# Creativity and Corporate Culture

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**Abstract:** *Creative problem-solving by corporations is frequently conducted within a group or a team framework. A relevant issue is to try to determine which type of corporate culture is most effective in enhancing performance in creative tasks. We present a series of experiments that aim at studying group creativity in contexts where corporate culture may tend to promote cooperation or competition among group members. Our experimental results show that cooperative corporate culture fosters creativity. We identify the reason for success as the emergence within the group of a social norm of high effort.*

**Keywords:** creativity; corporate culture; competition; cooperation; experiment.

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# 1. Introduction

As is often the case with strategic decisions, creative problem-solving by corporations or other organizations is frequently conducted within a group or a team framework. Organizational creativity is a function of the creative outputs of its component groups and contextual influences, and represents a complex individual-situation interaction (Woodman and Schoenfeldt, 1989).

An important dimension in organizational settings is known in economics as *corporate culture*. Performance differences across firms, even when operating in the same industry, can be attributed to organizational or corporate culture (Kosfeld and von Siemens, 2011). Among possible definitions, corporate culture can be described as "a strong set of managerial values that define the way to conduct business" (see e.g. Barney, 1986) or as "shared meanings, central values, assumptions and beliefs" (Brown, 1995). Cremer (1993) and Weber and Camerer (2003) define it as "shared understanding among organizational members, which usually comes about through shared experience" (p. 403).

A relevant issue is determining an effective type of corporate culture for enhancing performance in creative tasks. Several researchers have worked on identifying values, norms and assumptions involved in promoting and implementing creativity and innovation: among the factors influencing the degree to which creativity and innovation take place in an organization is the emergence of a cooperative attitude among team members (Arad et al. 1997; Covey; 1993; Tushman and O'Reilly, 1997). In general, cooperation is one of the key corporate values that companies advertise to attract employees with the same value system (Guiso et al., 2015).

Corporate culture differs from the culture of other communities in that there is an entity (i.e. the firm) that may wish to influence the evolution of its culture in order to increase profits or to achieve other goals. The firm can shape the process of preference formation by setting

incentives aimed at fostering the desired type of corporate culture (Rob and Zemsky, 2002; Dur and Sol, 2010): in fact, incentives may have an effect on the process of preference formation, for instance by inducing workers to be more helpful to each other or stimulating competition among them. A substantial part of corporate culture is concerned with controlling the behavior and attitude of organization members (Kerr and Slocum, 1981 and 1987; Lawler and Jenkins, 1992). The reward system is a primary way to achieve such control, by specifying the contributions the organization expects from members and the response individuals expect to receive according to their performance (Kerr and Slocum, 1987). Setting incentives at the individual or at the team level expresses the norms and values to which the organization conforms and is the key to understand corporate culture.

Although culture does not coincide with the way incentives are set, and focusing on incentives only may overlook the cultural context in which managers or employee make decisions, still the incentives system—who gets rewarded and why—is "an unequivocal statement of the corporation's values and beliefs" (Kerr and Slocum, 2005, p.130). Culture has its influence at the firm and at the individual level through compensation practices and ownership (Li et al., 2013): establishing a certain culture is pursued by aligning to it the financial interests of executives, or setting employees' compensation practices in that direction (Quinn, 2018). Compensation systems are also believed to affect culture and performance through self-selection of organizational members (Kuhn, 2009). As such, an analysis of incentive systems can provide executives with a basis for effectively managing long-term cultural change in favor of a more creative approach to problem solving. Since instilling long-term values in the lab is challenging,[1] we focus on the aspect of culture that can be manipulated more easily and immediately, namely

[1] Weber and Camerer (2003) depict culture as a form of specialized language a pair develops to solve a task and study the effects of merging two pairs of subjects who have experienced different cultures.

incentives, but are aware that incentives express and reinforce the values and norms that comprise corporate culture.

The research question we address in this paper concerns the role of corporate culture in shaping individual behavior and outcomes in creative tasks performed as members of a team. Are effort and performance in creative tasks affected by corporate culture? Is a cooperative corporate culture or a competitive corporate culture better in this respect? Our first contribution is to provide an experimental test of the effects of corporate culture on creativity. In our between-subject design, we experimentally model two (arguably) polar extremes of corporate culture by providing monetary incentives at the individual or at the group level, thus varying whether a corporate culture is "competitive" or "cooperative" with respect to the case where no monetary incentives are in place.

Our results concerning incentives are both quite clear and yet surprising in some respects: financial incentives are effective in a group context, but only with a cooperative corporate culture. Our experimental evidence thus provides support in favor of collaborative environments promoting performance in creative tasks significantly more than environments featuring a high degree of competition. To our knowledge, there has been no previous evidence regarding the relative benefit of corporate cultures on creative endeavors.[2]

The remainder of this paper is organized as follows. We discuss related literature in Section 2, and illustrate the experimental design in Section 3. Section 4 shows the experimental results. Section 5 provides a discussion and concludes.

## 2. Related literature

[2] To our knowledge, the closest work is Attanasi et al. (2019), who study whether intrinsic motivation is crowded out by extrinsic motivation with respect to group creativity. They find evidence of a negative interplay between monetary incentives and "closed" creativity at the group level. However, there is no variation in corporate culture.

There are a handful of recent experimental papers that consider aspects of incentives and the environment on creative behavior. Chen et al. (2012) consider the extent to which creativity-contingent incentives depends on their nature (piece-rate or tournament). While individual intragroup tournament pay increases individual efforts, it is ineffective in enhancing the creativity of group solutions relative to individual piece-rate pay. Eckartz et al. (2013) ask subjects to form words out of letters with a flat fee, a linear payment, or a tournament. There was little if any effect of any incentives on performance.[3]

Bradler et al. (2019) compare the effects of financial incentives on performance on a routine task (the Gill and Prowse, 2012 slider task) and a creative task (the "Unusual Uses task" from Guilford (1967), and Torrance (1968), where people list unusual uses for a routine object. The payoffs are structured as a tournament prize for above-average effort, and this incentive was found to work well. Concern for relative rank accounts for about one-fourth of this effect.[4] Erat and Gneezy (2015) consider piece-rate and competitive incentives with a rebus task ("a puzzle made with words and/or pictures with a hidden and non-obvious solution") with a unique correct response. While financial incentives led to more effort, they did not improve the creative output. In fact, competitive incentives reduced creativity relative to piece-rate incentives.

Laske and Schroder (2015) introduced incentives for either quantity alone or for quantity in combination with usability or novelty; the baseline had fixed incentives. Incentivizing quantity alone or quantity in combination with novelty results in an increase in quantity and novelty, but decreases the average quality compared to the baseline. The study closest to the research conducted in this paper is our own work (Charness and Grieco, 2019) on creativity and incentives

[3] There is also no correlation between gender and tournament entry rates.
[4] An interesting sidelight is that unconditional gifts lead to a form of reciprocity in the routine, but not in the creative, task.

with different types of individual tasks. The main results are that financial incentives for creativity are effective when a task is more delineated but not when it is more open-ended.

Yet no previous research has considered the effect of corporate culture on creativity. Corporate culture governs the ways a company's owners and employees think, feel and act. Both scholars and practitioners (e.g. Kotter, 2008; Kotter and Heskett, 1992) argue that corporate culture powerfully influences the economic performance of firms. A rationale for this view is that corporate culture acts as a guide or even a constraint in situations where employees face choices that cannot be properly regulated by formal contracts (for example, when there are unforeseen events). Among possible multiple equilibria, which of potentially multiple equilibria emerges may be determined by the underlying corporate culture that prevails in a company, as shown in models like O'Reilly (1989) and Kreps (1990). One crucial dimension of corporate culture is concerned with whether people are encouraged to work independently ("competitive" or "individualistic" corporate culture) or in teams ("cooperative" corporate culture). These two types of corporate culture may very well be differently conducive to creative performance.[5]

Organizational creativity is the successful implementation of creative ideas within a firm, these ideas being new products, processes, services, or even procedures or policies within the organization itself (Amabile, 1988). While shaped by its members' individual creativity, organizational creativity is a self-standing outcome that heavily depends on the organization features. The sum of values, resources, institutionalized mechanisms, and tacit tools the corporation uses to encourage (or discourage) novel behaviors represents the firm's "corporate culture" with respect to creativity and innovation.

[5] The topic of group decision-making and performance relative to that of individuals has increasingly become a focus in economics. See Charness and Sutter (2012) for an extensive discussion.

Although there is considerable work on group or team creativity, showing mixed evidence on the effect of competition on creativity (e.g. Hill and Amabile, 1993; Amabile, 1996; Shalley and Oldham, 1997; Paulus, 2000; Anderson and Cabral, 2007: Ariely et al., 2009; Gross, 2020), the relationship between corporate culture and creativity has never been studied explicitly. Furthermore, the mechanism through which group creativity develops is difficult to decode *per se*. Nonetheless, studies on innovation have emphasized that organizational culture is a decisive factor for a firm's innovativeness and performance (Matzler et al., 2013), and a number of articles have dealt with organizational culture as a key determinant of innovation (e.g., Ahmed, 1998; Dobni, 2008; Jassawalla and Sashittal, 2002; Martins and Terblanche, 2003). Still, establishing which cultural dimensions are conducive to higher innovation and better performance is far from easy: an "innovation supportive culture remains an intricate and amorphous phenomenon" (Khazanchi et al., 2007) and "empirical research remains somehow limited" (Naranjo-Valencia et al., 2010).

In general, the emphasis organizations should put on cooperation or competition among the members of work teams is an "age-old controversy" (Beersma et al., 2003). If teamwork is increasingly seen as an appropriate structure for organizing labor environments (e.g. Prat, 2002; Zwick, 2004), the suitable provision of incentives for teams remains one of the most challenging tasks in labor economics (Irlenbusch and Ruchala, 2008). The economics literature shows two alternative consequences of team-based incentives in real-effort tasks.

On the one hand, the literature emphasizes the effectiveness of incentives targeting individuals in a wide range of situation and tasks (see Camerer et al., 1999 for a review). Rewards depending on individual relative performance, as in tournaments, are often considered a fruitful way to promote efficiency because they stimulate individuals to outperform each other by

working faster, or smarter, or cheaper (Beersma et al., 2003). Furthermore, individual incentives do not face the problem of opportunistic behavior that frequently undermines the success of team-based rewards, as widely documented by the rich evidence on public-goods experiments: not only do free riders not exert effort, but reciprocators also become discouraged by the low contributions of others and so reduce their own. Finally, groups might be characterized by a relative inefficiency caused by coordination issues involved in combining members' contributions and by diminishing marginal productivity (e.g. Treffinger et al. 2006).

On the other hand, team-based incentives have been shown to prevail over individual incentives since the former are not only likely to enhance co-worker relations, but they also provide benefits of peer pressure, mutual monitoring (e.g. Lazear, 1989; Kandel and Lazear, 1992) and social norms (Barnes et al., 2011; Rankin, 2004). The allocation of collaborative rewards has been observed to promote trust, cohesiveness, and mutually-supportive behavior among team members, which in turn foster performance (Ivancevich and Matteson, 1999). Team-based pay may improve upon the work climate by increasing workers' willingness to help each other. Altruism serves as a commitment device to exert more effort, especially when workers' actions are strategic complements or, in Stanne et al. (1999)'s words, when people work on tasks with high "means interdependence" (i.e. when the task that one member of a team faces is affected by the performance of others on the team). Becoming altruistic thus represents a rational strategy to increase own payoff when payment is a function of joint output (Rotemberg, 1994).

And yet competition might nevertheless be destructive (e.g, Charness et al., 2014) because individuals place their own goals above those of the organization, obtain gains at the expense of the others, and suffer from competitive pressure. In this vein, some recent works interpret the effort choice as in a tournament as a bid an agent would make in an all-pay auction,

based on the idea that each agent puts some costly effort in the task, representing a sunk cost that one pays before knowing one's rank and the resulting payment. Fang et al. (2020) show that competition may discourage people because effort costs are convex, and more "spread-out" effort distributions yield lower expected effort when agents are homogeneous. Xiao (2018) accounts for heterogeneity among agents and finds that higher competition maximizes effort only if the top players are similar, whereas a less competitive prize sequence maximizes effort if the bottom players are similar.

The search for the roots of human cooperation has produced two main categories of explanations of cooperative behavior. First, individuals might derive an intrinsic pleasure from being cooperative, working with other people to reach a common goal, sharing the burden of the task with peers experiencing the same situation, and appreciating the gratification of seeing the group succeed. Second, people might enjoy the extrinsic returns of reciprocal positive externalities (e.g. Dijk and van Winden, 1997; Boone et al., 2008; Camerer and Fehr, 2006). This is especially true when the task features allow for synergies (Stanne et al., 1999) and the exchange of ideas, or require uncommon skills when effort alone is not sufficient. Extrinsic incentives deriving from positive externalities transform the payoff matrix of a social dilemma so that "cooperation becomes an economically rational choice yielding tangible rewards" (Declerck et al., 2013), convincing even those not naturally inclined to cooperate.[6]

Extrinsic incentives may come also in the form of long-term benefits from reciprocation of peers' pro-social behavior or from acquiring the reputation of being generous. However, this class of explanation requires a repeated-game setting where subjects interact for multiple periods

[6] The notion that mutual cooperation can be an equilibrium in a Prisoner's Dilemma game (due to reciprocity concerns) lies at the heart of Rabin (1993.

and modify their behavior after observing their peers' choices. We do not focus on this aspect since we have a one-shot design.

Although the management literature is not very explicit about how the atmosphere of a firm may nurture a particular form of behavior, previous economic approaches to corporate culture (Rob and Zemsky, 2008) assume that the firm is able to affect the process of workers' preference formation by choosing incentives. Intuitively, the type of task the team is asked to solve is likely to be strongly related to the (monetary) gains of cooperation. When the task requires complex, uncommon solutions, a team should be more likely to solve a problem than its smartest member would be if acting alone (Shaw, 1932) since one might expect some other group members to produce thoughtful work and reject incorrect solutions (Davis, 1992). In the case of more standardized endeavors, workers' need to rely on peers' help might be lower and the gains from cooperation would shrink.

## 3. The experiment

Our experiment involves asking individuals belonging to groups of three people to perform a task in a creative manner. Corporate culture is "instilled" in the lab by ranking and/or rewarding individual (competitive corporate culture) or group creative performance (cooperative corporate culture). Thus, corporate culture has two dimensions: the evaluation or ranking method and the determinants of financial payoffs; these can both depend on one's own performance or that of the group. We use a 2x2 design, varying different types of corporate ranking (at the individual or at the group level) and providing incentives or flat payments. In addition, we have a control treatment where neither individuals nor teams are ranked and the payment is flat. The payoff structure was set so that the average earnings from the tasks were identical across treatments.

Each participant completed an assigned type of real-effort task (see Charness and Grieco, 2019 for a discussion on different types of creative tasks); no person participated in more than one session. Group members could communicate and even switch tasks with each other: however, our perception is that interaction among subjects was limited and switching tasks with each other was quite rare.[7]

One group of three in the session evaluated the (anonymous) relative creativity of other participants so we could pay people immediately in the lab; two external judges (blind to treatment) later evaluated creativity. In no case did we provide any guidance concerning how to so do. After the end of the experiment, two additional judges evaluated all the answers on the basis of "objective" measures: the number of words, operations and figures the subjects used.

### *3.1. Tasks*

We used three types of creative questions: verbal, math, and drawing. Participants had 25 minutes to answer a specific question of this set of three questions:

1. *"Choose a combination of words to write a creative story." The words supplied were: house, zero, forgive, curve, relevance, cow, tree, planet, ring, send. Participants were told that they must use these words along with any other combination of words that they wished*. (verbal)

2. *"Starting from the number 27, obtain the number 6 in the most creative way you can by using at least two different numerical operations." Participants were told that they must use these numbers along with any other combination of numbers that they wished.* (math)

3. *"Draw a creative picture using the following shapes [a figure presenting a set of shapes follows]". Participants were told that they must use these shapes along with any other combination of shapes that they wished.* (drawing)

[7] Note that being assigned to a task rather than choosing it could affect behavior and performance Babcock et al. (2013) provide a clean test (with no selection bias) showing that people who select a task have better performance than those who were assigned the same task.

Participants were told that the creativity of their output in each specific question would be ranked in relation to that of the mutually-anonymous people in other groups answering the same question (verbal, math, or draw). People who answered a different question (in order to avoid strategic effects on the evaluations) performed this ranking.[8]

### *3.2. Treatments*

The manner in which we try to instill culture in the lab is twofold. We have two conditions where subjects receive flat payment but are ranked on the basis of individual ("Competitive culture with flat payment") or group performance ("Cooperative culture with flat payment"). Furthermore, we tailor financial incentives according to the specific type of corporate culture, i.e. by paying according to the individual relative performance ("Competitive culture with incentives") or to the group relative performance ("Cooperative incentives with incentives"). In addition, we have a control treatment where subjects are not ranked (neither at the individual nor at the group level) and receive a flat payment ("No corporate culture, flat payment").

**No corporate culture, flat payment (NC-F).** Subjects are not ranked (neither at the individual nor at the group level) and do not receive performance-based incentives. We paid people a flat amount of $9 (plus the $5 show-up fee) for completing the response.

**Competitive culture with flat payment (COMP-F).** In this condition, subjects do not receive performance-based incentives. We paid people a flat amount of $9 (plus the $5 show-up

[8] Subjects involved in the verbal task evaluated people in the math task; subjects involved in the math task evaluated people in the draw task; subjects involved in the draw task evaluated people in the verbal task. In principle, subjects could strategically assign the highest ranking to their peer, but one does not actually observe which work one's peer produced. In addition, since this is the same situation for everyone, we would expect any overall effect to be null.

fee) for completing the response. Participants who responded to the same task (verbal, math or drawing) were ranked according to their individual performance.

**Cooperative culture with flat payment (COOP-F).** Again, we paid people a flat amount of $9 (plus the $5 show-up fee) for completing the response. In this condition, not only were participants involved in the same task ranked according to their own relative performance, but *groups* were also ranked by combining the individual rankings: the group ranking is obtained by averaging the ranking of its members. Thus, individual ranking occurs also in this condition: this means that each subject's contribution to the group's performance is clearly identifiable. The only difference between the this condition and the previous one is that subjects in cooperative ranking receive, *in addition*, the feedback on group's ranking. The tasks were identical to those in the previous conditions.

**Competitive culture with incentives (COMP-I).** We paid each person on the basis of the assessments made in the task he or she was assigned, no matter the performance of the group to which they belong. Participants involved in the same task (verbal, math or drawing) were ranked: the person with the best ranking received $15, the person with the 2$^{nd}$-best ranking received $12, the person with the 3$^{rd}$-best rating received $9, the person with the 4$^{th}$-best ranking received $6, and the person with the worst ranking received $3; these payments were made in addition to the standard $5 payment for showing up on time to the experiment. The tasks were identical to those in the previous conditions.

**Cooperative culture with incentives (COOP-I).** In this condition, we paid people according to the group's assessed performance. Participants answering each task (verbal, math or draw) were ranked and then these ranks were summed for the three group members. In

addition to the $5 show-up fee, ach person in the group with the best ranking received $15, those in the group with the 2nd-best ranking received $12, those in the 3rd-best group received $9, those in the 4th-best group received $6, and those in the lowest-ranked group received $3. The tasks were the same as before.

### *3.3. Questionnaire*

After completing the task, our subjects were asked to answer two incentivized questions on risk and ambiguity attitude. In the question aimed at measure risk attitude, each individual was endowed with 100 units and could invest any portion of this amount in a risky asset that had a 50% chance of success and was paid 2.5 times the amount invested if successful and lost the investment if unsuccessful; the individual retained the units not invested (Gneezy and Potters, 1997; Charness and Gneezy, 2010). Participants were told that two different people (one for the risk-aversion question and one for the ambiguity-aversion question) would be chosen at random in each session for actual payoff implementation of these choices, and a coin would be flipped after the session to determine success or failure for these investors. This procedure provides a measure of risk aversion for each individual: the higher the investment, the less risk averse is the individual. The question on ambiguity attitude was identical except that we did not tell people the probability (which was 25 percent) that the investment would be successful.

Our subjects were also asked to complete a questionnaire where we requested information on their demographic characteristics: gender, age, major, number of siblings, birth-order, right or left-handed, married/divorced/unmarried parents plus other six questions on past involvement in creative activities, as in Hocevar (1980). For the latter set of questions, the scoring rule we used was to sum up each participant's ratings for the activities concerning six areas: art, crafts, performing arts, math-science, literature, and music.

In addition, subjects were asked to answer three further questions inspired by Wagner (1995)'s measure of collectivist attitude (versus individualistic attitude) aimed at capturing a person's preference for working in teams and sharing a group's value.

Finally, we presented subjects with ten questions on creative and cognitive style and sensation-seeking attitude, based on Nielsen at al. (2008)'s questions on creative style and on Zuckerman et al. (1964)'s questions on sensation-seeking attitude for the purpose of measuring one's preferences for the new and unfamiliar and one's need for general excitement. The questionnaire is reported in Appendix A.

### *3.4. Procedure*

The experiments were conducted at the University of California, Santa Barbara. There were 12 pen-and-paper sessions, with a total of 214 participants. There were 93 people in the competitive corporate culture treatment, with 48 in the incentives condition and 45 in the non-incentives condition; 81 people in the cooperative culture treatment, with 39 in the incentives condition and 42 in the no-incentives condition; 40 people in the control with no ranking and no incentives[9]. The subjects were students (35 percent from Social Sciences, 48 percent from STEM and 17 percent from Humanities), with 58 percent females. We used a between-subjects design, and no one participated in more than one session. Participants were paid a $5 show-up fee, plus their earnings from the experiment.

At the beginning of each session, participants were welcomed and the instructions were handed to them in written form before being read aloud by the experimenter. Each three-person group was seated separately from the other groups, with the group members seated in a row in

[9] NC-F data are from the non-ranking treatment in Charness and Grieco (2019), where people were in 5-person groups. These sessions were conducted in the same room as the others in this article.

seats about two feet apart. All subjects completed the final questionnaire. The sessions took approximately one hour, with average earnings of $15 (show-up fee included).

# 4. Experimental results

### *4.1. Creativity evaluation*

As mentioned above, people who performed a task (verbal, math, or draw) evaluated and ranked the individual responses from people who performed a different task. The rankings show a good level of consistency (Cronbach's alpha = .713). To make comparisons across treatments, we had two external judges - blind to treatments - evaluate all of the answers on a 1-10 scale: our creativity score is the average of the two independent evaluations. The two external judges' evaluations also exhibited a good degree of consistency (Cronbach's alpha = .685) and are correlated with the rankings (Spearman correlation test, with coef.= .159, $p = 0.049$).

As a further and more objective measure of subjects' output, we count the number of "items" (words, operations and shapes) used in the answers. On average, participants produced answers containing 225 words (std. dev. = 124.43), 55 operations (std. dev. = 96.47), and 71 shapes (std. dev. = 73.13).

### *4.2. Role of corporate culture*

Table 1 shows a clear pattern. The average creativity scores for three of the conditions with ranking are nearly identical (close to 4.7 out of a maximum score of 10), but the average score with cooperative incentives is much higher (6.141). The average creativity score is significantly higher in case of incentives to cooperative culture than for incentives with competitive corporate culture (Wilcoxon rank-sum test on individual averages, with $Z = -4.527$, $p = 0.000$). Incentives with competitive corporate culture do not affect the creativity score significantly with respect to

the condition where incentives are not in place (Wilcoxon rank-sum test on individual averages, with $Z = 0.232$, $p = 0.816$), while they do in case of cooperative corporate culture (Wilcoxon rank-sum test on individual averages, with $Z = 4.067$, $p = 0.000$).

**Table 1. Creativity score: summary statistics**

| Treatment | **NC-F** | **COMP-F** | **COOP-F** | **COMP-I** | **COOP-I** |
|---|---|---|---|---|---|
| Average | 3.626 | 4.700 | 4.756 | 4.760 | 6.141 |
| Std. Error | 0.224 | 0.219 | 0.227 | 0.182 | 0.200 |
| Min | 1 | 2.5 | 2.5 | 2.5 | 4 |
| Max | 7.5 | 8 | 8.5 | 7.5 | 9 |
| Obs. | 40 | 45 | 39 | 48 | 39 |

The average creativity score without ranking and incentives is significantly lower (3.626) than the score in all the conditions where subjects are ranked and receive a flat payment: no ranking versus competitive ranking: Wilcoxon rank-sum test, $Z = -3.097$, $p = 0.002$; no ranking versus cooperative ranking: Wilcoxon rank-sum test, $Z = - 3.374$, $p = 0.000$).

Table 2 reports a set of Tobit regressions (OLS regressions in Appendix B show the same results) where we explore the determinants of the individual creativity score. The regression results confirm the non-parametric tests findings described above. Column 1 shows a positive and highly significant effect for being ranked *per se* (compared to no ranking). Furthermore, cooperative incentives and cooperative corporate culture increase creativity score significantly. Column 2 shows that, while ranking is always beneficial for creative performance, the effects of incentives and cooperative culture are driven by the interaction between the two variables: cooperative culture entails a significantly higher creativity score only in the presence of incentives. As shown in the non-parametric tests, the number of items produced in the answer

(measured by the number of words, math operations and shaped she used in her answer) has no influence on these results; see column 3.

**Table 2. Determinants of creativity score (Tobit)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Ranking | 0.804*** | 1.115*** | 1.005*** | 1.014*** | 0.868*** | 1.601*** | 1.601*** |
| | [0.288] | [0.298] | [0.303] | [0.308] | [0.318] | [0.584] | [0.408] |
| Incentives | 0.665*** | 0.060 | 0.078 | 0.086 | 0.424 | 0.266 | 0.266 |
| | [0.214] | [0.284] | [0.297] | [0.283] | [0.464] | [0.504] | [0.518] |
| coop_culture | 0.728*** | 0.056 | 0.213 | 0.023 | 0.527 | -0.117 | -0.117 |
| | [0.215] | [0.299] | [0.317] | [0.299] | [0.517] | [0.562] | [0.560] |
| incentives*coop_culture | | 1.324*** | 1.164*** | 1.249*** | 1.396*** | 1.514*** | 1.514*** |
| | | [0.420] | [0.442] | [0.423] | [0.441] | [0.470] | [0.434] |
| number of items | | | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | | | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] |
| peers_score | | | | 0.020** | 0.049** | 0.049** | 0.049** |
| | | | | [0.016] | [0.024] | [0.024] | [0.021] |
| peers_score*coop_cc | | | | | -0.041 | -0.002 | -0.002 |
| | | | | | [0.033] | [0.036] | [0.031] |
| peers_score*incentives | | | | | -0.028 | -0.030 | -0.030 |
| | | | | | [0.034] | [0.039] | [0.034] |
| risk aversion | | | | | | 0.003 | 0.003 |
| | | | | | | [0.004] | [0.005] |
| ambiguity aversion | | | | | | -0.002 | -0.002 |
| | | | | | | [0.005] | [0.005] |
| creative_style | | | | | | 0.015* | 0.015* |
| | | | | | | [0.009] | [0.006] |
| sensation_seeking | | | | | | 0.155 | 0.155 |
| | | | | | | [0.121] | [0.125] |
| Male | | | | | | -0.027 | -0.027 |
| | | | | | | [0.207] | [0.206] |
| Observations | 211 | 211 | 211 | 211 | 211 | 185 | 185 |

Tobit (standard errors in parentheses, clustered at the group level in Column 7). The dependent variable assumes value ranging from 1 to 10. Ranking is a dummy variable assuming value equal to 1 when subjects are ranked (individually and/or group-based) and 0 elsewhere. Incentives is a dummy variable assuming value equal to 1 when payment is output-related and 0 elsewhere. coop _culture is a dummy variable assuming value equal to 1 when the corporate culture is cooperative and 0 when the corporate culture is competitive. incentives*coop_culture is the interacted variable between the dummy variables incentives and coop _culture. Number of items is the number of words, math operations and shapes subjects use in their answers. peers_score is the average creative score of other subjects belonging to the same group. peers_score*coop_culture is the interacted variable between peers_score and the dummy variable coop_culture. peers_score *incentives is the interacted variable between peers_score and the dummy variable incentives. Other controls: age, major, artistic endeavors the subject has performed in the past, risk attitude, ambiguity attitude, number of siblings, parents' marital status, birth order, right-handed, preference for collectivism instead of individualism. *** significant at 1%; ** significant at 5%; * significant at 10%.

Columns 4-5 show another interesting effect: one's' creative score increases with the average score of one's peers, with no interaction with the type of culture or the presence of incentives. This suggests that group members conform to the level of creative output prevailing in the group, as if they followed a social norm. A group comprised of industrious people has been shown in other contexts to generate a "positive climate": those who observe peers exerting high effort exert higher effort themselves (Banerjee and Besley, 1990; Falk and Ichino, 2006; Mas and Moretti, 2009). If the positive effect of peers' average creative score is clear in a cooperative context, where subjects might increase effort because they see an increase in the chances of winning if peers are industrious, the mechanism in a competitive setting like the one reproduced in our experiment is less straightforward.

It is important to note that, in the competitive culture treatment, subjects do not compete against their peers but instead compete against the other subjects in the session completing the same task (verbal, math, or draw). Since they cannot observe competitors, but do observe the effort level of their peers, we speculate that subjects may use peers' observed industriousness as a signal of competitors' performance. The signal could serve as a point of comparison for subjects' own behavior and appears to increase performance.

These results hold when controlling for demographic characteristics, creative style, sensation-seeking attitude, and risk/ambiguity attitude (column 6). Subjects with a more "explorative" creative style (i.e., people who do not have clearly-established methods or definite goals and who use trial and error) show slightly higher creative scores. Column 7 shows that clustering at the group level does not affect the results.

So Table 2 suggests that no matter the culture, subjects' individual creative output is positively affected by other peers' score, suggesting some effect from being part of a relatively

more creative group. The next section further investigates this aspect and tries to shed light on why cooperative corporate culture fosters individual creative output when subjects work as members of a group or team, while competitive culture does not.

### *4.3. The role of creative ability and effort*

Our analysis goes more deeply into what happens inside each group, examining in particular how cooperative or competitive incentives may encourage or discourage subjects' *effort* according to their level of creative *ability*. In fact, as suggested by the Fang et al. (2020) theoretical work on non-creative tasks, agents' effort might react differently to the competitiveness - in the sense of "skewness" - of prizes according to the concavity of the cost function. When considering heterogeneous agents, convex costs of effort have been shown to determine lower preference for competition for middle and low-ability players, as in Moldovanu and Sela (2001) and Xiao (2018).

We check for any possible asymmetric effects on individual effort of cooperative versus competitive incentives in a context, like ours, when the performance in the task depends not only on effort, but also on some intrinsic creative ability. Are highly-creative subjects more likely to put effort in a creative task, because they feel an intrinsic pleasure from being creative and suffer a lower cost from exerting creative effort? Or, vice versa, do they refuse to put effort in a task they are already good at? How do these effects interact with incentives? How are these mechanisms affected by the chance of observing (although imprecisely) group peers' effort?

To perform this analysis, we must first decompose the individual creative performance into two components: an intrinsic one, which we call "creative ability" and an extrinsic one, namely "effort", which can be incentivized. As noted by Antonji and Mansfield (2016), the idea

that observed outcomes reveal information about factors unobserved by the researcher has been utilized in a number of settings, including the estimation of the residual factor in economic growth (since Denison, 1964), firm production functions (e.g., among others, Olley and Pakes, 1996; Levinsohn and Petrin, 2003; Ackerberg et al., 2006), labor supply functions (e.g., Metcalf, 1974; Altonji, 1982), ability and school or wage attainment (e.g., Griliches and Mason, 1972; Abowd et al., 1999).

We consider the following simplified production function relating creative performance to individuals' characteristics and group's corporate culture. Let $Y_{gi}$ denote the outcome (e.g. the creative score) of individual $i$ who belongs to group $g$. Following Angrist and Pischke (2008) and Antonji and Mansfield (2018), suppose that $Y_{gi}$is determined according to:

$$Y_{gi} = [\boldsymbol{X_i\beta} + a_i^U] + [\boldsymbol{Z_g\Gamma} + c_g^U] \qquad (1)$$

where the vector $\boldsymbol{X_i}$ is a set of individual characteristics we observe (with corresponding creative productivities $\boldsymbol{\beta}$), while $a_i^U \equiv \boldsymbol{X_i^U\beta^U} + v_i$ captures unobserved individual ability, with $a_i^U$and $v_i$ uncorrelated by construction. Together, $[\boldsymbol{X_i};\ a_i^U]$ represent the complete set of individual characteristics that have a causal impact on individual $i$'s creative score. Analogously, the vector $\boldsymbol{Z_g}$ is a set of group characteristics observed by the researcher (with corresponding creative productivities $\boldsymbol{\Gamma}$), among which we are particularly interested in corporate culture and incentives, while $c_g^U \equiv \boldsymbol{Z_g}^{\boldsymbol{U}}\boldsymbol{\Gamma^U}$ combines the effects of unobserved group characteristics. Together, $[\boldsymbol{Z_g}; c_g^U]$ capture the complete set of group-level influences common to individuals who belong to group $g$.

In our experiment, individuals are exogenously assigned to groups and so the group average of $a_i^U$ should not vary across groups. In addition, the interactions within groups were observed to be rather limited, with the exception that individuals in the same group were sitting close to each other and thus could observe peers' behavior and collect some signal on their effort level. The lack of sorting and the limited interactions reduce the extent of possible unobserved groups' characteristics $c_g^U$; however, to account for them, we introduce group fixed effects in the regressions below.

We follow an Instrumental Variables (IV) approach analogous to the one implemented to address to the ability-bias problem in returns to schooling (e.g. Angrist and Imbens, 1995; Angrist and Pischke, 2014). Since corporate culture is expected to affect effort but not ability, we instrument individual creative effort with corporate culture dummies. Individuals' unobserved ability $a_i^U$ is proportional to the residuals and used to rank subjects: "high-ability" subjects are above the median or equal to it, "low-ability" ones are below the median. The procedure is based on the assumption that subject's ability should be unaffected by our dimensions of corporate culture (ranking and incentives). At the same time, the creative performance reacts to the exogenous variation in corporate culture obtained through treatments, which is necessary to apply an IV estimation.[10]

This allows us to explore, for both types of corporate culture, whether individual effort is influenced by peers' effort (which each subject can imperfectly observe), whether any possible effect of peers' effort interacts with incentives, and to compare high and low-ability subjects with this respect.

[10] We thank Josh Angrist, Peter Moffatt and Simon Quinn for very useful discussions on this methodology.

In Table 3, columns 1-3 refer to the case of cooperative culture, whereas columns 4-6 to competitive culture. Columns 1 and 4 consider all subjects; columns 2 and 5 restrict the analysis to high-ability subjects; columns 3 and 6 focus on low-ability subjects.

**Table 3. Determinants of creative effort**

| | Cooperative culture | | | Competitive culture | | |
|---|---|---|---|---|---|---|
| | *All* | *High ability* | *Low ability* | *All* | *High ability* | *Low ability* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Incentives | 1.140*** | 1.075*** | 0.912 | 0.409* | 0.529* | -0.799 |
| | [0.279] | [0.330] | [0.547] | [0.237] | [0.290] | [0.519] |
| Peers_effort | -0.758* | -0.666 | -0.857 | -0.173 | 0.058 | -5.172*** |
| | [0.430] | [0.537] | [0.685] | [0.404] | [0.418] | [1.816] |
| Peers_effort*incentives | 0.642* | 0.522 | 0.932 | 0.175 | -0.083 | 5.147*** |
| | [0.425] | [0.530] | [0.726] | [0.399] | [0.415] | [1.808] |
| Observations | 75 | 51 | 24 | 90 | 48 | 42 |

Tobit regressions, standard errors clustered at the group level in parentheses. Effort is the fitted value from the first-stage estimation of creativity scores using the treatment dummy as an instrument. The ability of high-ability individuals is higher (lower) than or equal to the median ability level, while low-ability individuals have ability is lower than the median ability level. Incentives is a dummy variable equal to 1 when payment is output-related and 0 elsewhere. peers_effort is the average creative effort of other subjects belonging to the same group. peers_effort *incentives is the interacted variable between peers_effort and the dummy variable incentives. Group-fixed effects. *** significant at 1%; ** significant at 5%; * significant at 10%.

Our regressions show three interesting results that help explaining the better performance of cooperative culture with respect to competitive culture. First, incentives determine a significant increase in effort in both types of culture (see columns 1 and 4): this effect is driven by high-ability people, as shown in columns 2 and 5. However, the effect of cooperative incentives is stronger and more significant and drives the positive and significant effect we observe for the whole sample of subjects operating in cooperative culture.

Second, although we observe some free riding behavior in cooperative culture for high-ability subjects (high-ability people decreasing effort the higher the peers' effort), this effect is

reversed in presence of incentives (the interacted variable Peers_effort*incentives is positive and significant). Thus, cooperative incentives succeed in engendering a social norm of high effort.

Third, a negative relationship between the individual's effort level and that of one's peers' also emerges in the case of competitive culture, but only for low-ability subjects. Since in a competitive context the mechanism cannot be driven by free riding, the interpretation might be related to the signaling effect of peers' effort: the high (low) effort subjects can directly observe from peers is considered informative of competitors' effort and thus treated as an indicator of tough (mild) competition. Observing peers exerting high effort could discourage low-ability players. However, this effect is weaker when incentives are in place. The aspect of considering a creative versus a routinized task, as we do in this paper, emerges clearly here, where we are able to distinguish between ability and effort: subjects with different ability levels react to peers' effort differently, as shown by the comparison between columns 2 and 3 for cooperative culture, and between columns 5 and 6 for competitive culture. In a routinized, non-creative task, we would expect to observe no heterogeneity in this respect.

## 5. Discussion and conclusion

We find that a cooperative pay structure can have a positive effect on group creativity due to the possibility of internalizing the effects of a social norm of high effort. It is important to make clear that the way we model cooperative corporate culture calls for the interplay of two dimensions: ranking and incentives. In our design, either when incentives are set cooperatively or competitively, performance is typically also ranked (also) at the individual level. The simple fact of being ranked induces an increase of about one score point (out of ten) in average creative score, whereas cooperative incentives cause an increase of 1.4 score points.

In groups where a social norm of high effort emerges, subjects do not want to let peers down and so exert high effort themselves. Our results on competitive culture show that competitive incentives crowd out creativity effort because low-ability subjects react to peers' creative effort exactly in the opposite way: they reduce effort the higher the effort of their peers. Being part of a group induces people to compare their own ability with those of their peers, stimulating higher effort if the consequences of others' high ability can be internalized (with cooperative incentives) or weakening effort if subjects learn that competitors might be better than they are.

In sum, the presence of a norm for desirable action can multiply the benefits of financial incentives, while the presence of a norm for undesirable action reduces the benefits. In a related vein, Fisher and Huddart (2008)'s model shows that the interplay between norms and financial incentives might alter the effectiveness of incentives. Due to the externalities the agents with high-powered incentives create for those agents with low-powered incentives, and *vice versa*, an increase in financial incentives may lead to larger or smaller changes than would arise in the absence of norm considerations. This mechanism arises when individuals work as part of a team but without internalizing peers' output: this mechanism motivates why tournaments can be effective in individual creative tasks (e.g. Charness and Grieco, 2019), while detrimental in a group setting.

Amabile (1996) provides a similar explanation regarding lower creative performance for individuals in groups than on their own by suggesting that this may reflect the degree of anonymity characterizing the interaction: creative performance suffers when others observe this or even with physical proximity. Bracha and Fershtman (2013) report an analogous result from their experiment: under competitive tournament incentives, subjects devote less time to tasks

requiring cognitive engagement - with respect to time devoted to more practical, "labor" effort - and have a lower success rate than when they are provided with a pay-for-performance incentive scheme. They appear to "work harder, but not smarter". The authors explain this finding referring to the psychological literature on "choking under pressure": pressure in various forms, including answering in front of peers or of a generic audience, may be detrimental for performance in various task. Gross (2020) shows that intensifying competition both creates and destroys incentives for creativity: while some competition is necessary to induce high-performing agents to develop new designs, intense competition discourages effort.

In general, our findings are consistent with previous investigations in suggesting that motivating independent individual efforts does not enhance group creativity, whereas incentives better promote group creativity by stimulating group cohesion. Among them, Boudreau et al. (2012) provide evidence that higher rivalry reduces the performance of all competitors in a contest with less uncertain problems. Chen et al. (2012) show that individual intra-group tournament pay increases individual efforts but is not able to enhance the creativity of group solutions relative to individual piece-rate pay. Azoulay et al. (2011) consider the impact of incentives on scientific exploration in two medical institutes. Where the corporate culture promoted cooperation among peers, tolerated early failure, and gave great freedom to experiment, investigators produced high-impact articles at a much higher rate than a control group of similarly accomplished scientists where the degree of competition was high and individuals were subject to both short review cycles and renewal policies unforgiving of failure.

Our results on creative tasks also have implications for innovation. The recommendation coming out of our results is to have people work together as a true team and providing them with financial incentives. Consistently, in organizational studies on how to promote team innovation,

empirical results have identified the roles of developing a team climate of trust and openness (Anderson and West, 1998), vision and shared objectives (West, 1990), and team collaboration (West and Wallace, 1991). In particular, goal interdependence describes the extent to which team members' goals and rewards are related such that each team member can only reach her goal if the other team members achieve their goals as well (e.g. Van der Vegt and Van de Vliert, 2002). With cooperative goals in place, team members want each other to perform effectively for their mutual benefit. Individuals "pull together, help each other, and discuss different viewpoints to optimize performance" (Hülsheger et al., 2009). This favors both each team member and the team as a whole (Tjosvold et al., 2004; Van der Vegt and Janssen, 2003) in engaging in critical discussions and the synthesis of different viewpoints; both mechanisms are shown to stimulate innovation (Bledow et al. 2009).

In closing, our results suggest some directions for fruitful research in this nascent area. We hope that other researchers will join us in exploring what is best for encouraging or facilitating creativity in a variety of economic environments.

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## Appendix A

## FINAL QUESTIONNAIRE

1) You are endowed with 100 units and can invest any portion of this amount in an asset that has a 50% chance of success and pays 2.5 times the amount invested if successful; you can retain the units not invested. Please note that a regular coin will be tossed at the end of the experiment, and one of you will be selected randomly and paid according the amount stated in this question. How much do you want to invest in this asset? …….

2) You are endowed with 100 units and can invest any portion of this amount in an asset with unknown chance of success are and pays 2.5 times the amount invested if successful; you can retain the units not invested. Please note that a regular coin will be tossed at the end of the experiment, and one of you will be selected randomly and paid according the amount stated in this question. How much do you want to invest in this asset? …….

3) You are presented with 10 couples of sentences: in each couple, please pick the one that better describes your personality.

   1A. Planning is essential for me to be creative. I often have detailed sketches for what I am going to do before I do anything.
   1B. Planning is not important for me to be creative. I rarely have detailed sketches for what I am going to do before I do anything.

   2A. I view working creatively as the systematic execution of a plan; I work easily and swiftly.
   2B. I view working creatively as mainly trial and error; I make choices, change them, and react to my changes.

   3A. I have a discontinuous creative career. Once I master one idea or topic, I move on to the next.
   3B. I am a perfectionist who is constantly searching. I am frustrated by my inability to achieve my goals.

   4A. I am finished working creatively when I complete my preconceived plan.
   4B. I am finished working only after inspecting and judging my work.

   5A. When working creatively, I precisely state my goals before beginning, either as an image or an exact procedure.
   5B. When I am working creatively, my goals are imprecise. Having imprecise goals leads me to use a tentative procedure.

   6A. I work creatively to produce something that achieves a purpose.
   6B. I work creatively to search for and discover the meaning of my work.

   7A. My innovation appears suddenly. My new ideas are very different from my old ideas.
   7B. My innovation appears through pursuing one image at a time. My new ideas tend to be different versions of the same thing.

8A. I get bored seeing the same old faces.
8B. I like the comfortable familiarity of everyday life.

9A. I like to explore a strange city or section of town by myself, even if it means getting lost.
9B. I prefer a guide when I am in a place I don't know well.

10A. If I were a salesman I would prefer a straight salary, rather than the risk of making little or nothing on a commission basis
10B. If I were a salesman I would prefer working on a commission if I had a chance to make more money than I could on a salary.

11A. I prefer to work with others in group rather than working alone.
11B. Given the choice, I would rather do a job where I can work alone rather than a job where I have to work with others in a group.

12A. If you want something done right, you have got to do it yourself.
12B. People in a group are more productive than people working alone.

13A. A group is more efficient when people do what they want to do instead of what the group wants them to do.
13 B. People in groups should be willing to make sacrifices for the sake of the group's well-being.

4) Please indicate your

- Gender F M
- Age ……
- Major ……
- Number of siblings …….
- Birth-order 1st 2nd 3rd 4th 5th more than 5th
- Right/Left-handed R L
- Married/Unmarried/Divorced parents M U D

5) Have you ever

(a) painted an original picture YES NO
(b) wrote an original computer program YES NO
(c) composed a poem or a novel/tale YES NO
(d) composed a song YES NO
(e) made a craft item YES NO
(f) directed or acted in a play YES NO

## Appendix B

## ADDITIONAL REGRESSIONS

### Table 2bis. Determinants of creativity score (OLS)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| ranking | 0.763*** | 1.075*** | 0.968*** | 0.974*** | 0.827** | 1.581** | 1.581*** |
| | [0.286] | [0.297] | [0.303] | [0.308] | [0.320] | [0.610] | [0.423] |
| incentives | 0.665*** | 0.060 | 0.080 | 0.086 | 0.427 | 0.273 | 0.273 |
| | [0.214] | [0.284] | [0.298] | [0.284] | [0.467] | [0.527] | [0.546] |
| coop_culture | 0.728*** | 0.056 | 0.215 | 0.023 | 0.529 | -0.123 | -0.123 |
| | [0.214] | [0.299] | [0.317] | [0.300] | [0.521] | [0.588] | [0.591] |
| incentives*coop_culture | | 1.324*** | 1.161*** | 1.249*** | 1.396*** | 1.510*** | 1.510*** |
| | | [0.420] | [0.443] | [0.424] | [0.443] | [0.492] | [0.458] |
| number of items | | | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | | | [0.001] | [0.001] | [0.001] | [0.001] | [0.001] |
| peers_score | | | | 0.020** | 0.049** | 0.049** | 0.049** |
| | | | | [0.016] | [0.024] | [0.025] | [0.022] |
| peers_score*coop_cc | | | | | -0.041 | -0.001 | -0.001 |
| | | | | | [0.033] | [0.038] | [0.033] |
| peers_score*incentives | | | | | -0.029 | -0.030 | -0.030 |
| | | | | | [0.034] | [0.041] | [0.041] |
| risk aversion | | | | | | 0.003 | 0.003 |
| | | | | | | [0.004] | [0.004] |
| ambiguity aversion | | | | | | -0.002 | -0.002 |
| | | | | | | [0.005] | [0.005] |
| creative_style | | | | | | 0.015* | 0.015* |
| | | | | | | [0.009] | [0.006] |
| sensation_seeking | | | | | | 0.149 | 0.149 |
| | | | | | | [0.127] | [0.131] |
| male | | | | | | -0.028 | -0.028 |
| | | | | | | [0.217] | [0.206] |
| Observations | 211 | 211 | 211 | 211 | 211 | 185 | 185 |

OLS (standard errors in parentheses, clustered at the group level in Column 7). The dependent variable assumes value ranging from 1 to 10. Ranking is a dummy variable assuming value equal to 1 when subjects are ranked (individually and/or group-based) and 0 elsewhere. Incentives is a dummy variable assuming value equal to 1 when payment is output-related and 0 elsewhere. coop _culture is a dummy variable assuming value equal to 1 when the corporate culture is cooperative and 0 when the corporate culture is competitive. incentives*coop_culture is the interacted variable between the dummy variables incentives and coop _culture. Number of items is the number of words, math operations and shapes subjects use in their answers. peers_score is the average creative score of other subjects belonging to the same group. peers_score*coop_culture is the interacted variable between peers_score and the dummy variable coop_culture. peers_score *incentives is the interacted variable between peers_score and the dummy variable incentives. Other controls: age, major, artistic endeavors the subject has performed in the past, risk attitude, ambiguity attitude, number of siblings, parents' marital status, birth order, right-handed, preference for collectivism instead of individualism. *** significant at 1%; ** significant at 5%; * significant at 10%.