONESS Lab (Giamattei et al., 2020), using two university student subject pools. Based on power calculations (with conventional values for β (0.2) and α (0.05) and assumed effect sizes based on our own and other previous studies) and our preregistration, we sampled 389 subjects. 298 subjects were from the Cologne subject pool and 91 from the Passau subject pool. 204 identified as female, and the mean age was 26.6 years. We sampled our participants such that they were evenly distributed across gender and conditions (before dropouts and exclusions). We ended up with 87 male and 103 female participants in treatment piece rate, and 90 male and 101 female participants in treatment competition. We obtained ethical approval from the Institutional Review Board of the Gesellschaft für experimentelle Wirtschaftsforschung e.V. (L5J8U9sE). The Supplementary material details the experimental procedures (Section 2), subject exclusion criteria (Section 3), and the power calculations we performed to determine the sample size (Section 6).

3 Results

All our results refer to our preregistered hypotheses (AsPredicted #123493), which can be found in Supplementary Section 4. Our main measures of dishonesty distinguish between the prevalence of lying, i.e., a binary variable indicating whether participants did not report the payoff of the first box they hovered over, and the extent of lying, measured as the deviation between the payoff under the first box they hovered over and the reported payoff. All results refer to lying for one's own benefit, i.e., to increase one's monetary payoff.

We use Fisher's exact tests to non-parametrically test for differences in the prevalence of lying and Mann-Whitney tests to non-parametrically examine differences in the extent of lying.

Figure 2 shows the prevalence of lying across our treatments. Around 30% of our participants lie on average, with no significant difference between our treatments ($p = 0.409$). We also find no significant difference between treatments if we look only at men ($p = 0.267$). Conversely, women are less likely to lie after the competition, with this result being marginally significant ($p = 0.083$).

An interesting pattern emerges when we look at the difference between genders within a treatment. In treatment piece rate, men and women are similarly likely to lie, with values of 32% for men and 29% for women. Instead, in treatment competition, men are much more likely to lie at 38%, while only 20% of women do. This difference is statistically significant ($p = 0.005$).

Figure 3 displays the extent of lying. On average, the reported value deviates from the actual value in the box by about 36 points

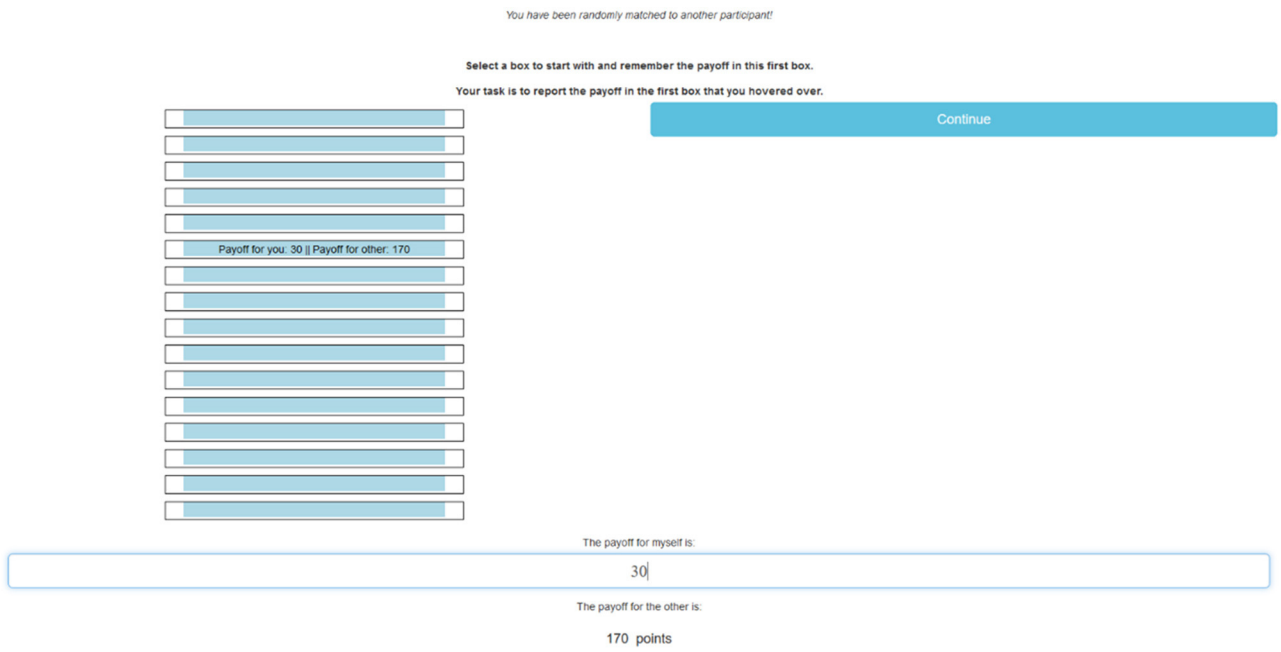

FIGURE 1
Sample screen.

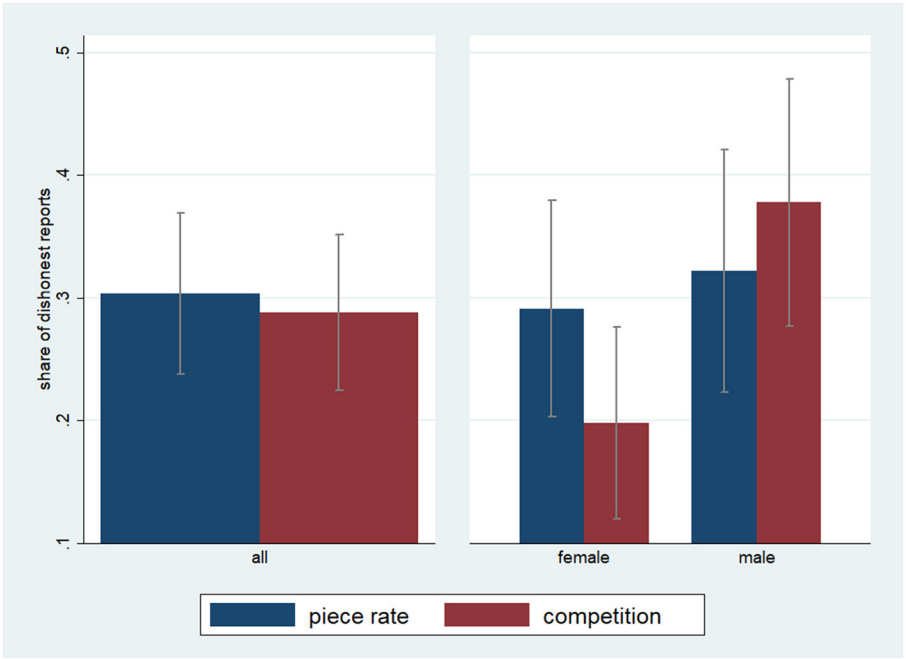

FIGURE 2
Prevalence of lying by treatment and by treatment and gender.

(in a possible range of reported payoffs from 2 to 198 points for oneself). Again, there is no overall difference between treatments when looking at all participants ($p = 0.8099$). Looking at gender differences, a similar pattern emerges as for the prevalence of lying. We find no significant difference between treatments for men ($p = 0.4129$) and women ($p = 0.1526$). However, when we compare men and women within the competition treatment, we find that women lie to a smaller extent, which is significant ($p = 0.0048$).

In Table 1, we run regressions to assess the robustness of our results. We regress the dependent variable [a dummy variable

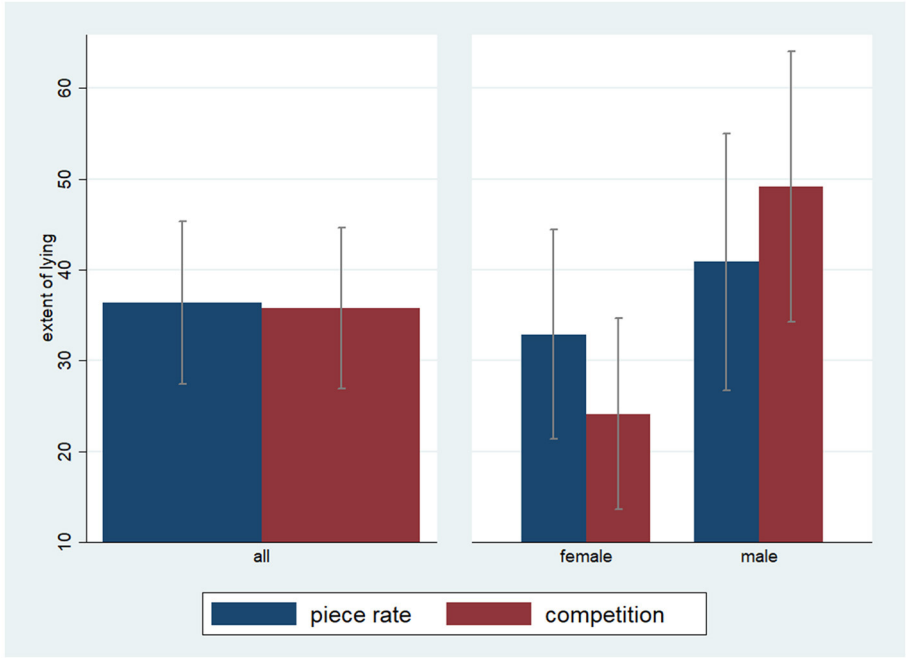

FIGURE 3
Extent of lying by treatment and by treatment and gender.

TABLE 1 Regressions.

	(1)	(2)	(3)	(4)	(5)
	Dishonest	Dishonest	Dishonest, competition	Extent of lying	Extent of lying, competition
Competition	0.25	0.25		8.13	
	(0.32)	(0.37)		(11.46)	
Female	−0.14	−0.21	−0.97*	−11.90	−25.53*
	(0.32)	(0.34)	(0.39)	(9.56)	(10.03)
Competition # female	−0.76^{+}	−0.83		−16.66	
	(0.46)	(0.52)		(14.12)	
Constant	−0.75**	0.24	−3.34^{+}	46.13	−58.11
	(0.23)	(1.10)	(1.96)	(31.25)	(54.51)
Controls	No	Yes	Yes	Yes	Yes
Observations	381	329	157	329	157
(Pseudo) R^2	0.017	0.073	0.113	0.074	0.151

Logit (1)–(3)/OLS (4)–(5), standard errors in parentheses clustered on group level.
Controls: Score in Part A, age, risk appetite, ambitiousness, confidence, location (Passau/Cologne), order of boxes in Part B.
$^{+}p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

indicating the prevalence of being dishonest, (1)–(3), a continuous variable expressing the extent of lying, (4)–(5)] on a female dummy. In (1)–(2) and (4), we use the full sample and additionally include a dummy for the treatment and the interaction of the treatment with the female dummy. In (3) and (5), we consider only the competition treatment to examine within-treatment gender effects. Regressions (2)–(5) include various controls (such as age, confidence, competitiveness, ambition, risk appetite, etc.). The regressions support the results from the figures and our non-parametric hypothesis tests: The coefficient for competition is positive but insignificant in all regressions, suggesting that men become (insignificantly) more dishonest after exposure to competition. The coefficient for female is negative and insignificant, implying that women are insignificantly less dishonest than men in treatment piece rate. The marginally significant interaction term in regression (1) confirms that women become slightly more honest relative to men post-competition than after piece-rate (i.e., that the gender difference is more pronounced in treatment

competition than in treatment piece-rate), as long as we do not include other controls [see regression (2)]. These three effects result in a significant gender gap in the competition treatment, both in the prevalence and the extent of dishonesty, as indicated by the coefficient for the female dummy in regressions (3) and (5), respectively. An additional marginal effect calculation on regression (3) reveals that women are about 17 percentage points less likely to be dishonest than men. Their lies are, on average, 25.53 points smaller than men's, as indicated by the coefficient in regression (5).

Supplementary Table S2 in the Supplementary Section 5 contains tables with coefficients for the full set of controls. The only notable effect of the control variables is that the Passau sample is characterized by a lower prevalence and extent of lying.

4 Discussion

This article examined competitive incentives and subsequent ethical behavior as an example of a potential externality. Specifically, we experimentally investigated spillovers from an environment with competitive incentives to honesty in an unrelated task. In a two-stage experiment, subjects were exposed to individual vs. competitive incentives in a real effort task. In the second stage, we used an innovative lying task to assess individuals' propensity to lie for their own benefit.

We find no overall treatment effect of the incentive scheme on the unrelated subsequent lying task. Closely related to our study, Schurr and Ritov (2016) find no overall spillover effect of competition on honesty. They report an effect only when looking at competition winners. In contrast to our study, they investigate spillovers between repeated interactions among the same dyad of subjects. Similarly, Heursen (2023) has participants interact with the same other participants in both parts of her experiment and finds no effect of relative performance feedback on subsequent willingness to support others' productivity. In contrast to Schurr and Ritov (2016) as well as Heursen (2023), we rematched our subjects between Task A and B so that they interacted with a different person. Therefore, the behavior in our part B was truly unrelated to part A.

Overall, we can conclude that competitive spillovers on honesty may work differently than spillovers on other domains. For example, studies have shown that competitive incentives may harm cooperation and prosocial behavior (Buser and Dreber, 2016; Grosch et al., 2022; Greiff and Giamattei, 2024). This seeming contradiction could be because while competition may encourage selfish behavior, most competitive environments are governed by clear and transparent procedures and rules that may signal that dishonesty is unacceptable.

On the other hand, we find that competition affects men and women differently with respect to their subsequent lying behavior. Post-competition, men tend to lie more often and to a larger extent than women. This is consistent with results by Dato and Nieken (2014), who find that women sabotage less than men within a competition, and with Nieken and Dato (2016), who show that women cheat less *within* a competitive than in a non-competitive setting. We extend these findings by showing a similar pattern *between* competition and an unrelated task. This suggests that competition also affects other domains and parties that are not directly involved in the competition and may thus have more far-reaching gender-specific consequences than previously assumed.

Our findings also speak to the extensive literature documenting gender-specific reactions to competitive environments. The gender effect we have found was mainly driven by women becoming more honest post-competition. Various studies show that women have a lower preference for competition than men (Niederle and Vesterlund, 2007, 2011) and that men respond more strongly to competitive incentives (Gneezy et al., 2003; Gneezy and Rustichini, 2004; Murad et al., 2019). One potential mechanism is that women exhibit different hormonal reactions to stress than men (Bateup et al., 2002; Taylor et al., 2000). These hormonal reactions make men more likely to attack or flee, while women respond by caring for others and reaching out to their social networks. A related reason may be that women are more inequality-averse than men, and competitive incentive schemes increase inequality (Balafoutas et al., 2012; Dasgupta et al., 2019). Being forced to compete may thus induce some discomfort in women and an urge to compensate for the competition and its associated inequality. This could explain why women are less willing to lie for their own benefit in our setting, which would harm the other party and could further induce inequality. This explanation is also supported by the fact that a gender gap in honesty often arises when lying harms others (Dreber and Johannesson, 2008; Bühren and Kundt, 2014; Grundmann and Lambsdorff, 2017), while there is no gender gap in lying in settings where lying can increase one's payoff without harming others (see meta-analysis by Capraro, 2018).

We test such potential mechanisms in the Supplementary Section 7. Specifically, we examine whether inequality aversion might be driving our findings by comparing the behavior of winners and losers of the competition (Section 7.1). While there appears to be a slight tendency for losers to be more dishonest than winners of the competition, the difference is not statistically significant. Moreover, the difference between winners and losers occurs mainly among male participants (Section 7.2). This runs counter to the idea that women refrain from cheating because it might exacerbate inequality (in which case we would expect female winners to lie significantly less than female losers). Moreover, the (insignificant) tendency of losers to lie more than winners in the competition treatment is mirrored by a similar tendency of the lower performer in a team treatment to lie more than the higher performer (Section 7.3). The fact that there is no inequality in this team treatment is another piece of evidence suggesting that inequality aversion is not the main driver of our results. In line with findings by Greiff and Giamattei (2024) and ideas by Heursen (2023), it rather seems that relative performance feedback might induce low performers to act more selfishly and lie more.

Our design may be subject to some limitations worth discussing. First, we focus on one-on-one competition, while competition in markets or organizational settings typically occurs between more than two competitors. Second, our design involves an honesty task with someone the subject has never interacted

with before. While this is common in market transactions, it may not be easily transferable to settings such as the workplace, where lying may occur to the same person with whom one has previously competed. We are uncertain as to how this could affect our results. If anything, we would expect the gender effects of prior competition to be stronger and might even find aggregate treatment effects for such a same-person interaction. Anonymity may also be much lower in such a setting, and it is difficult to predict how this would affect the results. A third issue could be that in our experiment, individual-level lying was observable, while in many studies lying at the individual level is not detectable (Abeler et al., 2019). Fourth, we studied a one-time interaction, whereas competition may only erode moral values after long-term interaction (Bartling et al., 2023). The latter two design features may have led to lower levels of lying. Finally, like in most other lab experiments on spillover effects, the spillover effects were measured directly after the competition took place. We know very little about how long such effects might last beyond the short time frames typically implemented in such experiments (see also Dolan and Galizzi, 2015). However, our design allows for many potential extensions and additional treatments that will enable future research to test further dimensions of the research questions.

Taken together, our results imply that policymakers should pay attention to the gender composition of organizations. While competitive settings may not inherently harm societal honesty, male-dominated organizations could generate more significant negative externalities than gender-balanced or female-dominated ones. Therefore, aligning initiatives to promote organizational social responsibility with efforts to enhance gender equality could achieve dual benefits.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: Repository x-econ.org. Link: http://x-econ.org/xecon/#!VerifyLink/ca80d911-1a3e-4ca2-b46a-94cbde0246e4.

Ethics statement

The studies involving humans were approved by German Society for Experimental Economic Research/Gesellschaft für experimentelle Wirtschaftsforschung e.V. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MG: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. KW: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. The research has been financed by Jun-Prof. Matthias Greiff's fixed budget at the Technical University of Clausthal.

Acknowledgments

We thank Susanna Grundmann and Matthias Greiff, who started the project with us and helped develop the setup and collect the data. We especially thank Matthias Greiff for financing the participants' payoffs. We used Grammarly to perform language and grammar checks.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frbhe.2024.1455686/full#supplementary-material

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