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The Dark Side of Competition for Status

Gary Charness, David Masclet, Marie Claire Villeval

Abstract: Unethical behavior within organizations is not rare. We investigate experimentally the role of status-seeking behavior in sabotage and cheating activities aiming at improving one's performance ranking in a flat-wage environment. We find that average effort is higher when individuals are informed about their relative performance. However, ranking feedback also favors disreputable behavior. Some individuals do not hesitate to incur a cost to improve their rank by sabotaging others' work or by increasing artificially their own performance. Introducing sabotage opportunities has a strong detrimental effect on performance. Therefore, ranking incentives should be used with care. Inducing group identity discourages sabotage among peers but increases in-group rivalry.

Keywords: Status, ranking, feedback, sabotage, doping, competitive preferences, experiment

JEL Classifications: C91, C92, M54, D63, J28, J31

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1. INTRODUCTION

It is traditionally assumed in standard economic theory that competition is desirable for several different reasons. Competition leads to an efficient allocation of productive resources on the market, giving consumers better products to a lower price. It promotes innovation by increasing the cost of failing to invest in research and development. Competition also enhances overall performance within firms by inducing employees to exert higher work effort. The tournament literature has shown how monetary prizes based on ranking of performance provide strong incentives to outperform (e.g. Lazear and Rosen, 1981; Bull *et al*., 1987; Hannan *et al*., 2008).

While feedback on relative performance may motivate employees to work harder by strengthening competitive preferences, they may also potentially encourage some individuals to engage in unethical activities in order to improve their ranking, which may have important detrimental effects for the firm (Lazear, 1989; Konrad, 2000; Chen, 2003).[1] For instance, a worker can increase his chances of winning a contest by reducing the output of a person with whom he is competing through means of sabotage (Lazear, 1989; Garicano and Palacios-Huerta, 2006; Harbring et al., 2007; Falk et al., 2008; Harbring and Irlenbusch, 2008; Carpenter et al., 2010; Abbink and Hermann, 2011; Balafoutas et al., 2012).[2] Similarly, workers may also cheat to artificially improve their performance by the use of performance-enhancing drugs, forgery, use of ghostwriters or plagiarism (List *et al*. 2001; Preston and Szymanski, 2003; Enders and Hoover, 2004; Shleifer, 2004; Fanelli, 2009; Schwieren and Weichselbaumer, 2010).

In this current paper, we contribute to the existing literature by investigating the extent of unethical activities such as sabotage or cheating activity to improve one's own performance and their consequences on overall performance. We aim primarily at investigating the determinants of

[1] According to the SUMER survey, on working conditions and hostile behavior in the workplace (49,984 respondents), conducted by the French Ministry of Employment (2008), 17% of workers declare that they have been victim of unethical behavior, including sabotage in the workplace. Such unethical activities can seriously harm the overall performance of the firm by discouraging effort, increasing absenteeism or inducing health problems. In the same vein, a survey by the Workplace Bullying Institute reports that 35% of the 4,210 respondents have experienced repeated mistreatment ranging from intimidation to sabotage in the workplace. This survey reports several cases of individuals who decided to leave the firm after having been sabotaged several times by other workers.

[2] Sabotage activities within firms can take several forms including locking someone's workstation, transferring false information to coworkers, destroying the work of others, or stealing company supplies or equipment. For instance at Digital Equipment, a major American company in the computer industry during the 1990s, workers invaded the computer files of co-workers to make electronic copies and claimed the work as their own. In academia, Maher (2010) cites the example of a postdoctoral student who destroyed a colleague's experiments to get ahead, a cautionary note for supervisors.

unethical activities. In particular, we check whether a pure taste for having the best rank in the performance distribution, apart from any possible material benefits associated or not with this rank, serves as a motivation for engaging in unethical activities.[3] The previous literature has assumed that unethical activities are motivated by the possibility of receiving higher earnings. However one may reasonably argue that such unethical activities may also be driven at least in part by the pure intrinsic desire for having a higher rank. This could be the case for instance if individuals have a strong concern for status and if status-seeking is related to the desire for dominance in competition (Charness and Grosskopf, 2001; Charness and Rabin, 2002; Abbink and Sadrieh, 2009).

Status seeking can be also related to self-image (Benabou and Tirole, 2006; Koszegi, 2006), public recognition (Frank, 1985; Moldovanu *et al*, 2007, Rustichini, 2008) or the joy of out-performing others (Chowdhury and Sheremeta, 2010; Dohmen et al. 2011).[4] Some recent research in neuroeconomics and biology has shown that such intrinsic competitive preferences may be "evolutionarily" rooted in our behaviors (Tran and Zeckhauser, 2012). Outperforming others would be associated with higher concentrations of serotonin, a neurotransmitter in the brain that enhances feelings of well-being (Madsen, 1994) by activating the neural circuitry associated with reward processing (Dohmen et al., 2011). Other recent behavioral studies have provided some evidences that people may be willing to harm others even in the absence of immediate or future expected monetary return, which may be partially explained by a strong desire for dominance (Zizzo and Oswald, 2001; Zizzo, 2003; Abbink and Sadrieh, 2009; Abbink et al., 2009 ; Bolle et al., 2011).[5]

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[3] Although surveys provide interesting information regarding the extent of unethical behavior in the workplace, nevertheless the individual determinants of unethical activities can hardly be observed directly in survey data because of the hidden nature of these activities. Controlled laboratory experiments may help in investigating these determinants. See Charness and Levine (2010) for survey evidence on attitudes towards sabotage in various scenarios.

[4] The role of relative position in individual utility has been substantially investigated in many social sciences. However, mainstream microeconomic theory has traditionally assumed that utility is a function only of one's own absolute income, with the notable exception of Duesenberry (1949), Veblen (1949), or Frank (1985). Experimental studies have demonstrated both the importance given by individuals to status and how it affects behavior in negotiations (Ball and Eckel, 1996), markets (Ball and Eckel, 1998; Ball *et al*., 2001), coordination games (Eckel and Wilson, 2007), and organizations either in cooperative settings (Eckel *et al*., 2009) or in competitive settings (Huberman *et al*., 2004; Rustichini and Vostroknutov, 2008).

[5] In a seminal paper, Zizzo and Oswald (2001) design a game where subjects can reduce (burn) other subject's money at own costs. Despite the own cost of burning money, the majority of subjects choose to destroy some part of others' money. Abbink and Sadrieh (2009) go one step further by considering the case of two players who can simultaneously destroy each other's endowment without any conventional reason to do so. The authors observe that up to 40% of subjects are willing to burn money, in particular in when agents can hide their action and assume impunity. In a recent study, Bolle et al. (2011) investigate the determinants of vendettas. The authors observe that vendettas frequently

From a methodological point of view, we chose to implement a flat-wage scheme with equal wages in order to properly isolate this pure effect of competitive preferences from the monetary reasons why feedback about rank may incite individuals to engage in unethical activities.[6] Indeed in a context where monetary incentives are strong enough to actually motivate people to work hard, it is difficult to disentangle the pure motive of competitive preferences from other motives. We acknowledge that in many firms more sophisticated remuneration schemes either based on individual or group performance are common and that long-term material concerns, including future promotions or salary increases are likely to be related to performance rank.

Nevertheless, the use of a fixed-pay regime is not totally disconnected from real life. Indeed despite the important literature showing the positive effects of performance-based remuneration schemes (e.g. Lazear, 2000), the use of flat-wage schemes remains surprisingly high within firms (e.g. Nguyen and Leung, 2009; Bartling and von Siemens, 2010; Franceschelli et al., 2010).[7] These observations were summarized twenty years ago by Holmström and Milgrom (1991): "It remains a puzzle for this theory that employment contracts so often specify fixed wages and more generally that incentives within firms appear to be so muted, especially compared to those of the market". The role played by flat-wage schemes is even more prominent when considering the public sector where employees are paid fixed salaries depending strictly on time worked (e.g. Ding et al., 2001; Prentice et al., 2007; Bartling and von Siemens, 2010).[8] Furthermore, while remuneration is in some cases tied to performance, the fixed portion still constitutes the larger proportion of workers' compensation.

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occur even when initial endowment are equal and despite the fact that vendettas are pointless. In a related money-burning experiment, Abbink et al. (2011) observe that equal distributions are also particularly prone to destruction.

[6] We note that this is a reasonably standard approach in experimental economics. For example, this was also the strategy used in Dohmen and Falk (2010) and Falk and Ichino (2006). From the latter paper: "In our experiment, we implemented a fixed-pay regime, that is, payments were not conditioned on output. This was done in order to keep things as simple as possible."

[7] Indeed, there are some cases, particularly in the public sector, where promotions and salary are almost wholly unaffected by performance. For example, promotions and salary increases for civil servants in the U.S. Postal Service are almost entirely based on seniority, and these workers are also largely immune from being fired for poor performance.

[8] Several factors may explain the persistence of flat-wage schemes within firms including the role of egalitarian concerns (Ding *et al.*, 2001; Bartling and von Siemens, 2010), monitoring costs, and centralization of authority (Prentice et al., 2007). Some authors have also investigated the reasons behind the persistence of flat-wage schemes in the public sector. These factors include the specificities of multi-faceted tasks and intrinsic motivation for public service that may compensate for quite low and relatively flat extrinsic incentives that the sector offers (Georgellis *et al.*, 2011).

Unethical activities may be possible in such an environment because paying a flat wage does not necessarily imply the absence of any feedback on relative performance. Indeed, firms commonly provide relative performance information to their employees even when employees' compensation is not tied to peers' performance (e.g. Anderson *et al*. 1982; Nordstrom *et al*. 1990; Tafkov, 2012). In such contexts, individuals simply substitute wages comparisons for effort comparisons and relative position is therefore determined not by income but by work performance.[9] In banking, for example, some branch managers disclose to their tellers the number of new accounts opened by each of their colleagues even though teller compensation has no incentive-based pay (Gino and Staats, 2011). In the public sector, employees are typically paid a flat wage but are still evaluated and ranked by their supervisor. And even when firms do not provide direct feedback on relative performance, the degree of proximity among co-workers may lead them to compare each other (e.g. Falk and Ichino, 2006; Mas and Moretti, 2009).

Another aim of this study is to investigate how the opportunity for unethical behavior influences the impact of social information on overall output. While economic theory has discussed in depth the positive effects of relative performance information in tournaments or under piece-rate payment schemes (Hannan *et al*., 2008; Azmat and Iriberri, 2010a,b; Blanes i Vidal and Nossol, 2011; Eriksson *et al*., 2009, find more nuanced results), the effects of feedback on relative performance in a flat wage environment that permits unethical behavior are unclear *a priori*. Some studies observed a positive effect of feedback with fixed compensation (Falk and Ichino, 2006; Mas and Moretti, 2009; Kuhnen and Tymula, 2012; Taafkov, 2012). Other studies have shown that feedback about rank may also de-motivate the lowest-performing employees (e.g. Barankay, 2012). However, while the studies mentioned above have focused their attention on the incentive effect of relative performance information under full wage compression, they are silent about the unethical activities in such contexts. Sabotage activities may have both direct and indirect negative impacts on performance. Its direct effect is that it destroys valuable resources, and particularly resources created by the most able individuals who are also those who are sabotaged more often (Chen, 2003). Indirect effects include demoralization and retaliation (Harbring *et al*., 2007; Abbink and Hermann, 2011). Sabotage may also lead workers to exert less effort because they anticipate that they might be the victims of sabotage (Carpenter *et al*., 2010). We do not expect such a

[9] In our experiment, relative position is determined by work performance in a real-effort task. Therefore, status is endogenous. In most experimental studies, status is assigned exogenously (with the exception of Ball and Eckel, 1998; Huberman *et al*., 2004; Rustichini and Vostroknutov, 2008).

negative impact of an artificial increase of performance compared to sabotage activities, as it does not affect directly any co-worker's output. However, it may indirectly reduce the motivating impact of ranking feedback, as individuals know that this information can be biased. To the best of our knowledge, we provide the first experiment on sabotage and cheating activities under a flat wage.

Our experiment consists of four treatments. In our *baseline* treatment, participants are matched in groups of three and each participant is required to perform a real-effort task (a decoding task) under a flat-wage scheme without any feedback on relative performance. The *ranking* treatment is similar to the baseline except that each participant is now informed about her relative performance. Our two remaining treatments (the *sabotage* and the *redemption* treatments) are identical to the ranking treatment except that we add a new stage in which participants can pay to change their relative performance either by reducing the performance of their co-workers (sabotage) or by purchasing extra units of 'output' to increase artificially their own performance (redemption). We ran two variants of the ranking, sabotage and redemption treatments, with or without symbols to visually emphasize the performance ranks in the group.[10] By comparing behavior in our different treatments we can isolate the pure effect on performance of the feedback on relative performance from the effects of introducing opportunities of either sabotage or redemption activities when wages are fixed.

Our results show that, even when wages are fixed, many individuals exhibit competitive behavior. Individual performance is positively influenced by feedback on one's relative position in the group, as people exert significantly more effort when they know they will receive ranking feedback. However, while providing feedback on ranking creates additional incentives, it also invites unethical behavior, as some individuals are willing to pay to improve their rank by sabotaging others' work or by increasing artificially their own relative performance. Indeed,

[10] In companies, status is often reinforced by means of symbolic awards such as the "Bravo Award" at IBM, the "Employee of the Month" at McDonald's or gold medals for good attendance. Similarly, informal sanctions may take several forms such as frowning 'emoticons', social embarrassment, or public disgrace. In the workplace, Grasmick and Kobayashi (2002) showed that non-monetary sanctions based on socially-imposed embarrassment are proposed to be deterrents to employee noncompliance with organizational rules. Regulators are also experimenting with the public disclosure of inspection results, names of violating companies in public registers, or shaming offenders in the media (Van Erp, 2008). In Denmark and the UK, scores on the doors are associated with negative smileys showing the extent to which restaurants do not comply with hygiene standards. In California, a utility company gave customers feedback by printing neighborhood comparisons on energy bills, along with a "smiley face" for bills with relatively low energy usage and a frown for those with high usage.

introducing the opportunity to sabotage others' output has a strong negative direct and indirect impact on performance. The effect of redemption activities on performance is also negative, but to a more moderate degree. We also find evidence that people from the same school are more likely to improve their own relative position artificially, although they are less likely to sabotage people from the same school than people from other schools. This suggests that group identity favors rivalry but discourages destructive competition. Overall, our findings provide evidence of competitive preferences in non-monetary competitive settings.

The remainder of the paper is organized as follows. Section 2 describes the experimental design. Section 3 presents our behavioral conjectures about the expected treatment effects. The results of the study are presented in section 4. Section 5 discusses our findings while section 6 concludes.

2. EXPERIMENTAL DESIGN

2.1. Treatments

Our experiment consists of four main treatments with ten periods each and is based on a between-subject design. In our *baseline treatment*, each person is matched with two other participants. We use a stranger matching protocol, so that groups are randomly reformed at the beginning of each new period. Participants are paid a flat wage of 10 Experimental Currency Units (with 10 ECU equal to one Euro) at the beginning of each period; it is common information that wage is uncorrelated to performance. Participants have to perform a task during a maximum of two minutes. This task consists of decoding sets of one-digit numbers into letters from a grid of letters that is displayed on the computer screen (see instructions in the on-line appendix). In each new period, a different grid of letters and different decoding numbers appear. This fastidious and boring task was chosen to induce sufficient disutility. Participants must press a button to start a new period and immediately receive the wage for the period. In every period they can solve as many problems as they wish. They can stop working at any time during the course of the period, they can resume work at will, and they can choose not to perform the task at all. To allow for alternative leisure activities on the job, two magazines are provided in each cubicle and the instructions indicate that it is allowed to read them at any time. In the field, leisure at work takes multiple forms: surfing the net, long coffee breaks, office gossiping, etc.

The participants are continuously informed about their current number of correct answers. If a submitted answer is not correct, the same letter is displayed until the correct answer is provided. Once the two minutes have elapsed, a vertical bar is displayed on the screen; its height indicates the total number of correct answers. In this treatment, people receive no feedback about the performances of the other two group members.

The *ranking treatment* is identical to the baseline except that the computer displays three vertical bars with the performance of each of the three group members at the end of each period. Each person is therefore able to see her relative performance and her rank; the worker who has performed the best in her group is ranked first while the lowest performer is ranked last. We ran two variants of the *ranking* treatment, with or without symbols to visually illustrate the relative performance in the group. Specifically, in the treatment with symbols the worker who has performed the best in her group receives a "gold medal" while the lowest performer gets a "donkey hat" on his computer screen. We consider whether adding symbolic rewards and sanctions crowd-in or crowd-out the effect of feedback on performance.

The *redemption treatments* (with and without symbols) are identical to the ranking treatments, except that we add a second stage in which participants can modify their performance. In stage two, participants have the opportunity to purchase extra units of 'output' to artificially increase their performance and possibly their rank in the performance distribution. They can buy from 0 to 20 units of output that are added to their original performance; the cost of each unit is 0.5 ECU. At the end of this stage, the computer program displays the final performance of each group member, and the associated ranking.

The *sabotage treatments* are similar to the redemption treatments except that in the second stage participants can pay to reduce the performance of their co-workers. They can assign from 0 to 20 costly points to each of the other members '*to reduce their score'*. Each point assigned by player *i* to player *j* reduces player *j*'s performance by one unit of output and this may modify the provisional ranking resulting from performing the task in stage one. Assigning points is equivalent to sabotage. While player *j*'s earnings are unaffected by receiving sabotage points, a participant who sabotages incurs a cost of 0.5 ECU per point of sabotage that is subtracted from the wage to determine the final earnings for the period. While each sabotage or redemption point costs the same, we acknowledge that in some cases, one redemption point allows the participant to improve

her position relative to the two other group members, whereas one sabotage point targets only one person. This brings up the issue of relative cost.[11]

As in the redemption treatment, participants can observe any change in the performance of the three group members at the end of the second stage. However, while they can see if their group members have artificially increased their own score in the redemption treatment, they are not informed about who has sabotaged their output. We also conducted a variant of the sabotage treatment with symbols to illustrate ranks.

Buying redemption and sabotage points can be associated with status-seeking, as the ranks or trophies earned will be displayed on the screen of the group members at the end of each period. In addition, this information will be also provided after groups have been re-matched in the next periods. Indeed, the participants can see the profile of their two co-workers at the beginning of each period. In the baseline treatment, the profile includes the group members' gender and school. In all the other treatments, it also includes a historical record of the number of times a participant has been ranked first and last throughout the previous periods. In the treatments with symbols, the screen displays the number of gold medals and donkey hats accumulated by each group member. The accumulation of displayable ranks and symbols builds the social image of the participant over time. It is important to provide this information 'publicly' since image and status require publicity. This also allows us to investigate the importance of in-group effects on decisions, and notably whether in-group biased individuals are less willing to sabotage their peers. Indeed, the literature in social psychology and economics has shown the importance of group identity on behavior (Brewer, 1999; Akerlof and Kranton, 2000; Charness *et al*. (2007), Halevy *et al*., 2008; Chen and Li, 2009; Delfgaauw *et al*., 2009).

2.2. Procedures

The experiment consists of 44 sessions of ten periods each. 26 sessions were conducted at the CREM-CNRS (LABEX) institute of the University of Rennes 1 and 18 others were conducted at the GATE-CNRS institute of the University of Lyon, France. Between nine and 15 individuals took part in each session, for a total of 585 participants who were invited via the ORSEE software (Greiner, 2004). The participants were undergraduate students from a variety of majors including

[11] In the context of public good games it has been found that the decision to punish is influenced not only by the cost of punishment but also by its impact on the target (Masclet and Villeval, 2008; Nikiforakis and Norman, 2008).

business, economics, law, engineering, medicine and literature. Table A in online appendix displays summary information about the sessions. The experiment was programmed using the Z-tree platform (Fischbacher, 2007). The experiment lasted on average 90 minutes and each participant earned an average of 14.64 Euros, including a show-up fee of 5 Euros.

3. BEHAVIORAL HYPOTHESES

If one assumes that individuals maximize their own payoff, the theoretical prediction for the baseline treatment is straightforward: the minimum effort possible should be exerted. The same prediction applies to the ranking treatments. In the redemption and sabotage treatments, the only subgame-perfect equilibrium of the game, whether played once or finitely repeated, is for no participant to work and purchase redemption or sabotage points.

One may, however, relax some assumptions and consider that participants may have an intrinsic motivation for working. Intrinsic motivation includes self-esteem, interest and pride in one's work, an innate sense of duty to honor contractual obligations (Baron, 1988; Kreps, 1997; James, 2005; Ellingsen and Johanesson, 2008), or a sense of fulfillment (Deci, 1975; Kuhnen and Tymula, 2012). Several studies of the gift-exchange game have shown that, despite the absence of any penalty for shirking, workers respond to flat wages by exerting non-null effort levels (Fehr *et al*., 1993; Gneezy and List, 2006; Cohn *et al*., 2009; Gächter and Thöni, 2010; Kube *et al.*, 2012). This holds even in the absence of repeated relationships or when wages are exogenously chosen (Falk and Ichino, 2006; Kuhnen and Tymula, 2012; Dohmen and Falk, 2010). Based on this and although our task is fastidious, we can write the following hypothesis:

H1: ***Even under flat wages, individuals exert positive levels of effort.***

Intrinsic motivation can be reinforced by feedback on relative performance and social comparisons. Individuals may be motivated by their relative performance, enjoy out-performing others, and desire even the modest status feasible in our experiment because it improves social (and perhaps even self) image. Indeed, there is strong evidence that people care not only about their own payoffs but also about social image and status (Ball and Eckel, 1998; Huberman *et al.*, 2004; Rustichini, 2008; Eckel *et al.*, 2009; Clark *et al.* 2010; Kosfeld and Neckermann, 2011).

Concerning performance comparisons, several studies have found positive effects of feedback on effort provision. Under a flat wage scheme, Falk and Ichino (2006) and Mas and

Moretti (2009) show that peer effects increase productivity when workers can observe each others' output. This supports the idea that individuals incur disutility when falling behind their fellow workers. Kuhnen and Tymula (2012) observe that agents work harder when they observe their ranking and underline the role played by self-esteem and desire for dominance.[12] A recent neuroeconomic study revealed that outperforming others activates the neural circuitry associated with reward processing (Dohmen *et al*. 2011). A notable exception is Barankay (2012), who finds a negative effect of rank feedback on salesmen's effort in a natural field experiment, due to a 'de-moralization effect' of being informed about a lower than expected rank. Based on most of these previous findings, we conjecture that the positive effect of rank feedback on performance should dominate.

The expected net effect on motivation of adding symbols to materialize ranks is unclear. On the one hand, symbols may incite individuals to outperform others in order to obtain a trophy or to avoid the stigmatization of a negative symbol (e.g. Kosfeld and Neckermann, 2011; Pan and Houser, 2011). On the other hand, previous studies have shown that small monetary but also non monetary rewards such as gold stars, candies or thank-you gestures may crowd-out intrinsic motivation (Deci, 1975; Harackiewicz, 1979; Gneezy and Rustichini, 2000; Cameron *et al*. 2001; Frey and Jegen, 2001; Shalley *et al*., 2004). A person may be reluctant to work for a small symbolic compensation because this may signal to others her willingness to accept a very small reward, which weakens her social image (Ariely *et al*. 2009). Based on these findings and on the fact that, in our current study, symbols have no real value *per se*, particularly in terms of recognition from the principal (Ellingsen and Johanesson, 2007), we conjecture that adding symbols would reduce performance. This is summarized in the following hypotheses.

H2: a) ***In a flat-wage environment, providing rank feedback increases performance. b) The introduction of symbols has a net negative effect on performance.***

Our next hypotheses concern the effects of sabotage or redemption. We are not aware of any study on redemption or sabotage activities in settings with a flat payment scheme. Sabotage has been widely studied in tournaments with monetary prizes (Lazear, 1989; Garicano and Palacios-Huerta, 2006; Harbring *et al.*, 2007; Falk *et al*., 2008; Harbring and Irlenbusch, 2008; Carpenter *et al*., 2010). These studies suggest that the rationale for sabotage lies in the urge to

[12] A positive effect of rank feedback has been identified under piece rate payment schemes and in tournaments (Azmat and Iriberri, 2010a,b; Hannan *et al*., 2008); however, Eriksson *et al*. (2009) found mitigated results.

earn more, as its frequency increases in the size and spread of prizes. But sabotage could also result from the desire to win *per se*. For example, destructive activities such as money burning can be partly explained by a desire for dominance (Abbink and Sadrieh, 2009).[13] We conjecture that in our experiment individuals may sabotage if they value their status sufficiently highly and if they have strong competitive preferences and desire for dominance. For similar reasons, individuals may artificially increase their own performance even under a flat wage scheme. Since for the same cost each redemption point may allow an individual to increase her position relative to the two other participants, while one sabotage point targets only one individual, we conjecture that participants buy more redemption points than sabotage points. This is stated precisely in H3:

H3: a) ***Individuals with strong competitive preferences may sabotage others or increase artificially their own performance. b) Individuals should buy more redemption points than sabotage points.***

Our last conjecture concerns the effects of sabotage and redemption on performance. We expect strong negative effects of sabotage on net performance. Such destructive effects have been observed in the context of monetary tournaments. Sabotage may reduce the efficiency of an organization for three main reasons: *i*) it destroys resources, in particular if the highest performers are also those who are more likely to be sabotaged (Chen, 2003); *ii*) it de-motivates workers if they anticipate that they will be the victims of sabotage (Carpenter *et al*., 2010); and *iii*) it may lead to retaliation if the saboteur's identity is revealed (Harbring *et al*., 2007; Abbink and Hermann, 2011). In a flat-wage environment, we expect sabotage to induce a significant decrease of initial performance (by destroying output) and final performance (net of sabotage activity). Even if workers are re-matched after each period, sabotage may also lead to blind revenge. We expect less negative effects of redemption activities on initial performance and motivation, as they do not alter co-workers' output. This is stated in H4:

H4: ***Sabotage has a detrimental effect on both initial and final performance by destroying output and discouraging effort. The impact of redemption activities on initial performance is also negative, but to a more moderate degree.***

4. EXPERIMENTAL RESULTS

[13] Sabotage may also be due to pure nastiness. In that case, one should observe that individuals sabotage indifferently the lowest and the highest ranked co-worker.

This section presents a comparative analysis of performance across treatments, before studying the determinants of redemption and sabotage activities.

4.1. Determinants of performance

Our findings reveal that informing participants about their relative performance in the ranking treatment increases work effort compared with the baseline treatment. Introducing the opportunity to artificially change one's own relative performance does not greatly affect work effort in the redemption treatment but decreases performance in the sabotage treatment, both in comparison to the ranking treatment.

4.1.1. Performance levels across treatments

Consider first the treatments without symbols. The average performance is 23.15 units per period in the baseline treatment and 28.84 units in the ranking treatment. A Mann-Whitney pairwise test indicates that this difference is significant (p=0.010).[14] These findings are consistent both with H1 and H2. The mean initial score in the redemption treatment (28.14 units) is slightly (but not significantly) lower than in the ranking treatment. The mean final performance (28.99 units) is almost the same as the performance in the ranking treatment. Sabotage has a negative impact on both initial and final performance. The mean final performance is 25.09 units, which is significantly lower than in the ranking treatment (p=0.010). Interestingly, sabotage has also an indirect negative effect on initial performance. On average, initial performance is 25.51 units in the sabotage treatment, which is significantly lower than in both the ranking (p=0.045) and the redemption treatments (p=0.082). Consistent with H4, these findings indicate that sabotage totally offsets the positive effects of feedback on performance both directly by destructing final performance but also indirectly by de-motivating individuals.

Figure 1 displays the time path of average initial performance by period in all treatments without symbols. Figure 2 describes the distribution of initial performance per treatment. The corresponding figures for the treatments with symbols are available in the online appendix (fig. A and B). These figures report similar findings.

[Figures 1 and 2: about here]

[14] All the tests reported in this paper are two-tailed Mann-Whitney pairwise tests with each session as an independent observation, unless specified otherwise.

Figure 1 shows that after an initial jump in performance between periods 1 and 2, likely due to learning, the average performance decreases after period 5 in all but the ranking treatment. This evolution suggests that performance comparisons prevent a decline in performance provided that there is no opportunity for unethical behavior. Figure 2 indicates that feedback reduces both the variability in performance and the number of no-effort (or very low effort) choices. The frequency of no-effort choices is 7.77% in the baseline and 0.60% in the ranking treatment, which differ significantly (p=0.018). In sharp contrast, it is 8.19% and 6.17% in the sabotage and redemption treatments, respectively, which is not different from the baseline (p=0.669 and p=0.623). This is probably because the positive impact of feedback is offset by the refusal of some individuals to work in such an unethical environment.

The econometric analysis reported in Table 1 provides more formal support to these results. Table 1 consists of three panels. The first panel displays the results of a regression in which the dependent variable is the initial individual performance in the treatments without symbols. The second panel displays a similar regression for the treatments with symbols. Finally the third panel presents the results of estimates on pooled data (with and without symbols). Models (1) to (3) are Generalized Least Squares models with robust standard errors clustered at the session level to control for serial correlation within each session. To check the robustness of our results, models (4) and (5) are random-effect Tobit models controlling for the number of left-censored observations. The independent variables include treatment dummies, a dummy variable for periods 6 to 10 and several demographic variables.[15] In addition, we include in models (3) to (5) several interaction variables to check whether adding symbols influences initial performance in each treatment. Model (5) also controls for trend differences across treatments in the second half of the game.

[Table 1 about here]

Model (1) shows that providing feedback on relative performance has a positive and significant effect on initial performance. All else equal, players' effort is predicted to increase by 5.89 units in the ranking treatment compared with the baseline. The dummy variable "redemption" also

[15] The demographic variables include gender, being a student at the university versus in another school, studying economics, and location (Rennes or Lyon). These variables are not significant or if significant, not robust. We checked whether males were more sensitive to ranking information by including an interaction variable "ranking*gender" in the estimates (available upon request). This variable is insignificant, indicating the absence of gender effect regarding ranking information in our experiment.

captures a positive and significant coefficient, indicating that individuals also provide more effort in this treatment than in the baseline. Performance is 5.32 units higher than in the baseline. Introducing the opportunity to sabotage reduces both the value and the significance of the effect of feedback on ranking, suggesting that the positive effects of ranking are almost totally offset by the introduction of sabotage activities.

Model (2) reports qualitatively similar results for the treatments with symbols, although the coefficients are both smaller and less significant. Models (3) and (4) confirm these findings, showing that symbols have a negative effect on initial performance (only significant in the ranking treatment). This supports our conjecture H2 that symbols may crowd out intrinsic motivation in absence of real value *per se*. In model (5), the coefficients of the interaction variables "*ranking*periods 6-10"* and "*redemption*periods 6-10"* are positive and significant. This confirms that status concern mitigates the decline of performance observed in the second half of the baseline. The variable "*sabotage*periods 6-10"* is not significant, probably because the impact of status concern is offset by the refusal of some individuals to work in such a hostile environment.
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In other Tobit regressions (available upon request), we estimate separately the determinants of final performance in the redemption and the sabotage treatments, with the ranking treatment as the reference. For the redemption treatment, we ran two estimates. In the first one, the independent variables include a dummy variable for the redemption treatment, a trend term and the usual demographics. In the second estimate we add the number of points purchased and a dummy for the individuals who never bought redemption points throughout the game. For the sabotage treatment, we include a dummy for the sabotage treatment, the numbers of assigned and received points, a dummy variable for the participants who never sabotaged throughout the game as well as an interaction term to control for those who never sabotaged and do not suffer from sabotage at the current period.

The coefficient associated with the redemption variable is not significant, indicating that the final performance in the redemption treatment does not significantly differ from the ranking treatment. Indeed, we learn from the second estimate that if the number of redemption points purchased has a positive effect on final performance (coeff. =0.806***, S.E. = 0.074), this effect is offset by the fact that those who never purchase redemption points have significantly lower final

performance (coeff. =-5.790***, S.E.=1.564). Regarding the sabotage treatment, the net effect of sabotage on final performance is clearly negative compared to the ranking treatment (coef.=-4.032***, S.E.=1.472). This is mainly due to the receipt of sabotage points (coeff.= -0.886***, S.E.=0.079) and to the fact that those who never sabotage decrease their effort significantly (coeff. =-5.280***, S.E. = 1.635). This is even the case for those who did not receive any sabotage point (coef.=-2.995***, S.E. 0.641), indicating a clear demotivating effect of working in such a hostile environment. Finally, those who assign sabotage points tend to have a higher final performance, although the difference is not significant.[16] Our main findings are summarized in Results 1.

Results 1. *a) Feedback has a positive significant effect on performance in the ranking treatment. b) Relative to the ranking treatment, this effect is decreased by the introduction of sabotage due to both a destruction of final performance and a de-motivating effect on initial performance. c) The introduction of symbols to illustrate rank has a slight negative effect on initial performance.*

4.1.2. Status seeking and the dynamics of performance

The rank in the distribution of performance and status-seeking activities in the previous period may be important determinants of subsequent performance. To measure these effects, we focus now on the impact of feedback on changes in individual performance across periods.

Table 2 reports estimates on the determinants of changes in individual performance between period *t-1* and period *t* in random-effects Generalized Least Squares regressions in each treatment. The independent variables in model (2) include $rank^x_i$ variables corresponding to the position of participant *i*. These variables are dummies that equal 1 if the individual is in relative position *x* in the distribution, and 0 otherwise (with *x* = 1, 2 or 3 for the highest, intermediate and lowest position, respectively). We also include interaction terms "$rank^x_i$ **symbol"* corresponding to the relative position of participant *i* in the treatments with symbols. In addition, we include a variable to test for the influence of changes in the relative position of a subject in the distribution of performance due to status-seeking activities in the previous period. The $rank^3_i$ *in (t-1)*change* variable equals 1 if the subject has ended up in the lowest rank in period *t*-1 while she had a higher rank at the end of the first stage of the previous period, and 0 otherwise. Finally we include the

[16] In the redemption treatment, the mean final performance is 25.07 (S.D.=12.12) for the participants who never bought redemption points and 31.87 (S.D.=6.68) for the others. The corresponding values in the sabotage treatment are 21.29 (S.D.=13.20) and 27.85 (S.D.=6.24). These statistics are based on pooled data of treatments with and without symbols. Similar findings are obtained on separate treatments.

number of sabotage points assigned and received. Model (3) displays a similar estimate for the redemption treatments with the same variables as in model (1) except that we add the number of redemption points purchased by the individual in the previous period.

[Table 2 about here]

Table 2 indicates that, in all treatments, having a lower rank in the distribution in *t*-1 leads people to increase their effort in the next period, confirming that performance comparisons support motivation in each treatment. This finding is consistent with studies showing that people ranked worse (better) than expected increased (decreased) output (Schultz *et al*. 2007; Kuhnen and Tymula, 2012). Furthermore being a victim of sabotage has a significant negative impact on future effort. Interestingly, those who purchase sabotage or redemption points exert significantly more effort in subsequent periods, indicating that sabotage (redemption) and work effort are complementary activities. Our findings are summarized in Results 2.

Results 2. *a) A lower rank in period t-1 induces people to increase their effort in the next period. b) Individuals who buy sabotage or redemption points in t-1 increase their subsequent effort. c) Being a victim of sabotage in t-1 has a significant negative effect on future work effort.*

4.2. Determinants of redemption and sabotage activities

In the treatment without symbols, 6.94% of individuals purchase sabotage points and 15.34% buy redemption points in a period in the treatments without symbols. In the treatments with symbols, these proportions are respectively 13.75% and 15.20%. While the proportions of cheaters in a period are relatively low, they may nevertheless be rather realistic since one does not expect a high proportion of people in the field to engage frequently in sabotage or redemption. However when considering the entire session, we observe that 34.72% of individuals buy at least one sabotage point during a session and 35.00% of individuals buy at least one redemption point during a session in the treatments without symbols.[17] In the treatments with symbols, these percentages are 51.39% and 41.33%, respectively. Thus, a very substantial proportion (one-third to one-half) of all participants is willing to spend money to affect their relative rank without any positive effects on their own income.

[17] The explanation behind these differences of percentages is that most players do not buy points repeatedly. Some may buy points only when their relative performance puts them at risk of finishing the period as the worst performer; others when they are not far from getting the first rank.

The participants buy on average 0.41 sabotage points (S.D.=2.87) and 0.85 redemption points (S.D.=1.55) per period in the treatments without symbols. A Mann-Whitney pairwise test indicates that people assign significantly more redemption than sabotage points (p=0.068), which is consistent with H3. The high standard deviation indicates that there is a great deal of heterogeneity among individuals. In the treatments with symbols, players buy on average 1.07 sabotage points (S.D.=3.05) and 0.78 redemption points (S.D.=2.56). These numbers are not significantly different (p=0.460). Thus, more sabotage points were assigned in the treatment with symbols than without symbols (p=0.044) while no difference was found between the two redemption treatments (p=0.753). The fact that sabotage is stronger in the treatment with symbols suggests that symbols activate overtly-destructive competitive preferences more for those who are inclined to engage in unethical activities.

In the treatments without symbols, those who sabotage buy an average of 4.00 points (S.D.=3.12), which represents 20.00% of their income for the period. Similarly, those who pay to increase their performance purchase 5.59 points on average (S.D.=5.26), representing 27.95% of their income for the period. In the treatments without symbols, those who sabotage buy an average of 5.11 points (S.D.=5.13), 25.55% of their income for the period, and those who buy redemption points purchase 5.11 points on average (S.D.=4.59), 25.55% of their income for the period).

4.2.1. Status seeking and redemption

Table 3 provides a more formal analysis of the determinants of redemption and sabotage activities. The left panel reports two random-effect Tobit regressions on the determinants of the number of redemption points participant *i* buys to artificially increase her performance (models (1) and (2)). The right panel reports similar regressions on the determinants of sabotage (models (3) and (4)).[18] In models (1) and (2), the independent variables include the participant's initial performance and its squared value to test for potential non-linearity, the rank in the distribution, a dummy variable for periods 6 to 10 and another dummy for the treatment with symbols. The "*tie in performance*" variable equals 1 if the participant's initial performance is identical to the performance of another group member, and 0 otherwise. We control for demographic variables. Model (2) also accounts for the characteristics of the two co-workers to identify the presence of in-group effects. Precisely, "*same gender"* takes the value 1 if all group members are either males or females, and 0 otherwise.

[18] Separate estimates for treatments with and without symbols report very similar findings.

"*Same school"* equals 1 if all the group members belong to the same school and 0 otherwise. Last, "*mean cumulated* $rank^1_{-i}$" ("*mean cumulated* $rank^3_{-i}$") variables indicate the mean number of times co-workers have received the highest (lowest) rank in total previous periods. These variables indicate the mean status of co-workers.

[*Table 3 about here*]

These regressions show that the higher their initial performance, the more individuals buy redemption points. Controlling for performance, the $rank^2_i$ and $rank^3_i$ variables have highly significant positive coefficients, indicating that participants buy more redemption points when they occupy the intermediate or the lowest position in the distribution compared with those who hold the highest position. They also buy redemption points to differentiate themselves from other group members in case of a tie. These findings support H3. No difference is found across treatments with and without symbols. Last, belonging to the same school and having the same gender as the two co-workers has a positive and significant impact on the willingness of people to increase their performance artificially. This finding suggests the existence of rivalry between in-groups. Our findings are summarized in Results 3.

Results 3. *a) Individuals buy redemption points to improve their ranking and to differentiate themselves from others. b) There exists a positive relationship between initial performance and redemption activity. c) Group identity in terms of gender and school leads individuals to artificially increase their performance.*

4.2.2. Status seeking and sabotage

The right panel of Table 3 reports estimates on the determinants of the number of sabotage points assigned by player *i* to player *j*. In addition to the independent variables included in models (1) and (2), in model (4) the "$rank_i^2 * rank_j^1$" and "$rank_i^3 * rank_j^2$" variables are dummies indicating when *i* occupies the intermediate and the lowest position while *j* occupies the highest and the intermediate one, respectively. The "*tie in performance*" variable equals 1 if *i*'s initial performance is identical to *j*'s performance, and 0 otherwise. We control for demographic variables.

As for redemption, the harder individuals work, the more they sabotage. We find a more significant inverted U-shaped relationship between initial performance and the number of sabotage points. After controlling for performance, the positive effect of "$rank^2_i$" and "$rank^3_i$" in model (3) indicates that those who are not the best performers are more likely to sabotage. The coefficients of these variables are no longer significant in model (4) when "$rank^2_i * rank^1_j$" and "$rank^3_i * rank^2_j$"

are included. The positive and significant coefficients of these interaction variables suggest that individuals only target the participant who is ranked immediately above them. Participants assign more sabotage points when a co-worker's performance is equal to their own. Our analysis confirms our previous findings that sabotage is significantly higher in the treatment with symbols, suggesting that symbols reinforce the competitive preferences of those who are inclined to exert unethical activities.[19] Having received sabotage points in the previous period has a significant positive impact, suggesting that sabotage is also partly motivated by blind revenge.

Finally, our data indicate that the composition of the group may matter. The variable "*mean cumulated rank*$^{3}_{-i}$" has a significant and negative coefficient: the presence of low-status co-workers (who accumulated a higher number of last ranks in previous periods) reduces the willingness to sabotage. Belonging to the same school as the other group members reduces the willingness to sabotage. A possible interpretation is that people are reluctant to sabotage their peers because of in-group preferences. Belonging to the same gender does not generate the same behavior, suggesting that this confers a weaker sense of group identity. These findings differ from our previous results on redemption. One interpretation is that in a group of peers people are particularly competitive provided that rivalry does not harm others. Our findings summarize in Results 4.

Results 4. *a) Individuals sabotage i) to achieve a better rank in the group, ii) to differentiate in case of ties and ii) to retaliate blindly. b) Individuals sabotage more in the treatment with symbols. c) There is an inverted U-shaped relationship between sabotage and effort. d) Belonging to the same school reduces the participants' willingness to sabotage.*

4.2.3. Robustness test

One might be concerned about one assumption of our treatments because of the possibility that it is the certainty of being close to another person's performance level that drives cheating. Indeed, in real-world settings, individuals are not always informed about their exact relative performance. Therefore, they may be more reluctant to engage in cheating, since it is more difficult to correctly anticipate its effect on final rankings. We addressed this issue by designing a new sabotage

[19] This finding is in apparent contradiction with our previously identified crowding-out effect of symbols on performance. However this may simply reflect the heterogeneity of participants. Those who have strong competitive preferences are even more willing to sabotage in the presence of symbols, while the others decrease their effort even more. Another possible explanation may be that people exert less initial effort in anticipation that sabotage is going to be higher.

treatment with uncertainty and with symbols.[20] In this treatment, participants cannot observe their true relative output at the end of the first stage. They are only informed about an approximate value of each co-worker's performance randomly drawn from an interval [x-2, x+2]. More explicitly, participants are informed about their exact own performance. In contrast, they can only get a signal of others' performance that is randomly chosen among the values: x-2, x-1, x, x+1, x+2. This treatment is included as a robustness test to check whether unethical activities might be also influenced by uncertainty about one's relative position.

In a period, 17.50% of the participants buy sabotage points, while 13.75% did so in the treatment with certainty. The direction of this difference is opposite of what would be found in relation to the concern mentioned above. When considering the entire session, our data show that the percentage of saboteurs is relatively stable with respect to the degree of uncertainty. The percentage of participants who buy at least one sabotage point during a session is 50.00% in the new treatment, while it was 51.39% in the treatment with certainty. The estimation of a random-effects Tobit model in which the number of sabotage points is the dependent variable shows that the difference between these two treatments is not significant.[21]

This finding may be due to the existence of two opposite effects: uncertainty may refrain some individuals to engage in sabotage as it is difficult to anticipate its impact on final ranking; others may seek to compensate for the effect of uncertainty by sabotaging even more to increase their chance of getting a better rank.

5. DISCUSSION

Our data confirm that even under a flat wage scheme most individuals exert substantial effort, especially when they learn their ranking. This suggests that feedback about rank gives additional incentives to outperform. At the same time, rank feedback leads some individuals to incur a cost to sabotage the work of others or to increase artificially their own output. Our intuition is that paying people a flat wage and giving them feedback on their performance ranking leads those who have competitive preferences to invest in status-seeking activities, including unethical ones.

[20] We chose to focus on the sabotage treatment as it provides the clearest evidence of detrimental effects on overall performance; we would expect quite similar effects of uncertainty in the redemption treatments.

[21] This model is similar to model (4) in Table 3, except that we only consider the treatments with symbols and the independent variables include a dummy variable for the treatment with uncertainty. The *p*-value for this treatment dummy is p=0.633. N=2806; log-likelihood=-2022.19. This regression is available upon request.

An objection to this interpretation in terms of competitive preferences is that feedback may simply convey information regarding norms about the appropriate productivity level.[22] Alternatively, individuals may work harder because they want to signal that they are smart. Although we acknowledge that these reasons are plausible, these interpretations are inconsistent with some of our findings. In particular, both redemption and sabotage activities are relatively inconsistent with an interpretation in terms of signaling or social norms.

Another possible objection to this interpretation is that both effort choices and the purchase of sabotage and redemption points may simply derive from the fact that participants feel committed to perform the task and buy points in order to please the experimenter perceived as an 'authority' (see Zizzo, 2010 on experimenter demand effects). Levitt and List (2007) also raise the concern that in a laboratory setting, morality issues can affect participants' behavior especially because their actions are scrutinized.[23] Although we acknowledge that such effects may exist, this interpretation is unlikely to account for our results for several reasons.[24] First, we were careful to avoid having our own students in the experiment, to use no frame in the instructions, and to minimize the interactions between the players and the experimenter.[25] Second, we have designed a neutral environment. Third, even if some forms of authority relationship between the participants and the experimenter did still exist, this would mirror the field setting where such a vertical relationship exists, enhancing the external validity of our experiment. Finally, a demand effect could not explain all the differences observed across treatments.

We interpreted the fact that people exert positive effort under the flat wage scheme in the baseline in terms of intrinsic motivation. However, another interpretation is that individuals chose to perform because they may have perceived the real-effort task as simply a computer game and feel fun to play it. We acknowledge that this possibility may exist. Yet, several precautions have

[22] We thank an anonymous referee for this helpful remark.

[23] In any case, to the extent that such an effect is present, it would imply that the level of unethical behavior that we observe is something of a floor. Another typical concern of Levitt and List (2007) is that participants in typical lab experiments are not representative of the population and that the stakes are low compared to real settings. We acknowledge that our results should probably be limited to highly educated people. As regards the stakes, it should be acknowledged that they are small in our experiment. But if we observe sabotage and redemption for such low stakes, we can reasonably anticipate that their likelihood should be higher for higher economic stakes.

[24] Nevertheless, to the extent that the participants feel scrutinized, it is reasonable to think that this should lead them to emphasize moral norms; if this was the case, our findings regarding sabotage and redemption activities are probably underestimated relative to a natural setting.

[25] A debriefing written questionnaire asking players to describe their strategy does not show any evidence for such a demand effect.

been taken to minimize such effect. First, we were careful to choose a task that was sufficiently fastidious to avoid such bias. Second, we allowed for alternative leisure activities on the job. Third, the fact that we observe variance both across treatments and among participants in the provision of effort seems to indicate that people did not simply decode for fun and that decoding tasks required a real and costly effort. In particular, several individuals chose to exert no effort at all in the baseline. Finally, if the disutility of effort is decreased because the individuals find the task enjoyable, it might be considered as intrinsic motivation.

One may also argue that our observation of unethical activities may be biased. First, one might conjecture that the level of unethical behavior may be overestimated due to the cost associated with such behavior in real life (notably the penalty if caught) that are absent in this study. Note, however, that due to the informal nature of such activities, it is difficult for a firm to set up mechanisms that would allow detection. It seems that peer sanctions are more probable. Second, one might also argue that the observed unethical behavior might be explained by pure nastiness (Abbink and Sadrieh, 2009). However, it seems that it is not really the case as individuals buy redemption or sabotage points either to reach the highest rank in their group or to avoid the lowest one. This behavior is therefore more consistent with status-seeking motivated by competitive preferences and desire for dominance (Rustichini, 2008). Third, one may postulate that the observed unethical behavior may simply reflect noise, confusion or boredom. Although we cannot totally exclude the possibility that some decisions may have been taken randomly, this interpretation is unlikely to account for our results for several reasons. Our data analysis clearly shows that decisions to sabotage or to buy redemption points are not chosen randomly. As shown in our estimates, sabotage points are assigned either *i)* to achieve a better rank in the group, *ii*) to differentiate in case of ties or *ii*) to retaliate blindly. In the same vein, individuals buy redemption points to improve their ranking and to differentiate themselves from others. Furthermore, we also observe a positive relationship between effort and unethical activities, which is clearly inconsistent with the notion that these reflect confusion or boredom. Indeed, we observe an inverted U-shaped relationship between sabotage and effort and a positive relationship between initial performance and redemption activity.

One might also be concerned with the assumption regarding the anonymity of sabotage activities. To what extent would providing individuals with information regarding those who sabotaged them in the past and allowing them to retaliate lead to more or less sabotage? Previous

experiments on money-burning and public good experiments with punishment have shown that the effect of information is not clear-cut. One the one hand, individuals refrain from destroying money if they anticipate possible retaliation (Nikiforakis, 2008; Abbink and Sadrieh, 2009).[26] On the other hand, the opportunity to avenge previous destruction may lead to escalation and vendetta (Zizzo, 2003; Bolle et al., 2011). Introducing a risk of detection could be an interesting extension of our paper.

6. CONCLUSION

There are many examples in everyday life at work in which people invest resources in non-productive activities to improve their own relative position in their reference group. This may lead to interpersonal or organizational deviance and to illegal or unethical practices like plagiarism, forgery, and sabotage. Our experiment investigates the existence of such behavior in a setting where we pay participants a flat wage to perform a task, useless and deprived from any prestige, and provide them with a feedback on their performance ranking.

Our paper indicates that introducing ranking feedback motivates individuals to work harder, as the mean performance is significantly higher in the ranking treatment than in the baseline. This provides evidence that people care about their relative position, and that social comparisons increase motivation for work despite the absence of monetary incentives to outperform. However, we also find that in this environment, some people are willing to incur a cost (over a quarter of their income) to artificially increase their relative position in their group without any expectation of monetary return of any sort, either by sabotaging the work of others or by increasing their own output artificially. Sabotage and redemption activities are wasteful (apart from the destruction from sabotage), as in the field some energy and effort (which could be devoted to other activities) must be devoted to implement these. In addition sabotage and redemption have some negative de-motivating effects on initial performance. Note that sabotage and redemption activities have been observed although our task does not require any particular talent; one can

[26] In a repeated money burning experiment, Abbink and Sadrieh (2009) observe significantly more destruction in the game under full information compared to a treatment where subjects can hide their destruction behind random destruction. Similarly, Nikiforakis (2008) shows that in the presence of counter-punishment opportunities cooperators are less willing to punish free riders. As a result, cooperation breaks down and groups have lower earnings in comparison to a treatment without punishments where free riding is predominant.

suspect that with a more prestigious and meaningful task, we could observe an even stronger concern for performance ranking.

Our work may have several managerial implications in terms of companies' feedback policies. Our findings show that providing ranking feedback creates incentives for employees even when employees are paid a flat wage. As such, it is tempting to recommend that firms give regular feedback on ranking to their employees even under full wage compression. However, sufficient precautions should be taken to avoid that such positive effects of feedback incentives be totally offset by sabotage or cheating activities. Indeed, these feedback incentives may become detrimental to the company if employees can sabotage others' work or artificially increase their performance. The firms may mitigate this problem by making binding announcements that such unethical activities, if detected, would be strongly penalized. Furthermore it seems that making group identity more salient may also help in reducing sabotage. Indeed, when individuals are matched with peers from the same school they are less likely to sabotage their in-groups. However, while group identity appears to discourage destructive competition among peers, it seems to favor rivalry, as peers from the same gender and from the same school are more likely to increase their performance artificially.

The literature has established that the opportunities for sabotage or cheating may therefore undermine the power of tournaments and influence employers to choose wage compression by paying equal wages regardless of relative performance (Lazear, 1989; Falk *et al.* 2008).[27] According to Lazear, (1989), some wage compression may be optimal when the proportion of sabotage-prone workers ('hawks') in the firm is sufficiently high. In the current paper, we show that even flat and compressed wage environments are not exempt from the occurrence of unethical activities when employees receive feedback on their ranking in performance. This finding mitigates the conclusion that wage compression may be preferable when the proportion of sabotage-prone workers is relatively high since flat-wage environment are not exempt from such activities. Although our paper is not directly aimed at comparing full wage compression and

[27] Other factors may also explain the persistence of flat-wage schemes within firms including the role of egalitarian concerns (Ding *et al.*, 2001; Bartling and von Siemens, 2010), monitoring costs, and centralization of authority (Prentice et al., 2007). Finally, some authors have investigated the reasons behind the persistence of flat-wage schemes in the public sector. These factors include the specificities of multi-faceted tasks and intrinsic motivation for public service that may compensate for quite low and relatively flat extrinsic incentives that the sector offers (Georgellis *et al.*, 2011).

performance based schemes, it provides interesting findings regarding the issue of optimal wage dispersion. Since flat-wage schemes may also potentially lead to unethical activities, and due to the fact that they provide weaker incentives than performance-based schemes (Tafkov, 2012), one may reasonably argue that remuneration scheme tied to performance may be more efficient for the firm.

A natural extension of this work is to compare the extent of unethical activities under both compensation schemes where unethical activities are available. Whether these activities are higher under a flat-wage scheme compared to a performance-based scheme is a priori unclear. On the one hand, individuals may have more incentives to artificially change performance under a performance-based scheme in order to increase their chance of winning the monetary prize. On the other hand, introducing performance-based schemes may also provide a more direct way to express one's competitive preferences, making less clear the use of unethical acts to artificially raise one's status.[28] Whether the first effect dominates remains an empirical question that is left for future research.

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Table 1. Determinants of effort

	Treatments without symbols	*Treatments with symbols*	*All Treatments*		
DependentVariable	*Initial performance*	*Initial performance*	*Initial performance*		
Models	*RE GLS*[a]	*RE GLS*[a]	*RE GLS*[a]	*RE Tobit*[b]	*RE Tobit*[b]
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Baseline	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Ranking	5.888***	2.715**	5.535***	5.884***	4.408***
	(0.627)	(1.301)	(0.691)	(1.681)	(1.711)
Redemption	5.317***	2.777**	5.107**	5.278***	4.256**
	(1.894)	(1.132)	(2.064)	(1.797)	(1.830)
Sabotage	2.441*	0.998	2.202*	2.177	1.644
	(1.332)	(1.312)	(1.290)	(1.725)	(1.757)
Ranking*symbols			-2.799**	-3.030**	-2.813*
			(1.161)	(1.475)	(1.503)
Redemption*symbols			-2.206	-2.268	-2.800*
			(2.252)	(1.655)	(1.686)
Sabotage*symbols			-1.081	-1.068	-1.123
			(1.692)	(1.597)	(1.627)
Ranking*periods 6-10					2.972***
					(0.646)
Redemption*periods 6-10					2.065***
					(0.696)
Sabotage*periods 6-10					1.080
					(0.670)
Ranking*symb.*pds 6-10					-0.428
					(0.568)
Redemp.*symb*pds 6-10					1.066*
					(0.641)
Sabotage*symb*pds 6-10					0.110
					(0.620)
Periods 6-10	0.095	0.314	0.389	0.254	-1.719***
	(0.459)	(0.498)	(0.352)	(0.166)	(0.507)
Demographics	*Yes*	*yes*	*Yes*	*Yes*	*Yes*
Constant	21.391***	22.182***	21.752***	21.365***	22.342***
	(0.966)	(0.979)	(0.819)	(1.521)	(1.539)
Observations	2700	2850	5010	5010	5010
Left-censored obs.	-	-	-	292	292
Log likelihood	-	-	-	-16071.18	-16052.21
R squared					

Notes: RE GLS [a] = Random Effects Generalized Least Squares; RE Tobit[b] = Random Effects Tobit. *** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. Since observations within a session may be dependent, estimates are conducted with robust standard errors clustered on sessions. Robust standard errors are in parentheses.

Table 2. First differences in work effort by treatment (Random-Effects GLS models)

Treatments *Models*	*Ranking* *(1)*	*Sabotage* *(2)*	*Redemption* *(3)*
$Rank_i^1$ in (*t*-1)	*Ref.*	*Ref.*	*Ref.*
$Rank_i^2$ in (*t*-1)	1.260***	0.363	1.043*
	(0.249)	(0.573)	(0.581)
$Rank_i^3$ in (*t*-1)	2.156***	1.821***	3.345***
	(0. 369)	(0.498)	(0.709)
$Rank_i^2$ in (*t*-1)*symbol	0.119	0.167	0.825
	(0.308)	(0.630)	(0.506)
$Rank_i^3$ in (*t*-1)*symbol	0.174	0.133	-0.112
	(0.406)	(0.408)	(0.690)
$Rank_i^3$ in (*t*-1)*		2.942	-1.708*
Change		(1.856)	(0.940)
Sabotage received		-0.246**	
in (*t*-1)		(0.125)	
Sabotage assigned		0.142***	
in (*t*-1)		(0.029)	
Redemp. Purchased			0.236***
in (*t*-1)			(0.063)
Constant	-0.707***	-0.534**	-1.282***
	(0.134)	(0.268)	(0.307)
Observations	1512	1296	1215

Notes: *** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. “Sabotage received”, “sabotage assigned”, and “redemption purchased” refer to the number of points. Robust standard errors are in parentheses, clustered at the session level. Demographics that are invariant across periods are not included in the estimates.

Table 3. Determinants of redemption and sabotage activities (random-effects Tobit models)

Dependent variable	*Number of points purchased by i in Redemption treatment*		*Number of points assigned by i to j in Sabotage treatment*	
Models	*(1)*	*(2)*	*(3)*	*(4)*
Initial performance	0.443**	0.439*	0.642***	0.705***
	(0.225)	(0.225)	(0.171)	(0.199)
Initial performance ^{2}	-0.008*	-0.008	-0.009***	-0.010***
	(0.005)	(0.005)	(0.003)	(0.004)
$Rank_i^1$	*Ref.*	*Ref.*	*Ref.*	*Ref.*
$Rank_i^2$	2.026***	2.179**	1.759***	-0.617
	(0.937)	(0.960)	(0.572)	(0.764)
$Rank_i^3$	3.340***	3.410***	2.784***	1.107
	(1.145)	(1.241)	(0.710)	(0.913)
Tie in performance	2.637**	2.512**	3.174***	3.047***
	(1.088)	(1.071)	(0.810)	(0.865)
$Rank_i^2$* $Rank_j^1$				3.979***
				(0.679)
$Rank_i^3$* $Rank_j^2$				2.065**
				(0.876)
Treat. with symbols	0.416	0.671	3.863***	3.252***
	(1.961)	(1.976)	(0.883)	(0.934)
Periods 6-10	-3.351***	-3.082***	-0.729*	-0.407
	(0.697)	(0.722)	(0.427)	(0.474)
Sabotage received by *i* in (t-1)				0.209***
				(0.081)
Mean cum. $Rank^1_{-i}$		-0.683		0.271
		(2.196)		(1.692)
Mean cum. $Rank^3_{-i}$		-2.327		-4.026**
		(2.025)		(1.758)
Same gender as co-Workers		1.447**		-0.058
		(0.721)		(0.520)
Same school as co-Workers		3.063**		-2.645***
		(1.207)		(0.998)
Demographics	*Yes*	*Yes*	*Yes*	*Yes*
Constant	-21.856***	-22.327***	-25.329***	-25.827***
	(3.879)	(3.943)	(2.766)	(3.322)
Observations	1350	1350	2880	2592
Left-censored obs.	1144	1144	2567	2316
Log likelihood	-918.495	-911.250	-1453.043	-1261.535

Notes: Data from the treatments with symbols and without symbols are pooled. *** Significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. Standard errors are in parentheses.

Fig.1. Evolution of the average initial performance over time by treatment (without symbols)

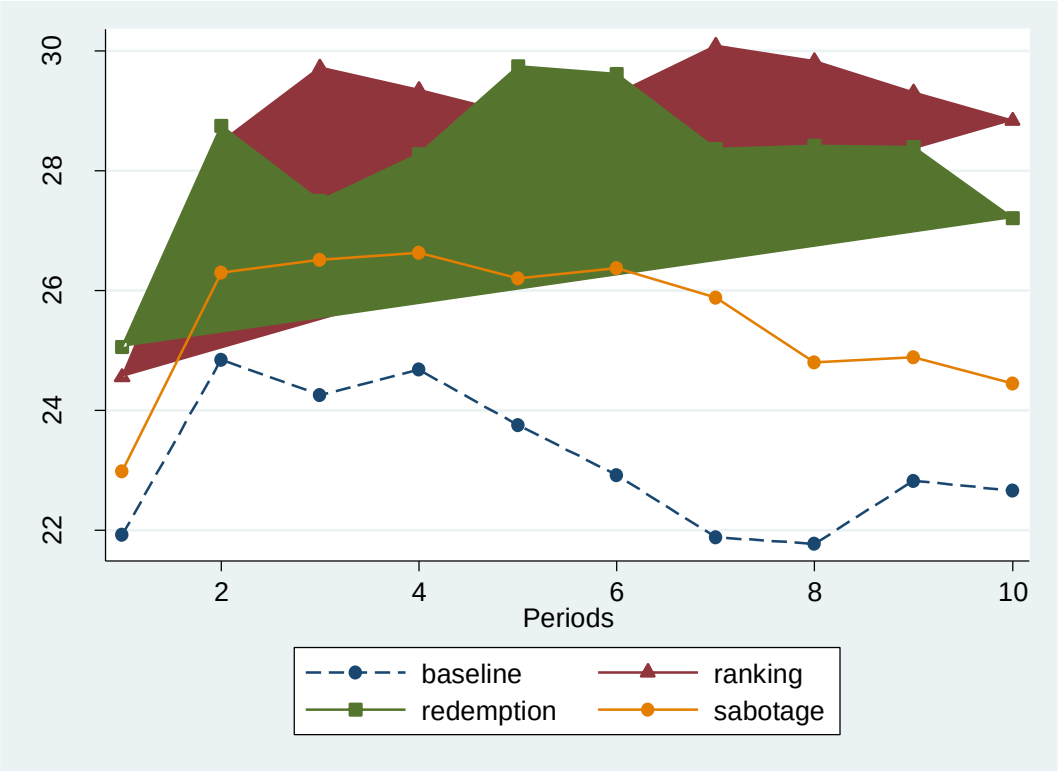
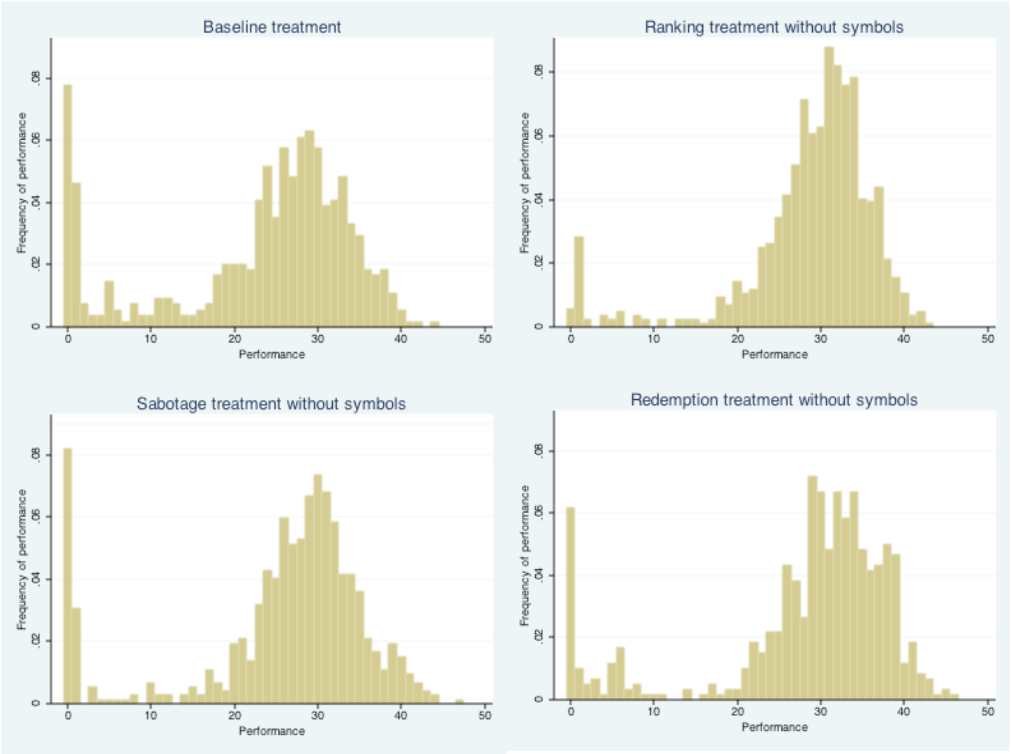
Fig.2. Distribution of performance per treatment (without symbols)