Prize Structure and Information in Tournaments: Experimental Evidence

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Abstract

This paper examines behavior in a tournament in which we vary the tournament prize structure and the information available about participants' skill at the task of solving mazes. The number of solved mazes is lowest when payments are independent of performance; higher when a single, large prize is given; and highest when multiple, differentiated prizes are given. This result is strongest when we inform participants about the number of mazes they and others solved in a pre-tournament round. Some participants reported that they solved more mazes than they actually solved, and this misreporting also peaked with multiple differentiated prizes.

Tournament models predict that total effort is maximized by giving multiple prizes rather than a single prize, given a constant total tournament purse, heterogeneous skills, and a convex cost for participants of putting forth effort (Benny Moldovanu and Aner Sela 2001). Multiple prizes give more participants an incentive to work hard than does a single large prize, which many participants may have little chance of winning. Prizes unrelated to output produce low effort as participants see no return to effort. While the theory is clear, there is little empirical work examining how behavior responds to differing prize structures or to information about participants' level of ability at the tournament task. Behavioral economics adds potential twists to traditional tournament theory, including suggesting that incentives may crowd out intrinsic motivation (Uri Gneezy and Aldo Rustichini 2000).

This study uses a maze-solving experiment to assess behavior under different tournament prize structures and different information given to participants. We asked groups of six subjects to solve a set of mazes in two rounds.[2] In Round 1 of the experiment, we rewarded individuals by piece rates so that their reward depended only on their own performance. After the groups completed Round 1, we told participants in half of the groups about the distribution of mazes solved in Round 1 in their group, but we did not tell participants in the other half of the groups about the distribution in their groups.

In Round 2 of the experiment, we gave three incentive treatments: a treatment that paid each person the same regardless of performance; a treatment with one large prize for the tournament winner; and a treatment with multiple prizes that increased with a participant's rank in the tournament. Total prize money was constant across the three incentive treatments. We measured the effects of the six treatments—three prize treatments in each information environment—on effort by measuring the number of mazes individuals solved.

Using the total number of mazes solved as a measure of output, we find that output is lowest when payments to participants are independent of performance; higher when only a single large prize is given; and highest when we give multiple differentiated prizes. While we cannot pinpoint the prize structure corresponding to the global maximum among the infinite number of

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[2] Gneezy, Muriel Niederle, and Rustichini (2003) use maze-solving to gauge the effort of subjects.

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possible allocations of a fixed tournament prize budget, our results demonstrate that consistent with the theory, multiple differentiated prizes in some form can produce higher output than either one single prize or prizes unrelated to performance.

We also find that multiple prizes yield the highest output relative to the other incentive conditions when participants know the number of mazes they and others solved in Round 1. The differences in output among the conditions are, moreover, driven largely by the different responses to incentives of subjects with high or low maze solving ability, seemingly in response to the different marginal returns to effort in specific prize and information settings. When subjects knew the distribution of solved mazes from Round 1, those lower in the ability distribution solved more mazes with multiple prizes than they did with the single prize condition; while by contrast, those higher in the ability distribution solved similar numbers of mazes with multiple prizes as under the single prize condition. Lower-ability subjects produce little when they know they have little chance of winning a single prize through more effort. When subjects did not know the distribution of solved mazes from Round 1, the single and multiple prize treatments produced similar outcomes across the ability distribution—suggesting that when individuals did not know they ranked poorly in ability, they did not "give up" on winning the single prize.

The experiments closest to ours (Weiland Müller and Andrew Schotter 2004; Haig Nalbantian and Schotter 1997) examine how tournament prize structure affects effort but not how information interacts with incentives or how incentives and information differently affect individuals with different ability levels. They also investigate tournaments in which the experimenter gives subjects "cost-of-effort" functions instead of asking them to perform real tasks.[3] Niederle and Lise Vesterlund (2007) compare the decisions of men and women to enter a tournament. Ronald Ehrenberg and Michael Bognanno (1990) find that golf tournaments have incentive effects but do not study the provision of information or which distribution of prizes maximizes effort. Oriana Bandiera, Iwan Barankay, and Imran Rasul (2007) and Clive Bull, Schotter, and Keith Weigelt (1987) compare piece rates and tournaments.

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[3] Müller and Schotter (2004) find that some participants work hard in tournaments while others effectively drop out. Nalbantian and Schotter (1997) find that relative performance schemes outperform target-based schemes.

We did not plan to examine cheating in our experiment but the paper and pencil maze technology that we used allowed subjects to falsely report unsolved mazes as solved. This serendipitously provides an independent test of the impact of incentives on behavior and a new approach to detecting cheating in the laboratory. As some form of cheating is widespread in many real-world contexts (e.g. Brian Jacob and Steven Levitt 2003), our experiment provides an analog to a common setting. In our experiment, the extent of misreporting varied with incentives in a similar way as did the number of mazes solved.

Section I describes the experiment. Section II presents the main results. Section III discusses results relating to cheating in the experiment. Section IV concludes.

I. The Experiment

Our experiment recruited participants from the Harvard Business School Computer Lab for Experimental Research subject pool. We asked subjects to solve a set of mazes from Dave Phillips (1988, 1991) in a group with six participants. The experiment had two rounds, each lasting for 15 minutes: a piece rate incentive session (Round 1) and a tournament session (Round 2). The maze packet used for Round 2 contained different mazes than those in the maze packet for Round 1. We presented the mazes in the same order to all subjects. The directions for each round and treatment are in the Appendix.

The participants were paid a $13.00 show-up fee for participating in the experiment. In Round 1 we paid each subject an additional 20 cents per maze solved to motivate effort. We used the results under piece rates to identify their skill at solving mazes. At the end of Round 1, we told subjects in half of the groups the scores of all group members in Round 1. Since individuals knew their own score, this information allowed them to place themselves in the distribution and assess their chances of ranking high or low in Round 2. We refer to this treatment as "full information" because it gives subjects all the information that we have relevant to assessing their chances of winning in the ensuing tournament. In the other half of the experiments, we said nothing about how others performed, which we refer to as "no

information." In all treatments, we announced the Round 2 prize structures after Round 1 was complete.

In Round 2 subjects competed in a tournament with three incentive treatments, each of which distributed $30 in total prizes to each group. Our *equal prize* treatment gave each participant $5.00 regardless of their performance. The only incentive was thus the intrinsic desire to solve mazes or to do well relative to others. Our *single prize* treatment gave $30 to the top scorer and nothing to anyone else. In the *multiple prize* condition, we gave out multiple differentiated prizes. Out of the many ways to do this, we chose one that gave incentives to persons in all parts of the distribution of maze-solving skill as reflected in their Round 1 maze performances. We gave the first-prize winner $15, the second-prize winner $7, the third-prize winner $5, the fourth-prize winner $2, and the fifth-prize winner $1. The experiment took approximately 50 minutes. Mean total earnings, including the show-up fee, Round 1 earnings, and Round 2 earnings, was $20.45.

We presented the exercise to the subjects in paper and pencil form. We asked subjects to report the number of mazes they solved and told them that they had to solve them *in the order they were presented in the packet*. Initially, we did not consider that subjects might cheat, say by jumping over a line to complete a maze, or that some would misreport the mazes solved by counting as completed mazes they solved after they had skipped one. When we checked the first sets of maze packets, we found discrepancies between the number of mazes subjects reported solving and the mazes that our rules would count as solved. We considered re-doing the experiment in ways that would rule out such activity (for instance by using a computer maze design) but realized that the potential for cheating serendipitously provides a second test of the effect of incentives on cheating in a tournament that differs greatly from the type of evidence in other experimental studies of cheating, such as studies on taxes.[4]

Incentives and Potential Behavior in the Experiment

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[4] Studies on cheating in taxes ask subjects to choose a level of cheating or shirking and explicitly state the reward or punishment scheme they will face; see James Alm, Gary McClelland, and William Schulze (1992).

The performance of individuals in maze-solving depends on their ability and the effort they expend. The individual controls his or her effort. With total mazes solved in the group as the measure of output, the relation between output and the prize structure in a tournament setting depends on the distribution of participants' abilities, their perceived probability that increased effort will gain them a prize, and the prizes' values. In the model of Edward Lazear and Sherwin Rosen (1981), participants have equal ability and the optimal prize for winning mimics an optimal piece rate. In the Moldovanu and Sela (2001) (M&S) model, which fits our experimental design better, participants have heterogeneous ability levels.[5] In this analysis, multiple prizes can lead to greater output than a single prize because individuals with little chance of winning the single prize put in greater effort when they can win the 2nd, 3rd, or nth prize. The most able person may be less motivated by the presence of other prizes since the return to coming in first will be less than with a single prize but less able contestants will be motivated by the rewards from doing better in the lower part of the prize distribution. M&S show that with a convex cost of effort function, total effort is maximized in a setting with multiple prizes.[6]

The information structure of the tournament should affect behavior as well. In the M&S model, individuals know the distribution function from which abilities are drawn. This enables those with high ability to assess their chances of winning. Assuming that individuals in the "no information" conditions have correct priors over the distribution of ability, then the M&S information setting mimics the "no information" condition. Our experiment has a stronger information condition: In the full information case, individuals know the *realized* values of the abilities of other contestants. This approximates an alternative set of real-world conditions in which participants have a better idea of their potential for winning than in the M&S model where they only know the distribution function from which competitors are drawn. This should affect the perceived probability that a given individual will win a prize – for instance, causing someone who is in a tournament with others with much higher Round 1 scores to put in low effort in the single prize condition as they perceive a low probability of winning it.

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[5] Vijay Krishna and John Morgan (1998) also study settings with multiple prizes.
[6] This is their Proposition 5, p. 249.

II. Findings

Table 1 summarizes the means and standard deviations of subjects' scores in each treatment and both rounds of the experiment.[7] Since we randomly assigned individuals to treatments and gave the same Round 1 piece rate incentive to all subjects, Round 1 scores should not differ noticeably among the groups. The Round 1 means show the different groups solved similar numbers of mazes. F-tests and pair-wise two-tailed Mann-Whitney U-tests confirm that there are no statistically different results in this round.[8] The Round 2 means show noticeable differences in scores among the treatment groups, which are significant by F-tests and pair-wise two-tailed Mann-Whitney U-tests. In the full information treatment, mean prizes solved rises from the equal prize to the multiple prize condition and then falls with the one prize treatment. In the no information treatment, the lowest mean score is in the equal prize group but the one prize group and the multiple prize group have similar mean outputs.[9] Comparing the full information and no information treatments, mean mazes solved are higher in the equal prize and multiple prize treatments under full information (15.55 and 18.56) than under no information (12.88 and 16.36, respectively), which are statistically significant at p=.02 and p=.07, respectively. By contrast, the results are not discernibly different under full information and under no information for the single prize treatment (16.10 vs. 16.53, respectively; p=.58).

Regression Analysis

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[7] We specified that the "mazes you solve that follow mazes you skipped will not be included in your total number of mazes," but some participants ignored this instruction and proceeded to solve mazes after failing to solve one, perhaps intending to go back and solve that one later. Thus, one measure of output is the number of mazes that subjects completed even when some solved mazes followed unsolved mazes. A second measure of output is the number of mazes a subject solved prior to skipping a maze. The first measure provides a potentially better indicator of the effort induced by the treatment while the second follows our instructions. We analyzed both output measures and obtained similar results. We present in the text the results from the first measure. We exclude misreported mazes from the totals and examine them in section III.

[8] For all three possible pairs of conditions, the pairwise test shows p > 0.40.

[9] In the no information condition, the two-tailed Mann-Whitney test for the single prize vs. equal prize distribution shows p = .001; multiple vs. equal shows p = .008; equal vs. single shows p = .78. In the full information condition, the two-tailed Mann-Whitney test for the single vs. equal prize group shows p = .73; multiple vs. equal shows p = .008; equal vs. single shows p = .04.

We use regression analysis to probe the Table 1 finding that multiple prizes produce higher output for the full information case but not for the no information case. We regressed the number of mazes solved in Round 2 on the number solved in Round 1 and dummy variables for treatments:

$$R2_i = \beta_0 + \beta_1 R1_i + I_i\beta + \varepsilon_i$$

where $R1$ and $R2$ represent Round 1 and Round 2 score respectively, I_i is a vector of dummies representing the incentive treatments, ε is an error term, and i is an individual indicator. Table 2 reports the estimated coefficients and standard errors relating Round 2 scores to Round 1 scores, the prize treatment and, where relevant, a dummy variable for full information. The deleted group in all of the regressions is the equal prize treatment. The estimated coefficients on the Round 1 score uniformly exceed 1.0, which indicates that individuals/groups with higher scores improved their scores by larger absolute amounts than those with lower scores. Looking at individuals, those who solved more mazes in Round 1 tended to solve more mazes in Round 2 as well, which suggests that the Round 1 score is a reasonable indicator of the person's maze solving ability or, alternatively, of their intrinsic effort independent of incentives. The coefficient on the full information treatment in Column 1 is positive, indicating that on average the provision of information improved performance.

The key result from the Table 2 regressions is that output is highest under the multiple prize condition. The regression coefficients in Column 1 for all treatments show a strong difference among the incentive treatments: the mazes solved by the equal prize group are substantially less than those solved by subjects in the other two treatments, and the multiple prize group has a statistically significantly higher number of mazes solved than the single prize group. When the sample is divided by information treatment in Columns 2 and 3, the difference in coefficients between the multiple prize and single prize treatment dummies is larger in the full information case (a difference of 1.72 in Column 3) than in the no information case (a difference of 0.26 in Column 2). The maximum under the multiple prize treatment is stronger under full information.

To examine the robustness of this result, we investigated other specifications. We had data on the gender of subjects and added a female dummy variable to the regression, with little

impact on the other coefficients.[10] We entered the square of Round 1 score along with Round 1 score in the regressions, again without impacting the finding that output was highest in the middle inequality group. We introduced the Round 1 score of the highest-scoring person in the group as an independent variable on the hypothesis that this could affect performances in the full information condition.[11] We aggregated the mazes solved to the group level and regressed aggregate group Round 2 scores on the treatment dummies and aggregate group Round 1 scores. As an alternative specification, we calculated changes in the mean number of mazes solved from Round 1 to Round 2 for each of the treatments and used this as the dependent variable. The same patterns remained significant (see Richard Freeman and Alexander Gelber 2006). We investigated gender differences by estimating the models in Table 2 with the addition of a gender dummy and the interaction of that dummy with each of the five incentive treatments. None of the interactions was significant at the 5% level.[12]

Unpacking the results

At the heart of the analysis linking outcomes to incentive treatments is the notion that different prize structures should affect individuals differently depending on their maze-solving skills, assuming they are aware of their skills relative to others in the tournament. We investigate the impact of treatments on individuals in different positions in the maze-solving ability distribution by dividing the sample into those in the upper half of the distribution of mazes solved in Round 1 in the group in which they participated and those in the lower half of the group. In this analysis we ran the regressions for the full information and no information groups together on Round 1 score and dummy variables for five treatments with the no information,

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[10] Gneezy, Niederle and Rustichini's (2003) findings suggest that women may perform differently in tournaments than men.

[11] In the full information single prize condition, a high top first-round score in a group lowered the second round scores of other participants. The point estimate of the effect (-0.54) is large with a standard error of .10. By contrast, in the no information single prize condition, the point estimate is an insignificant -.12 with a standard error of .65. This suggests that when one person was far ahead of the rest, and this was known, subjects put forth substantially less effort.

[12] The same robustness checks also did not materially affect the Table 3 results.

equal prize treatment group deleted.[13] With this specification the coefficient on the constant term reflects the deleted group while the other coefficients reflect deviations from that score.

Table 3 shows the estimated regression coefficients and standard errors from this analysis. The coefficients under the columns labeled top half and bottom half of the Round 1 distribution show different effects of the treatments. Under full information, the single prize treatment is associated with a large, positive, and highly significant coefficient (6.31) in the top half of the distribution, but a much smaller and insignificant coefficient (.93) in the lower half of the distribution. By contrast, there is only a modest and statistically insignificant difference between the effects of the multiple prize treatment on the two halves of the distribution (6.03 vs. 5.29). Knowledge of their low chance of winning seemingly discouraged people in the lower half of the distribution while encouraging those in the upper half. As a result, the maximum associated with the multiple prize condition is most pronounced for the bottom half of the distribution.

The results for the no information treatment are different. Individuals in the top half of the distribution score more under both single prize and multiple prize incentives than individuals in the equal prize group. There is little evidence of a maximum under multiple prizes in the bottom half of the distribution as the score for the multiple prize treatment just exceeds that for the equal prize and falls short of that for the single prize treatment. Provision of information has its biggest effect on individuals in the bottom half of the Round 1 distribution of maze-solving scores. Knowledge that they have little chance of winning a single large prize appears to discourage them.[14]

One other pattern in the data requires explanation. This is the higher scores of subjects in the full information equal prize group compared to the scores of subjects in the no information equal prize (deleted) group. The unadjusted mean differences in Table 1 are significantly different in the two conditions, and a regression controlling for Round 1 score also shows a

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[13] The coefficients on Round 1 scores were similar for the groups analyzed separately, so this pooling does not distort the results.

[14] Freeman and Gelber (2006) report regressions with the addition of the person's Round 1 score as an additional explanatory variable, which does not affect the main results.

significant difference. Since subjects gained no money from solving more mazes in the equal prize treatment, pecuniary incentives cannot account for this result. One possible explanation is that individuals at the low end realized they could do better in the full information treatment and tried harder due to intrinsic competitive motivation. Niederle and Vesterlund's (2007) finding that men respond more competitively to tournaments than women is consistent with the hypothesis that men are more subject to an intrinsic motivation effect. Looking at our data by gender, we find a pattern consistent with this hypothesis: in the equal prize treatment men raised their scores more in the full information case than did women. In the equal prize treatment the mean Round 1 to Round 2 gain in scores was 2.16 more in full information than in no information for men, whereas it was 1.30 more for women ($p<.05$).

As a final check on the differential response to the treatments of subjects in different positions in the maze-scoring distribution, we report in Columns 3 and 4 of Table 3 the coefficients on outcomes for the person who scored highest in their group in Round 1 and the person who scored lowest in their group in Round 1. In both the full information and no information cases, the individuals who did best in Round 1 increased their scores more in the multiple prize and single prize treatment than in the equal prize treatment, while those who did worst in Round 1 improved their scores most in the full information multiple prize treatment. Comparing the difference in scores between full information and no information, those with high scores increased their scores from the no information to the full information treatment by the greatest amount in the equal prize case and the smallest amount in the multiple prize case. By contrast, the lowest scoring subjects in Round 1 increased their scores most from no to full information in the multiple prize treatment, presumably because they realized that they had a chance to win some reward from greater effort. By contrast, they reduced their scores from the no information to the full information treatments in the single prize treatment, presumably because they realized they had little chance to win the single prize.[15]

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[15] In some situations, the top score from a group may matter rather than the sum of all the scores. Using a group's top score to measure output, we still find that multiple prizes produce the greatest output, though the difference between multiple prizes and the single prize is smaller than in the comparable regression in Table 3. In other situations, the performance of the lower scoring individual may matter most. Under full information, the multiple prize condition gives markedly higher results than the other treatments, due to the incentives that multiple prizes give in the lower part of the distribution. See Freeman and Gelber (2006).

III. Incentives and Misreporting/Cheating

By asking subjects to solve paper mazes where the subjects draw lines from the beginning of the maze to the end with a pencil, we unexpectedly created another test of how incentives affect behavior by opening the door for misreporting or cheating.[16] Our instructions told subjects to solve the mazes in the order that they appeared in their packets and that "any mazes you solve that follow a maze you skipped will not be counted in your total number of mazes...." We also told subjects that "solving a maze means drawing a continuous line from the place marked 'Start' to the place marked 'Finish,' without crossing any of the walls of the maze with your line." Finally, we asked subjects to report the number of mazes they solved according to those rules.

Reviewing the packets of solved mazes after the first set of experiments, we discovered that subjects sometimes reported more mazes solved than met our rules. The vast majority of misreporting consisted of subjects starting a maze but not finishing it, then moving on to subsequent mazes in their maze packet, and reporting the subsequent mazes in their total number solved. There were three other less frequent forms of misreporting. Some subjects completely skipped a maze, yet reported subsequent mazes they solved in the number solved; some subjects crossed one of the walls of a maze with a line, yet counted this maze among the total number they solved; and some subjects reported a different total number solved than the total they actually solved. The results we report include all four types of cheating, but all types of cheating show similar patterns across treatments, and the results are robust to excluding the less frequent forms of cheating.

The final two columns of Table 1 present summary statistics on the frequency of such misreporting. In Round 1, the largest number of misreports occurred under the full information multiple prize treatment. But F- or chi-squared tests of the effect of the treatments show no statistically significant difference among the groups in this round. By contrast, the means for Round 2 show that misreporting is higher in the full information treatment than in the no

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[16] Breaking the rules of a maze solving experiment is not possible when subjects solve mazes on the computer, as in previous literature.

information treatment (p=.006). This is presumably because people in full information have a better idea of how they might improve their chances of gaining a prize by misreporting. In both the full information case and the no information case, the mean number of misreports is several times larger in the multiple prize and single prize treatments compared with the equal prize treatment. In both the full information and no information setting, the largest number of misreports is associated with the multiple prize condition. Thus incentives seem to work in a similar way in misreporting as well as they do in genuine maze solving.

Table 4 presents the coefficients and standard errors from a Poisson regression in which the dependent variable is the number of misreports in Round 2. We use the Poisson model because misreports are a relatively infrequent event.[17] In the full information case, the regressions show that misreporting is greatest in the multiple prize setting, second-highest in the single prize setting, and lowest in the equal prize condition (Column 1). Looking at behavior among subjects in the upper and lower halves of the distribution of maze-solving in Round 1, the regression coefficients in Columns 2 and 3 show that this result is due to much higher misreporting by individuals in the multiple and single prize treatments than those in the equal prize treatment for those at upper half of the distribution and a low number of misreports among individuals in the single prize treatment in the bottom half of the distribution. When a lot of prize money is at stake and participants know that they have a chance of winning, they are more likely to cheat to win it. By contrast, there are no statistically significant differences in misreporting in the no information treatment. Moreover, the percentage difference in cheating across treatments is greater than the percentage differences across treatments in output.[18]

IV. Conclusion

This paper has examined the impact of tournament prize structure and provision of information about individuals' skill. The first round of the experiment gave all participants the same piece rate incentive. The second round varied the incentives and information about the

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[17] Negative binomial regressions show similar results to the Poisson regressions. A linear model shows differences among the treatments with similar magnitudes to those implied by the unadjusted differences shown in Table 1. Adding individuals' Round 1 score to the model does not appreciably change the results.
[18] This is consistent with Jacob and Levitt (2003) who find that cheating is extremely sensitive to the incentives to cheat.

number of mazes solved by participants in the pre-tournament round. The primary finding is consistent with Moldovanu and Sela's (2001) analysis that multiple prizes maximize total effort. The evidence that the multiple prize effect is stronger under full information than under no information goes beyond their model because our full information treatment gives individuals information not only about their own abilities but also about the realized distribution of the abilities of their competitors rather than knowledge or expectation about the general distribution of abilities.

The results were strongest for individuals in the bottom half of the distribution, where output fell in the single prize treatment relative to the multiple prize treatment. When individuals are aware of their ability relative to others, a single large prize does not motivate those at the bottom of the ability distribution, who have little chance of winning it. They put forth more effort when they have a better chance to win more in a multiple prize setting. Our analysis found that misreporting also followed similar patterns and was extremely sensitive to the information and incentive structure. While previous laboratory investigations of cheating artificially asked subjects to choose a level of cheating, our experimental design offers a new way to detect cheating without alerting participants to the fact that their cheating will be detected by the experimenters.   The evidence that participants solved more mazes in the full information no inequality treatment than in the no information no inequality treatment suggests that behavior is affected by intrinsic motivation or some other psychological factor not typically examined in incentive models.

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Table 1 *Means and standard deviations of individuals' mazes solved and mazes misreported, by treatment*

Treatment	Mean (SD) Mazes Solved		Mean (SD) Mazes Misreported	
Full Information	(1) Round 1	(2) Round 2	(3) Round 1	(4) Round 2
Equal prize	12.65 (4.86)	15.55 (7.08)	.09 (.33)	.18 (.58)
Multiple prize	12.40 (4.44)	18.56 (6.87)	.13 (.54)	.51 (1.44)
Single prize	11.74 (5.24)	16.10 (7.88)	.19 (1.20)	.46 (1.15)
No Information				
Equal prize	12.46 (4.68)	12.88 (5.62)	.09 (.33)	.13 (.49)
Multiple prize	11.91 (5.27)	16.36 (7.89)	.17 (.84)	.32 (1.62)
Single prize	12.30 (5.05)	16.53 (7.38)	.12 (.39)	.23 (.68)

Source: Tabulated from the experiment described in text. The sample size is 78 subjects for each of the six treatments shown, or 468 subjects total.

Table 2 *Regression coefficients and standard errors for determinants of mazes solved in Round 2*

	(1) All Participants	(2) No Info	(3) Full Info
EQUAL	--	--	--
MULTIPLE	3.69 (.61)***	4.06 (.80)***	3.30 (.90)***
SINGLE	2.68 (.60)***	3.80 (.75)***	1.58 (.91)*
FULL INFO	1.44 (.52)***		
Round 1 Score	1.10 (.04)***	1.06 (.06)***	1.13 (.05)**
Constant	-.30 (.59)	-.33 (.75)	1.23 (.76)
R-squared	.59	.59	.58
N	468	234	234

The dependent variable is the number of mazes solved in Round 2. EQUAL, MULTIPLE, and SINGLE represent dummies for the equal, multiple, and single prize conditions, respectively; FULL INFO represents a dummy for full information conditions. "Round 1 score" is the total number of mazes an individual solved in Round 1. Robust standard errors, clustered by group, are in parentheses. *** denotes significance at the 1% level; ** 5%; * 10%.

Table 3 *Regression coefficients and standard errors for determinants of mazes solved in Round 2, by position in Round 1*

	(1) Round 1 Top Half	(2) Round 1 Bottom Half	(3) Round 1 Rank = 1	(4) Round 1 Rank = 6
Full Information				
EQUAL	3.55 (1.05)***	1.07 (.90)	4.19 (1.88)**	1.65 (1.09)
MULTIPLE	6.03 (1.30)***	5.29 (.99)***	7.46 (1.90)***	5.46 (1.32)***
SINGLE	6.31 (1.40)***	.93 (.90)	7.23 (1.99)***	2.48 (1.05)**
No Information				
EQUAL	--	--	--	--
MULTIPLE	5.65 (1.07)***	1.94 (.88)**	6.14 (2.17)***	1.56 (1.02)
SINGLE	5.30 (1.04)***	1.93 (.99)*	5.82 (1.75)***	4.28 (1.29)***
Round 1 Score	1.06 (.07)***	.98 (.07)***	.84 (.12)***	.96 (.10)***
Constant	-1.22 (1.09)	1.54 (.79)*	2.04 (2.19)	.74 (.92)
R-Squared	.47	.49	.42	.63
# obs	254	214	94	71

The participants' Round 2 scores are regressed on dummies for each of the 6 treatments, their Round 1 score, and a constant term. Column 1 displays results for a regression in which the sample is all participants with Round 1 score ranked between 1 and 3 (inclusive); Column 2 displays results for a regression in which the sample is all participants with Round 1 ranks 4 to 6 (inclusive). The sample size is larger for the top half than the bottom half because tied scores were assigned the same rank; results are similar with other ways of assigning ties. This is also the reason that the sample size is larger for those ranked 1 in Round 1 than those ranked 6 in Round 1. Robust standard errors, clustered by group, are in parentheses. *** denotes significance at the 1% level; ** 5%; * 10%.

Table 4 *Poisson regression coefficients and standard errors for determinants of total number of mazes misreported in the Round 2*

	Full Information			No Information		
	(1) All Subjects	(2) Top Half	(3) Bottom Half	(4) All Subjects	(5) Top Half	(6) Bottom Half
EQUAL	--	--	--	--	--	--
MULTIPLE	1.01 (.41)**	1.29 (.57)**	.94 (.49)*	-.21 (.58)	.33 (.79)	-.50 (.88)
SINGLE	.50 (.43)	1.75 (.55)***	-.71 (.82)	.55 (.44)	.61 (.76)	.45 (.53)
Mazes Misreported in Round 1	.38 (.05)***	1.87 (.87)**	.46 (.09)***	.74 (.07)***	.85 (.96)	.72 (.11)***
Constant	-1.76 (.35)***	-2.56 (.50)***	-1.39 (.41)***	-2.16 (.33)	-2.75 (.70)***	-1.75 (.41)***
# obs	234	127	107	234	127	107
Log Pseudo-Likelihood	-177.52	-79.77	-88.16	-102.20	-40.41	-59.31

The number of mazes misreported in Round 2 is regressed on dummies for the incentive conditions, the number of mazes misreported in Round 1, and a constant term. Columns 1 and 4 display results for a regression in which the sample is all participants; Columns 2 and 5 display results for a regression in which the sample is all participants with Round 1 ranks 1 to 3 (inclusive); Columns 3 and 6 display results for a regression in which the sample is all participants with Round 1 ranks 4 to 6 (inclusive). The sample size is larger for the top half than the bottom half because tied scores were assigned the same rank; results are similar with other ways of assigning ties. Robust standard errors, clustered by group, are in parentheses. *** denotes significance at the 1% level; ** 5%; * 10%.

Appendix

Instructions (Round 1)

Each of you has been given a packet of mazes. Please do not turn this packet over until the room monitor says to start. Please write your name on the back of this packet.

"Solving" a maze means that you draw a continuous line from the place on the maze marked "Start" to the place marked "Finish," without crossing any of the walls of the maze with your line. All of the mazes in your packets have solutions. Please begin working on the first maze in the packet and work through the packet in order. Begin working on a new maze only when you have finished solving the maze that preceded it in the packet. If you work out of order and skip at least one maze, you will not be given credit in your total number of mazes for mazes you solved that follow the maze you skipped. We will check the accuracy of your solutions to the mazes.

You will have 15 minutes to solve as many mazes as you can. You will receive 20 cents for each maze you solve (on top of your guaranteed payment of \$13 for showing up at the experiment). If, over the course of this session, you make stray lines on your sheet that do not lead from the start of the maze to the finish, you are not required to erase these lines during the 15-minute session itself, but you may erase them if you wish to do so.

Each of you has received a packet of mazes that is identical to the packet each other participant has received. It will not be announced at any point in the experiment which participant received which score in this session.

Please do not talk to other participants while you are solving the mazes. Also, please do not talk in the break between solving mazes in the packet you have been given and solving mazes in the next packet. Please turn off your cellular phones before the experiment begins.

If you have a question about these directions, please raise your hand now.

Instructions (read by experimenter after Round 1)

Please count the number of mazes that you solved correctly in the first session, and please write this number on the front of your maze packet with a circle around it. If you skipped a maze, please do not include subsequent mazes solved in the total you report. Please raise your hand when you have finished this, so that the room monitor can collect your packet from you.

Only in the "Full Information" Treatments, Read: An experimenter will now give to each of you a list of the number of mazes each member of your group solved in the first session. The

number that you solved has been circled, and the numbers that the other members of your group solved have not been circled.

Instructions (Round 2)

Each of you has been given a second packet of mazes. Please write your name on the back of this packet. Please do not turn this packet over and begin working on it until the room monitor says to start.

"Solving" a maze means that you draw a continuous line from the place on the maze marked "Start" to the place marked "Finish," without crossing any of the walls of the maze with your line. All of the mazes in your packets have solutions. Please begin working on the first maze in the packet and work through the packet in order. Begin working on a new maze only when you have finished solving the maze that preceded it in the packet. If you work out of order and skip at least one maze, you will not be given credit in your total number of mazes for mazes you solved that follow the maze you skipped. We will check the accuracy of your solutions to the mazes.

You will have 15 minutes to solve mazes in your packet.

For "Equal prize" Treatments, read:

In this session, which is the final session of the experiment, you will receive **$6**, regardless of how many mazes you solve.

For "Multiple Prize" Treatments, read:

In this session, which is the final session of the experiment, you will be paid based on how many mazes you solve, in comparison with how many mazes the other participants solve. If you solve the **most** mazes in this session out of the members of this group, you will receive **$15**, in addition to your show-up fee, plus what you earned in the first session. If you solve the **second-most** mazes in this session out of the members of this group, you will receive **$7**, in addition to your show-up fee, plus what you earned in the first session. If you solve the **third-most** mazes in this session out of the members of this group, you will receive **$5**, in addition to your show-up fee, plus what you earned in the first session. If you solve the **fourth-most** mazes in this session out of the members of this group, you will receive **$2**, in addition to your show-up fee, plus what you earned in the first session. If you solve the **fifth-most** mazes in this session out of the members of this group, you will receive **$1**, in addition to your show-up fee, plus what you earned in the first session. If you solve the **sixth-most** mazes in this session out of the

members of this group, you will receive **only** your show-up fee, plus what you earned in the first session.

      Your payment from this session (the second session) will be based **only** on how many mazes you solve in the second session. The number you solved in the first session is irrelevant to the payment you receive in this session.

For "Single Prize" Treatments, read:

      You will have 15 minutes to solve mazes in your packet. In this session, which is the final session of the experiment, you will be paid based on how many mazes you solve, in comparison with how many mazes the other participants solve. If you solve the **most** mazes in this session out of the members of this group, you will receive **$30**, in addition to your show-up fee, plus what you earned in the first session. Everyone else will receive **only** their show-up fee, plus what they earned in the previous session.

      Your payment from this session (the second session) will be based **only** on how many mazes you solve in the second session. The number you solved in the first session is irrelevant to the payment you receive in this session.

In all treatments, read:

      Each of you has received a packet of mazes that is identical to the packet each other participant has received. It will not be announced at any point in the experiment which participant received which score in this session. Please do not talk while you are solving the mazes.

      If you have a question about these directions, please raise your hand now.