Economics Letters 151 (2017) 23–27

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Asymmetric discouragement in asymmetric contests

Christoph March[a,c], Marco Sahm[b,c,*]

[a] Technische Universität München, Arcisstraße 21, D–80333 Munich, Germany.
[b] University of Bamberg, Department of Economics, Feldkirchenstraße 21, D–96052 Bamberg, Germany
[c] CESifo, Poschingerstraße 5, D–81679 Munich, Germany

HIGHLIGHTS

- We provide new experimental evidence on asymmetric contests.
- Our findings suggest an asymmetric discouragement effect.
- Compared to a symmetric contest, subjects invest less when facing a stronger opponent.
- However, they invest the same when facing a weaker opponent.
- Disappointment aversion rationalizes the results.

ARTICLE INFO

Article history:
Received 22 September 2016
Received in revised form 11 November 2016
Accepted 23 November 2016
Available online 25 November 2016

JEL classification:
C72
C92
D72

Keywords:
Asymmetric contest
Discouragement effect
Disappointment aversion
Laboratory experiment

ABSTRACT

We provide new experimental evidence which suggests an asymmetric discouragement effect in lottery contests with heterogeneous abilities. Compared to a symmetric contest, subjects invest less effort when facing a stronger opponent, but they invest the same when facing a weaker opponent. Our results can be explained by a simple model of disappointment aversion.

1. Introduction

Many economically relevant situations take the form of a contest in which participants compete for a prize by spending non-refundable effort which increases the likelihood of winning but does not guarantee victory (see e.g. Konrad, 2009). Contestants are rarely symmetric: they differ with respect to abilities, resources, or preferences, amongst others. Theory predicts that contestants invest less effort in an asymmetric than in a symmetric contest (Baik, 1994; Stein, 2002). In fact, empirical evidence on this so-called *discouragement effect* mostly confirms the prediction (Dechenaux et al., 2015).

In this paper, we scrutinize how discouragement depends on a contestant's (relative) ability. Our experimental evidence suggests that the discouragement effect is *asymmetric*. Compared to the symmetric contest, participants invest less when facing a stronger opponent, but they invest the same when facing a weaker opponent. Furthermore, this asymmetry is the stronger the larger the prize of the contest. We are able to explain our findings by *disappointment aversion* (Bell, 1985; Kőszegi and Rabin, 2006).

2. Theory

We consider a winner-take-all contest with two risk-neutral participants $i \in \{1, 2\}$ who compete for a rent of size $R > 0$. Each participant $i \in \{1, 2\}$ has an initial wealth endowment $e_i \in \mathbb{R}_+$ and can invest effort $x_i \in [0, e_i]$ in order to improve her probability of winning p_i. Given effort levels x_i and x_j for $j \neq i$, this probability is

* Corresponding author at: University of Bamberg, Department of Economics, Feldkirchenstraße 21, D–96052 Bamberg, Germany
E-mail addresses: christoph.march@tum.de (C. March), Marco.Sahm@uni-bamberg.de (M. Sahm).

http://dx.doi.org/10.1016/j.econlet.2016.11.032
0165-1765/

given by the contest success function (CSF) $p_i : [0, e_i] \times [0, e_j] \to [0, 1]$ with $p_i(0, 0) = 1/2$ and

$$p_i\left(x_i, x_j\right) := \frac{\theta_i x_i}{\theta_i x_i + \theta_j x_j} \quad (1)$$

for $x_i + x_j > 0$, where $\theta_i > 0$ expresses participant i's ability.[1] Without loss of generality, we assume that $\theta_1 \geq \theta_2$ and call participant 1 (2) strong (weak).

The contest is organized as a simultaneous move game with complete information, i.e. each participant knows her own as well as her opponent's ability. Taking the opponent's effort x_j as given, participant $i \neq j$ chooses x_i to maximize her expected payoff

$$E\pi_i\left(x_i, x_j\right) = p_i\left(x_i, x_j\right)\left(e_i - x_i + R\right) + \left[1 - p_i\left(x_i, x_j\right)\right]\left(e_i - x_i\right). \quad (2)$$

In the unique Nash equilibrium (Baik, 1994)

$$x_1^* = x_2^* = \frac{\theta_1 \theta_2}{\left(\theta_1 + \theta_2\right)^2} R = \frac{\eta}{(\eta + 1)^2} R, \quad (3)$$

where $\eta \equiv \theta_1/\theta_2 \geq 1$ denotes the relative difference in ability. In equilibrium, both participants submit the same effort even if asymmetric. Moreover, equilibrium efforts are decreasing in η and reach a global maximum of $R/4$ at $\eta = 1$. Hence, larger asymmetry discourages both participants' efforts. Intuitively, as η increases, the strong participant has an incentive to lower her effort since she can obtain the same probability of winning with less effort. On the other hand, the weak participant lowers her effort, since her marginal probability of winning decreases, i.e. her effort is less effective in improving her probability of winning.

3. Experimental design and procedures

We test the discouragement effect in an experiment with two treatments and four sessions each. A session proceeds as follows: In the first part, we elicit subjects' risk preferences using a multiple price list format similar to Holt and Laury (2002).[2] Subjects then play 30 repetitions (*rounds* henceforth) of the basic contest game. In each round, subjects are randomly matched into pairs and each subject receives an endowment of $e_i = 600$ points which she may invest to obtain lottery tickets. Subjects compete for a prize of $R = 200$ points in the first 20 rounds (part 2) and for a prize of $R = 1{,}000$ points in the last 10 rounds (part 3).

The two treatments differ in the number of lottery tickets subjects obtain for each point invested. In each round of treatment *Symmetric*, each subject receives one lottery ticket for each point invested. Accordingly, differences in ability are absent. In treatment *Asymmetric*, one subject in each pair receives one ticket per point ($\theta_i = 1$), whereas the other subject receives two tickets per point ($\theta_j = 2$). The assignment of abilities varies across rounds. A subject is assigned the same ability level in the first half of rounds for a given prize and switches to the other level for the second half.[3]

In each round, we remind each subject of her own and her opponent's assigned ability level, and we inform her about the number of times she and her opponent selected the safe amount in part one. In addition, we provide several tools to assist subjects in their decision-making. First, the instructions contain six fictitious examples. Second, the computer interface offers subjects the opportunity to enter fictitious efforts for themselves and the other investor to learn about the resulting likelihoods of winning and losing the contest and the corresponding number of points at the end of the round.

The sessions took place at the experimental laboratory of the Technical University of Munich ("experimenTUM") in March and November 2015. Students from TU Munich were invited using the ORSEE recruitment system (Greiner, 2015). 22 to 26 subjects participated in each session. The experiment was programmed and conducted with zTree (Fischbacher, 2007).

Upon arrival at the lab, subjects were randomly assigned to cubicles that did not allow for any visual communication between them. Subjects were immediately asked to read the computer screen, which informed them about rules of conduct in the laboratory, the existence of the three parts, and that instructions for a given part would be distributed directly before its start. Once all subjects were seated, paper instructions for part 1 were distributed and subjects were given time to read them at their own pace. Instructions were then read aloud and subjects were permitted to ask questions. Once all subjects had submitted their ten decisions, paper instructions for the second part were distributed. Subjects were again given time to read them at their own pace before the instructions were read aloud. Instructions for part 2 were followed by a short quiz to check subjects' understanding. The experimenters controlled subjects' answers and explained mistakes in private if necessary. Afterwards, the 20 rounds of part 2 were run. Finally, subjects received short paper instructions for the third part and the third part was conducted in a similar way as the second one.[4]

At the end of the session, we randomly selected one out of the 10 decisions from part 1, one each out of the first and the last ten rounds from part 2, and one round from part 3 for payment using a ten-sided dice. Points were converted into cash at the rate 1 point = €0.01 and added to a show-up fee of €4.00. Before collecting their earnings, we asked subjects to fill out a short questionnaire consisting of some demographic questions and some questions related to the experiment. Afterwards, subjects retrieved their earnings in private and left.

Session lasted 100 min on average. The average payment was €28.42 in treatment *Symmetric*, and €27.83 in treatment *Asymmetric*. Overall, we collected 5,760 effort choices submitted by 192 subjects.

4. Experimental results

Fig. 1 displays the evolution of average effort levels across rounds. Panel a (b) contains the results for part 2 (3) where subjects compete for a prize of $R = 200$ ($R = 1{,}000$) points. We find a clear downward trend in efforts when subjects compete for the low prize. Averaging across the first (last) five rounds, the average effort equals 71.7 (58.2) in treatment *Symmetric*, 72.9 (49.3) for weak subjects, and 83.5 (54.7) for strong subjects in treatment *Asymmetric*.[5] By contrast, when subjects compete for the high prize, efforts in treatment *Symmetric* and efforts of strong subjects in treatment *Asymmetric* hardly change: the average effort equals 243.3 (256.2) in the first (last) three rounds of treatment *Symmetric* and 266.6 (261.1) for strong subjects in the first (last) three rounds

[1] This asymmetric CSF was given an axiomatic foundation by Clark and Riis (1998), following an earlier axiomatization of the symmetric form with $\theta_1 = \theta_2$ by Skaperdas (1996).

[2] Each subject is presented with a table of ten ordered decisions between a safe amount of 180 points and a risky lottery which offers either 400 points or 0 points. The likelihood of receiving 400 points increases across the table from 0.1 in the first row to 1.0 in the last row. Subjects are required to select one of the options in each row (we do not allow for indifference). Probabilities are explained in terms of throws of a ten-sided dice.

[3] More precisely, we employ a median split of all participants in a given session according to the number of times subjects choose the safe amount in part 1. Subjects in the more (less) risk averse group are assigned the low (high) ability in rounds 1 to 10 and 21 to 25 and the high (low) ability in rounds 11 to 20 and 26 to 30.

[4] The instructions are available from the authors upon request.

[5] The spikes in round 11 of treatment *Asymmetric* coincide with the change in abilities.