ECONOMICS & Sociology

Sylwestrzak, M. (2025). Overbidding in contests – can nudging decrease expenditures? Experimental evidence. *Economics and Sociology*, *Economics and Sociology, 18*(1), 132-148. doi:10.14254/2071-789X.2025/18-1/7

OVERBIDDING IN CONTESTS – CAN NUDGING DECREASE EXPENDITURES? EXPERIMENTAL EVIDENCE

Marta Sylwestrzak
University of Warsaw, Warsaw, Poland
E-mail: martasylwestrzak@wne.uw.edu.pl
ORCID 0000-0002-7809-5826

Received: March, 2024
1st Revision: January, 2025
Accepted: March, 2025

DOI: 10.14254/2071-789X.2025/18-1/7

ABSTRACT. This paper examines overbidding in contests and the potential of default options (nudges) to reduce expenditures and enhance cooperative behavior. The study is based on an online laboratory experiment (N = 222), using a 2x2 design with two treatment factors: contest type (winner-take-all [WTA] vs. proportional prize [PP]) and the presence or absence of a nudge. Participants were divided into three-person groups and urge to decide how many tokens to invest in intergroup contests. The WTA contest determined the probability of winning the prize based on the relative expenditures of the groups, while the PP contest distributed rewards proportionally. The nudge, introduced in two of the four scenarios, involved setting a default contribution level, allowing for the investigation of its impact on expenditures and coordination. We found that expenditures exceeded the predicted optimal levels across all treatments but decreased over successive rounds. The PP contest with the nudge resulted in the lowest expenditures and least resource wastage, leading to the highest participant payoffs. Even though the WTA contest with the default option showed the highest expenditures, these findings highlight the effectiveness of nudges under this setting in promoting efficient resource use overall and suggest that behavioral interventions can significantly impact expenditure patterns in competitive environments. The research contributes to the broader debate on economic and social interactions, offering insights into strategies for improving resource management and cooperation in both local and global contexts.

JEL Classification: C92, D90

Keywords: overbidding, winner-take-all contest, proportional prize contest, nudge, group decision-making

Introduction

Overbidding in contests is a widespread phenomenon that refers to a scenario where participants expend more resources or effort than what is predicted by theoretical equilibrium models (Sheremeta, 2013). In such contests, competition arises when individuals or groups strategically allocate resources, known as contest expenditures or contributions, to win a reward, with relatively higher expenditures increasing the likelihood of winning (Konrad, 2009). Overbidding behavior often leads to a significant resource loss, where parties could benefit from cooperation through lower expenditures. Such situations commonly arise in various competitive environments, including political campaigns, corporate bidding wars, and research funding contests, where parties excessively invest resources to outdo competitors (Tullock, 1980; Baik, 1994). Understanding the underlying causes of overbidding and potential solutions for it can inform strategies to enhance cooperative behavior, optimize resource use, and ultimately improve social and economic outcomes.

Research has shown that overbidding tends to persist in competitive environments where communication is limited or absent (Konrad, 2009; Dechenaux et al., 2015). This is exacerbated by a lack of coordination mechanisms, which could otherwise facilitate mutually beneficial outcomes. Addressing this issue is particularly relevant from an economic and sociological perspective, as it touches upon the dynamics of competition, collective action, and social welfare. Thus, it is crucial to explore various methods of coordinating actions among groups that cannot communicate and negotiate, but whose cooperation can yield mutual benefits.

The relevance of this topic is further magnified in the context of global challenges such as climate change, where coordinated efforts are fundamental for sustainable solutions (Ostrom, 2009). Investigating overbidding in contests improves our understanding of economic and social interactions and contributes to the broader debate on collective action and resource management. Addressing these challenges can provide insights into efficient resource management and cooperative strategies in diverse and interconnected contexts.

Against this background, we analyze participant behavior in winner-take-all (WTA) and proportional prize (PP) contests, which are used for the study of competitive and cooperative behaviors in the context of excessive contribution. In both types of contests, participants are divided into three-person groups and decide how many tokens to invest in an intergroup competition to win a fixed reward. The difference between these contests is that in the WTA contest, only one group wins the entire reward, with the probability of winning determined by the ratio of investments (Tullock, 1980; Lazear & Rosen, 1981). In contrast, in the PP contest, groups share the reward proportionally based on their expenditures (van Long & Vousden, 1987). In two additional treatments, we introduced a nudge in both contests by setting a default option, aiming to investigate whether this nudge could suggest lower expenditures to participants and facilitate coordinated action among players.

The introduction of nudges, subtle changes in the choice architecture that influence behavior without restricting options, has been a revolutionary concept in behavioral economics (Thaler & Sunstein, 2008). Nudges have been shown to significantly impact decision-making processes, from increasing organ donation rates through default options (Johnson & Goldstein, 2003) to enhancing savings behavior in retirement plans (Madrian & Shea, 2001). However, the application of nudges in competitive environments, such as WTA and PP contests, remains underexplored.

The results of this study indicate that in all four treatments, group expenditures exceeded the predicted optimal level. However, a downward trend in expenditures was observed over successive rounds. The lowest expenditures were noted in the PP contest with the applied

nudge, which also corresponded to the least resource wastage and the highest participant payoffs in this treatment. On the other hand, the highest expenditures occurred in the WTA contest with the default option. In the initial rounds of the contests, the average difference in partner group expenditures was relatively small compared to later rounds, with the smallest differences observed in the WTA contest.

The structure of this paper is as follows: Section 1 provides a comprehensive literature review. Section 2 details the design and procedures of the conducted experiment. Section 3 outlines the formulated hypotheses. The results are presented in Section 4, and last Section offers the concluding remarks.

1. Literature review

Expenditures in winner-take-all and proportional-prize contests among individuals have been the subject of comparison across several studies (Fallucchi et al., 2013; Shupp et al., 2013; Chowdhury et al., 2014; Cason et al., 2020; for an overview see Dechenaux et al., 2015). Nonetheless, these investigations have yielded ambiguous findings regarding whether contributions are higher in one type of contest over the other. In particular, research indicates that providing feedback exclusively on individual contributions tends to increase expenditures in a WTA contest, whereas it leads to a decrease in a PP game (Fallucchi et al., 2013). Some studies suggest that PP contests yield outcomes more closely aligned with the Nash Equilibrium compared to WTA settings, especially when a convex cost function is employed (Chowdhury et al., 2014). However, other studies report contrasting findings, indicating lower contributions in a WTA setting (Shupp et al., 2013). Studies comparing the decisions of groups and individuals participating in a WTA contest indicate that group expenditures significantly exceed individual expenditures (Abbink et al., 2010; Ahn et al., 2011).

Most studies examining behavior in contests report substantial overbidding of effort compared to theoretical predictions, particularly within group contexts (Sheremeta, 2018). Literature indicates several potential explanations for such overbidding, including the joy of winning (Herbst, 2016), bounded rationality (Lim et al., 2014), discontinuity effect (Schopler & Insko, 1992), in-group favoritism, and social identity (Sheremeta, 2018). Increased expenditures in WTA lotteries and PP contests can lead to significant inefficiencies in economic terms. Such overbidding often results in a misallocation of resources, where participants devote excessive effort or resources that exceed the optimal levels predicted by Nash equilibrium models (Sheremeta, 2013), and reduces overall economic efficiency as resources that could be more productively used elsewhere are wasted in the competition (Fallucchi et al., 2013). Moreover, the heightened competition and associated stress can negatively impact social well-being, intensifying inequalities (Dechenaux et al., 2015).

Several factors have been highlighted in the literature that can reduce expenditures in WTA lotteries and PP contests including leadership (Heine & Riedl, 2019), communication between groups (Cason et al., 2012), and the use of punishment and reward mechanisms (Abbink et al., 2010). The research presented here expands upon previous studies by investigating the impact of nudging in WTA and PP contests played between groups. Implementing behavioral nudges, such as default options or suggested contribution levels, can influence decision-making and reduce excessive expenditures. Thaler and Sunstein (2008) discuss how nudges can help individuals make more rational choices in competitive environments.

Many studies provide evidence that nudges play a significant role in modifying behavior and outcomes in competitive or cooperative environments. For instance, Johnson and Goldstein's study (2003) demonstrates that default settings can have a profound effect on organ

donation. Shang and Croson (2009) showed that people contribute more to public goods when are informed about others' contributions, aligning actions with social norms. Gråd et al. (2024) found that three types of nudges increased charity donations in an online experiment. In public goods games, setting a default option leads to higher contributions and facilitates the coordination of decisions (Barron & Nurminen, 2020). This effect is often attributed to the default option acting as a reference point that simplifies decision-making and encourages cooperative behavior in collective action. Yoeli et al. (2013) demonstrated that making cooperative behavior more visible through nudges, such as public commitments, can enhance cooperation in community-based settings. These findings suggest that carefully designed nudges can enhance both individual and collective outcomes in various economic contexts.

To date, there has been no research investigating the role of nudges within the context of contest settings. This study aims to fill this gap and examine the impact of default option nudges on the reduction of contributions in winner-take-all and proportional prize contests, with a focus on aligning contributions more closely with the Nash equilibrium. Furthermore, the study will explore the efficacy of such nudges in facilitating coordinated decision-making among groups.

2. Experimental design and procedures

The experiment was programmed using the LIONESS Lab platform (Giamattei et al., 2020) and conducted online in November and December 2023 by the Laboratory of Experimental Economics at the Faculty of Economic Sciences of the University of Warsaw (LEE WNE UW). Participants were recruited by the ORSEE platform (Greiner, 2015). 222 participants took part in the study, of which 130 were women and 92 were men. The average age of the participants was 29.70 (±8.8). Twelve experimental sessions were conducted, with an average duration of 20 minutes. The average payment was 25.68 (±5.92) PLN, which is approximately 5.97 (±1.38) EUR, assuming an exchange rate of 4.3 PLN = 1 EUR. Additionally, each participant received a show-up fee of 10 PLN (~2.32 EUR). Within two weeks after the experiment was concluded, participants received their payoff to the bank account they provided.

Participants who registered for the study received a link that became active on the date and at the time specified in the invitation. At the beginning of the experiment, before the game started, participants were randomly assigned to groups of three, and each group was then paired with another group of three. The term ‘the other group’ was used in the instructions to refer to the opposing group, in order to maintain a neutral tone and not suggest either cooperation or competition between the groups. The composition of the groups and the group pairs remained the same until the end of the experiment. After the random division of players, participants read the instructions that appeared on their screens (see Appendix) and then made their decisions during 20 rounds of the experiment. At the end, they filled out a personal questionnaire and answered two hypothetical questions designed to determine social preferences and attitudes towards risk (see Appendix). The final screen displayed information about the participant's payoff that depended on the total number of tokens that were accumulated over the 20 rounds of the experiment. We used the following exchange rate: 8 tokens = 1 grosz (where 100 groszy = 1 PLN). Each participant took part in only one of the four treatments. In case of any technical problems or questions, participants had the opportunity to communicate with the experimenter live via MS Teams and Skype during the experiment. Before, during, and after the experiment, participants remained anonymous to each other and had no opportunity to communicate with one another in any way.

In our study, we conducted four treatments using WTA and PP contest designs. In the WTA contest, participants can win a prize with a probability equal to the ratio of the expenditures on the contest contributed by both groups. In particular, at the beginning of each round, each group member receives 1,000 tokens and decides how many tokens to allocate to the contest (they can choose any number from 0 to 1,000 tokens). The tokens not allocated to the contest accumulate after each round and increase the participant's final payoff. Once all members of both groups make their decisions, each person receives information about the number of tokens allocated by each member of their group, the total number of tokens allocated by the other group, the total tokens accumulated by the player so far, and the probability of their own group and the other group winning the prize. Based on this probability, the computer randomly selects which group receives the prize, and this information appears on the next screen. The prize in each round is the same, equal to 3,000 tokens for the winning group, which is then equally divided among its members. The group that loses receives 0 tokens in that round.

The PP design is very similar to the WTA. The difference is that the participants' expenditures on the contest determine the ratio of the prize distribution of 3,000 tokens between the two groups, rather than the probability of receiving it. Therefore, assuming positive contributions from both sides, there is no single winner. Within the group, the prize is equally distributed among its members.

We proposed two additional treatments in which we used a nudge by presenting a default option that was the same for each player and equal to 1 token. This nudge appeared in each round at the place where the participant was to enter the number of tokens they wanted to allocate to the contest. The participant could easily erase this value and enter their own choice. Additionally, the instructions included the following information: "Note: a value will appear in the response field, which will be the same for all participants. You can leave this response and accept it or erase it and enter your own". Table 1 presents a summary of the treatments. In particular, we refer to the winner-take-all and proportional prize contests WTA and PP treatments, respectively. To the treatments with nudge, we added '_N' ending to their names.

Table 1. Summary of the treatments

	Treatments			
	WTA	PP	WTA_N	PP_N
No. of participants	48	48	60	66
No. of groups	16	16	20	22
No. of observations	960	960	1200	1320

Source: *own compilation*

3. Hypotheses

The design of our experiment is based on the study by Abbink et al. (2010). Theoretical predictions assume a risk-neutral player who maximizes her own payoff which can be written as follows:

$$\pi_i(x_i, X, Y) = E + \frac{X}{X+Y}1000 - x_i \quad (1)$$

where x_i represents the number of tokens contributed in a contest by the player i, X is the sum of expenditures by the player's group, Y represents the sum of tokens contributed by the partner group, and E represents the player's initial endowment.

The first-order conditions calculated for representative players from group X and group Y are equal to $(X + Y)^2 = 1{,}000Y$ and $(X + Y)^2 = 1{,}000X$, respectively, which leads to the conclusion that X must equal Y in equilibrium. Therefore, we receive $X^* = Y^* = 250$ as predicted

contest tokens contributed in equilibrium (Abbink et al., 2010). It has to be noted that while the total reward may depend on the group size (e.g., in contest between two-players groups the total reward would be equal 2,000 tokens, and between five-players groups this reward would be equal to 5,000 tokens), the reward per individual member remains constant at 1,000 tokens per player. Thus, regardless of the group size, the equilibrium contribution per player is always the same and equal 250 tokens.

In addition, in treatments with a WTA game, part $\frac{X}{X+Y}1000$ of the player's payoff function denotes the probability of winning a prize of 1,000 tokens, whereas in treatments with a PP game, it represents the division of the reward between groups, which is based on groups' contributions. Therefore, both contests have the same player's payoff function and consequently the same predicted equilibrium equal to 250 tokens.

Based on the previous literature and theoretical predictions we can formulate the following research hypotheses:

H1: There is no differences in expenditures between WTA and PP contests.

This is because predicted expenditures are equal to 250 tokens in equilibrium and this value is the same for both contests. However, it is important to note that despite theoretical predictions, empirical research results indicate significant differences in expenditures between WTA and PP contests (Fallucchi et al., 2013; Shupp et al., 2013; Chowdhury et al., 2014; Cason et al., 2020).

H2: Nudging with a low default option decrease contributions in both WTA and PP contests.

Research suggests that the default option can increase contributions in public goods games. Studies, including Barron and Nurminen (2020), demonstrate that defaults act as effective nudges, guiding individuals to align their contributions with the default choice. This phenomenon leverages behavioral insights, simplifying decision-making and promoting cooperative behavior in collective action settings (Thaler & Sunstein, 2008; Johnson & Goldstein, 2003).

H3: Nudging with a low default option enhances the coordination of decisions.

Based on the insights from Barron and Nurminen's (2020) findings, we argue that the default option may function as a salient focal point for participants, facilitating the coordination of decisions, particularly during the initial phase of the game. Coordination of decisions means that groups align their investment strategies, which leads to more predictable and balanced expenditures. The default option helps by providing a common reference point, encouraging groups to choose similar levels of contributions, thus minimizing differences in how much each group spends. Initially, participants base their decisions on the most readily available information. In subsequent rounds, they may also consider other factors, but the initial coordination from the default option still influences their choices, helping groups maintain balanced contributions and avoid large differences in their expenditures.

4. Results

Figure 1 presents the average group expenditures for each treatment over the 20 rounds of the experiment. It can be observed that groups in the PP treatment contribute more compared to those in the PP with nudge treatment. However, in the WTA treatment, expenditures were

lower compared to the WTA_N treatment. Additionally, all these expenditures significantly exceed the optimal level of 250 tokens, determined based on theoretical predictions.

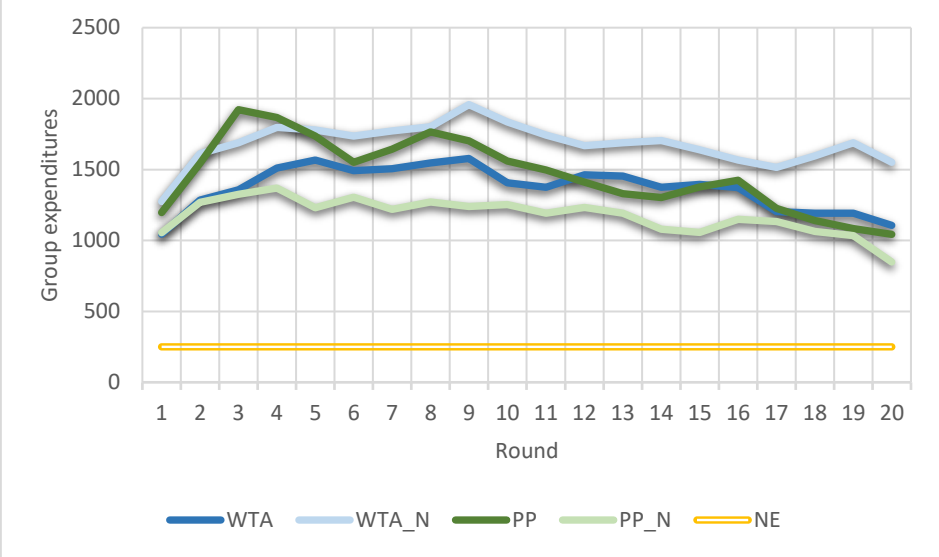

Figure 1. The average group expenditures over the 20 rounds of the experiment, by treatment. Source: *own compilation*

Table 2 summarizes the mean statistics of expenditures and payoffs for each treatment separately. The findings indicate that groups in the WTA contest expended an average of 1371.08 tokens, whereas in the PP contest contributed 1466.07 tokens. This difference is statistically significant as determined by the Mann-Whitney test ($p<0.05$), a nonparametric test chosen for its robustness to non-normal data distributions, making it suitable for comparing expenditures between contest types. However, further analysis of expenditure patterns over rounds reveals that the significant difference is primarily observed by the first five rounds, during which the average expenditures in the PP contest were consistently higher than those in the WTA contest. From the 6th round, the differences in expenditures between the two contest types diminish, as indicated by the convergence of expenditure trends observed in Figure 1. Based on these results, the first hypothesis, stating that no differences would be observed between expenditures in the two contests, must be rejected, although the observed differences are limited to the initial rounds.

The lowest expenditures in the PP_N treatment equal to 1175.91 tokens resulted in the highest average payoff of 27.68 PLN (Mann-Whitney test, $p<0.001$). In turn, the lowest payoff was observed in the WTA_N treatment, amounting to 23.49 PLN which was associated with the highest expenditures equal to 1680.51 tokens. According to the Mann-Whitney test, is significantly greater than the expenditures in the WTA contest ($p<0.001$). When verifying the second hypothesis, it should be noted that the nudge was an effective mechanism in reducing expenditures in the PP game, but not in the WTA game, where we observed the opposite effect to what was intended.

Table 2. Treatment statistics

	Treatments			
	WTA	PP	WTA_N	PP_N
Mean group expenditure	1371.08 (556.62)	1466.07 (704.56)	1680.51 (769.49)	1175.91 (787.59)
Percentage of expenditures = 0	7.39	10.83	9.08	10.91
Percentage of expenditures = 1	1.04	2.92	4.33	8.11
Percentage of expenditures = 500	12.40	7.72	7.5	5.98
Percentage of expenditures = 1000	6.66	17.29	23.08	13.11
Mean payoffs	26.07 (5.96)	25.28 (5.41)	23.49 (5.90)	27.68 (5.51)

Note*:* Standard deviations in parentheses.
Source: *own compilation*

Table 2 also presents the percentage of individual-level contest expenditures equal to 0, 1, 500, or 1000 tokens. Expenditures of 0 tokens could indicate free-riders who sought to benefit from the contest without contributing, anticipating positive expenditures from other group members. It is noted that in over 10% of decisions in the PP and PP_N contests, participants expended nothing. Expenditures of 1 token in the nudge treatments constituted the default option, and it is observed that this expenditure level was chosen more frequently in these treatments compared to the WTA and PP treatments indicating that it may have served as a focal point for participants. An expenditure of 500 tokens represented the median expenditure choice available to participants, with the highest frequency of such decisions (12.4%) occurring in the WTA treatment. Moreover, expenditures of 1,000 tokens represent the least rational choice in terms of net gain, as a player could not obtain a reward exceeding 1,000 tokens in a given round. In this scenario, the player could expect zero profit or a loss. The highest percentage of 1000-token decisions (23.08%) was made in the WTA_N treatment, and the lowest in the WTA treatment, with 6.66% of such decisions.

Figure 2 illustrates the average difference in expenditures between partner groups in the contest over 20 rounds, depending on the treatment. We can observe a rising trend in PP, PP_N, and WTA_N treatments, indicating that the difference in expenditures between groups increased in successive rounds of the experiment, however, in PP_N treatment the disparity ceased to increase, and the trend began to stabilize. In the WTA treatment, it remained at a consistently low level, with a decrease between rounds 12-16.

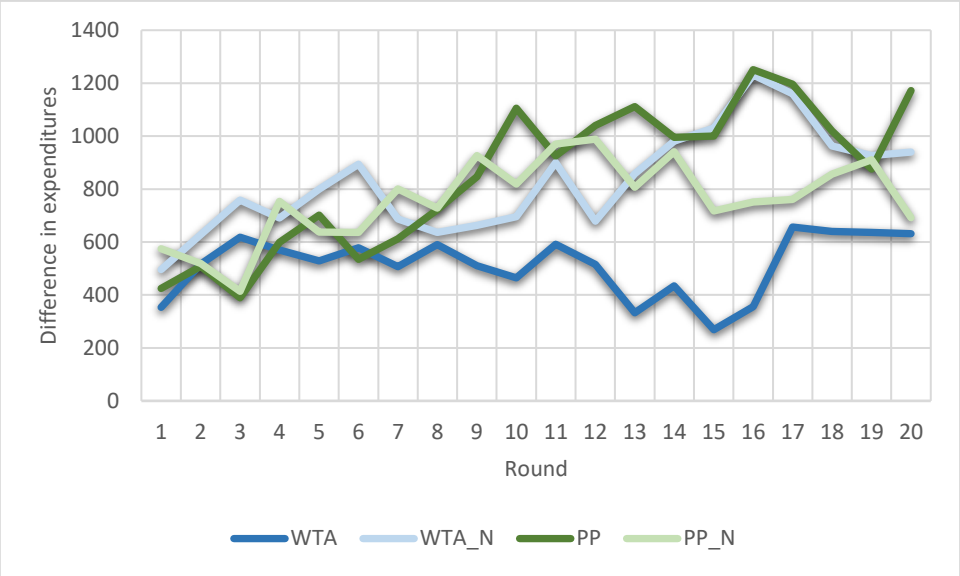

Figure 2. The average difference in partner group expenditures over the 20 rounds of the experiment, by treatment.
Source: *own compilation*

To further analyze these observed trends, we calculated the average difference in expenditures divided into rounds 1-5, 6-10, 11-15, and 16-20, as presented in Table 3. The first observation is that during the initial five rounds, the average difference in expenditures between partner groups is lowest in the PP, PP_N, and WTA_N treatments compared to subsequent rounds. As the rounds progress, this disparity widens; however, in the PP_N treatment, it decreases during the final five rounds. In contrast, in the WTA treatment, the average differences in contest expenditures are the lowest compared to other treatments, with a significant statistical decline after the 10th round (Mann-Whitney test, $p<0.05$) and an increase in the last five rounds ($p<0.001$). Therefore, hypothesis three should be rejected, as coordination of participants' decisions is observed in the initial rounds, though this effect is weaker in the presence of a default option.

Table 3. The average difference in expenditures between partner groups, by treatment

	Treatments			
Rounds	WTA	PP	WTA_N	PP_N
1-5	517.3 (28.81)	524.55 (24.87)	674.38 (23.56)	579.63 (26.70)
6-10	530.05 (26.91)	764.1 (31.66)	715.22 (37.06)	782.27 (38.25)
11-15	428.45 (22.73)	1014.47 (36.38)	889.62 (42.05)	884.83 (46.57)
16-20	584.2 (26.61)	1103.1 (42.27)	1043.88 (47.59)	793.98 (47.36)
All	515.00 (13.28)	851.55 (18.65)	830.77 19.74	760.18 (20.50)

Note: Standard errors in parentheses.
Source: *own compilation*

Table 4 presents an Ordinary Least Square (OLS) linear regression model where the dependent variable is individual-level contest expenditures, and the independent variables include the player's expenditure from the previous round, group expenditures in round *t-1*, partner group expenditures in round *t-1*, net profit from the previous round (calculated as the difference between tokens allocated to the contest and the reward received), and control variables such as gender, age, and measures of risk and social preferences from the questionnaire. OLS regression is employed to analyze expenditures at the individual level. While expenditures are discrete (ranging from 0 to 1000), they are treated as continuous due to the large number of unique values and their approximate distribution. OLS is widely used in experimental economics and remains robust to non-normality as long as the residuals are approximately normal. Model 1 shows results from all observations, while Models 2-5 include observations from the respective treatments.

Table 4. The results from OLS regression with the dependent variable equal to individual-level contest expenditures

Variable	Model 1 All treatments	Model 2 WTA	Model 3 PP	Model 4 WTA_N	Model 5 PP_N
Player's expenditure at *t-1*	.60*** (.01)	.50*** (.03)	.70*** (.14)	.56*** (.03)	.45*** (.05)
Group expenditure at *t-1*	.07*** (.01)	.05*** (.01)	.04 (.03)	.08*** (.01)	.12*** (.01)
Partner group expenditure at *t-1*	.00 (.00)	.03** (.01)	.00 (.03)	-.00 (.01)	-.03** (.01)
Net profit at *t-1*	-.02* (.01)	-.02 (.01)	.04 (.14)	-.00 (.01)	-.17*** (.05)
Female	-18.77** (7.12)	-38.83** (15.21)	-31.93 (16.92)	35.44** (16.27)	-28.73** (11.48)
Age	.01 (.397)	-.09 (.85)	.24 (.76)	-.47 (.84)	1.06 (.82)
Risk preferences	.45*** (.12)	1.34*** (.29)	.64* (.31)	.30 (.28)	.04 (.19)
Dictator game	1.02*** (.15)	2.16*** (0.37)	.67* (.30)	1.26*** (.35)	.43 (.31)
Constant	49.97** (18.86)	35.20 (42.25)	58.54 (84.18)	14.13 (45.22)	125.21** (40.37)
N	4,218	912	912	1,140	1,254
Prob > F	.0000	.0000	.0000	.0000	.0000
R^2	.5873	.5242	.5734	.5256	.6734

Note: estimations are computed at the individual level. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: *own compilation*

We observe that coefficients for the variable related to the player's expenditure in the previous round are positive and significant across all models, indicating that expected expenditure increases if the player allocated tokens to the contest in the previous round. Similarly, group expenditure coefficients are significant, except in the PP treatment, where this is not significant. Interestingly, a positive net profit from the previous round negatively affects contest expenditures, but only in the PP_N treatment. Considering the results from all observations (Model 1), it is evident that women tend to spend less on the contest; however,

within the WTA_N treatment, this relationship reverses. Expenditures also increase among players inclined to take risks and those more willing to share with others.

Conclusion

Overbidding in contests is a pervasive issue that results in substantial resource wastage, as participants invest more than what is economically optimal to gain. This phenomenon not only leads to inefficient resource allocation but also highlights the need for strategies to mitigate excessive spending and foster cooperative behavior among competitors. Addressing overbidding is crucial for enhancing social welfare and ensuring more efficient outcomes in various competitive settings.

This study investigates the impact of default options (nudges) on token expenditures in different types of group-based contests. In particular, we analyzed participant behavior in winner-take-all and proportional prize contests, where participants decide how many tokens to invest in an intergroup competition to win a reward. The WTA contest awards the entire reward to one group based on investment ratios, while the PP contest divides the reward proportionally according to expenditures. Additionally, we introduced a default option in both contests to explore whether nudging could reduce expenditures and improve coordination among players.

The findings of this study reveal that group expenditures consistently exceeded the predicted optimal levels across all four treatments, though there was a noticeable decrease in expenditures over successive rounds. This outcome is consistent with the results obtained by Abbink et al. (2010). The PP contest with the nudge exhibited the lowest expenditures, which minimized resource wastage and resulted in the highest participant payoffs. This outcome suggests that the nudge effectively encouraged more efficient expenditures. However, the WTA contest with the default option showed the highest expenditures, possibly due to the competitive nature and the desire to increase the probability of winning the entire prize. Initially, the differences in expenditures between partner groups were relatively small, but they widened in later rounds, with the smallest differences noted in the WTA contest, potentially due to the distinct competitive pressures in this setting.

Potential explanations for these findings include the escalation of commitment, particularly in the WTA contest. The WTA lottery intensifies competitive behavior as the probability of winning is directly tied to relative expenditures. When participants observe a default expenditure, it can escalate their commitment to winning by encouraging them to contribute significantly more than the default to maximize their chances of winning. This escalation of commitment is a well-documented phenomenon in competitive environments, where individuals progressively invest more resources to outcompete rivals (Staw, 1981). In highly competitive environments like WTA lotteries, participants are motivated not only by the desire to win but also by the fear of losing. This can lead to a form of competitive overbidding, where individuals contribute significantly more than the default to ensure their relative advantage.

On the other hand, in the PP contest, the low default option likely serves as an anchor, influencing participants' perceptions of an appropriate level of contribution. Unlike in winner-take-all settings where the default may escalate commitment, in PP contests, the default can simplify decision-making by providing a clear, low-effort option. This anchoring effect can reduce cognitive load, leading participants to accept the default rather than engage in extensive strategic calculations (Tversky & Kahneman, 1974; Johnson & Goldstein, 2003).

This study has several limitations. The low level of the default option used in the experiment may have been insufficient to fully trigger the anchoring effect, potentially limiting its impact on expenditures. A higher default option, closer to the equilibrium level, could

provide stronger evidence for the nudge's effectiveness, especially in promoting efficient behavior. Additionally, the experiment was conducted in a controlled laboratory setting, which may not fully capture the complexities of real-world competitive environments.

Overall, this study highlights the potential of nudges, specifically default options, to influence strategic behaviors in economic contests. These results have important implications for the design of competitive mechanisms and suggest that incorporating behavioral insights can optimize expenditure patterns and improve outcomes in proportional prize settings. For example, in corporate bidding scenarios or public goods provisioning, carefully designed nudges can reduce excessive expenditures and resource wastage, leading to more sustainable and cost-effective outcomes (Thaler & Sunstein, 2008). Future research should further explore the contextual factors that mediate the effectiveness of nudges in different competitive environments, potentially extending these insights to real-world applications in policy and corporate strategy.

Acknowledgement

The research was supported by a grant from the National Science Centre, Poland (2018/31/N/HS4/01215).

References

Abbink, K., Brandts, J., Herrmann, B., & Orzen, H. (2010). Intergroup conflict and intra-group punishment in an experimental contest game. *American Economic Review*, *100*(1), 420-447. https://doi.org/10.1257/aer.100.1.420

Ahn, T. K., Isaac, R. M., & Salmon, T. C. (2011). Rent seeking in groups. *International Journal of Industrial Organization*, *29*(1), 116-125. https://doi.org/10.1016/j.ijindorg.2010.01.003

Baik, K. H. (1994). Effort levels in contests with two asymmetric players. *Southern Economic Journal*, *61*(2), 367-378. https://doi.org/10.2307/1059984

Barron, K., & Nurminen, T. (2020). Nudging cooperation in public goods provision. *Journal of Behavioral and Experimental Economics*, *88*, 101542. https://doi.org/10.1016/j.socec.2020.101542

Cason, T. N., Masters, W. A., & Sheremeta, R. M. (2020). Winner-take-all and proportional-prize contests: theory and experimental results. *Journal of Economic Behavior & Organization*, *175*, 314-327. https://doi.org/10.1016/j.jebo.2018.01.023

Cason, T. N., Sheremeta, R. M., & Zhang, J. (2012). Communication and efficiency in competitive coordination games. *Games and economic behavior*, *76*(1), 26-43. https://doi.org/10.1016/j.geb.2012.05.001

Chowdhury, S. M., Sheremeta, R. M., & Turocy, T. L. (2014). Overbidding and overspreading in rent-seeking experiments: Cost structure and prize allocation rules. *Games and Economic Behavior*, *87*, 224-238. https://doi.org/10.1016/j.geb.2014.05.004

Dechenaux, E., Kovenock, D., & Sheremeta, R. M. (2015). A survey of experimental research on contests, all-pay auctions and tournaments. *Experimental Economics*, *18*, 609-669. https://doi.org/10.1007/s10683-014-9421-0

Fallucchi, F., Renner, E., & Sefton, M. (2013). Information feedback and contest structure in rent-seeking games. *European Economic Review*, *64*, 223-240. https://doi.org/10.1016/j.euroecorev.2013.09.003

Giamattei, M., Yahosseini, K. S., Gächter, S., & Molleman, L. (2020). LIONESS Lab: a free web-based platform for conducting interactive experiments online. *Journal of the Economic Science Association, 6*(1), 95-111. https://doi.org/10.1007/s40881-020-00087-0

Gråd, E., Erlandsson, A., & Tinghög, G. (2024). Do nudges crowd out prosocial behavior?. *Behavioural Public Policy, 8*(1), 107-120. https://doi.org/10.1017/bpp.2021.10

Greiner, B. (2015). Subject pool recruitment procedures: organizing experiments with ORSEE. *Journal of the Economic Science Association, 1*(1), 114-125. https://doi.org/10.1007/s40881-015-0004-4

Heine, F., & Riedl, A. (2019). *Let's (not) escalate this! intergroup leadership in a team contest*. Working Paper.

Herbst, L. (2016). Who pays to win again? The joy of winning in contest experiments. https://doi.org/10.2139/ssrn.2766934

Johnson, E. J., & Goldstein, D. (2003). Do defaults save lives?. *Science, 302*(5649), 1338-1339. https://doi.org/10.1126/science.1091721

Konrad, K. A. (2009). *Strategy and dynamics in contests*. Oxford University Press. https://doi.org/10.1093/oso/9780199549597.001.0001

Lazear, E. P., & Rosen, S. (1981). Rank-Order Tournaments as Optimum Labor Contracts. *Journal of Political Economy, 89*(5), 841-864. https://doi.org/10.1086/261010

Lim, W., Matros, A., & Turocy, T. L. (2014). Bounded rationality and group size in Tullock contests: Experimental evidence. *Journal of Economic Behavior & Organization, 99*, 155-167. https://doi.org/10.1016/j.jebo.2013.12.010

Madrian, B. C., & Shea, D. F. (2001). The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior. *Quarterly Journal of Economics, 116*(4), 1149-1187. https://doi.org/10.1162/003355301753265543

Moldovanu, B., & Sela, A. (2001). The Optimal Allocation of Prizes in Contests. *American Economic Review, 91*(3), 542-558. https://doi.org/10.1257/aer.91.3.542

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science, 325*(5939), 419-422. https://doi.org/10.1126/science.1172133

Shang, J., & Croson, R. (2009). A field experiment in charitable contribution: The impact of social information on the voluntary provision of public goods. *The Economic Journal, 119*(540), 1422-1439. https://doi.org/10.1111/j.1468-0297.2009.02267.x

Sheremeta, R. M. (2013). Overbidding and heterogeneous behavior in contest experiments. *A Collection of Surveys on Market Experiments*, 109-134. https://doi.org/10.1002/9781118790700.ch6

Sheremeta, R. M. (2018). Behavior in group contests: A review of experimental research. *Journal of Economic Surveys, 32*(3), 683-704. https://doi.org/10.1111/joes.12208

Shupp, R., Sheremeta, R. M., Schmidt, D., & Walker, J. (2013). Resource allocation contests: Experimental evidence. *Journal of Economic Psychology, 39*, 257-267. https://doi.org/10.1016/j.joep.2013.09.001

Staw, B. M. (1981). The Escalation of Commitment to a Course of Action. *Academy of Management Review, 6*(4), 577-587. doi:10.5465/amr.1981.4285694 https://doi.org/10.5465/amr.1981.4285694

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press. https://doi.org/10.1086/592313

Tullock, G. (2008). Efficient rent seeking. In *40 Years of Research on Rent Seeking 1* (pp. 105-120). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-79182-9_6

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. *Science, 185*(4157), 1124-1131. https://doi.org/10.1126/science.185.4157.1124

Van Long, N., & Vousden, N. (1987). Risk-averse rent seeking with shared rents. *The Economic Journal, 97*(388), 971-985, https://doi.org/10.2307/2233083.

Yoeli, E., Hoffman, M., Rand, D. G., & Nowak, M. A. (2013). Powering up with indirect reciprocity in a large-scale field experiment. *Proceedings of the National Academy of Sciences*, 110(Supplement 2), 10424-10429. https://doi.org/10.1073/pnas.1301210110

Appendix

Post-experiment questionnaire

1. Are you: (Male /Female)
2. Age
3. Which is your major: (Economics / Others / Never studied)
4. The size of the city you live in (Village / City with up to 20,000 residents / City with from 20,000 up to 100,000 residents / City with from 100,000 up to 500,000 residents / City with over 500,00 residents)
5. How would you describe your political preferences from 1 to 7 where 1 = very right-wing and 7 = very left-wing?
6. Lottery question (hypothetical):
   Imagine that you receive PLN 100 from us. You have to decide how much of this amount (from 0 to 100 PLN) you would like to spend on participating in the following lottery: you have a 50% chance to lose the allocated amount and you have a 50% chance to win three times the amount wagered. How much of PLN 100 would you spend on this lottery?
7. Dictator game (hypothetical):
   Imagine you are playing the following game where you and another participant in today's experiment play. You receive PLN 100 from us, while the other participant does not receive any money. How much of this amount (from 0 to 100 PLN) would you decide to transfer to the other person, knowing that the other player will not be able to reject your offer and you will remain anonymous to yourself? How much of PLN 100 would you give to the other player?
8. How much do you agree with the following statements? [Indicate: 1 - Strongly disagree – 5 - Strongly agree]

   'WTA' and 'WTA_N' treatments:

   1. Sometimes I transferred more of my tokens so that my group had a better chance of winning the prize.
   2. Sometimes I transferred less of my tokens because I was hoping other people in my group would donate more of their tokens.

   'PP' and 'PP_N' treatments:

   1. Sometimes I transferred more of my tokens in order for my group to win a greater share of the prize.
   2. Sometimes I transferred less of my tokens because I was hoping other people in my group would transfer more of their tokens.

Instructions (all instructions were prepared in the Polish language)
All treatments

Welcome!

You are now taking part in a decision-making experiment. Your decisions and decisions made by others will affect your final earnings.
We ask you to take your time to read and understand the instructions carefully.

Rules during the experiment

During the experiment, you will have the chance to earn tokens, which will be converted into cash using an exchange rate of 8 tokens = 1 grosz. The more tokens you collect, the more cash you will receive.

At the beginning of the experiment, we will randomly select two people with whom you will create a group of three. Your group will play against another (randomly matched) group. We will refer to this group as "the second group". During or after the experiment, you will not find out who is in your group or the other group. Other players will also not receive any information about your identity.

The experiment will consist of 20 rounds and in each round, your group and second group will be competing for a prize in the following way. At the beginning of each round, each participant will receive 1,000 tokens. Each member of your group will decide simultaneously on the number of tokens (from 0 to 1,000) that they want to allocate to the common pool and on the number of tokens to keep for themselves. You will keep tokens that you do not transfer into the common pool – they will be added to the tokens you have collected so far. Other members in your group will also be able to decide how many tokens to transfer to the common pool. The members of the second group will have their own common pool and will decide how many tokens to transfer into it - just like in your group.

WTA and WTA_N treatments

How much each person puts into the common pool will affect the probability of receiving the prize. The prize amount in each round equals 3,000 tokens - or 1,000 tokens for each member of the winning group. The probability of winning a prize depends on the number of tokens in the common pool of yours and the second group.

Probability of winning a prize (3,000 tokens for the winning group, i.e. 1,000 tokens for each person) = $\frac{(X1+X2+X3)}{(X1+X2+X3)+(Y1+Y2+Y3)}$, where $X_1 + X_2 + X_3$ are the tokens, which members of your group have allocated to the common pool, and $Y_1 + Y_2 + Y_3$ are the tokens in the common pool of the second group.

In each round, you will be informed about the number of tokens that the members of your group have allocated to the common pool – their decisions will always be displayed in the same order. You will also receive information on how many tokens the second group has allocated to their common pool.

Example

If each player in your group transferred 300 tokens into the common pool in a given round and 200 tokens in the second group, the probability of winning a prize by your group would be 60% because $\frac{300+300+300}{(300+300+300)+(200+200+200)} = \frac{900}{1500} = 0{,}6 = 60\%$. The probability of winning a prize by the second group would be 40%.

If your group in this round won the contest, each person in your group would receive a prize of 1,000 tokens, so everyone in your group would receive $1000 - 300 + 1000 = 1700$ tokens each. Each member of the second group would keep $1000 - 200 + 0 = 800$ tokens. If your group lost the contest, you would keep $1000 - 300 = 700$ tokens in this round. Each member of the second group would receive $1000 - 200 + 1000 = 1800$ tokens.

If nobody in one of the groups transfers anything to the common pool, the other group will receive a prize. If no one donates anything to the common pool, neither in yours nor in the second group, then neither group will win the prize and the prize will be lost.

In WTA_N treatment only:

Note: a value will appear in the response field, which will be the same for all participants. You can leave this response and accept it or erase it and enter your own

Payoffs

Your final score will be the sum of all the tokens you collect in each round of this experiment. Regardless of your result, you will receive PLN 10 for participating in the experiment.

PP and PP_N treatments

In each round, the prize is worth 3,000 tokens. Your group will receive a share of this prize - its size will be proportional to the tokens that your group has allocated to the common pool compared to the number of tokens in the common pool of the second group:

The share of the prize received by your group = $\frac{(X1+X2+X3)}{(X1+X2+X3)+ (Y1+Y2+Y3)} * 3000$, where $X_1 + X_2 + X_3$ are the tokens, which members of your group allocated to the common pool, and $Y_1 + Y_2 + Y_3$ are the tokens in the common pool of the second group.

The tokens received by your group will be divided equally among the group members. This means that you will get $\frac{1}{3}$ of the prize received by your group: $\frac{(X1+X2+X3)}{(X1+X2+X3)+ (Y1+Y2+Y3)} * 3000 * \frac{1}{3} = \frac{(X1+X2+X3)}{(X1+X2+X3)+ (Y1+Y2+Y3)} * 1000.$

In each round, you will be informed about how many tokens your group members have allocated to the Common Pool - their decisions will always be displayed in the same order. You will also receive information on how many chips the second group has allocated to its own pool.

Example

If each player in your group allocated 300 tokens into the common pool in a given round, and 200 tokens in the second group, the share of the prize received by your group would be 1,800 tokens, because $\frac{300+300+300}{(300+300+300)+ (200+200+200)} * 3000 = \frac{900}{1500} * 3000 = 1800$, and you would get $\frac{1}{3}$ of that amount that is 600 tokens. Each person in your group would receive $1000 - 300 + 600 = 1300$ tokens this round. The share of the prize received by the second group would be $3000 - 1800 = 1200$ and each member would get $1000 - 200 + 400 = 1200$ tokens.

If nobody in one of the groups transfers anything to the common pool, the other group will receive a prize. If no one donates anything to the common pool, neither in yours nor in the second group, then neither group will win the prize and the prize will be lost.

In PP_N treatment only

Note: a value will appear in the response field, which will be the same for all participants. You can leave this response and accept it or erase it and enter your own

Payoffs

Your final score will be the sum of all the tokens you collect in each round of this experiment. Regardless of your result, you will receive PLN 10 for participating in the experiment.