The Influence of a Competition on Noncompetitors

Supporting Information (SI Appendix)

Further Discussion on the Studies

Study 1. As stated in the main text, the results from Study 1 are subject to several potential confounding factors that are peculiar to this field setting. One potential confounding factor is that the noncompetitors might have felt guilty and obliged to pay more because they had turned down the zoo's invitation to participate in the competition. But note that the customers could pay whatever they liked whether they were competitors or not. In turning down the option to participate in the competition, the noncompetitors had not shut themselves off from paying any amount to the zoo, nor had they compromised any moral obligations.

Another potential confounding factor is that customers in the treatment conditions could have perceived the competition as a new means to raise funds, and by implication, that the zoo might be in dire need of revenues. Therefore, it could be argued, noncompetitors would be motivated to pay more than they would have done without being aware of the competition. However, from our observations in the field, the zoo had a public image to the local population (who made up a large majority of its customers) of being very well funded. We find no evidence that the PWYW initiative or the competitions were perceived as fundraising exercises.

A third confounding factor can be put forward based on self-selection. The policy of the zoo dictated that customers who entered the zoo on the days of the competitions must be entitled to compete. That is, any noncompetitor observations could only be from customers who voluntarily opted out of their assigned competition. The field experiment is in fact empirically useful in this sense, as many competitions in real life involve voluntary participation. Nevertheless, the policy

also implies potential self-selection issues, as customers self-selected into the role of competitors or noncompetitors. As stated in the main text, we address these issues in Study 2A – from which we obtain confirmatory evidence of the contagion effect in a more controlled setting, with exogenous random assignment of competition roles.

Study 2B. Here, we propose three possible alternative mechanisms for the observed contagion in the two previous studies. One alternative mechanism is that the noncompetitors might have been conscious of being assigned into one half of a group with the other half being the competitors. This group assignment might have increased social comparison motivations among the noncompetitors leading to improved performance (1, 2). While the group assignment is part of the implementation of the experimental conditions, its potential effect is not necessitated, in principle, by the awareness of a competition, but by more general group dynamics. Another alternative mechanism is that the presence of an additional incentive among competitors might have created a vicarious motivating effect on noncompetitors. A third alternative mechanism can be proposed based on an anchoring effect mechanism: the awareness of a competition might have induced the noncompetitors in our studies to hypothesize that the performance levels of the competitor would be higher than had there been no competition at all; the hypothesized performance levels could have in turn induced an anchoring effect (3) that caused the noncompetitors to perform better. While this alternative mechanism is driven by the awareness of a competition, it is not necessitated, in principle, by that awareness, but by the anchoring effect that follows it.

In Study 2B, participation roles are randomly assigned within each 50-person groups - with half of the group being assigned to be participants and the other half being assigned to be nonparticipants; an additional incentive is present among the participants of the scheme; and

nonparticipants of the scheme might hypothesize that the participants of the scheme would perform better than had there been no incentive scheme, which could then induce an anchoring effect. As discussed in the main text, we observe no contagion effect in Study 2B. As such, we obtain evidence that the contagion effect in previous studies is necessitated by the awareness of a competition, and none of the proposed alternative mechanisms could account for it.

Notes on Methods and Further Data Analysis Results

Study 1. Formally, the treatment conditions form a 2(framing: neutral versus contest) × 2(number of prizes: one versus seven) between-subjects design. The manipulations are as described in the next section of this document.

We analyze the payment data of customers who stated they were visiting the zoo for the first time during the period of the experiment, and focus on the price the customer decided to pay for his/her own entry. As such, we screen out questionnaire respondents who, as noted by the zoo staff at the entrance, were not adults, and thus were relatively likely to have not made independent payment decisions; these respondents made up 3.14% of the pre-screening payment observations. The final dataset consists of a total of 22,886 payment observations from 12,076 (52.77%) self-reported females and 10,212 (44.62%) self-reported males; the remaining 598 or 3.61% payment observations have missing data on gender.

Of the analyzed payment observations, 13,056 (57.05%) are from the control condition and 9,830 (42.95%) are from the treatment conditions. Among the latter, 1,652 are from customers who opted to participate in the competition, yielding a participation rate of 16.81%. The remaining 8,178 observations are from noncompeting customers who were aware of the existence of an ongoing competition but were not taking part in it themselves.

A 2 (framing) × 2 (number of prizes) between-subjects ANOVA on noncompetitors' payments in the treatment conditions does not yield any significant main or interaction effects ($P > 0.25$ for the main effects; $P = 0.11$ for the interaction), suggesting that the contagion in our field experiment is robust across the treatment conditions: neither an explicit contest framing or a reward structure with a single prize, is needed for the contagion.

The overall mean PWYW payment of competing consumers is 6.34 Euros (s.d. = 3.84 Euros, 95% CI: [6.15,6.52]) across conditions, a 16.97% increase from the control that is statistically significant ($t(14,706)=12.17, P<0.01$). Participation in a competition over PWYW payments with prizes leads to higher payments, which is predictable from both psychological and economic perspectives. It is also useful to confirm that the payments of competitors are generally higher than those of noncompetitors: aggregate comparison yields $t(9,828)=6.86$, $P < 0.01$, and the same conclusions hold for pairwise *t*-tests for each treatment condition ($P < 0.01$ in all comparisons).

Study 2A. Formally, the treatment conditions form a 2(competition context: no competition versus competition) × 2(competition role: competitor versus noncompetitor) × 2(competition reward: $0.5 versus $10) mixed design, where competition context is a within-subjects factor while competition role and competition reward are between-subjects factors. Section A, the first four rounds (round 1-4) of the slider task, being identically setup as in the control condition, form the "no competition" manipulation in terms of the within-subjects factor of competition context. Section B, the final two rounds (round 5-6), form the "competition" manipulation of the competition context factor. The other two manipulations are as described in the Materials and Methods.

Study 2B. Formally, Study 2B has a 2(incentive scheme context: no incentive scheme versus presence of incentive scheme) × 2(incentive scheme participation role: participant in scheme versus nonparticipant in scheme) × 2(incentive scheme reward: $0.5 versus $10) mixed design, where incentive scheme context is a within-subjects factor while incentive scheme participation role and incentive scheme reward are between-subjects factors.

Study 3. Formally, the treatment conditions follow a 3(competition reward: $0 versus $0.5 versus $10) × 2(competition role: competitor versus noncompetitor) between-subjects design. The lottery control conditions have a 2(lottery reward: $0.5 versus $10) × 2(lottery participation role: lottery participant versus non-lottery-participant) between-subjects design.

As is apparent in Table 4, we managed to achieve, in two of the competitions and two of the lotteries, a proportion of 25%-36% participants to be competitors/lottery participants. For the competition with $10 reward, due to unforeseeable exhaustion of the MTurk subject pool at the time of execution, we ended up assigning proportionally too many participants to be competitors. Nevertheless, the participants were informed before the tasks (as in other conditions) that approximately one-third of them would be competing, and at no point during the experiment could they have inferred otherwise.

Competitors' performance scores are higher than those of noncompetitors when the reward level was nil (reward = $0; $t(134)=3.26$, $P < 0.01$) or when the reward level was high (reward = $10; $t(185)=3.10$, $P < 0.01$). Both are in predictable directions; the first effect is especially consistent with the possibility that, even without a cash incentive, participating in a competition can still lead to higher performance because of social incentives of the kind observed in (4) and other studies. The pattern of competitors' performance scores across reward levels also has a consistent U-shaped dependence although without significant statistical

evidence (P = 0.066 and P = 0.19 when comparing competitors' scores at reward=$0.5 with reward=$0 and reward=$10, respectively).

However, performance scores do not differ significantly by participation role when the reward is positive but low (reward = $0.5, $P > 0.25$). This is consistent with a contagion effect on noncompetitors to the extent that noncompetitors' performance can approach that of competitors. Another possibility is that the low but positive reward level has an adverse effect on competitors as in (4): as the monetary incentive increases from no cash reward to $0.5, the competitors' focus might have switched from the social to the monetary aspect of the competition; but the reward level is so low that the competitors did not work too hard for it.

We find that the total performance score is positively correlated with self-reported effort in both the lottery ($r = 0.30$, $P < 0.01$) and the competition ($r = 0.43$, $P < 0.01$) conditions. Moreover, self-reported effort is positively correlated with both self-reported monetary and social comparison motivations in both the lottery and the competition conditions, with $r > 0.2$ and $P < 0.01$ in all four correlations.

Regarding the self-report measures, apart from the results reported in the main text, we also find that competitors' monetary motivation increases significantly ($t(89)=3.72$, $P < 0.01$) when the reward level increases from nil ($0) to low ($0.5). All other related pairwise t-test comparisons over changes in reward levels, including in the lottery control conditions, yield nonsignificant effects at $P > 0.15$.

It thus seems that competitors across different reward level manipulations do not perceive themselves to have exerted different effort (indeed their performance scores do not differ significantly by reward level), but their monetary motivation increases when the reward level increases from $0 to $0.5, signifying a change in focus from the social to the monetary aspect of

the competition. However, there are no corresponding changes in the lottery control conditions, despite the similar reward levels. This lends further supporting evidence that the contagion effect is necessitated by the awareness of a competition.

Instruments in the Experiments

Manipulations and Presentation of Competition Information in Study 1. In the neutral frame/1 prize condition of Study 1, the customer was presented with the following tabulated information at the outset (edited and translated from German):

Receive a Gift Card

If your payment is, among all participating customers' payments …	*… you will receive …*
… highest …	*an annual family pass to the zoo (145€) and a 400€ Amazon Gift Card*

In the contest frame/1 prize condition, the customer was instead presented with the following information:

Customer Competition

If your payment is, among all participating customers' payments …	*… you will receive the …*
… highest …	*<u>Winner prize:</u> an annual family pass to the zoo (145€) and a 400€ Amazon Gift Card*

In the contest frame/7 prize condition, the customer was presented with the following information:

Customer Competition

If your payment is, among all participating customers' payments …	*… you will receive the …*
… highest …	*Winner prize: an annual family pass to the zoo (145€) and a 135€ Amazon Gift Card*
…second highest…	*2nd prize: a 90€ Amazon Gift Card*
…third highest…	*3rd prize: a 60€ Amazon Gift Card*
…fourth highest…	*4th prize: a 40€ Amazon Gift Card*
…fifth, sixth, or seventh highest…	*5th prize: each a 25€ Amazon Gift Card*

The information presented to customers in the neutral frame/7prize condition can be inferred accordingly.

Sample Real Effort Task in Study 2A, Study 2B, and Study 3. The experiments in the three studies were conducted using the Qualtrics interface. The following is a sample of the task interface for the $10-reward/noncompetitor treatment condition in Study 3. It presents the main decision tasks as seen by subjects on their computer screens. The highlighted passages in yellow are as appeared in the experimental interface to ensure participants took note of key information. On the other hand, any text in square brackets [ ] are notes on the procedures for the purpose of this document, and is not part of the experimental interface.

Instructions

Please read the following very carefully.

Please do not communicate with other participants for the entire duration of this study.

Overview

This study consists of 4 rounds. In each round, you will undertake an identical task within a time limit of 1 minute 15 seconds.

Every participant will receive $0.5 for his/her participation in the 4 rounds.

In addition, we have randomly assigned approximately one-third of the participants to compete against each other in this study. The participant with the highest performance score among the competing participants will be the winner. The winner will be announced among the competing participants after the study is over. The winner will receive an additional reward of **$10** on top of the $0.5 participation payment. Ties will be settled by a coin toss.

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Your role

You have been assigned to be a **non-competitor** in this study. As such, you **will not be competing** with other similarly assigned participants for the **additional $10 reward**.

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Task description

This study consists of 4 rounds. In each round you will undertake an identical task within a time limit of 1 minute 15 seconds. The task will consist of a screen with 60 sliders. Each slider is initially positioned at 0 and can be moved as far as 100. You can use the mouse in any way you like to move each slider. You can readjust the position of each slider as many times as you wish.

When moved, each slider will show a number indicating its current position. Your task is to move each slider to 50. You may drag the slider from its initial position to reach 50 or alternatively click at the middle of the slider bar. **Your performance score in the study will be the total number of sliders positioned at exactly 50 over all of the 4 rounds.**

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Task results

You will see your performance score at the end of the study. You have been provided a results form, which is on your desk. Once you have received your performance score, please write this score down on the results form along with your name and email address. Please leave this form on your desk.

If you have further questions, please raise your hand and wait until the study coordinator comes over to you.

Do not ask any question aloud!

Thank you for your participation!

Please click the button below when you are ready to begin.

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Round 1 of 4

There are 60 sliders in each round.

Your task is to move each slider to 50. You may drag the slider from its initial position to reach 50 or alternatively click at the middle of the slider bar.

You have a time limit of 1 minute 15 seconds for this round. At any point during the 1 minute 15 seconds, you can scroll to the bottom and click a button to skip to the next round immediately. Please note that your performance score in the study will be the total number of sliders positioned at exactly 50 over all 4 rounds.

Please be aware that the 1 minute 15 seconds timer begins when you click the button.

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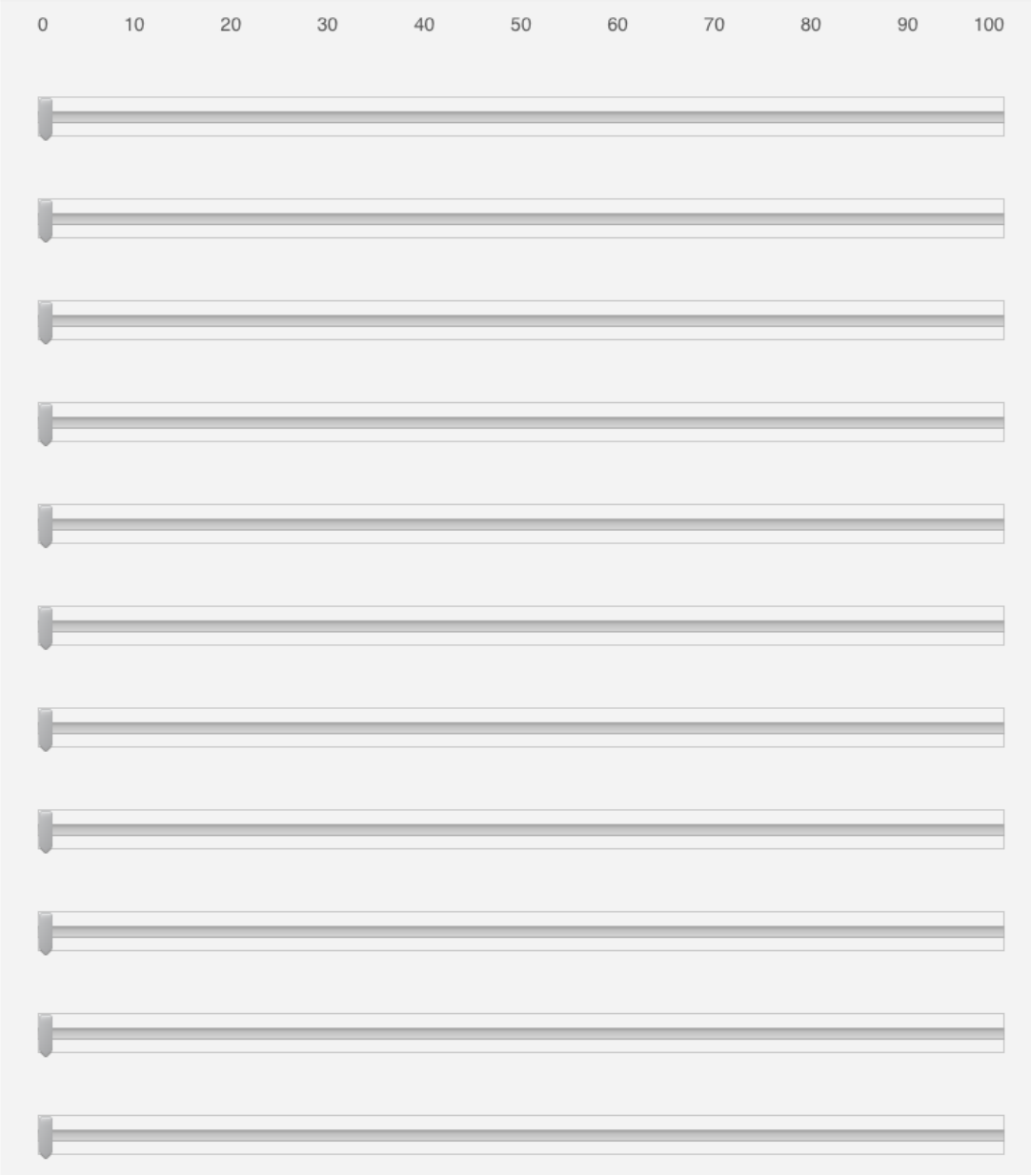
Round 1 of 4

As stated earlier, you can use the mouse in any way you like to move each slider. You can readjust the position of each slider as many times as you wish.

This round ends when the 1 minute 15 seconds time limit is over, or when you click the button at the bottom to skip to the next round. Your performance score in this round will be the number of sliders positioned at exactly 50 when it ends.



[There were 60 sliders in the task. Subsequent rounds had the same set up.]

SI References

1. Bornstein G, Erev I (1994) The enhancing effect of intergroup competition on group performance. *Int J Confl Manage* 5:271-184.

2. Lount RB Jr, Phillips KW (2007) Working harder with the out-group: The impact of social category diversity on motivation gains. *Organ Behav Hum Dec* 103:214-224.

3. Tversky A, Kahneman D (1974) Judgment under uncertainty: Heuristics and biases. *Science* 185:1124-1131.

4. Heyman J, Ariely D (2004) Effort for payment: A tale of two markets. *Psychol Sci* 15:787-793.