Journal of Economic Behavior and Organization 215 (2023) 60–73

Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

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

Conflict in the pool: A field experiment☆

Loukas Balafoutas [a,*], Marco Faravelli [b], Helena Fornwagner [c], Roman Sheremeta [d]

[a] University of Exeter Business School, Department of Economics, and University of Innsbruck, Department of Public Finance. Streatham Court, Rennes Drive, Exeter EX4 4PU, United Kingdom
[b] University of Queensland, School of Economics
[c] University of Exeter Business School, Department of Economics
[d] Case Western University, Weatherhead School of Management, Department of Economics

ARTICLE INFO

JEL codes:
C72
C93
D74
D91

Keywords:
Conflict
Valuations
Scarcity
Field experiment

ABSTRACT

We conduct a field experiment on conflict in swimming pools. When all lanes are occupied, an actor joins the least crowded lane and asks one of the swimmers to move to another lane. The lane represents a contested scarce resource. We vary the actor's valuation (high and low) for the good through the message they deliver. Also, we take advantage of the natural variation in the number of swimmers to proxy for their valuation. Consistent with theoretical predictions, a swimmer's propensity to engage in conflict increases in scarcity and decreases in the actor's valuation. We complement the results with survey evidence.

1. Introduction

Conflict is an unavoidable part of life. People engage in conflict when competing for scarce resources, such as physical resources, employment opportunities and promotions, mates, scarce vaccines, and so on. The workplace is not immune to it. Conflict within organizations *'emerges when one party - be it an individual or a group of individuals – perceives its goals, values, or opinions being thwarted by an interdependent counterpart'* and typically involves competing for scarce resources such as *'time, responsibility, status or budgets'* (De Dreu, 2008). It costs firms time and money, negatively affects customers' experience, reduces workers' wellbeing, affects their health, and increases stress levels (De Dreu et al., 2004). A vast literature extending across different disciplines examines several aspects of

☆ We are grateful to Ralph-Christopher Bayer, Subhasish Chowdhury, Martin Dufwenberg, Ben Greiner, Steffen Huck, Kai Konrad, Marie Claire Villeval, as well as seminar and conference participants at Humboldt University of Berlin, Vienna University of Economics and Business, the University of Padua, the University of Exeter, the University of Southampton, New York University Abu Dhabi, the 2019 ESA World Meeting in Vancouver, 2019 ESA European Meeting in Dijon, French Experimental Talks Workshop and RExCon21 Conference on Social Preferences and Social Norms for helpful comments and suggestions. Special thanks are due to Alex Cummins, Isobel Grummels, Lucy Heathcote, John Humphreys, Ethan Lwin and Josh McDonough for assisting in the experiment. This study has received a certificate of good standing from the Board for Ethical Questions in Science of the University of Innsbruck (Approval Number 13/2019) and from the Human Ethics Research Office at The University of Queensland (Clearance Number 2,018,001,352). This research was supported by the Tyrolean Science Fund through grant number 0404/2147 and by the Australian Research Council's Discovery Projects funding scheme (DP190102629).

* Corresponding author.
E-mail addresses: l.balafoutas@exeter.ac.uk (L. Balafoutas), m.faravelli@uq.edu.au (M. Faravelli), h.fornwagner@exeter.ac.uk (H. Fornwagner), rms246@case.edu (R. Sheremeta).

https://doi.org/10.1016/j.jebo.2023.08.028
Received 18 November 2022; Received in revised form 11 July 2023; Accepted 31 August 2023
Available online 14 September 2023

conflict using theoretical and empirical methods. This literature is characterized by a strong heterogeneity in the methodological approaches used to study conflict, but an even more fundamental diverging feature is the way in which conflict is defined in theory and operationalized in empirical analysis.[1] In an effort to systematize existing work, Kimbrough et al. (2000: p. 999) – following Garfinkel and Skaperdas (2007) – define conflict *'as a situation in which agents choose inputs that are costly, both to themselves and relative to some socially efficient optimum, in pursuit of private payoffs framed as wins and losses'*. This definition is helpful in demarcating conflict from situations in which a principal (e.g., firm) seeks ways to maximize effort from agents (e.g., workers), because it precludes cases where expended efforts create positive third-party externalities.

In this paper, we present novel evidence from the field on the behavior of economic agents in an environment where competing parties can engage in conflict and the efforts they invest create no positive externalities. More specifically, we test the role of scarcity and players' valuations in determining the effort invested into conflict. Following a simple framework that resembles those commonly used for the study of contests but, in addition, allows for altruistic preferences, we predict that effort increases in scarcity (through an increase in a player's valuation of the contested resource) and decreases in the other player's valuation (through a stronger altruistic response). While it may apparently sound contradictory to imagine a conflict between pro-social players, this is extremely common. Human beings are social animals, and conflict cannot fully wipe out these deep-set preferences, even in acutely conflictual contexts.[2] A key contribution of this work is that it represents a methodological advancement in the literature on conflict by introducing a method for initiating conflict and testing theoretical predictions related to it in a field experiment. In doing so, we show how previous lab evidence generalizes to a field setting.

The experiment was conducted in a number of swimming pools in Brisbane, Australia. We staged a conflict scenario by employing four actors who, acting individually, asked swimmers in the pool to move to a different lane so that the actors could have more space to train.[3] Hence, our actors initiated a conflict over a scarce resource, namely space in the water. In this tightly controlled environment in the field, we vary a signal on the actors' valuation for the scarce resource by manipulating the type of justification that they deliver along with their request. In addition, we exploit the naturally occurring variation in scarcity (measured by the number of people swimming in each lane). We document the responses of swimmers to the request by our actors and whether they agreed to leave the lane or not. We also code these responses into varying degrees of willingness to engage in conflict.

We find that, in line with theoretical predictions, a swimmer's propensity to engage in conflict increases in scarcity and diminishes in the actor's stated valuation. Moreover, the propensity to engage in conflict increases in the swimmer's speed, lending more support to the finding that individuals with a higher valuation are more likely to invest resources into conflict. We complement these results with survey evidence, which helps us better understand the way that the conflict scenario is perceived by swimmers and to interpret the variables and effects of interest. To the best of our knowledge, this is the first study using experimental data from the field in order to test theoretical predictions related to conflict. One likely reason for the lack of existing studies is the difficulty in implementing such a scenario in the field. We present here a methodology that engages the experimental participants in conflict and allows us to test the effects of interest through a controlled treatment variation, without creating any physical risks for participants.[4] By doing so, we take advantage of the benefits of field experiments in terms of ecological validity and realism (Harrison and List, 2004).

One of the most common ways to model conflict in economics is to cast the problem in terms of a contest (see Kimbrough et al., 2020) between players who compete for a scarce resource (i.e., a prize) with '*imperfectly specified and imperfectly enforced property rights*' (Garfinkel and Skaperdas, 2007: p. 652).[5] The two most popular contest models are rent-seeking models (Tullock, 1980) and all-pay auctions (first adopted by Nalebuff and Stiglitz, 1983, and described in detail by Hillman and Riley, 1989). Over time, the development of these models has provided valuable theoretical predictions for the study of strategic behavior in conflicts (see Konrad, 2009, for a review). Among these, two well-established theoretical results are worthy of attention (see Kimbrough et al., 2020, for a detailed description). First, the aggregate level of conflict increases in the size of the prize; this is known as the *incentive effect*. Second, in contests with asymmetric players, the equilibrium effort exerted by the contestant with the lowest valuation diminishes as the asymmetry increases (Baye et al., 1993, 1996; Baik, 1994).[6] This is called *discouragement effect*: weaker players strategically cut their losses when facing stronger players.

Lab experiments have offered support both for a positive effect of own valuation on effort (Bull et al., al.,1987; Van Dijk et al., 2001) as well as for the discouragement effect (Davies and Reilly, 1998; Fonseca, 2009). Beyond the lab, however, results are not as clear-cut. A different strand of the literature using empirical data from sports tournaments generally finds mixed results. While some studies find

[1] On this issue, see Kimbrough and Sheremeta (2019): *'Not only do the various disciplines [management, economics, psychology, evolutionary biology, anthropology, political science] use different methods, models and kinds of data studying conflict and war, there is also surprisingly little agreement on fundamentals such as how to define conflict.'*

[2] Possibly the most iconic image of this is the 1914 Christmas Truce. On Christmas day in the first year of the Great War, all along the Western Front, French, British and German soldiers stopped fighting, fraternized and exchanged gifts, while several football games were organized in no man's land (see Brown and Seaton, 1995).

[3] To avoid any confusion, we will always refer to our confederates as the *actors* and to the persons they engaged with as the *swimmers*.

[4] This methodology has received ethical approval from two independent institutional review boards (see the acknowledgements footnote for further details). We made sure no physical risks were involved, by instructing actors to de-escalate any situation that might appear likely to lead to a fight. However, in a study of conflict, some psychological costs during the interaction (through, for instance, unpleasant emotions) are inevitable.

[5] Notice, however, that contest and conflict are not synonyms. Contests can also be employed to model situations where positive third-party externalities are present, such as sports competitions or workplace tournaments, while the lack of such externalities is an essential attribute of conflict.

[6] The problem can be either in terms of asymmetric valuations or asymmetric abilities, the two frameworks being isomorphic.

evidence in line with the incentive effect (Ehrenberg and Bognanno, 1990), others do not (Orszag, 1994). Similarly, the discouragement effect is supported in some (Brown, 2011; Tanaka and Ishino, 2012) but refuted in others (Guryan et al., 2009; Babington et al., 2020). Two kinds of reasons help explain why these findings are inconclusive. First, empirical studies, by definition, lack the control of experiments. Second, unlike a conflict, effort in sports competitions is typically characterized by positive externalities (first and foremost on spectators), further complicating the matter. We contribute to the still open and important research questions on the relationship between scarcity, valuation, and conflict by offering evidence from a controlled field experiment.[7]

2. Experimental design

The experiment described here was conducted in six swimming pools in Brisbane, Australia, between January and February 2019. We consider this setting well-suited for a study on conflict due to a number of reasons. First, it features a scarce resource – space in the water – with naturally occurring scarcity. Second, it offers a tightly controlled environment in the field, in which certain important aspects of the environment can be objectively measured, such as the extent of scarcity and observable characteristics of the individuals under consideration (swimmers in the pool). This environment is also highly standardized, with all pools being of the same size (Olympic size, including eight 50-meter-long lanes). Third, it offers the possibility of engaging with the swimmers one-on-one, without the involvement of bystanders or other parties. Fourth, the study is conducted in Australia, a country with a long successful tradition in the swimming sport and one in which swimming is performed by highly competitive individuals who take it very seriously. Hence, we have an environment where the scarce resource is of substantial value for the typical individual in the sample.

The interaction in our experiment includes the following elements: An actor employed by the researchers walks to the shallow end of a swimming lane, enters the lane, and waits until a swimmer stops, making sure that the swimmer is alone and no one else can overhear the conversation.[8] Then, the actor speaks to the swimmer and asks him or her to leave the lane so the actor has more space to train. This is the key feature of our design, in which our actors essentially initiate a conflict with the swimmers over a scarce resource (space in the water).[9]

Our exogenous treatment variation consists of two different messages delivered by the actors, corresponding to two different levels of their valuation of the scarce resource. In treatment *Low Valuation*, the message is the following: *'Excuse me, I need to train for a race. Do you mind moving to a different lane?'* In treatment *High Valuation,* the message was modified to reflect an even higher valuation by the actor: *'Excuse me, there's a race tomorrow I really need to train for. Do you mind moving to a different lane?'* In order to standardize the interactions and keep interaction protocol as tightly controlled as possible, we instructed actors to avoid engaging in additional free-form conversation with the swimmers and respond to most possible queries from the swimmers by saying *'Well, I need to train, will you leave the lane or not?'*, thus provoking a binary decision by the swimmer on whether to follow the request or stay in the lane.[10] They were also instructed to avoid any form of escalation and to immediately end the interaction and avoid all provocation in case a swimmer showed any sign of aggression.[11] Actors recorded the exact verbal response of the swimmer and whether they agreed to leave the lane. They also recorded certain observable characteristics of the swimmer (gender, approximate age, approximate height, perceived muscularity on a scale from 1 to 10, with higher values indicating a more muscular swimmer).

The second key dimension in which variation occurred in the experiment was the scarcity of the resource. This naturally occurring variation is measured by the number of swimmers per lane, with more swimmers corresponding to more scarcity. Data were collected only under conditions of scarcity, which in this setting means two things. First, in all collected observations, all lanes in the pool were busy with at least one swimmer. Second, the lane in which the interaction took place was always the least busy one in the pool, in the sense that all other lanes had at least as many swimmers as the selected lane.[12] This is necessary in order to ensure that leaving the lane at the actor's request imposes a non-negative cost on the swimmer in terms of the scarce resource.[13]

We employed four actors (two male and two female), trained them before the experiment, and simulated the interactions until we were sure that they were sufficiently prepared. Data were then collected in teams of three, including two actors and one research assistant (henceforth, RA). The RA's job was to select an appropriate lane for the next observation and record the number of swimmers

[7] There are studies using field experiments to assess the role of tournaments as incentive mechanisms. Such studies examine performance at the workplace (Erev et al., 1993; Bandiera et al., 2013), educational attainments (e.g., Leuven and Oosterbeek, 2011; Herranz-Zarzoso and Sabater-Grande, 2018), salespersons motivation (e.g., Casas-Arce and Martinez-Jerez, 2009; Delfgaauw et al., 2013), or status (e.g., Kosfeld and Neckermann 2011). However, these experiments are conducted in principal-agent settings and are not directly related to conflict.

[8] In order to be inconspicuous and not attract any attention, we averaged between one and two observations per hour.

[9] The actors were recruited from the acting course of the School of Creative Practice of the Queensland University of Technology (QUT). QUT's course is the most prestigious acting course in Queensland and among the best in Australia. The recruited actors were in their final year and had already had substantial acting experience.

[10] In case the swimmer asked what kind of race the actor is referring to, actors were instructed to respond that this was a race at The University of Queensland. Indeed, each day, we conducted races among our actors, to avoid potential criticism that our messages involved deception.

[11] We note, however, that no escalation and no sign of aggression occurred in any of the 205 collected observations.

[12] We did not collect any observations in lanes with more than three swimmers, because in such situations the value of the prize (staying in the lane) is rather low in the first place.

[13] The cost can still be zero in cases where the adjacent lanes have the same number of swimmers as the selected one. In such cases, the potential cost of complying with the actor's request consists solely of the inconvenience of switching lanes. Conducting the analysis only with those cases where the cost of switching lanes is strictly positive in terms of resource losses (60% of the sample) does not change any of the main findings of the paper, and in fact increases the magnitude and significance of the coefficients of interest.

in each lane in the pool, as well as the speed of each swimmer in the selected lane. Then, the RA told the actor which lane to enter and which message to deliver. Hence, randomization across treatments was performed by the RA, who was instructed to switch between the two messages using a simple randomization device.[14] The full instructions given by the experimenters to the RAs and the actors can be found in Appendix A.

3. Conceptual framework and hypotheses

Conflict and contest models in economics commonly assume that a number of players invest costly and irreversible efforts while competing for a prize, and that their probability of winning the prize is increasing in own and decreasing in the other player's effort, according to some contest success function. Kimbrough et al. (2019) classify models used to study conflict in economics into contest models, war of attrition games, Colonel Blotto games, guns versus butter games, and spatial conflict models. Without loss of generality, we rely here on a simplified version of the well-known rent-seeking contest by Tullock (1980) in order to describe the effects of interest.[15] We consider two risk-neutral players ($i = 1,2$) who can exert effort levels e_1, e_2, in order to win a prize of value v_1, v_2, respectively. Swimming in a relatively less crowded lane represents the prize, while we assume that engaging in conflict is costly. The contest success function of player 1 takes the form $p_1 = \frac{e_1}{e_1+e_2}$, where p_1 is the probability that player 1 wins the prize (with the contest success function being analogous for player 2). This is known as a lottery contest success function. Costs of effort are linear: $c_1(e_1) = e_1$, $c_2(e_2) = e_2$. Given the above, the expected payoffs π_1 and π_2 for players 1 and 2 are equal to the respective probability of winning the prize (p) times the prize value (v) minus the cost of effort (e):

$$E(\pi_1) = \frac{e_1}{e_1 + e_2} v_1 - e_1, \tag{1}$$

$$E(\pi_2) = \frac{e_2}{e_1 + e_2} v_2 - e_2. \tag{2}$$

We assume that players have altruistic preferences, resulting in the following utility functions for player 1 and player 2, respectively: $u_1 = E(\pi_1) + \alpha_1 E(\pi_2)$, $u_2 = E(\pi_2) + \alpha_2 E(\pi_1)$, where $E(\pi_1)$ and $E(\pi_2)$ are defined as in Eqs. (1) and (2), and $\alpha_1, \alpha_2 \in [0,1)$ reflect the players' degree of altruism. Solving the first-order conditions yields the following equilibrium efforts: $e_1^* = \frac{(v_1-\alpha_1 v_2)^2 (v_2-\alpha_2 v_1)}{(v_1+v_2-\alpha_1 v_2-\alpha_2 v_1)^2}$; $e_2^* = \frac{(v_2-\alpha_2 v_1)^2 (v_1-\alpha_1 v_2)}{(v_1+v_2-\alpha_1 v_2-\alpha_2 v_1)^2}$. With no loss of generality, call the swimmer player 1 and the actor player 2. Then, the comparative statics for the swimmer reveal that: i) $\frac{\partial e_1^*}{\partial v_1} > 0$, and ii) $\frac{\partial e_1^*}{\partial v_2} < 0$ whenever $v_1 < \frac{(1+\alpha_1)}{(1+\alpha_2)} v_2$. In other words, the swimmer's effort (e_1) is increasing in their own valuation (v_1) and decreasing in the actor's valuation (v_2) as long as v_2 is sufficiently high relative to v_1. For this reason, we have chosen messages for the actors that convey a high valuation for the resource, especially in the high valuation treatment. Moreover, survey evidence (reported in Section 4) suggests that this assumption generally holds in our setting. The preceding analysis leads us to formulate our two hypotheses.

Hypothesis 1. *The probability that the swimmer engages in conflict is lower when the actor delivers a higher valuation message.* This hypothesis follows from the fact that a player's effort is decreasing in the other player's valuation when the other player's valuation is high enough in relative terms.

Hypothesis 2. *The probability that the swimmer engages in conflict is higher when the resource is scarcer (*i.e., *the lanes are busier).* This hypothesis captures the positive relationship between a player's own valuation and his or her effort. Seen from the perspective of the swimmer, more acute scarcity translates into a higher prize of winning the conflict and hence a higher willingness to invest effort.[16] An alternative formulation is in terms of the well-known incentive effect, which states that the aggregate level of conflict increases in the size of the prize. Since the actor's effort is by design fixed in our setting, any change in the effort invested by the swimmer directly translates into an equivalent change in the aggregate level of conflict.

In the absence of altruism ($\alpha_1 = \alpha_2 = 0$) the comparative statics are very similar. In particular, the equilibrium efforts are now $e_1^* = \frac{v_1 v_2}{(v_1+v_2)^2} v_1$; $e_2^* = \frac{v_1 v_2}{(v_1+v_2)^2} v_2$, and the comparative statics are: i) $\frac{\partial e_1^*}{\partial v_1} > 0$, and ii) $\frac{\partial e_1^*}{\partial v_2} < 0$ whenever $v_1 < v_2$. Adding altruism into the utility

[14] Brisbane has more than 20 public, outdoor Olympic-size pools. Based on a two-week period of observation prior to the experiment, we selected the six with the best conditions: they had to be sufficiently crowded to create conditions of scarcity, and easy for the actors and RAs to mix in the crowd and disappear after each observation. The pools all included a location (e.g., a cafe) where the RA could sit and take notes of the interaction without appearing suspicious. In this respect, we note that in no single pool or occasion did our teams arouse any suspicion or attract the attention of pool staff.

[15] The particular choice of formalization that uses a rent-seeking contest is not crucial for obtaining the effects of interest. It would suffice to formulate a generic contest success function that defines a player's probability of winning as a continuous and monotonic function, increasing in own and decreasing in the opponent's effort (see Chowdury, 2021, for such a contest success function). Our objective is not to recreate a field setting that perfectly corresponds to a stylized theoretical representation of conflict; after all, theoretical models aspire to capture certain elements of the real world, while abstracting from others. The aim of the conceptual framework is to better illustrate how players' valuations can be expected to affect their behavior.

[16] See, for instance, Verhallen and Robben (1994) for the relation between scarcity and valuation.

functions of the two players does not change the prediction regarding the effect of own valuation on effort (the incentive effect), but it moderates the negative relationship between the opponent's valuation and own effort. Fixing, for simplicity, $\alpha_2 = 0$, we can see that if a swimmer is altruistic ($\alpha_1 > 0$), the negative relationship between the opponent's valuation and own effort is more frequently observed than in the purely self-interested case, the reason being that $\frac{\partial e_1^*}{\partial v_2}$ is negative under a large range of parameters.

An important part of our identification strategy is the interpretation of observed outcomes in terms of the two hypotheses. In particular, an empirical question is how to measure the effort invested by swimmers. In the experiment, we observe two aspects of a swimmer's behavior: first, his or her verbal response to the request formulated by the actors; second, his or her actual decision on whether to leave the lane as requested.

The decision to stay in the lane or leave is a crude measure of effort in the sense that it takes a binary form, but it has the advantage of being more directly and objectively quantifiable. A swimmer who agrees to leave the lane essentially avoids conflict, conceding the prize (more space in the water) by moving to a more crowded lane. By contrast, a swimmer who stays in the lane engages in direct confrontation and does not concede the scarce resource. Hence, comparing the two actions (staying in the lane or leaving), staying is associated with higher effort for the swimmer. This rests on our assumption that engaging in confrontation by responding negatively to the actor is indeed a costly act, in other words, that individuals are generally averse to being involved in a disagreement. We hold this to be a plausible assumption. In this respect, notice also that the swimmer does not know whether his or her refusal to leave the lane could escalate into a prolonged verbal disagreement or even physical confrontation. The survey evidence discussed in Section 5 shows that a considerable share of swimmers would consider an escalation likely in this scenario. Following the above considerations, in the remainder of the paper and in the data analysis, we refer to swimmers "engaging in conflict" when they stay in the lane, and rates of conflict correspond to the share of swimmers who do so.

The swimmer's verbal response can deliver a more nuanced picture of the swimmer's effort, especially in case of a refusal to move to a different lane. Conditional on the swimmer staying in the lane and thus engaging in confrontation, a verbal response can signal varying degrees of determination and willingness to fight for the scarce resource. For instance, it can signal a willingness to compromise by suggesting sharing the lane or promising to leave soon. On the other hand, some swimmers deliver an absolute, firm refusal, or even express their annoyance at the request. In order to perform the data analysis with the verbal measure, we asked two independent coders to rate the responses of all swimmers into one of four categories: 0 (swimmer left the lane); 1 (mild refusal, meaning that the swimmer refused to leave but signaled a willingness to compromise or made some kind of concession); 2 (firm refusal); 3 (firm refusal accompanied by an expression of annoyance or anger). The coders were given the exact text of the swimmer's response, along with a description of each interaction (including the information on whether the swimmer left the lane, as well as additional remarks by the actor on non-verbal reactions by the swimmer). We then constructed the average of the two coded responses, resulting in a variable that ranges from 0 to 3 in steps of 0.5, with higher values indicating a higher invested effort.[17]

Regarding scarcity, the main measure used in the analysis is the average number of swimmers in the two lanes adjacent to the one where the interaction takes place (or in the one adjacent lane in cases when the interaction takes place at one end of the pool). We rely on this primary measure because the adjacent lanes are more readily visible to the swimmer at the time of interaction. However, we confirm the robustness of our findings by measuring scarcity in terms of the average number of swimmers per lane in the entire pool.

4. Results

Our sample consists of 205 swimmers (64% male). 104 observations were collected by male and 101 by female actors. Randomization across treatments resulted in 107 observations for the *Low Valuation* and 98 observations for the *High Valuation* treatment. On average, there were 2.0 swimmers per lane in the pool and also per adjacent lane, while the selected lane where the interactions took place had 1.4 swimmers in it (such that moving to a different lane always came at a cost, as already explained in the previous section). 86 out of 205 swimmers (42%) followed the actor's request and left their lane, thus avoiding conflict. Conversely, 58% of swimmers declined the request, thus engaging in the conflict situation that our actors initiated. Comparing by treatment, a clear pattern emerges, with swimmers significantly less likely to engage in conflict when the actor signaled a high valuation (51.0% in *High Valuation* vs. 64.5% in *Low Valuation*, $p = 0.05$, χ^2 test). Using the non-binary measure of swimmers' effort based on the distribution of coded responses (see Fig. 1) confirms that effort is lower in the high valuation treatment (0.82 in *High Valuation* vs. 1.08 in *Low Valuation*, $p = 0.04$, Mann-Whitney U test). These results provide strong support for Hypothesis 1.

Turning to Hypothesis 2, we find that swimmers are significantly more willing to engage in conflict as scarcity increases. The Spearman rank correlation coefficient between scarcity (average number of swimmers in the adjacent lanes) and engaging in conflict is 0.22 ($p<0.01$). Comparing those swimmers who left the lane and those who did not (see Panel a in Fig. 2), we find that the resource is scarcer in the latter group (average number of swimmers in the adjacent lanes: 2.20 vs. 1.77, $p = 0.02$, Mann-Whitney test). If we use the average number of swimmers in the entire pool as our measure of scarcity, the result is very similar (2.18 vs. 1.79, $p = 0.02$, Mann-Whitney U test). Based on the non-binary measure, we find a positive relationship between coded effort and the average number of swimmers in the pool (Spearman's ρ=0.14, $p = 0.05$). Hence, our data support Hypothesis 2 as well.

A different way of testing Hypothesis 2 is by comparing rates of conflict between low and high scarcity observations. This comparison relies on defining appropriate cut-off points for scarcity. Splitting the entire sample into two sub-samples around the median and comparing the cases of relatively low scarcity (average number of swimmers in the adjacent lanes of up to 1.5, 46% of the sample)

[17] The tau-equivalent reliability of the two ratings is very high, with Cronbach's alpha equal to 0.95.

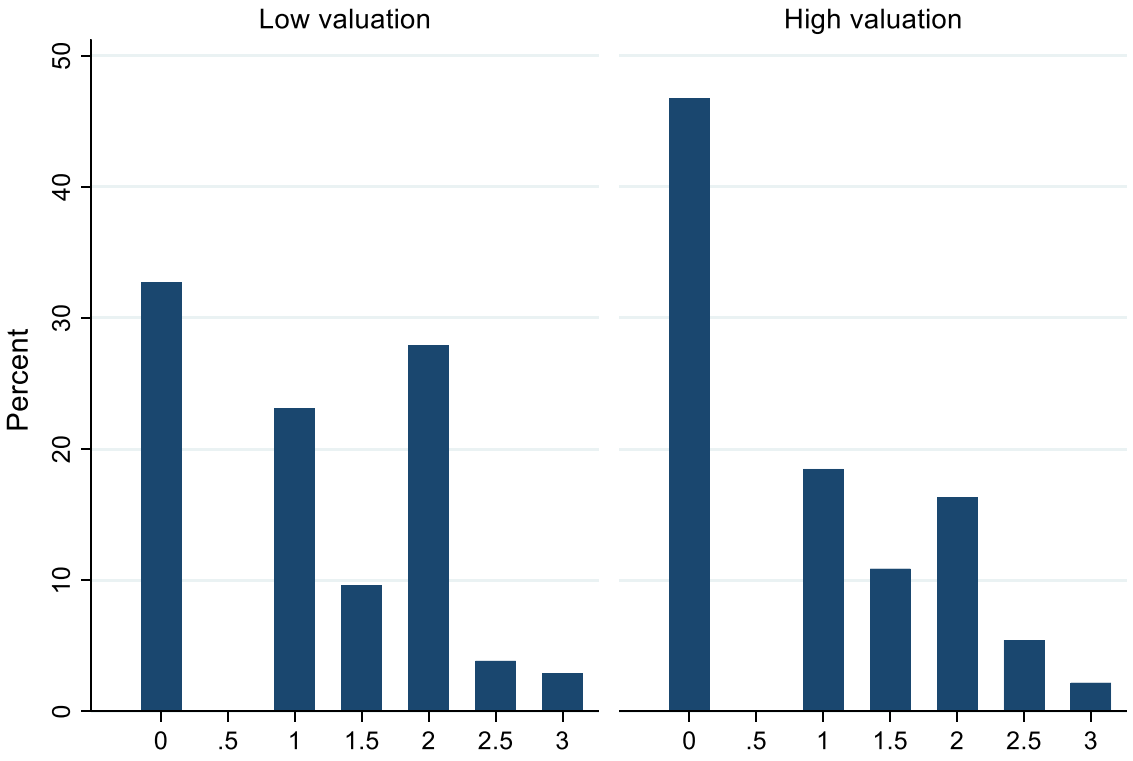

Fig. 1. Swimmer's coded effort, by actor's valuation.

to those of relatively high scarcity (54% of the sample), the difference in conflict rates is not significantly different ($p = 0.19$, χ^2 test). However, this is because most of the effects are concentrated at the more extreme levels of scarcity. To have a sharper distinction and a more powerful test, we compare the lower scarcity quartile (roughly corresponding to an average of up to one swimmer per adjacent lane) to the highest scarcity quartile (roughly corresponding to three or more swimmers). The difference in leaving rates is highly significant, despite the sample being smaller ($p = 0.01$, χ^2 test). The same is true if we look at terciles, in which case the lower tercile coincides with the lower quartile, while the upper tercile corresponds to 2.5 or more swimmers per adjacent lane. Again, the difference in rates of conflict between the two sub-samples is significant ($p = 0.01$, χ^2 test)

In the preceding analysis on the role of scarcity, the implicit assumption needed for identification has been that scarcity can be considered exogenous with respect to relevant swimmer characteristics. In Appendix B, we show pairwise correlations between the average number of swimmers per lane and observable swimmer characteristics, as well as time of day and day of the week. None of the correlations are statistically significant. The results remain the same if we use alternative measures of scarcity. Hence, the evidence supports the assumption that the natural variation in scarcity is unrelated to swimmer characteristics. In addition, the regression analysis presented in Table 1 and discussed below controls for all these characteristics and is fully in line with the non-parametric test results.

We proceed to offer some additional support for Hypothesis 2. Our RAs measured the speed of all swimmers in the sample before the interaction with the actors, allowing us to relate their responses to how fast they are. Panel b in Fig. 2 shows that those swimmers who refuse to leave the lane are, on average, significantly faster than those who agree to leave (0.82 m/s vs. 0.77 m/s, $p<0.01$, Mann-Whitney U test). One can interpret this finding in terms of the incentive effect that we are interested in, because faster swimmers are likely to have a higher valuation for the scarce resource. This interpretation rests on the assumption that speed is positively associated with valuation. An alternative interpretation of the effect of speed could be that it is related to a sense of entitlement if faster swimmers believe that they have more right to space in the water compared to slow swimmers, who are less likely to be obstructed during their laps by someone in front of them. Evidence from the post-experimental surveys (see Section 5 for details) clearly supports the valuation interpretation and rejects the one based on entitlement. In the question '*In general, would you say that a fast swimmer values swimming in a less crowded lane more or less compared to a slow swimmer?*', a large majority of 69% answered that a fast swimmer values the less crowded lane more than the slow swimmer (with 27% of responses supporting an equal valuation and only 4% a higher valuation by the slower swimmer). On the contrary, when we asked '*In general, would you say that a fast swimmer has more or less right to have free space compared to a slow swimmer?*', an overwhelming 93% of respondents said that both types of swimmers have the same right to free

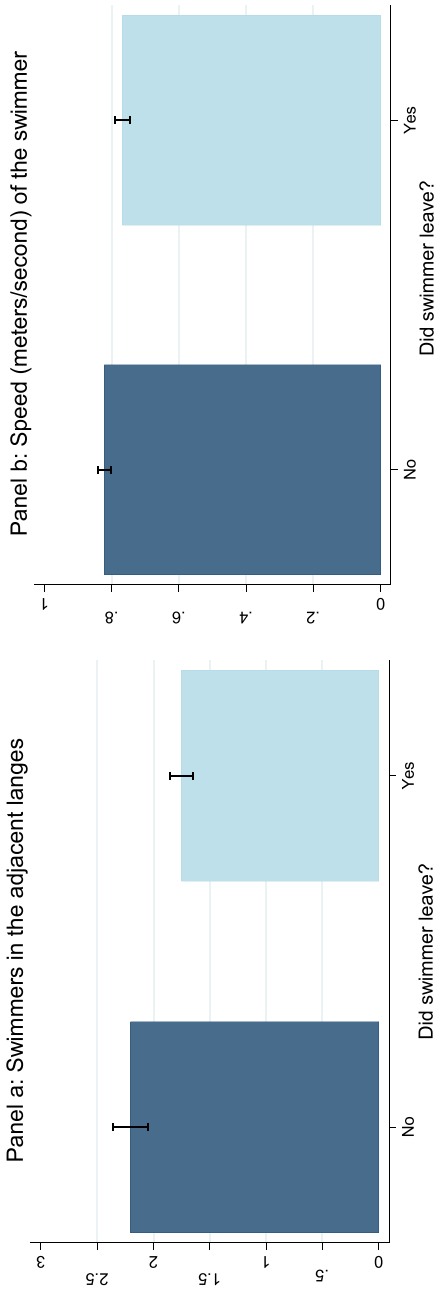

Fig. 2. Scarcity and swimmer's speed.
Note: The error bars extend from the lower to the upper values of the confidence intervals.

Table 1
Regression analysis on swimmers' behavior.

	Binary variable (stay in lane)			Coded response (effort)		
	(1)	(2)	(3)	(4)	(5)	(6)
High Valuation	−0.42**	−0.42**	−0.37*	−0.47**	−0.44**	−0.33*
	(0.18)	(0.19)	(0.20)	(0.22)	(0.22)	(0.20)
Swimmers per adjacent lane	0.33***	0.33***	0.32***	0.26**	0.24**	0.25**
	(0.10)	(0.10)	(0.12)	(0.10)	(0.10)	(0.11)
Swimmer's speed	1.60***	1.62**	1.52**	1.37*	1.57**	1.28*
	(0.62)	(0.67)	(0.71)	(0.74)	(0.79)	(0.73)
Swimmer's muscularity		−0.01	0.04		−0.03	0.05
		(0.06)	(0.06)		(0.06)	(0.06)
Swimmer's height		−0.24	−1.71		−0.36	−1.78
		(1.54)	(1.76)		(1.79)	(1.75)
Female actor		−0.10	−0.25		−0.04	−0.28
		(0.19)	(0.51)		(0.22)	(0.33)
Female swimmer		0.02	−0.15		0.23	0.09
		(0.28)	(0.32)		(0.33)	(0.32)
Actor random effects	No	No	Yes	No	No	Yes
Pool fixed effects	No	No	Yes	No	No	Yes
Number of observations	205	205	203	196	196	196

Notes: In columns 1–3 the estimation method is the Probit model, and the dependent variable is a dummy equal to 1 if the swimmer refused to leave the lane at the actor's request, and 0 otherwise. In columns 4–6 the estimation method is the Tobit model, and the dependent variable is the swimmer's response as coded by the two raters. This variable is left-censored at 0 and right-censored at 3, with higher values indicating a higher effort invested into conflict. The number of observations is slightly lower in columns 4–6 because the coders did not assign a value to the response of those swimmers who stayed in the lane but did not verbally respond to the actor's request. *Swimmer's speed* is the number of meters covered per second, such that higher values indicate faster speed; *Swimmer's muscularity* is based on the ratings of the actors and ranges from 1 to 10, with higher values indicating higher perceived muscularity. *Swimmer's height* is measured in meters. Standard errors in parentheses. *, **, *** denotes statistical significance at the 10%, 5%, 1% level, respectively.

space.[18]

Table 1 displays the results of a multivariate regression analysis with the swimmer's response as the dependent variable. In the first three columns, this is a binary variable on whether the swimmer stayed in the lane and thus engaged in the conflict initiated by the actor, while in the last three columns it is the intensity of the swimmer's response, as coded by the two raters and with higher values corresponding to a stronger perceived propensity to engage in conflict.[19] The explanatory variables in the parsimonious specifications (1) and (4) include a dummy variable for the high valuation treatment, the average number of swimmers per adjacent lane as a measure of scarcity, and the swimmer's speed as measured by our RA. Additional control variables in the remaining specifications include the swimmer's perceived muscularity as rated by the actor, the swimmer's height, and the actor's and swimmer's gender (as female dummy variables, and noting the absence of significant interactions between the actor's and swimmer's gender).[20] The rationale for including the swimmer's height and muscularity is to control for his or her physical strength, which could become relevant in case of a physical confrontation. Although no such confrontation could ever take place given the way our actors were instructed, it is conceivable that stronger, taller swimmers feel more confident in a conflict situation. Finally, columns (3) and (6) include actor random effects and pool fixed effects.[21]

In line with the non-parametric analysis, Table 1 regressions offer support for Hypotheses 1 and 2. With regard to Hypothesis 1, the *High Valuation* treatment leads to significantly less frequent and less intense refusals to leave the lane in every specification. With respect to Hypothesis 2, we find that swimmers are more likely to refuse to leave their lane when the pool is busier (with more swimmers per lane), and therefore the resource is scarcer. Moreover, faster swimmers are, on average, less likely to heed the actor's request. As we have already argued, we view this as additional evidence in support of the incentive effect, which implies that effort increases in own valuation.

[18] This percentage remains very high when we only include those respondents who consider themselves to be at least "fairly good" swimmers or at least "very good" swimmers based on question 2 of the survey (92% and 86%, respectively).

[19] Given the distributions of the dependent variables, estimation is based on the Probit model in the first three columns and on the Tobit model in the last three columns. The results in columns (4)-(6) are generally robust to estimation with Ordinary Least Squares instead of Tobit, although we note that the variable *High Valuation* retains its sign and magnitude but loses its significance in the random effects OLS regression, due to a large increase in its standard error.

[20] As already discussed, we have opted for the average number of swimmers per adjacent lane as the primary measure of scarcity. We replicate all regressions replacing this variable with the average number of swimmers per lane in the entire pool, and also with the difference between the number of swimmers in the adjacent lanes and the swimmer's lane. The results remain qualitatively the same.

[21] A Hausman specification test does not reject the null hypothesis that the random effects estimator is consistent for actors ($p = 0.98$). Hence, we include actor random effects and add pool dummies in specifications (3) and (6). We note the presence of substantial differences in outcomes across the four actors: conflict rates are 68% and 52% for the two male actors, and 78% and 33% for the two female actors (the difference between the two actors of the same gender being significant only for females).

The regression analysis also allows us to assess the potential role of several observable characteristics – included as control variables – on the propensity of swimmers to invest effort into the enacted conflict scenario. As it turns out, the only significant predictors of behavior are the ones linked to our key hypotheses, with all additional variables being very small in magnitude and insignificant. These variables include the swimmer's height and perceived muscularity (as proxies for his or her physical strength), as well as the gender of both the actor and the swimmer. The addition of actor random effects in (3) and (6) has no notable impact on any of the coefficients of interest either.[22]

5. Interpreting the results: post-experimental surveys

Four months after the completion of our experiment, in June 2019, our research assistants conducted an ex-post survey in the same six swimming pools. The sample size for the surveys was $N = 201$. The purpose of these surveys is to help us interpret the results of the experiment and better understand the motivation behind swimmers' responses, as well as the way in which they perceive the experimental setting. The full surveys, including the distribution of responses, are shown in Appendix C.

One of the survey questions (question 3) presented respondents with a hypothetical scenario, which was identical to the interaction that we staged during the actual experiment. Specifically, we asked respondents to tell us if they would be willing to move to a different lane if they found themselves in the position of the swimmer. Here we had two different versions of the survey, one corresponding to the actor's message in the *Low Valuation* and one to the message in the *High Valuation* treatment (each respondent was randomly assigned to one message only). The stated rates of willingness to leave the lane at the actor's request were 69% in *Low Valuation*, and 80% in *High Valuation*. Hence, survey respondents generally overstate their propensity to comply with the actor's request,[23] but – in line with Hypothesis 1 and the results of the actual experiment – they report a higher hypothetical willingness to avoid conflict and switch lane when receiving the high valuation message ($p = 0.08$, χ^2 test).

A discussion is due with respect to our findings in support of Hypothesis 1. Why is it the case that swimmers are more likely to avoid conflict and concede the scarce resource to high valuation – as compared to low valuation – actors? Based on the simple theoretical framework of Section 3, a player facing an opponent with a higher valuation anticipates a low winning probability and therefore will strategically reduce their own effort in order to keep effort costs low. When we assume altruism, we have shown that this effect is reinforced. Considering this, one may be tempted to think that altruism alone can explain our results. However, taken in isolation, altruism cannot account for our findings in support of Hypothesis 1. Indeed, in order to explain why an altruistic person is less likely to give up the lane when the pool is busier, one must assume a cost of altruism. In a setting characterized by a private good and well-established property rights, this would be implicitly captured by the disutility of not owning the good any longer. However, in our setting, there are no property rights, and the good (i.e., the lane) is contested. For this reason, even if one assumes underlying altruistic preferences, it is nonetheless necessary to model the situation as a conflict. And such conflict, embedded in a context where agents are potentially altruistic, is the necessary ingredient that moderates altruism when the resource is scarcer.

Question 4 in the survey asked respondents to state their reasons for complying with the actor's request in the hypothetical scenario, with multiple answers being allowed. The responses to this question are illuminating. The two most common reasons given for leaving the lane refer to the fact that the other person needs the lane more (67%), and a desire to help people (55%). The fact that two-thirds of respondents say that the hypothetical actor needs the lane more than they do provides direct support for the assumption that the actor's valuation is sufficiently high compared to the swimmer's valuation ($v_1 < \frac{(1+\alpha_1)}{(1+\alpha_2)} v_2$), which is necessary to generate Hypothesis 2 as described in Section 3. It also indicates that social preferences do matter in this setting, a conclusion further supported by the fact that more than half of the respondents mention helping people as a reason for switching lanes. Notably, the share of respondents who said they would leave the lane because they like to help people (the third response in question 4) is lower in the *High Valuation* than in the *Low Valuation* treatment (49% vs. 63%, $p = 0.08$, χ^2 test). This is consistent with an altruistic motivation, because the benefit (to an altruistic swimmer) of switching lanes and helping the actor is higher in the *High Valuation* treatment, and therefore in this treatment there is a share of swimmers with a lower alpha who will accommodate the actor's request not because they like to help people in general, but because the person is in need.

At the same time, we argue that swimmers largely perceive the situation as a conflictual one. To begin with, we have staged a scenario in which swimmers face an unexpected and direct request from a stranger in a face-to-face interaction. Hence, contrary to lab settings, one is forced to actually interact with a demanding stranger who is challenging one's claim to a resource without knowing that this claim is taking place within a controlled interaction protocol (such as an experiment). Moreover, in Question 4 of the survey, a substantial number of people state that they would leave the lane in order to avoid 'confrontation', or wasting time 'arguing with

[22] The results are robust to the inclusion of time and day fixed effects, as well as to the inclusion of historical weather data on minimum and maximum daily temperatures and on rainfall, collected from the Australian Government Bureau of Meteorology. They are also robust if we only consider data collected during the weekend (N = 64). Moreover, we have information on the speed provision in some lanes (slow, medium, or fast). This information is not included in the regressions, since less than half of the observations (84 out of 205) were collected in lanes with such a provision. We note, however, that neither the binary nor the coded measure of swimmer effort varies by speed provision ($p = 0.15$, $p = 0.69$, respectively; χ^2 tests).

[23] It is well known among social scientists that non-incentivized survey responses are subject to social desirability bias, i.e., respondents tend to conceal preferences that are considered socially undesirable (Maccoby and Maccoby, 1954; Edwards, 1957). Moreover, respondents can be subject to a hypothetical bias that drives a wedge between actual and hypothetically stated behaviors (Harrison and Rustrom, 2008). It is thus important to acknowledge that survey responses should be interpreted with caution.

people'. We believe that verbal confrontation is unpleasant for most people and often associated with a substantial amount of effort and costs for individuals. In addition, some swimmers may believe that the interaction with the actor could even escalate into physical confrontation. Indeed, responses to question 7 reveal that a considerable share of respondents (37%) find it 'possible' or 'quite likely' that the situation described to them could escalate into physical conflict if they did not agree to move to a different lane. Hence, overall, we believe that we have been able to create a situation that captures a number of essential aspects of conflict in this field setting and is largely perceived as such by individuals.

6. Concluding remarks

We presented new evidence from a field experiment on conflict. We studied a situation where economic agents compete over a scarce resource by expending irreversible effort with no third-party externalities. We analyzed the role of scarcity and valuations in determining the effort that potentially altruistic players choose to invest in conflict. In line with a simple theoretical model, we find that a player's effort invested into the conflict increases in scarcity and decreases in the other player's valuation. In addition, we presented survey results supporting in different ways our findings, offering insights on the role of altruism in this context, and corroborating that the interaction we staged in our experiment is, indeed, perceived as conflictual by the population from which our sample is taken.

To the best of our knowledge, ours is the first field experiment on conflict. The most likely reason for this lacuna in the literature is that the design of controlled field studies on this topic undoubtedly presents significant challenges. First and foremost, the selection of a tightly controlled, easily replicable environment, where agents naturally and artlessly may happen to enter into conflict over a scarce resource; where scarcity, valuations, and effort are measurable; where third-party externalities are absent; and where a conflict can be initiated inconspicuously, without creating any physical risk for the participants, and equally unostentatiously observed for study. An important contribution of our study is that it provides a methodological advancement that can add to the economist's toolkit for studying interactions in the field, for which we possess mostly laboratory evidence so far.

Declaration of Competing Interest

The authors declare no competing interests with regards to the above-mentioned manuscript, submitted to the *Journal of Economic Behavior & Organization*.

Data availability

Since acceptance, we have deposited all data and analysis here: https://osf.io/3j5eh/?view_only=c8fc86d2431542f2bcde7b487c406e82.

Appendix A. Instructions

Actor instructions

Please carefully follow these steps:

1) Walk to RA and ask which lane and message were selected for you

2) Walk to the shallow end of the selected lane and wait until a swimmer stops, then jump into the lane

3) Deliver to the swimmer either Message 1 or 2, depending on how you were instructed by RA:

Message 1: "*Excuse me, I need to train for a race. Do you mind moving to a different lane?*"

Message 2: "*Excuse me, there's a race tomorrow I really need to train for. Do you mind moving to a different lane?*"

If the swimmer asks you what kind of race is it? You should say: "*It is a UQ race.*"

If the swimmer replies with a question, try to respond as succinctly as possible and to elicit a clear response to your request

4) Try to remember the exact corresponds with the swimmer and his/her response to each of the questions that you ask, because you will need to report these responses to RA.

For example: "no, I was here first", "sure, no problem", "I am almost done", "I will be done in 10 min" etc.

5) While interacting with the swimmer, please pay attention to the following information, because you will need to report this information to RA.

What is the gender of the swimmer? _____

What was the ethnicity of the swimmer (Caucasian, Asian, South Sea Islander, Black)? _____

Was English his/her first language? _____

Approximately how tall was the swimmer (in centimeters)? _____

Approximately how old was the swimmer (in years)? _____

How muscular is the swimmer on 0 to 10 scale (0 = very weak, and 10 = very strong)? _____

RA instructions

Please carefully follow these steps:

1) What is the date and time?

Date: _____

Time: _____

2) What is the name of the swimming pool?

Pool name: _____

3) Check all lanes that are active, meaning they are available for all swimmers to use. Also, if some lanes have a dedicated speed please record it below:

Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8

4) How many swimmers are in each active lane?

Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7	Lane 8

5) Look for an active lane with the least number of swimmers in it (but no more than 3 swimmers). If there are several such lanes, then randomly choose one. Write down the number of this lane. Make sure that the actors have not previously interacted with the swimmers in that lane.

Lane number: ___

6) Measure the speed (in seconds per 50 m) of swimmers in that lane. If there are several swimmers, then what is the speed of each swimmer?

Swimmer 1′s seconds to swim 50 m: _____

Swimmer 2′s seconds to swim 50 m: _____

Swimmer 3′s seconds to swim 50 m: _____

7) Randomly select one of the two messages for the actor to deliver to a swimmer in the lane.

Message 1: _ "*Excuse me, I need to train for a race. Do you mind moving to a different lane?*"

Message 2: _ "*Excuse me, there's a race tomorrow I really need to train for. Do you mind moving to a different lane?*"

8) Record the name of the actor and tell the actor which lane to join. Actor will wait for a swimmer in that lane to stop and then join that lane.

Actor's name: _____

9) Record the speed of that particular swimmer with which actor interacts.

What was the swimmer's speed measured in step 5: _____

10) After the actor swims for 5 min and comes back to you, please ask the actor the following questions and record the corresponding answers:

What was the gender of the swimmer? _____

What was the ethnicity of the swimmer (Caucasian, Asian, South Sea Islander, Black)? _____

Was English his/her first language? _____

Approximately how tall was the swimmer (in centimeters)? _____

Approximately how old was the swimmer (in years)? _____

How muscular was the swimmer on 0 to 10 scale (0 = very weak, and 10 = very strong)? _____

Did the swimmer agree to leave the lane? _____

What was the exact response of the swimmer to the question "*Excuse me, do you mind moving to a different lane?*" _____

What was the exact response of the swimmer to the question "*Well, I need to train, could you move?*" _____

What was the exact response of the swimmer to the question "*OK then, can you tell me how much time will you need to finish your swim?*" _____

Appendix B. Scarcity, swimmer characteristics, time, and day

Spearman correlation coefficients between scarcity (average number of swimmers per lane) and the following variables:		
Female swimmer	0.09	$p > 0.1$
Swimmer's age	0.11	$p > 0.1$
Swimmer's height	0.05	$p > 0.1$
Swimmer's perceived muscularity	−0.07	$p > 0.1$
Time of day (in 1-hour intervals)	−0.03	$p > 0.1$
Day of the week (dummy)	−0.09	$p > 0.1$

Appendix C. Post-experimental survey, including distribution of responses

Hello. I am part of a team of researchers from The University of Queensland, who are conducting a survey regarding social behavior. Could you please spare us about 3 min of your time and answer a few short questions?

1. How often do you go swimming in a pool?

Five days a week or more	8%	Three to four days a week	34%
One to three days a week	48%	Less than once a week	10%

When you swim, do you usually come to this particular pool?

Yes, always	50%	Sometimes	12%
Yes, most of the time	32%	I usually go to a different pool	5%

2. How good a swimmer do you consider yourself to be?

Not very good	13%
Fairly good	69%
Very good	18%
Semi-professional or professional	1%

3. Imagine the following hypothetical situation: Suppose there is at least one person in every lane and you are swimming in one of the least crowded lanes; while taking a short break at the shallow end, someone gets into the lane and asks you the following:

[Low Need] : "*Excuse me, I need to train for a race. Do you mind moving to a different lane*?"

[*High Need*] : "*Excuse me, there's a race tomorrow I really need to train for. Do you mind moving to a different lane?*"

Would you accept this person's request and move to a different lane?

YES, I would move to a different lane	75%
NO, I would not move to a different lane	25%

Can you tell us what you think your exact response would be? [coded as text]

4. [If the answer to (3) is YES] For which reason(s)? [multiple answers allowed]

Because I do not like confrontation	29%
Because this person apparently needs the lane more than I do	67%
Because I like to help people	55%
Because arguing with people is a waste of time	29%
Other	6%

5. [If the answer to (3) is NO] For which reason(s)? [multiple answers allowed]

Because I was in the lane first	14%
Because we can share the lane, no-one has to leave	84%
Because this request is rude	18%
Because I also need to train	49%
Other	12%

6. How would you characterize the request of this person?

Unacceptable	3%
Somewhat unacceptable	28%
Somewhat acceptable	3%
Acceptable	41%
Neither acceptable, nor unacceptable	24%

7. Do you think that such a situation could escalate into a physical conflict if you do not agree to move?

No	63%
It is quite likely	13%
It is possible	24%

8. Has anybody ever asked you to move lane?

Yes	17%
No	83%

If yes, when? [coded as text]

9. In general, would you say that a swimmer who is already in a lane has more right to swim in it compared to someone

who has just arrived?

Yes	57%
No	43%

10. In general, would you say that a fast swimmer values swimming in a less crowded lane more, or less compared to a slow swimmer?

More	69%
Less	4%
The same	27%

11. In general, would you say that a fast swimmer has more, or less right to have free space compared to a slow swimmer?

More	6%
Less	1%
The same	93%

12. Gender

Male	40%
Female	60%

13. Age (evaluated by RA, in years): [41]
14. Muscularity (evaluated by RA on a scale from 0 to 10): [5.6]
15. Height (evaluated by RA, in meters): [1.76]
Date: _____
Pool: _____

References

Babington, Michael, Goerg, Sebastian J., Kitchens, Carl, 2020. Do tournaments with superstars encourage or discourage competition? J. Sports Econom. 21 (1), 44–63.
Baik, Kyung Hwan, 1994. Effort levels in contests with two asymmetric players. South. Econ. J. 367–378.
Bandiera, Oriana, Barankay, Iwan, Rasul, Imran, 2013. Team incentives: Evidence from a firm level experiment. J. Eur. Econ. Assoc. 11 (5), 1079–1114.
Baye, Michael R., Kovenock, Dan, De Vries, Casper G., 1993. Rigging the lobbying process: an application of the all-pay auction. Am. Econ. Rev. 83 (1), 289–294.
Baye, Michael R., Kovenock, Dan, De Vries, Casper G., 1996. The all-pay auction with complete information. Economic Theory 8 (2), 291–305.
Brown, Jennifer., 2011. Quitters never win: The (adverse) incentive effects of competing with superstars. J. Polit. Econ. 119 (5), 982–1013.
Brown, Malcolm, Seaton, Shirely, 1995. Christmas Truce. Pan.
Bull, Clive, Schotter, Andrew, Weigelt, Keith, 1987. Tournaments and piece rates: An experimental study. J. Polit. Econ. 95 (1), 1–33.
Casas-Arce, Pablo, Martinez-Jerez, F.Asis, 2009. Relative performance compensation, contests, and dynamic incentives. Manage. Sci. 55 (8), 1306–1320.
Chowdhury, S.M. (2021). The Economics of Identity and Conflict. In Oxford Research Encyclopedia of Economics and Finance.
Davis, Douglas D., Reilly, Robert J., 1998. Do too many cooks always spoil the stew? An experimental analysis of rent-seeking and the role of a strategic buyer. Public Choice 95 (1), 89–115.
De Dreu, Carsten K.W, 2008. The virtue and vice of workplace conflict: food for (pessimistic) thought. J. Organ. Behav. 29 (1), 5–18.
De Dreu, Carsten K.W., Dierendonck, Dirk Van, Dijkstra, Maria T.M., 2004. Conflict at work and individual well-being. Int. J. Confl. Manage. 15 (1), 6–26.
Delfgaauw, Josse, Dur, Robert, Sol, Joeri, Verbeke, Willem, 2013. Tournament incentives in the field: Gender differences in the workplace. J. Labor Econ. 31 (2), 305–326.
Edwards, Allen L., 1957. The Social Desirability Variable in Personality Assessment and Research. Dryden Press, Fort Worth, TX, US.
Ehrenberg, Ronald G., Bognanno, Michael L., 1990. Do tournaments have incentive effects? J. Polit. Econ. 98 (6), 1307–1324.
Erev, Ido, Bornstein, Gary, Galili, Rachely, 1993. Constructive intergroup competition as a solution to the free rider problem: A field experiment. J. Exp. Soc. Psychol. 29 (6), 463–478.
Fonseca, Miguel A., 2009. An experimental investigation of asymmetric contests. Int. J. Ind. Organiz. 27 (5), 582–591.
Garfinkel, Michelle R., Skaperdas, Stergios, 2007. Economics of conflict: An overview. Handb. Def. Econ. 2, 649–709.
Guryan, Jonathan, Kroft, Kory, Notowidigdo, Matthew J., 2009. Peer effects in the workplace: Evidence from random groupings in professional golf tournaments. Am. Econ. J. Appl. Econ. 1 (4), 34–68.
Harrison, Glenn W., List, John A., 2004. Field experiments. J. Econ. Lit. 42 (4), 1009–1055.
Harrison, Glenn W., Rutström, E.Elisabet, 2008. Experimental evidence on the existence of hypothetical bias in value elicitation methods. Handb. Exp. Econ. Results 1, 752–767.
Herranz-Zarzoso, Noemí, Sabater-Grande, Gerardo, 2018. Monetary incentives and self-chosen goals in academic performance: An experimental study. Int. Rev. Econ. Edu. 27, 34–44.
Hillman, Arye L., Riley, John G., 1989. Politically contestable rents and transfers. Econ. Pol. 1 (1), 17–39.
Kimbrough, Erik O., Sheremeta, Roman M., 2019. Theories of conflict and war. J. Econ. Behav. Org. 159, 384–387.
Kimbrough, Erik O., Laughren, Kevin, Sheremeta, Roman, 2020. War and conflict in economics: Theories, applications, and recent trends. J. Econ. Behav. Org. 178, 998–1013.
Konrad, Kai A., 2009. Strategy and dynamics in contests. OUP Catalogue.
Kosfeld, Michael, Neckermann, Susanne, 2011. Getting more work for nothing? Symbolic awards and worker performance. Am. Econ. J. Microecon. 3 (3), 86–99.
Leuven, Edwin, Oosterbeek, Hessel, 2011. Overeducation and mismatch in the labor market. Handb. Econ. Edu. 4, 283–326.
Maccoby, Eleanor E., Maccoby, Nathan, 1954. The interview: A tool of social science. Handb. Soc. Psychol. 1 (1), 449–487.
Nalebuff, Barry J., Stiglitz, Joseph E., 1983. Prizes and incentives: towards a general theory of compensation and competition. Bell J. Econ. 21–43.
Orszag, Jonathan M., 1994. A new look at incentive effects and golf tournaments. Econ. Lett. 46 (1), 77–88.
Tanaka, Ryuichi, Ishino, Kazutoshi, 2012. Testing the incentive effects in tournaments with a superstar. J. Jpn. Int. Econ. 26 (3), 393–404.

Tullock, Gordon, 1980. Efficient rent-seeking. In: Buchanan, J.M, Tollison, R.D., Tullock, G. (Eds.), Towards a Theory of the Rent-Seeking Society. Texas A&M University Press.
Van Dijk, Frans, Sonnemans, Joep, Van Winden, Frans, 2001. Incentive systems in a real effort experiment. Eur. Econ. Rev. 45 (2), 187–214.
Verhallen, Theo M.M., Robben, Henry S.J., 1994. Scarcity and preference: An evaluation on unavailability and product evaluation. J. Econ. Psychol. 15, 315–331.