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Ola Andersson
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Carl-Zeiss-Str. 3
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www.uni-jena.de

Max Planck Institute of Economics
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D-07745 Jena
www.econ.mpg.de

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Productivity in Contests: Organizational Culture and Personality Effects*

Ola Andersson† Marieke Huysentruyt‡ Topi Miettinen§
Ute Stephan¶

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Abstract

We study the interaction of organizational culture and personal prosocial orientation in team work where teams compete against each other. In a computerized lab experiment with minimal group design, we assign subjects to two alternative subliminally primed organizational cultures emphasizing either self-enhancement or self-trancendence. We find that effort is highest in self-trancendent teams and prosocially oriented subjects perform better than proself-oriented under that culture. In any other value-culture-mechanism constellation, performance is worse and/or prosocials and proselves do not differ in provided effort. These findings point out the importance of a 'triple-fit' of preferences, organizational culture and incentive mechanism.

JEL: Tournaments; Organizational Culture; Personal Values; Teams; Economic Incentives

Keywords: C91, D23, J33, M52

1 Introduction

Team incentives are present in a majority of US firms (Ledford 1995) and the trend of adopting them amongst large firms is positive (Lazear and Shaw 2007).

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†Stockholm School of Economics; ola.andersson@hhs.se

‡London School of Economics & SITE at Stockholm School of Economics; m.e.huysentruyt@lse.ac.uk

§Aalto University, School of Economics & SITE, Stockholm School of Economics; topi.miettinen@hse.fi

¶Catholic University of Leuven; ute.stephan@econ.kuleuven.be

Even in academia, team incentives receive increasing attention (Wuchty et al. 2007).[1] Part of the explanation for the extensive use of team incentives may be the need to compensate the drawbacks of relative performance incentives, implied by best-performer promotion practices, found in nearly all hierarchical organizations.[2] As suggested by field evidence (Bandiera et al, 2005), relative evaluation may render close-knit groups' performance suboptimal if other-regarding group members internalize the negative externality of their effort on others.[3] With regards to this finding, notice that under relative performance schemes, team incentives may be used to provide a countervailing positive externality on others. Indeed, in a laboratory study, Nalbantian and Schotter (1997) compare a number of incentive structures, among others one where teams compete against each other in a repeated contest game (*competing teams* mechanism).[4] They conclude that *competing teams* outperform other forms of incentives both in yielding a higher average effort and a lower variance. One shortcoming of the Nalbantian and Schotter (1997) study is that they do not control for other-regarding preferences. Bandiera et al. (2005) deem prosocial concern a crucial factor undermining the effectiveness of relative individual performance incentives since it motivates holding back effort in order not to inflict a negative externality onto others.

By contrast, prosocially-oriented individuals may effectively thrive under team tournaments where effort has a positive externality for fellow team members. Indeed, it may have been prosocial individuals in particular who were providing the extra productivity in Nalbantian and Schotter's (1997) study. In addition, once a group is created, the way it functions and the values it adopts gains importance. Organizational culture may thus be central for the performance of the incentive scheme.[5] Moreover, a long tradition in organizational research supports the notion that individuals whose values align with those of the organization they work for are more productive, so called person-organization fit theory (e.g., Hoffman & Woehr, 2006; Verquer, Beehr & Wagner, 2003; Schnei-

[1] This may be surprising given the strong associated free-riding incentives (Holmström, 1982).

[2] Evidence on the frequent usage of tournaments is provided by Bull et al. (1987), Baker et al. (1988).

[3] Bandiera, Barankay and Rasul (2009) conduct a field experiment to investigate the effect of social-ties (each subject must name 5 others they knew before they started working and 5 others who they became friends with) to other workers on productivity under absolute performance measures. They find that overall there is a positive effect of social ties on aggregate productivity.

[4] In *competing teams* there is a positive externality on one's team members alongside the negative externality on the out-group which is the only externality when *individuals* compete. The intra-team positive externality may well more than offset the inter-team negative one given the tendency for parochial altruism, preference for being nice to ingroups and neutral or even hostile to outgroups (Choi and Bowles, 2007; Billig and Tajfel, 1973; Rand et al. 2009).

[5] Organizational culture is an idea in the field of organizational studies and management, which describes the psychology, attitudes, experiences, beliefs and values (personal and cultural values) of an organization. It has been defined as "the specific collection of values and norms that are shared by people and groups in an organization and that control the way they interact with each other and with stakeholders outside the organization" (Hill and Jones, 2001).

der, 1987). A similar alignment may exist between individuals and incentives schemes, as well as between incentives schemes and the organizational culture within which these incentive schemes are applied. If true, then this implies that managers may be well advised to tailor incentives schemes to individuals or select individuals based on their compatibility with incentives schemes. Similarly, organizations may be best advised to adopt incentive schemes compatible with the organizational context (such as shared organizational values) to motivate high performance. In a recent paper, Kosfeld and von Siemens (2007) present a model where individuals, with different degrees of prosocialness, self-select into ex-ante identical firms. The firms compete for labor force by offering different incentive schemes. They show that there exists a separating equilibrium where workers self-select into firms whose incentive schemes are aligned with their personal preferences, hence providing support for the alignment argument above. Over time, such self-selection processes are likely to lead to the emergence of different corporate cultures.

In this paper, we attempt to identify the effects of the organizational culture and other-regarding concerns on performance under competing teams incentives. As opposed to the close-knit non-anonymous groups of Bandiera et al. (2005) and the correlational field evidence in person-organization fit research (Hoffman and Woehr, 2006 for a review), we study this issue in a controlled computerized laboratory experiment with a minimal group design, which will allow us to draw causal conclusions.[6] If any effect can be identified under these conditions, then the effect should also matter in environments where the group and others are more vividly and concretely present. The crucial advantage the lab gives us is maximal control. First, the competing teams design of Orrison et al. (2004) allows us to control for free-riding incentives. Second, we exogenously and randomly assign subjects to two alternative organizational culture treatments. More specifically, to manipulate organizational culture experimentally we prime organizational values since organizational values are regarded to be the core element of organizational cultures (e.g. Hofstede, 2001) and value congruence is the dominant dimension along which organization-person fit is determined (e.g. Hoffman and Woehr, 2006). Evidence suggests that organizational values supportive of cooperation may particularly facilitate team effectiveness (Mathieu, Maynard, Rapp and Gilson, 2008). Hence, we specifically primed a supportive, prosocially-oriented culture by priming self-transcendence values such as benevolence and universalism (e.g. Schwartz, 1992), which we contrast with a competitive, self-interest oriented culture by priming self-enhancement values such as achievement and power. We also introduce a neutral control condition in which subjects receive no prime.[7] Third, prior to priming, we measure prosocial preferences by asking each subject to divide a sum of money between

[6] For literature in economics on group membership and minimal groups, see Eckel and Grossman (2005) Charness, Rigotti and Rustichini (2007), and McLeish and Oxoby (2007).

[7] See Schwartz (1992) on personal values. We use value-laden word-scrambles as our priming method. More specifically this is a so-called supraliminal priming technique, in which subjects are aware of the task itself, but are not aware that the pattern of words primes values. This is a well-established method used by psychologists (Bargh, 2006; Bargh and Chartrand, 2000).

him/herself and an anonymous partner (a one-shot Dictator game). To fix ideas, subjects giving more than the median amount to the partner will be referred to as prosocials and the subjects giving less as proselves throughout the paper.

With exogenous control of organizational cultural values and with knowledge of individual pro-sociality, we can study which match of personal characteristics and organizational values induces highest effort in the competing teams mechanism. In line with the tenet of person-organization fit research, we expect prosocials to perform well in a prosocial organizational culture, whereas performance to be worse with any other preference-organizational value constellation due to a mismatch between either the incentive mechanism (team tournament) and preferences (proself) or preferences and the organizational values (competitive, self-interest culture).[8]

We find that subjects primed with competitive, self-oriented organizational values provided significantly less effort than subjects primed with either prosocial organizational values or not exposed to a prime. Both proselves and prosocials provided least effort when primed with competitive, self-oriented organizational values. However, prosocials reacted to prosocial priming differently than proselves: they put in significantly more effort when working in a (primed) organizational culture that matches their preferences. There was no such effect when there was a mismatch between the organizational culture, individual preferences, and the way of incentivizing individuals (competing teams).[9] In ancillary analyses we provide further evidence on detrimental productivity effects of highly competitive incentive mechanisms, as well as further evidence on the importance of aligning individual preferences (using additional measures of individual proself values and risk preferences) with both organizational cultural values and incentive mechanisms.

To our knowledge, there is only one other economic experiment studying the effect of prosocial priming on behavior.[10] Our study can be seen to complement this growing literature. Drouvelis, Metcalfe and Powdthavee (2010) find that, compared to a neutral prime, prosocial priming increases effort in a one-shot public goods game. Though their findings are supportive of ours, we do not find any difference in average effort between the no priming and prosocial priming condition -we only find one between the self-oriented and the pro-social prime. However, their study differs from ours in many aspects: firstly, the public goods game they consider has a different strategic structure from contests and team contests. In public good games, equilibrium efforts are inefficient whereas in our case deviating and contributing more than in the equilibrium decreases efficiency. In public good games increasing effort from equilibrium increases all other participants expected payoffs, whereas in ours it has a positive effect on

[8] The competing teams incentive mechanism does not match with proself personal values. The competitive, self-interest culture does not match with prosocial personal preferences.

[9] In a laboratory labor market Cabrales et al (2009) find that employers and employees with similar social preferences self-select onto a commonly preferred incentive platform.

[10] Methodologically, priming is only recently used in a few pioneering economics experiments, such as Ahmed and Salas (2009) using religious primes and Boschini, Muren and Persson (2009) using gender primes.

own team members only and a negative effect on others. Second, they study a one-shot interaction whereas we have a repeated situation which allows us to analyze possible deterioration of the priming effect. Previous studies on public goods games exhibit deteriorating contributions over time (Gächter and Fischbacher, 2009), thus validating this concern. Thirdly, they do not control for individual prosocial preferences, which we show constitutes an important moderator of the prosocial priming effect.

Although no one doubts there will be individual variations in the propensity to respond to tournament incentive schemes, most analyses of tournaments have nonetheless made the (usually) silent assumption that the observed results reflect general "human" response propensities that everyone is equally likely to display. This is why experiments are conducted to find out if "people" react differently to tournament incentives – and not to find out who in an obviously heterogeneous population is particularly responsive to these schemes, and why. This neglect is now being corrected with many researchers asking the difficult "individual differences" question.

The paper is organized as follows. Section 2 presents the competing teams incentive mechanism and elaborates on several game theoretical predictions. Section 3 explains the experimental protocol and the design. In Section 4, the hypotheses are put forward. Section 5 lays out the statistical analysis. Section 6 concludes.

2 The competing teams game

In this section, we describe the competing teams tournament game.[11] For expositional purposes we do not present the general model, instead we focus on the particular game that subjects in the subsequent experiment actually played. Consider a game with six participants $i = 1, 2, ..., 6$. Participants are equally divided into two teams $j = A, B$. Without loss of generality we let $\{1, 2, 3\} \in A$ and $\{4, 5, 6\} \in B$. The strategy for each player i is to choose a level of effort $e_i \in [0, 100]$. Let $e \in [0, 100]^6$ be the corresponding strategy profile. Exerting effort is associated with a cost $c(e_i) = e_i^2/(20)$ Output is measured at the team level and is given by the sum of team members effort choice plus a random term, $X_j = \sum_{i \in j} e_i + \varepsilon_j$, where ε_j is *iid* and uniformly distributed on the interval $[-60, 60]$. The team with the highest output wins 4800 ECU's which is equally distributed so that every member of the winning team gets 1600 ECU's. Team members of the loosing team each receive 600 ECU's. The individual profit function (for a risk-neutral player) is given by:

$$\pi_i(e) = \Pr\{X_j > X_{-j} \text{ for } i \in j : e\}1600 + (1 - \Pr\{X_j > X_{-j} \text{ for } i \in j : e\})600 - c(e_i)$$

We are now ready to state the following main result (proof in appendix).

[11] In the appendix, we give a more general treatment of the game. We show that the Nash equilibrium prediction given here is the same both under competing *teams* and in competing *individuals* schemes. In fact, equilibrium effort is independent of the number of prizes in the competition, or whether participants compete in teams. Therefore, in a symmetric Nash equilibrium, equilibrium effort is independent of the contest design.

Proposition 1 *The team tournament game has a unique Nash equilibrium equilibrium* $e^* = (250/3, 250/3, ..., 250/3)$. *There is a unique symmetric Nash equilibrium also when all agents are equally inequity averse.*

In the appendix we show that if subjects are equally risk averse then the equilibrium effort is below the one under risk neutrality. The formal analysis here focuses on subjects who are risk neutral and opportunistically motivated and thus are only interested in maximizing their expected monetary returns. There is abundant evidence that this is not an exhaustive description of motivating factors of humans in small scale social interactions as the present one. Let us therefore next briefly discuss the predictions when we accommodate some of the most predominant alternative theories.

There is evidence that equity concerns (Adams 1965) or altruism (Andreoni, 1990) influence peoples' choices. It turns out that most important formalizations of outcome-oriented or expected outcome-oriented other-regarding preferences also imply a unique Nash equilibrium which is symmetric (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Bolton et al 2005 - see appendix for a formal treatment under the first modelling approach) at least if all agents are identical. To intuitively understand the result, consider a symmetric equilibrium with identical players. Clearly expected payoffs are equal and each participant has an equal chance of winning 1600 ECUs. Deviations up (down) from the equilibrium effort would generate advantageous (disadvantageous) expected inequity if the agent is concerned with the expected prizes whereas these relationships are reversed if the agent is concerned with the expected net payoffs. Purely outcome oriented inequity averse agent would prefer contributing more than in the opportunistic equilibrium effort since this increases the likelihood of ending up in the domain of advantageous inequity as opposed to disadvantageous inequity – inequity aversion is equivalent to an increase in the value difference between the large and the small prizes. A subject who is altruistic (Andreoni, 1991) towards his co-participants would choose a lower effort in individual contests because increasing effort will harm the co-players by reducing their chances of winning.[12]

3 Experimental procedures

3.1 General procedure

The computerized experiment was conducted in the laboratory of the Max Planck Institute of Economics in Jena, Germany. The 132 participating subjects were recruited using ORSEE software (Greiner, 2004) and the experiment was programmed and conducted using z-Tree software (Fischbacher, 2007).

At the beginning of each session, subjects were seated at visually isolated computer terminals where they received a hardcopy of the instructions, written

[12] Predictions on the behavior of reciprocally motivated agents are more challenging to pin down. Increasing one's effort is kind towards team members and unkind towards non-team-members. There may be multiple equilibria.

in German. Each session consisted of six parts, displayed in Table 1. In the first part of each session, each subject made a standard dictator game[13] choice on how to share 1000 experimental currency units between him/herself and a randomly drawn participant. After this initial stage, subjects were again randomly matched to groups of six to make effort choices in the contest. The contest was repeated 10 times, keeping the matching fixed (partners matching). After each round, the subject learned whether he/she had won the prize and he/she was reminded of his/her effort in that round. The contest was unchanged throughout the first ten rounds. At round 11 a different kind of contest was introduced. Subjects made effort choices at ten consecutive rounds of this alternative contest keeping the group matching fixed. There were three alternative contest designs: one where the six participants competed individually for a single prize of 1600 ECUs (IC(1P)), a second where the six participants competed individually for three prizes of 1600 ECUs (IC(3P)), and finally a third where two teams of three were competing for a single prize of 4800 ECUs, a share of 1600 for each member of the winning team (TC).[14]

In the first session, subjects first interacted in a repeated contest game between individuals with only one winning prize (IC(1P)), and played contests between teams (TC) thereafter for the remaining ten rounds. The second session was identical to the first apart from the fact that the first contests between individuals involved three prizes instead of one. Now, the first block of ten rounds in the third session consisted of repeated team contest. The novel feature here was that each subject was asked to fill out a word scrambling task after the dictator game choice and before the first round of the team contest. (This priming task is explained in detail in the next subsection). The word scramble was used to prime subjects into a prosocial, or self-transcendent organizational culture (TC(PP)) where universalism and benevolence values are the main dimensions (see description of value theory in Appendix). During rounds 11 to 20, participants interacted in contests between individuals with three prizes. In the fourth session, the procedures were identical to the third treatment apart from the fact that the word scramble task primed participants into a competetive self-oriented, or self-enhancement organizational culture (TC(SP)), where power and achievement values are the central dimensions. The fifth session was identical to the third and fourth, but now subjects did not fill out the word scrambling task and thus there was no priming (TC(NP)).

[13] See Camerer and Fehr (2004), for instance.

[14] The theoretical results of the previous section were derived for this latter contest. The results for the first two can be found in the appendix.

	Prosoc. pref.	Priming	Tourn. 1	Tourn.. 2	Risk pref.	Values
S1	DG	–	$IC_1(1P)$	TC_2	RP	PVO
S2	DG	–	$IC_1(3P)$	TC_2	RP	PVO
S3	DG	Prosocial	TC_1	$IC_2(3P)$	RP	PVO
S4	DG	Self-orient.	TC_1	$IC_2(3P)$	RP	PVO
S5	DG	-	TC_1	$IC_2(3P)$	RP	PVO

(1)

After the 20 rounds of interaction in contests, each participant made a choice regarding risky lotteries using the Holt and Laury (2002) procedure. This gave us a measure of risk-aversion of each individual participant. Thereafter, each participant answered a standard personal value elicitation survey (Schwartz et al., 2001, explained in the Appendix). Finally, each participant answered an ex post questionnaire where he/she was asked about the particular strategies used and for general feed-back about the participation experience. This ex post questionnaire also indirectly inquired whether participants grasped the purpose of the experiment and the priming task in particular (standard procedure in priming experiments, Bargh & Chartrand, 2000).

One of the 22 payoff-relevant rounds (one round of dictator game, 20 rounds of contests, one round of Holt-Laury lottery choice) was chosen for actual payment. The average earnings amounted to 24,82 Euros.

In the remainder of this paper, we narrowly focus on the first 10 rounds and consider only the three alternative competing teams contests. The details of all the contests are explained in the Section 2 on theoretical predictions.

3.2 Priming procedure

The priming procedure requires subjects to construct a meaningful and grammatically correct sentence using four of the five words they are presented with. We followed the procedures described in Bargh and Chartrand (2000, also Bargh et al., 2001). Subjects had to solve 30 items, i.e. scrambled sentences, 15 of which in each condition primed prosocial / self-transcendence or a self-interest / self-enhancement values, corresponding to a prosocial and self-oriented organizational culture, respectively. The other 15 items in each condition represented neutral sentences. Examples are 'just be ball we can' (we can be just, prosocial prime), 'determined be ball we can' (we can be determined, self-oriented prime), and 'cold food the was be' (the food was cold, neutral item). Prime-words for the prosocial and self-oriented condition were taken from the Schwartz Value Survey (Schwartz, 1992), which lists for each value a series of synonymous or specifying words. For example, the prime words for prosocial / self-transcendence were reliable, responsible, helpfulness, honest, loyal, forgiving, sincere, tolerant, just, wisdom, equality, peace, preserving nature, broad-minded, environmentally conscious. We took prime words from the German version of the Schwartz Value Survey to circumvent translation problems.

Participants were presented the scrambled sentences on a sheet of paper and were given an example how to solve this 'word-puzzle' task. Prime-items and neutral items were alternated, in order to limit the likelihood that subjects become aware of the prime content. As already mentioned, the ex post questionnaire asked subjects a series of 'funneled' questions after the experiment (see e.g., Bargh et al., 2001). More specifically, subjects were asked what they thought the experiment tried to capture, whether they think their behavior in one task was influenced by another experimental task, if so what those influences were, whether they noticed something unusual in the word puzzle, whether they noticed some kind of pattern or common topic in the word puzzle items and if so what kind of pattern or common topic they noticed. A total of five respondents were excluded from the analyses as they recognized a common theme among the scrambled sentences (e.g. social justice, achievement, success, power).

3.3 The hypotheses

Our four main hypotheses are summarized as follows:

Hypothesis 1: Average effort in competing teams is higher under the prosocial prime, i.e. in a prosocial organizational culture, than under the self-interest prime, i.e. in a competitive, self-oriented organizational culture.

Hypothesis 2: Prosocials provide significantly more effort than the proselves in competing teams under the prosocial prime, i.e. in a prosocial organizational culture. There is no such difference in competing teams under the self-interest prime, i.e. in competitive self-oriented organizational culture.

Hypothesis 3 Average effort in the non-primed competing teams treatment is greater than the average effort under the self-interest prime, i.e. competitive self-oriented organizational culture.

Hypothesis 4 Average effort in the non-primed competing teams treatment is smaller than the average effort under the prosocial prime, i.e. prosocial organizational culture.

4 Results

We begin with focusing on the team incentives and thus restrict attention to the first ten rounds of team contests. Let TC(PP), TC(SP) and TC(NP) denote the prosocial/self-transcendent, the self-oriented/self-enhancement, and the no-prime team contests, respectively.

As evident from Figure 1 average effort is higher in TC(PP) than in TC(SP). Average effort in TC(NP) is also greater than in TC(SP). We study these observations in some detail below.

A fairly conservative way to test whether the effort levels under these two priming conditions were different is to treat every group (a group consists of two competing teams) as an independent observation and to take the average

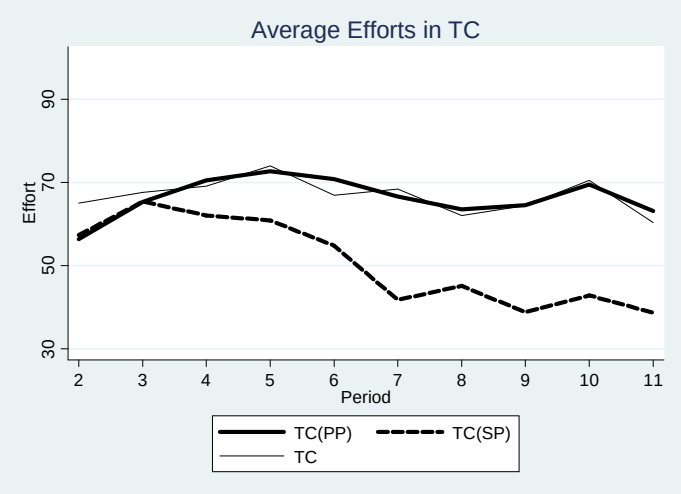

Figure 1: Average group effort by round in competing teams.

effort over all periods of each group as the test statistic. Even this conservative approach indicates a significant statistical difference (a Mann-Whitney U Test) between the two priming treatments ($p = 0.0433$) and between the non-primed and the self-interest primed ($p = 0.0143$). Yet, there is no significant difference between the prosocial prime and the non-prime treatment.[15]

Result 1 *(Hypothesis 1) Average effort in prosocially primed competing teams is higher than in self-interest primed teams.*

Result 2 *(Hypothesis 3) Average effort in non-primed competing teams is higher than in self-interest primed teams.*

Result 3 *(Hypothesis 4) Average effort in non-primed competing teams is not lower than in prosocially primed teams.*

Organizational researchers (Hoffman and Woehr, 2006) find correlational field evidence suggesting that a match between individuals' preferences and the values of the organization they work for promotes employee performance and engagement. Extrapolating from this, a match between the incentive mechanism (team tournament), individuals' prosocial orientation, and the organizational (primed) values should induce higher effort than if there is a mismatch between these three.

We use the dictator game to capture individuals' pro-sociality, or prosocial preferences. Subjects giving more than the median amount of this study are

[15] The first result is borderline significant if we add the dropped subjects ($p > 0.0864$). Moreover, as can be seen from Figure 1, the average efforts are below the NE prediction although not significantly so (using a binomial test on the average group effort).

classified as *prosocials* and subjects giving less than the median are classified as *proselves*. Notice first that this coarse measure of pro-sociality is taken before the subjects were primed and thus the measure is unaffected by the behavior in the contest.[16] The priming condition constitutes a proxy for the organizational culture. We primed *prosocial* or self-transcendent organizational values (PP) and *self-interest* or self-enhancement organizational values (SP). Furthermore, we included a control condition with no prime, denoted (NP). *Competing teams (TC)* constitutes the incentive mechanism in all cases. We test the hypothesis that prosocials put in higher effort than proselves in a prosocial organizational culture whereas there is no such difference in a self-oriented organizational culture due to the mismatch either between the individual's prosociality and the self-oriented primed organizational culture or between individual proself preferences and the team incentive mechanism. Average effort conditional on both organizational culture and individual prosociality is given in Table 2.

	Prosocial Prime	Self-oriented Prime	No Prime
Prosocials	73.4	50.8	64.9
	(12.5)	(13.7)	(18.0)
Proselves	59.8	50.8	69.0
	(19.6)	(25.0)	(19.0)

(2)

Indeed, using a one-sided Mann-Whitney U-test we find a significant difference in the average individual effort ($p = 0.0424$) between pro-socials and proselves in the prosocially primed condition, whereas no such effect is found in the self-interest primed condition ($p = 0.40845$) nor in the non-primed condition ($p = 0.20875$).[17]

Result 4 *(Hypothesis 2) Prosocials put in higher effort than proselves in a prosocially primed organizational culture. There is no such difference in a self-oriented primed culture nor in the non-primed condition.*

We can shed light on this result by comparing the average effort of prosocials, on the one hand, and proselves, on the other, across the three different priming conditions. Table 3 captures the p-values of Mann-Whitney U-tests of equality

[16] Using this measure in explaining differences in effort choices across the two priming conditions is not subject to robustness criticism directed to the dictator game experiments (List 2007; Levitt and List, 2007) as long us the underlying pro-sociality is positively correlated with dictator giving.

[17] It should be noted that in this test observations are assumed to be independent. This commonly made assumption can always be debated. We used individual averages over ten rounds as a unit of observation. At later rounds effort may be influenced by effort of other group members from earlier rounds. Clealy average efforts within a group can be argued to violate the indepdence assumption. Rember however that direct feed-back about others' effort was not given thus downplaying this concern.

of average effort conditional on individual prosocial preferences.

	PP vs SP	NP vs SP	PP vs NP
Prosocials	$p = 0.0017^{**}$	$p = 0.1436$	$p = 0.1671$
Proselves	$p = 0.2801$	$p = 0.0508^{*}$	$p = 0.1649$

(3)

We find that prosocials exert significantly higher effort when prosocially primed than when self-interest primed ($p = 0.0017$). There are no significant differences among prosocials in the other priming conditions. Non-primed proselves, for their part, provide (weakly) significantly more effort than self-interest primed proselves ($p = 0.0508$) whereas there are no significant differences among proselves in the other priming conditions. This further suggests that it is the prosocials who react positively to prosocial priming whereas avoiding priming altogether might be most effective when motivating the proselves to exert effort - at least under a team incentive scheme. In other words, the self-oriented prime, i.e. a competitive self-interest organizational culture, seems to have supressed effort provision of both prosocials and proselves.

A simple OLS estimation (see Table 4, robust standard errors and clustering by individual), allowing us to control for risk-aversion, provides further support for our findings. The individual risk-aversion was elicited using the Holt-Laury (2002) protocol (see Section 3 and the appendix for more details). As for the estimates, dictator game giving is significant only in the prosocial prime condition thus further supporting person-organization fit theory.

	Prosocial Values Prime		
	Coef.	Std. Error	P-value
DG	.0323385	.0154893	0.049
RP	−1.257681	1.177934	0.298
Constant	64.61355	10.28909	0.000
	Self-oriented Values Prime		
	Coef.	Std. Error	P-value
DG	.001087	0.01909	0.955
RP	1.800464	2.73498	0.601
Constant	37.84172	21.64651	0.092
	No Prime		
	Coef	Std. Error	P-value
DG	.0091121	.0065423	0.222
RP	-1.341407	1.028217	0.249
Constant	71.5291	7.950922	0.000

(4)

4.1 Robustness and Extensions

In this subsection, we present further results that build upon and extend the above results in two ways: 1) results further suggestive of a detrimental ef-

fect of strong competition and self-orientation, and 2) additional results on the relevance of the alignment of individual characteristics with organizational conditions (primed organizational values and incentive schemes). For this purpose, we include data collected under conditions of individual (rather then team) competition with one and three prizes respectively.[18] Recall that the Nash equilibrium effort coincides in all three contest designs.

When comparing effort levels under non-primed competing teams with the (non-primed) competing individuals conditions, we find that effort is significantly lower when individuals compete for one prize than when individuals compete for three prizes or compete in teams (p=0.0253 and p=0.0090 respectively, using a Mann-Whitney U-test and treating group averages as individual observations). Effort levels for the latter two conditions (competing individuals with three prizes and competing teams) do not significantly differ (p=0.01011). See Table 5 (and also Table 8 in the Appendix). We will discuss these results with respect to differences in negative externalities that these different incentive schemes might include.

Result 5 *Effort is lower when individuals compete for one price than when individuals compete for three prizes or when teams compete.*

	TC (No prime)	IC (1 prize)	IC (3 prizes)
Effort	66.8200	54.2367	76.9944

(5)

In addition to the behavioral dictator game measure of prosocial preferences, we use an additional survey measure of prosocial orientation popular in psychology (Schwartz et al., 2001). This personal value orientation measure (PVO) of prosocial preferences differentiates between prosocial or self-transcendence values and proself or self-enhancement values. As indicated in Table 1, in part 6 of each experimental session, each subject answered the personal value orientation questionnaire (see appendix for a description).

In Table 6 below, we report results of linear random effects regressions where we use the full range of elicited preference variables as explanatory variables, including the ex-post elicited personal value orientation. RP and DG capture the Holt-Laury (2002) risk-aversion measure and the dictator giving prosociality measure, respectively. History takes two values, 1 if the subject won the contest in the previous round and 0 if not. Period takes values 1 to 10 and indicates the running round number of the contest.

Without any organizational culture emphasis, i.e no prime condition (rightmost column of Table 6), neither our behavioral measure of prosocial preference (DG), nor our survey measure of it (Pros / Self), nor the behavioral

[18] There were 6 participants in all groups thus either 1/6 or 1/2 won a prize in these contests. There were in total N=48 subjects in sessions 1 and 2 where competing individuals treatments were carried out. See experimental procedure above and the appendix.

risk-preference measure (RP) is predictive of effort. Yet, we find evidence of an interaction effect of the proself-orientation and a matching organizational culture both with prosocial values and with proself values. Proselves (PVO survey) choose higher effort when under an proself culture (middle column); prosocials (behavioral DG) choose higher effort under prosocial culture (leftmost column).

Competing teams							
	Prosoc. Prime		Self-orient. Prime		No Prime		
	Coef.	R.P-v.	Coef.	R.P-v.	Coef.	R.P-v.	
Hist.	12.291	0.003	23.841	0.001	11.618	0.002	
Per.	−.1627	0.733	−3.554	0.000	−.8001	0.199	(6)
DG	.02744	0.080	.0115	0.395	−.0073	0.652	
RP	−2.033	0.150	.8223	0.707	−1.302	0.480	
Pros	.3041	0.534	.5048	0.507	.2511	0.634	
Self	−.6618	0.249	1.279	0.086	−.3541	0.520	
Const	67.294	0.005	4.171	0.939	74.247	0.027	

Result 6 *Individual preferences interact with primed organizational values such that prosocial individuals as measured by dictator game provide higher effort under prosocial organizational values and proself oriented individuals as measured by value self-reports provide higher effort under self-oriented organizational values.*

Results regarding the individual competition are more fully reported in the appendix since they are not the focus of this paper. However, we wish to highlight one result supplementing the above analysis and results. There is no conceivable influence of prosociality (neither measured as DG or value orientation) on effort in the competing individuals conditions. However, we find that risk-preference influences subjects' effort choices in the competing individuals condition with one prize, i.e. IC (1P) see Table 7. This is a finding one might expect, given that chances of winning a prize were lowest in the IC(1P) condition.

	Competing Individuals			
	IC(1P)		IC(3P)	
	Coeff,	R. P-v.	Coeff,	R. P-v.
History	29.44846	0.000	11.52816	0.054
Period	-3.101451	0.000	.4953601	0.587
DG	.0053173	0.814	-.0111428	0.469
RP	-4.100682	0.061	.1631726	0.885
Pros	-9.194155	0.229	-.4050298	0.925
Self	4.765381	0.335	4.620679	0.392
Constant	121.6642	0.007	54.86868	0.048

Note: History is 1 if subject won big prize in previous period.
R. P-v.: Robust standard errors and cluster over groups.

(7)

Result 7 *Individual risk-preferences interact with individual incentives such that more risk preferring individuals provide higher effort when there is only one prize to win.*

5 Discussion

In this study we have provided new evidence on the celebrated competing teams mechanism (Nalbantian and Schotter, 1997). We studied the effects of organizational and personal values on its effectiveness. Values, whether organizational or personal, come in two kinds in our study: either prosocial or competitive (self-oriented).

It should be clear that both organizational and personal values may be critical for the success of the competing teams mechanism. Yet, a priori it is not clear whether competitive or prosocial values promote the effectiveness of the mechanism. First, competitive values could further encourage teams to outperform each other thus driving up effort. Alternatively, prosocial values could focus individuals to promote the best of their teams and work harder for its success. These value effects may be at play both at the individual and at the organizational level. Moreover, as suggested by the organization-person fit theory (e.g., Hoffmann and Woehr, 2006; Schneider, 1987), matching personal and organizational values may boost performance through an interaction effect - prosocial personalities may thrive in prosocial organizational cultures and competitive individuals in competitive cultures. The question then is whether it is better to have teams of prosocial individuals competing in prosocial organizations or to have competitive teams competing under a competitive organizational culture, or perhaps even competitive individuals competing under a competitive organizational culture.

In line with the organization-person fit theory, we find that individuals with prosocial preferences thrive in pro-social organizational culture and expend more effort than competitive individuals - providing first experimental support for

the notion that organizational values supportive of cooperation facilitate team effectiveness (Mathieu, Maynard et al., 2008).[19] Yet, there are no differences between these groups either in the neutral condition without any organizational culture or under the competitive culture. The latter result seems to challenge the organization-person fit theory according to which competitive individuals should provide more effort in that condition. We conjecture that this is driven by the fact that competing teams is incompatible with competitive values and thus propose and triple-fit conjecture suggesting that personal and organizational values must fit the incentives used in the organization as well.

Our conjecture is supported by our finding that competitive organizational culture has detrimental effects on (both prosocial and self-oriented) individuals' willingness to provide effort when working in competing teams. The average effort of all individuals is in fact lower under that culture than under the prosocial or neutral one. In other words, the results indicate that organizations relying on team work and team incentives need to be careful in vigorously promoting organizational values of competition and self-interest.

We also compared team and individual incentive contests where either individuals or teams compete neck-to-neck - with three alternative prize constellations: one prize for a highest output individual, three prizes for highest outputs, one prize for each individual in the three-member winning team. Although, Nash-equilibrium predictions coincide in all three contests, we find least effort in the individual competition for one prize. One explanation for this result is the relatively stronger negative externality on one's peers when exerting effort in the one prize individual tournament game. Prosocial individuals may wish to downplay the externality by providing less effort.[20] This suggests a future agenda of studying whether individuals with proself personal values thrive particularly when exposed to strongly competitive incentive mechanisms in competitive, self-oriented organizational cultures, thus establishing the flip-side of our main result under the competing teams mechanism.

Beyond the hypothesized findings, additional analyses on individual prosocial and risk preferences preliminarily suggest that the way individual preferences drive motivation is particularly responsive to intangible workplace characteristics such as organizational culture. Prosocial preferences are responsive to prosocial organizational values in competitive team work, and risk preferences responsive to competitiveness of individual contests. Given that both intangible workplace characteristics and relative incentive schemes play an important role in today's organizations, we hope our study will stimulate future research and more effective organizational design practices.

The paper contributes more generally to organization-person fit theory (e.g., Hoffmann and Woehr, 2006; Schneider, 1987) and management research into pay for performance (Gerhardt et al., 2009) in pointing to the importance of a 'triple-fit' of preferences, organizational culture and incentive mechanism. Organization-person fit theory so far mostly considered the match of people's

[19] See also Drouvelis et al. (2010).

[20] See also Bandiera, Barankay and Rasul (2005).

value preferences with the organizational culture only. Similarly, organizational and management research discuss incentive mechanisms generally without considering its match with personal preferences or the wider organizational context such as organizational culture.

Future studies, should use larger samples to increase statistical power that is needed when testing for interaction effects (e.g., Brookes et al., 2004). Moreover, personality variables including the value self-reports should ideally be assessed independent of and before the experiment. In our study, the contests and the priming procedure itself may have influenced responses to the questions eliciting personal value orientation and risk preference. Yet, it is important to note that the dictator-giving measure of prosocial preferences cannot be subject to this potential endogeneity since dictator-giving is elicited before the play of the contest game. In addition, future research would benefit from using more fine-grained measures of individual prosociality, as well as a more differentiated prime. For instance, value theory differentiates benevolence as prosocial behavior towards the ingroup from universalism as prosocial behavior towards everybody (Schwartz, 1992). Incentives based on competition may be generally incompatible with a strong prosocial universalism preference. This is the negative externality effect of the Bandiera et al. (2005) conjecture relevant under relative performance incentives. At the same time, individuals valuing benevolence might be ideally suited to compete in team tournaments, where effort 'helps' the in-group/own team. This suggests interesting, to be further examined, connections between ingroup-favoritism/parochial altruism, personal values, and organizational culture.

6 Appendix

6.1 Values orientation questionnaire (How much am I like this person?)

The personal prosocial and proself value orientations were captured with the Portrait Values Questionnaire (PVQ, Schwartz, 2003; Schwartz, Lehmann, & Roccas, 1999; Schwartz, Melech, Lehmann, Burgess, Harris, & Owens, 2001). The PVQ has been widely used in different contexts and shows good psychometric qualities[21]. Cronbach Alpha reliabilities were .80 for prosocial, self-transcendence values (consisting of the lower-order universalism and benevolence value scales) and .86 for proself, self-enhancement values (consisting of the lower-order achievement and power value scales, see Schwartz et al. 2001). More specifically, the PVQ presents subjects with short portrayals of different people, each describing a person's goals, aspirations, or wishes that point implicitly to the importance of a single value type (Schwartz et al., 2001). For

[21] Psychometric qualtiy refers to the measurement reliability of a self-report measure in, e.g. psychological research. It is typically estimated with Cronbach alpha coefficient. Typically test for psychometric quality include test of dimensionality, or in other words test the clearness with which the questions that are indicators of underlying constructs map onto the corresponding constructs in factor analytic or multidimensional scaling techniques (e.g., DeVellis, 1991).

example, "It is important to Z to be rich. Z wants to have a lot of money and expensive things." (power) or "E thinks it is important that every person in the world be treated equally. E wants justice for everybody, even for people E doesn't know." (universalism). Following the protocol of the PVQ, proself orientation was captured with seven such statements (three capturing power, four achievement) and prosocial orientation with 10 statements (four for benevolence and six for universalism). Statements were presented in random order. Subject rated the portrayals in response to the question "How much like you is this person?" on the following scale "very much like me", "like me", "somewhat like me", "a little like me", "not like me", and "not like me at all". Answers were coded 6 (very much like me) to 1 (not like me at all) and mean sum scores for the corresponding items per value calculated.

6.2 Values theory

In this section, we complement the above discussed economists' approach to other-regarding concerns with a psychological account on the topic. Values are desirable, stable, transsituational goals that vary in importance and serve as guiding principles in people's lives (e.g. Schwartz, 1992). They capture an essential part of a person's personality relevant to motivation (Roccas et al., 2002). Values motivate behavior, are decision-making standards as well as guide attention and the interpretation of situational cues (e.g. De Dreu and Nauta, 2009; Maio et al., 2009; Schwartz, 1992; Schwartz, Sagiv and Boehnke, 2000).

Values differ in their motivational goal, for instance the value of power motivates behaviours to dominate others, seek recognition, wealth and authority. Schwartz' theory of basic human values proposes 10 such value types organized in two higher-order dimensions. The theory, furthermore, posits that values show a systematic pattern of conflict and compatibilities. While valuing power is compatible and indeed associated with valuing achievement (i.e. seeking personal success through demonstrating competence according to social standards); power is conflicting with universalism (i.e. understanding, appreciation, tolerance and protection for the welfare of all people and for nature) and with benevolence (i.e. caring about the welfare of people to whom one is close). Past research widely supports the value theory. The structure and proposed pattern of relations of the 10 value types could be replicated across over 70 cultures (e.g. Schwartz, 2005). Associations of values with various outcomes including prosocial behaviours (e.g. Schwartz, 2005, 2009) as well as the stability of values over time have been demonstrated (Bardi et al., 2009).

Of particular interest for the present research are four values that make up the higher-order dimension of self-enhancement (including power and achievement values) vs. self-transcendence value (universalism and benevolence). While a self-enhancement value orientation reflects a focus on extrinsic motivation and self-interest, self-transcendence reflects a focus on intrinsic motivation and prosocial, other-regarding interest (Schwartz, 2009).

6.3 Descriptive statistics

Table 8 reports average effort choices in our contest games. Average effort is higher under the prosocial, self-transcendent prime and under no prime than under the proself, self-enhancement prime in team tournament contests (TC). Overall the average effort levels are often well below the symmetric NE prediction $e = 83.333$.[22] and even more so for the symmetric equilibrium inequity aversion prediction. See below for a more detailed evaluation of the competing individuals (IC) condition.

Session	Treatment	mean	sd	N	min	max
1	$IC_1(3P)$	54.2367	38.82687	300	0	100
	TC_2	57.4233	31.30395	300	0	100
2	$IC_1(3P)$	76.9944	27.14939	180	0	100
	TC_2	70.0667	34.4219	180	0	100
3	TC_1	66.2913	25.89595	230	0	100
	$IC_2(3P)$	73.66957	25.87903	220	0	100
4	TC_1	50.77308	30.26687	260	0	100
	$IC_2(3P)$	71.8407	28.25219	260	0	100
5	TC_1	66.82	27.30812	300	0	100
	$IC_2(3P)$	77.06667	28.55931	300	0	100

(8)

Table 9 reports how much each subject (between 0 and 1000) offered to an anonymous subject.[23] As expected, giving does not vary much between sessions. The average giving is around 30% in all sessions (see Table 9) which is in line with previous findings (Camerer and Fehr, 2004). In each session, some subjects gave nothing and maximal giving was 50% in all but one session.

Session	mean	sd	min	max
1	237.1667	178.4303	0	500
2	377.7778	186.4705	0	500
3	326.0435	244.3917	0	1000
4	255.1538	208.6963	0	500
5	320.3333	236.1105	0	1000

(9)

An adjusted Holt-Laury list (Holt and Laury 2002) was conducted in order to elicit risk-preferences from subjects. Table 10 report the average switch point of subjects in each session. A higher number of safe choices indicates more aversion to risk. Four safe choices indicates risk neutrality - the agent maximizes expected monetary return. On average our subjects display some risk aversion with the number of safe choices settling at 5.7. This is a bit higher

[22] Looking at the efforts from the second contests (contest 2) we see that for TC there seems to be some history dependence since results differ widely between session 1 and 2. In contest 2 there seems to be a weak negative trend in TC treatments but not in the IC(3P) treatments.

[23] In what follows we denote the Dictator Game offer DG.

risk aversion than subjects in the original Holt-Laury (2002) experiment, for instance, where the average number of safe choices was just above 5.

Session	mean	sd	min	max
1	6.652778	1.804114	1	10
2	6.166667	2.437453	1	10
3	6.826087	2.166945	0	10
4	7.096154	1.60012	4	10
5	6.155556	1.797685	0	9

(10)

According to expected utility theory, subjects should switch once and only once. Unfortunately, this was not the case as can be seen in Table 11 which reports the average number switches exceeding one. In the analysis section, we will use the average switch point, denoted (RP), as a measure of risk preferences. Using the average switch point is common to many experiments using multiple-price lists (see for example Holt-Laury 2002).

Session	mean	sd	min	max
1	.2333333	.8976342	0	4
2	.8888889	1.745208	0	6
3	.3913043	1.87663	0	9
4	.0384615	.1961161	0	1
5	.5333333	1.775957	0	9

(11)

Table 12 reports data from the standardized personal value elicitation questionnaire pioneered by Schwartz et al. (2001, see above). For each of the two value orientations (prosocial/self-transcendence value orientation denoted Pros and proself/self-enhancement value orientation denoted Self) and each individual, the average of reported scores from the questions related to that category constitutes a measure of the importance of the value in question for a given individual. A higher value [between 1 and 6] indicates a stronger personal endorsement of the value in question.

session	Pros	Self
1	4.65	3.585714
2	4.216667	4.031746
3	4.634783	3.130435
4	4.273077	3.373626
5	4.483333	3.371429

(12)

For completeness, Table 13 reports correlations between the above measures. We note that there is a negative correlation between *prosocial value orientation* and *proself value orientation*, which is in line with the theoretical predictions (Schwartz 1992, Schwartz et al. 2001).

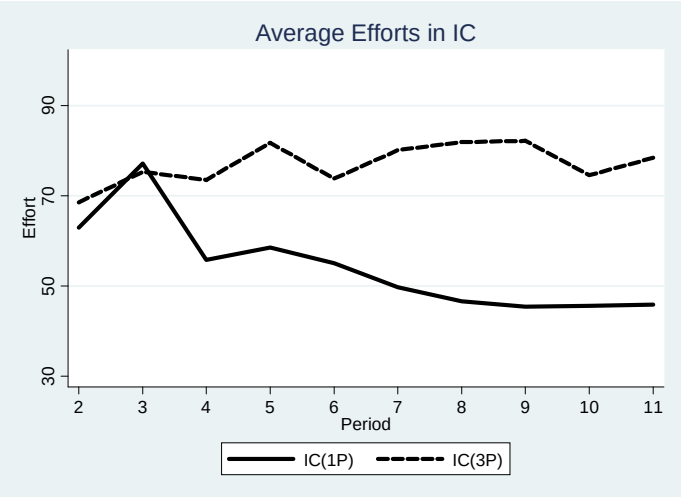

Figure 2: Average effort by round in competing individuals.

	DG	RP	Pros	Self
DG	1.0000			
RP	-0.0220	1.0000		
Pros	0.1054	0.0108	1.0000	
Self	-0.0893	-0.1173	-0.1593*	1.0000
*Note: *indicates significance at 10% level*				

(13)

6.3.1 Competing individuals (IC)

We briefly present results for the incentive mechanism in which individuals rather than teams compete. Figure 2 illustrates the evolution of efforts over time in the competing individuals treatments.[24]

Figure 2 and Table 8 indicate that individuals competing for three prizes, IC(3P) put in higher effort than individuals competing for one prize IC(1P). We note that this is contrary to the theoretical predictions. While effort levels are similar for the first two periods, effort under IC (1P) levels off afterwards. As a point of departure we first check if the observed effort choices are statistically different from the NE prediction $e = 83.33$. A Wilcoxon matched-pair test shows that this is case for IC(1P) ($p = 0.0431$) but not for IC(3P) ($p = 0.2850$) [25] These results conform with what can be observed in Figure 2. We now

[24] The corresponding figures for competing teams are given in Figure 1 above.

[25] A less conservative test is to consider every observation as independent and test for differences using all observations. We then find that there is statistical difference between observed effort and equilibrium effort in all sessions.

turn to testing for differences between the sessions IC(1P) and IC(3P). There is a statistical difference ($p = 0.0253$) between the two treatments. Thus we can safely say that individual contests with three prizes elicit more effort than similar contests with only one prize. Notably, this complements the findings of Orrison et al. (2004). They report that in six-person competing individuals treatments there is no significant difference in effort when there are two or three large prizes but significantly *less* effort when there are four prizes. Together, these experiments suggest that the relationship between effort in individual contests and the number of prizes in non-monotonic, exhibiting an inverse U-shape.

Result 8 *Individual competition with three prizes elicits more effort than individual competition with one prize.*

Results for the effects of individual preferences on effort choices in the competing individuals contests are reported above.

6.4 Theoretical predictions

In this section we present the proof of Proposition 1 but also equilibrium results concerning individual competition, risk-aversion and equity concerns. For the interested reader we provide a more general version of the results. Suppose that there are N players and $n > 0$ prizes of size M where $N > n$. If a player does not win a prize M, she gets the default amount m. Also let $\varepsilon_j \sim U(-q, q)$ and iid. Thus when teams compete, team A's output is distributed over $[\sum_{k\in A} e_k - q, \sum_{k\in A} e_k + q]$. When individuals compete, individual $i's$ output is distributed over $[e_i - q, e_i + q]$. Moreover the cost function is always defined as $c(e_i) = e_i^2/(2 \cdot c)$. A part from this everything is as stated in the theoretial section.

6.4.1 Risk-neutral symmetric equilibrium, competing teams

Suppose that other teams members as well as members of the other team all choose $\widehat{e}$. Thus the other team has a stochastic output x_j distributed uniformly over $[3\widehat{e} - q, 3\widehat{e} + q]$. Player i's probability of winning a high prize M reads

$$\int_{x\in X(e_i,\widehat{e})} F(x, 3\widehat{e}) f_i(x; e_i) dx$$

where $X(e_i; \widehat{e}) = [2\widehat{e} + e_i - q,\ 2\widehat{e} + e_i + q]$ is the support of i's team output given effort, $f_i(x; e_i)$ is the density of output[26] of agent i's team given e_i by i and $\widehat{e}$ by other two team members and $F(x, 3\widehat{e})$ is the cumulative distribution function of the opposing team's output given their aggregate effort $3\widehat{e}$. If $e_i > \widehat{e}$,

[26] $f_i(x; e_i) = \frac{1}{2q}$ if $x \in [e_i - q, e_i + q]$ and $f_i(x; e_i) = 0$ otherwise.

the marginal probability of winning reads

$$[\frac{1}{2q} - \frac{2\widehat{e} + e_i - q - (3\widehat{e} - q)}{2q}\frac{1}{2q}] + \int_{e_i - q}^{e_i + q} F(x; 3\widehat{e}) f_{e_i}(x; e_i) dx],$$

where $f_{e_i}(x; e_i) = 0$ since the distribution is uniform. This reduces to

$$\frac{1}{2q}[1 - [\frac{e_i - \widehat{e}}{2q}]]$$

. If $e_i < \widehat{e}$, the marginal probability of winning reads

$$[\frac{e_i + q - (\widehat{e} - q)}{2q}]\frac{1}{2q} = [1 + \frac{e_i - \widehat{e}}{2q}]\frac{1}{2q}.$$

Thus the unique symmetric equilibrium can be found by setting

$$e^* = \frac{c \cdot (M - m)}{2q}. \tag{14}$$

This can be seen for instance by noticing that in the case $e_i > \widehat{e}$ the second derivative reads

$$-e_i \frac{(M - m)}{4q} - \frac{1}{c}$$

which is negative. In the case $e_i < \widehat{e}$ the second derivative reads

$$(M - m)\frac{1}{4q} - \frac{1}{c}$$

which is positive if at e_i the first derivative is zero.

Assume, to get a contradiction that there exists an asymmtric eqilibrium. With out loss of generality assume that $\sum_{k \in A} e_k > \sum_{l \in B} e_l$, the first order condition for any $i \in A$ reads

$$\frac{1}{2q}[1 - [\frac{\sum_{k \in A} e_k - \sum_{l \in B} e_l}{2q}]](M - m) - \frac{e_i}{c} = 0.$$

For any $t \in B$ we have the corresponding condition is

$$\frac{1}{2q}[1 + \frac{\sum_{l \in B} e_l - \sum_{k \in A} e_k}{2q}](M - m) - \frac{e_t}{c} = 0$$

hence we must have

$$\begin{aligned}
\frac{1}{2q}[1 - [\frac{\sum_{k \in A} e_k - \sum_{l \in B} e_l}{2q}]](M - m) - \frac{e_i}{c} &= \frac{1}{2q}[1 + \frac{\sum_{l \in B} e_l - \sum_{k \in A} e_k}{2q}](M - m) - \frac{e_t}{c} \\
\frac{1}{2q}[1 - [\frac{\sum_{k \in A} e_k - \sum_{l \in B} e_l}{2q}]](M - m) - \frac{e_i}{c} &= \frac{1}{2q}[1 - [\frac{\sum_{k \in A} e_k - \sum_{l \in B} e_l}{2q}]](M - m) - \frac{e_t}{c} \\
\frac{e_i}{c} &= \frac{e_t}{c}
\end{aligned}$$

Implying that $e_i = e_t$ which contradicts our hypothesis.

6.4.2 Risk-neutral symmetric equilibrium, competing individuals

We now consider that individuals compete individually and not in teams. Player i's output is given by $e_i + \varepsilon_i$. In particular, player i wins a prize if her effort is amongst the n highest outputs. In our individual competition treatments we had six participants ($N = 6$) competing for either one prize ($n = 1$) or three prizes ($n = 3$).

Suppose that others choose $\widehat{e}$ and they have stochastic outputs $x_j \tilde{} U[\widehat{e} - q, \widehat{e} + q]$ for $j \neq i$. Player i's probability of winning a high prize reads

$$\int_{x \in X(\widehat{e})} F^{N-n}(x, \widehat{e}) f_i(x; e_i) dx$$

where $X(e_i) = [e_i - q, e_i + q]$ is the support of i's output given her effort, $f_i(x; e_i)$ is the density of output[27] of agent i given effort e_i, and $F(x, e_j)$ is the cumulative distribution function[28] of agent j's output given effort e_j. If $e_i > \widehat{e}$, the marginal probability of winning reads

$$\frac{1}{2q} - [\frac{e_i - q - (\widehat{e} - q)}{2q}]^{N-n} \frac{1}{2q} + \int_{e_i - q}^{e_i + q} F^{N-n}(x; \widehat{e}) f_{e_i}(x; e_i) dx],$$

where $f_{e_i}(x; e_i) = 0$ since the distribution is uniform. This reduces to $[1 - [\frac{e_i - \widehat{e}}{2q}]^{N-n}] \frac{1}{2q}$. If $e_i < \widehat{e}$, the marginal probability of winning reads

$$[\frac{e_i + q - (\widehat{e} - q)}{2q}]^{N-n} \frac{1}{2q} = [1 + \frac{e_i - \widehat{e}}{2q}]^{N-n} \frac{1}{2q}$$

. In equilibrium, the marginal probability of winning must equal $e/[c \cdot (M - m)]$ and thus, independently of the number of prizes, the unique symmetric equilibrium satisfies

$$e^* = \frac{c \cdot (M - m)}{2q}.$$

This can be seen for instance by noticing that in the case $e_i > \widehat{e}$ the second derivative reads

$$-(N - n)(\frac{e_i - \widehat{e}}{2q})^{N-n-1} \frac{(M - m)}{4q} - \frac{1}{c}$$

which is negative. In the case $e_i < \widehat{e}$ the second derivative reads

$$(M - m)(N - n) \frac{1}{4q} [1 + \frac{e_i - \widehat{e}}{2q}]^{N-n-1} - \frac{1}{c}$$

which is positive if at e_i the first derivative is zero.

[27] $f_i(x; e_i) = \frac{1}{2q}$ if $x \in [e_i - q, e_i + q]$ and $f_i(x; e_i) = 0$ otherwise.

[28] $F_i(x; e_i) = \frac{x - (e_i - q)}{2q}$ if $x \in [e_i - q, e_i + q]$ and $F_i(x; e_i) = 0$ otherwise.

More generally if $\overline{e}^1, ..., \overline{e}^{n+1}$ are the the n highest efforts of others, then the marginal expected payoff of the player with the lowest efforts reads

$$(M-m)\Pi_{k=1}^{n}[1+\frac{e_i-\overline{e}^k}{2q}]\frac{1}{2q}-\frac{e_i}{c}$$

and that of the player with the highest effort reads

$$(M-m)[1-\Pi_{k=2}^{n+1}\frac{e_i-\overline{e}^k}{2q}]\frac{1}{2q}-\frac{e_i}{c}.$$

The second order condition of the lowest effort player's maximization problem is not satisfied. Therefore the only equilibrium has symmetric efforts and satisfy condition (14) above.

6.4.3 Risk-aversion

Generally in contests, the effect of risk aversion on individual effort is ambiguous (see Cornes and Hartley, 2003). In our case, increasing individual risk aversion drives down effort. A player's first order condition reads

$$e^*=\frac{c}{2q}\frac{(u_i(M-c(e^*))-u_i(m-c(e^*)))}{\Pr\{n;e^*,e_{-i}\}u_i'(M-c(e^*))+(1-\Pr\{n;e^*,e_{-i}\})u_i'(m-c(e^*))}, \quad (15)$$

where $\Pr\{n;e^*,e_{-i}\}$ denotes the probability of winning one of the n prizes. Using the fact that $f(x)=f(y)+\int_y^x f'(z)dz$, one can rewrite this as

$$e^*=\frac{c}{2q}\frac{u_i'(m-c(e^*))(M-m)+\int_{m-c(e^*)}^{M-c(e^*)}\int_{m-c(e^*)}^{y}u_i''(x)dxdy}{u_i'(m-c(e^*))+\Pr\{n;e^*,e^*\}\int_{m-c(e^*)}^{M-c(e^*)}u_i''(x)dx}, \quad (16)$$

and dividing both the numerator and the denominator by $u_i'(m-c(e^*))$ yields

$$e^*=\frac{c}{2q}\frac{(M-m)+\int_{m-c(e^*)}^{M-c(e^*)}\int_{m-c(e^*)}^{y}\frac{u_i''(x)}{u_i'(m-c(e^*))}dxdy}{1+\Pr\{n;e^*,e^*\}\int_{m-c(e^*)}^{M-c(e^*)}\frac{u_i''(x)}{u_i'(m-c(e^*))}dx}. \quad (17)$$

For risk averse individuals $u_i''<0$. There are two negative effects of increasing risk aversion: in the numerator

$$\int_{m-c(e^*)}^{M-c(e^*)}\int_{m-c(e^*)}^{y}\frac{u_i''(x)}{u_i'(m-c(e^*))}dxdy$$

and

$$\Pr\{n;e^*,e^*\}\int_{m-c(e^*)}^{M-c(e^*)}\frac{u_i''(x)}{u_i'(m-c(e^*))}dx$$

in the denominator of which the latter is smaller in absolute value and thus risk-averse individuals provide less effort.

6.5 Equity concerns

The predictions of equity concerns (Adams 1965) will depend on whether agents are concerned about the equity of actual distribution of prizes and/or payoffs (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), the equity of expected prizes, or the equity of expected net payoffs (including effort) (Bolton et al 2005).

Let us first consider expected equity. Clearly in a symmetric equilibrium, expected payoffs are equal and each participant has an equal chance of winning 1600 ECUs. Deviations up (down) from the equilibrium effort would generate advantageous (inadvantageous) expected inequity if the agent is concerned by the expected prizes whereas these relationships are reversed if the agent is concerned by the expected net payoffs. Thus, the symmetric equilibrium with $e^* = 250/3$ remains an equilibrium.

More traditional inequity aversion models in economics have modelled an agent concerned by outcome equity. When three participants receive a prize, let it be with competing teams or individuals, an inequity averse agent would prefer contributing more than the equilibrium effort since this increases the likelihood of ending up in the domain of advantageous inequity as opposed to disadvantageous inequity – inequity aversion is equivalent to an increase in the value difference between the large and the small prizes.[29] These results are spelled out in the following proposition.

The weakness of the theoretical inequity aversion analysis provided here is that all agents are assumed identical. Experimental evidence, and introspection, certainly favors a more nuanced view of reality with heterogeneity in (also) preferences for equity.

Proposition 2 *Assuming that all participants are inequity averse with parameters $\alpha_i = \alpha \geq \beta_i = \beta$ for all i, then the unique symmetric equilibrium satisfies*

$$e^* = \frac{c(1 - \frac{N-n}{N-1}\beta + \frac{n}{N-1}\alpha))(M-m)}{2q}$$

where n is the number of winning participants in the contest. Thus the equilibrium effort in the contest between individuals with one prize equals

$$e^* = (1 - \frac{4}{5}\beta + \frac{1}{5}\alpha))\frac{250}{3},$$

and the equilibrium effort in the contest between individuals with three prizes and the contest between teams equals

$$e^* = (1 + \frac{3}{5}(\alpha - \beta))\frac{250}{3}.$$

[29] When there is only one winning prize, agents highly concerned with advantageous inequality would lessen their effort to avoid ending up being the only winner.

Proof. With inequity aversion the maximization problem reads

$$\max_{e_i}\{\Pr\{e_i, e_{-i}; n\}[1600 - c(e_i) + \beta \sum_{i \neq j}(\mu_i - c(e_i) - \mu_j - c(e_j))]$$
$$+(1 - \Pr\{e_i, e_{-i}; n\})[600 - c(e_i) - \alpha \sum_{i \neq j}(\mu_j - c(e_j) - \mu_i - c(e_i))\},$$

where μ_i and μ_j are the prizes of player i and j respectively. Consider a symmetric equilibrium with $e_i = e^*$ and the scenario with three participants winning 1600 and three other receiving 600. ■

$$\{\Pr\{e_i, e_{-i}\}[1600 - c(e^*) + \beta \sum_{i \neq j}(\mu_i - c(e^*) - \mu_j - c(e^*))]$$
$$+(1 - \Pr\{M; e_i, e_{-i}\})[600 - c(e^*) - \alpha \sum_{i \neq j}(\mu_j - c(e^*) - \mu_i - c(e^*))\}$$

and the first order condition equals $\{F^{N-n}(E+q)\frac{1}{2q} - F^{N-n}(E-q)\frac{1}{2q}\}(1-\beta+\alpha)1000 - c'(e^*) = 0$ where E is the competor's effort (be it teams or individuals). With our parametrization, we can solve for the symmetric equilibrium e^* explicitly yielding

$$e^* = \frac{c(1-\beta+\alpha)(M-m)}{2q},$$

and thus, since α is greater than β, inequity aversion drives up equilibrium effort to levels above $\frac{250}{3}$. Yet, equilibrium effort is invariant across teams contests and individual contest with three prizes.

6.5.1 In-group favoritism

In-group favoritism is a phenomenon evidenced in social psychogy research. In group favoritism asserts that people put a higher weight on the well-being of in-groups as opposed to out-groups (Yamagishi et al 1999) and, in the case of parochial altruism, even a negative weight on the well-being of out-groups (Choi and Bowles, 2007). In-group favoritism and parochial altruism are thus close relatives of reciprocity. Yet, whom you are kind to is typically exogenously set by group membership rather than endogenously arising in equilibrium.

In-group favoritism predicts that effort in the competing teams treatment is substantially higher than in other incentive schemes because by increasing effort one can be kind to in-groups and hostile to out-groups whereas without teams there are no well-specified in- and out-groups.

Notice that in Schwartz's personal value classification (see Section Values theory below), benevolence is defined as in-group pro-sociality whereas universalism is pro-sociality towards generalized others including out-groups. Thus, high scores on benevolence and low scores on universalism seem indicative of parochial altruism tendencies.

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