

Sabotage vs Discouragement: Which Dominates Post Promotion Tournament Behavior?*

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Abstract

We explore the behavior of losers of promotion tournaments after the tournament is concluded. We do so through the use of an experiment in which we vary the design of the promotion tournament to determine how tournament design affects post tournament effort. We provide a theoretical model demonstrating two possible effects from the tournaments which are strategic sabotage and the possibility that a worker becomes discouraged by the tournament outcome. We examine behavior after the tournament and find evidence suggesting that bad tournament design can lead to workers being discouraged. This discouragement effect is strong for low ability workers but not for high ability workers. On the other hand we do find evidence that some high ability workers engage in strategic sabotage but the incidence does not vary with the design of the promotion tournament.

JEL Codes: C90; C91; D03; J32; J33

Key Words: Sabotage, Experiment, Tournament Design

1 Introduction

A central problem faced by employers is how to motivate employees to exert a desired level of effort. This problem is classically represented in the Principal-Agent problem. A variety of payment schemes have been developed as ways to incentivize effort. One common approach involves the use of promotion tournaments. This is also often known as “promotion from within” and many well known companies pride themselves on engaging in the practice (e.g. Walmart¹, Fedex², and UPS³). Not only are promotion tournaments (theoretically)

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¹Kavilanz, P. (2013). Wal-Mart: We promote 500 workers a day. *cnnmoney*. Retrieved 6/2013. From <http://money.cnn.com/2013/06/07/news/companies/walmart-shareholder-meeting/index.html>

²FedEx Attributes Success to People-first Philosophy. (2013). Retrieved 6/2013. From <http://www.fedex.com/ma/about/overview/philosophy.html>

³Working at UPS (2013). Retrieved 6/2013. From <https://ups.managehr.com/workingatupsfaq.htm>

capable of inducing high effort among employees but some will also claim that there are also other advantages. Bidwell (2011), for example, notes that internal promotions are generally thought to be cheaper for the firm and are more likely to lead to higher quality employees.

While the theoretical properties of promotion mechanisms are clear (see Prendergast (1999)), in practice there can be a downside to these sorts of tournaments as they may create negative emotional responses among the tournament losers. Negative emotional responses from losing the tournament may lead to workers decreasing their work effort either because they are intentionally sabotaging their new bosses or because they have been demoralized from exerting any more effort. While both effects might yield similar results, in terms of lower work effort, the steps a firm might take in response to prevent these two effects are quite different. Thus it is necessary to cleanly distinguish between these two responses (to losing a tournament) to identify which, if either, drives post tournament behavior.

The existence of workplace sabotage is well documented and widespread. For the purposes of our discussion we will define sabotage as purposeful behavior intended to harm others. Workplace sabotage manifests itself in many forms and stems from a variety of motives. Ambrose, Seabright, and Schminke (2002) and Giacalone and Rosenfeld (1987) provide background information on various sorts of workplace sabotage and discuss many of the potential motives for such behavior. These include such things as: (1) powerlessness, (2) organization frustration, (3) facilitation of work, (4) boredom/fun, and (5) injustice. Chowdhury and Gürtler (2013) and Dechenaux, Kovenock, and Sheremeta (2012) provide extensive surveys of recent experimental and theoretical literature on contests and sabotage, providing numerous other examples of workplace sabotage. An important commonality in much of this literature is that the key issue examined is the extent of, or affect of, sabotage taking place during the tournament (i.e. sabotage that is intended to effect the outcome of the tournament).⁴ Understanding this form of sabotage is certainly important and worth studying but what seems to be much less studied in the literature is how the behavior after the tournament is effected by the outcome of the tournament. There is at least one exception to this norm as McGee and McGee (2013) also examines post tournament behavior. There are important differences as well as similarities between that paper and ours but we will defer a discussion of these issues until the conclusion.

There is clear evidence workplace sabotage is common during and after a tournament. This leads to two obvious questions: (1) why is it happening and (2) how can its incidence be reduced? It is claimed in some analyses (e.g. Hoad (1993) and Neuman and Baron (1998)) that unfair treatment leads to anti-social workplace behavior. While this certainly seems like a reasonable driver of the behavior, there are still important questions to be answered regarding what is considered “unfair” treatment. What is judged as unfair may come from unexpected sources, resulting in unfavorable outcomes for the employer. For example, Gill, Prowse, and Vlassopoulos (2012) finds workers perceive randomized bonuses to be unfair and end up cheating their employer more often if such a payment scheme is in place. On the other hand as demonstrated in Carpenter, Matthews, and Schirm (2010), employees engage in sabotage during a tournament competition and their level of sabotage may increase if they

⁴In Carpenter, Matthews, and Schirm (2010) for example, the form of sabotage is under reporting a rivals productivity which occurs after the production stage. We would still classify the sabotage as during the tournament since it occurs prior to the winner being determined.

anticipate unfair treatment by fellow workers. These two examples illustrate the importance for management to consider both the mechanism of the promotions and its effect on the extended game that is the workplace (i.e. the continued interaction between employees and a boss that was formally in similar position).

In addition to tournaments leading to workers intentionally engaging in acts that hurt others and their firm, tournaments may lead to losers becoming demoralized which can discourage them from further effort. This slackening of effort is certainly something the firm would wish to avoid. This issue is discussed in Nalebuff and Stiglitz (1983) in which the authors note that “A problem with penalties is that they can become self-perpetuating. The loser becomes demoralized, fails to continue competing, and thus continues to lose.”⁵ They go on to point out that this problem may be so substantial that it might explain why competitive compensation schemes seem less widely used than they should be given their attractive theoretical properties. This possible discouragement effect could manifest as a result of any competition but it is also possible the nature of the competition could affect the degree of discouragement.

There is a growing literature on how individuals judge and respond to the fairness of mechanisms that determine outcomes. Bolton, Brandts, and Ockenfels (2005) demonstrates that individuals take into account the fairness of the procedure generating an offer in an ultimatum game and Trautmann (2009) develops a theoretical characterization of such preferences. Chlaß, Güth, and Miettinen (2013) provide a detailed set of contexts regarding how different elements of bargaining procedures affect the preferences individuals have over the outcomes. One key to much of this literature is the notion that random procedures in which all parties have equal likelihood of winning are often considered “fair” and can even be used to resolve potential conflicts, Kimbrough, Sheremeta, and Shields (2011).

An alternative point of view is that meritocratic mechanisms should be considered “fair” due to the fact that the winners in these mechanisms are the ones who have earned the right to their advantaged position. Hoffman, McCabe, Shachat, and Smith (1994) show that proposers in ultimatum games make significantly lower offers to responders when the proposer has “earned” their advantaged position rather than when their position was determined randomly. This finding has reinforced a commonly held view that procedures in which an advantaged position is earned should be considered acceptable to all. One caveat to the Hoffman et al. results though is that the study is not able to provide insight regarding how the losers in their tournament viewed the outcome of the assignment mechanism. Ku and Salmon (2014) provide an investigation of the that issue. The study finds that, as expected, winners in a meritocratic assignment mechanism make decisions consistent with the hypothesis that the meritocratic mechanism is more acceptable than a random mechanism. On the other hand, losers in the meritocratic system find the outcome to be as objectionable as those who receive their disadvantaged role through other mechanisms that were designed specifically to appear as unfair and capricious.⁶ These results call into question the degree

⁵One extreme version of this is demonstrated in Fershtman and Gneezy (2011) in which the authors document that competitions with larger rewards lead to higher rates of competitors quitting during a race or competitors choosing not to participate. This behavior is in anticipation of the tournament outcome though, not in reaction to actually losing.

⁶One of the other mechanisms assigned those who contributed the least in a one shot public goods game the advantaged role. The other elicited subjects preferences over several paintings and then assigned those who happened to like one particular artist the most the advantaged role.

to which losers in a meritocracy will see the outcome as “fair.” The setting for those findings is very different from a workplace but the results suggest substantial concerns for the design of promotion tournaments and therefore the issue warrants further examination.

The question of how the design of a promotion tournament affects its acceptance by those who fail to be promoted is the central question of the current study. Our aim is to investigate the degree to which the design of a promotion tournament affects the post tournament work effort. Our particular interest is in determining whether tournaments will discourage workers from future effort or induce them to engage in strategic sabotage of their new bosses. Specifically in our experiment we have subjects participate in promotion tournaments of various designs and then provide tournament losers an opportunity to work on behalf of their new boss. We have designed the work task the losers engage in to have a very naturalistic way for the workers to sabotage their bosses if they choose to. To sabotage, a worker need only modestly pull back work effort in a way that would be undetectable to someone in the boss role. The promotion mechanisms we use involve a tournament scheme in which individuals are promoted based on their ability on a task that is relevant to the production task in the experiment, a scheme in which promotion is based on a criteria having nothing to do with ability in the production task, a mechanism allowing for workers to self-select into the different types of tournament schemes and a random assignment mechanism.

Our treatments are designed to reflect the fact that there will usually be a variety of factors leading to one worker being promoted over another in a workplace. If two salesmen are vying for a promotion to a supervisor job then the meritocratic basis for promotion would be their sales ability. Of course many other factors often come into consideration that may have no direct bearing on how well the worker would do at the new job. This could range from physical traits and characteristics (Hamermesh and Biddle (1994); Black and Strahan (2001); Mobius and Rosenblat (2006); Case and Paxson (2006)) as well as social factors such as how well liked the worker is by the boss (Bandiera, Barankay, and Rasul (2009)). While it might be the case that most promotions are based on merit, employees may not always perceive that to be the case and responses to the tournament will be based on perception regardless of the underlying reality.

To understand how perceptions of appropriate versus inappropriate tournament designs might influence behavior we conduct promotion tournaments where promotions are based on relevant job related activities that one might think losers would find acceptable and compare this to cases in which promotion tournaments are based on activities irrelevant to job performance, expecting that losers will find these less acceptable.⁷ We are also interested in the effect of self-selection into a type of tournament on the acceptability of its outcome as workers can choose firms to work for in part based on how the firm is known to evaluate employees. While some may find a particular tournament design unacceptable if it is forced on them, it might be the case that the act of voluntarily choosing to be evaluated on a certain criteria makes it more acceptable and so knowing if self-selecting into a scheme changes the reaction is important. This is similar to the issue discussed in Chlaß, Güth,

⁷Balafoutas and Sutter (2012) also investigate how the apparent unfairness of different promotion mechanisms may impact behavior in the context of affirmative action programs. We note, though, that the authors examine the effect of the promotion mechanism on entry rates into the competitions and on effort during the competition, not on how effort is affected after the competition is concluded.

and Miettinen (2013) regarding how individuals feel a procedure is more fair if they have the ability to voice disagreement over a proposal.

We present a simple theoretical model to provide predictions regarding the behavior in the experiments which allows us to separate between strategic sabotage and discouragement. Our results demonstrate that both discouragement and strategic sabotage seem to occur though in different segments of the worker population. Low ability workers become discouraged after losing in the first stage tournament and respond with greater discouragement in the treatment where the promotion is made on an inappropriate basis. Perhaps surprisingly we find that promotions based on random assignment are considered as acceptable to these workers as those based on a meritocratic tournament. While we find some evidence of strategic sabotage occurring among the higher ability workers, the frequency with which they engage in such behavior does not vary with the design of the promotion tournament,

2 Experimental Design

2.1 Stages

The experiment consists of two stages. Prior to the start of the first phase, subjects are given instructions stating that in the second phase they will be paired with another subject and one of them will be in a position to earn more money than the other. In all treatments, except random assignment, subjects are told their performance in the first phase determines their role in the second phase. Prior to completing the first phase, subjects are not told exactly how performance in the first phase influences their position in the second phase only that it is relevant. In the first phase, subjects participate in two tasks. One is a mathematics task (MT) which asks subjects to answer as many math problems as they can in three separate sixty second periods. Subjects earn 8 cents for each correct answer and nothing for incorrect answers. There is no penalty for an incorrect answer. At the conclusion of each period, subjects see the number of problems they correctly solved and a running average of the number of correct answers they provided over the periods completed up to that point. Subjects are not told how their performance compares to other subjects.

In the second task, subjects engage in a painting preference task (PT), based on the one used in Chen and Li (2009) and Ku and Salmon (2014), in which the subjects are shown 5 pairs of paintings. Each pair of paintings has one by Paul Klee and the other by Wassily Kandinsky though the painters are not identified to the subjects. The paintings are paired in such a way so that the average person is likely to see the two as being highly similar. Subjects are asked to indicate their preferred painting for each of the five pairs. There are no earnings for this task and this is explained to the subjects.

After the initial phase is complete, the subjects move to a second phase. In the second phase all players participate in multiple rounds earning money at a task that is identical to the MT seen in the first phase with one key difference; subjects are placed into pairs with one being assigned the role of boss and the other worker. The roles, worker versus boss, are persistent across all of the rounds in this phase. In the experiment we used the labels Blue type and Green type but for the ease of exposition we will use the contextualized language here. We defer the explanation of the promotion decision until later as the promotion

mechanism differs across treatments. Subjects assigned the boss role receive a raise relative to the first phase and earn 15 cents for each MT problem they correctly answer. In addition, bosses have the possibility of earning a bonus of 150 cents per round if the worker in their group correctly answers at least a certain lower bound of MT problems correctly. The lower bound changes across subjects and rounds. Subjects in the worker role earn the same piece rate wage as in phase 1, 8 cents for each MT problem they correctly solve, and are told that if they solve enough of the problems correctly that they will earn the 150 cent bonus for their boss. The workers are also informed about the wage rate of the boss though not the boss' total earnings or productivity. The threshold which a worker faces in a round is equal to a fraction of his average individual performance on MT in the first phase of the experiment where the fraction is from the set $\{.25, .5, .75, 1, 1.25, 1.5, 1.75\}$. The ordering of threshold fractions in the second phase is randomly drawn prior to the start of running sessions and is held fixed for all sessions. The threshold is given to subjects at the start of each period. Subjects are not told the exact formula that calculates their thresholds nor are they told that their threshold may differ from other subjects in the session. Making the thresholds a function of a subject's own average productivity, allows us to ensure that for all workers that we have some thresholds that should be easily achievable, i.e. thresholds from the set we will call Group 1 $\{.25, .5, .75\}$, some thresholds that are achievable but with a bit of effort that we will call Group 2, i.e. $\{1, 1.25\}$, and then some that are likely not achievable no matter how hard the worker tries, Group 3, i.e. $\{1.5, 1.75\}$.

The way a worker might sabotage their boss in this setting would be for a worker to halt production on the MT problems prior to hitting the threshold. Due to previous findings that subjects tend to work more than necessary out of boredom, Engel (2007), it is important to provide workers with a credible outside option that provides them with an alternate activity should the worker decide to sabotage his boss. It is also important that the activity should not generate earnings which dominate those of the main task. To accomplish this we gave workers a second way of earning money. On the workers' screens we display the MT as previously described on the left side while on the right side of the screen we present them a digit identification task (DT) similar to the one used in Mohnen, Pokorny, and Sliwka (2008). DT has subjects identify the number of times a specific numeric character appears in a string of characters.

Workers earn 3 cents for each correct DT answer given but their DT performance has no impact on the earnings of their boss. DT compensation is calibrated such that most workers would earn more money if they concentrated on the MT. We find for example that 32 subjects spent at least one period completing only DT questions and managed to complete 13-14 of them earning about 40 cents. The average performance of people completing MT questions is around 8, yielding earnings of about 64 cents. Since workers would have no experience on the DT prior to the first period of stage 2, it is possible that they wouldn't automatically realize which is the more lucrative task. Learning seems to occur rather quickly and we will show in the data that subjects spend little time on DT questions.

DT and MT questions are displayed on workers' screens at the same time and it is made clear to workers they can switch between the two as often as they like and at any time. Moreover, the instructions explain the incentives of the two tasks and do not refer to the DT as sabotage nor do the instructions exhort the workers to work on behalf of their bosses.

Bosses do not observe the productivity of the worker on either task nor do they know the threshold required of the worker in a given round; they only observe whether or not they receive the bonus.

2.2 Treatments

There are four experimental treatments conducted in which we vary the basis for the promotion. In our Task Appropriate treatment (or TA) performance on the MT section of phase 1 is used to determine who is in the boss role in phase 2. Specifically those who score in the top 50% in terms of average performance in the phase 1 rounds of MT earn the boss position and those in the bottom 50% earn the worker position. We also have a treatment we refer to as Task Inappropriate or TI in which it is performance on the PT section of phase 1 that determines the roles in phase 2. Subjects are promoted to the boss position if they are among the 50% of subjects exhibiting the strongest preferences for the paintings of Paul Klee. The idea in which these are “appropriate” versus “inappropriate” is because the production task in the second phase is the MT again and so while one might find it appropriate to promote someone based on their previous MT performance, it might seem less appropriate to promote them based on their preferences regarding paintings. Assigning the roles on the basis of the painting preferences is effectively random but random in a way that is designed to appear to the subjects as arbitrary and capricious. One might object to the TI mechanism due to the fact that we do not actually tell the subjects how their performance on this task might be judged making it impossible for them to even try to out compete others. This is intentional as it must appear to be “inappropriate.” Also, many promotion decisions are made on the basis of personal judgments by supervisors in which workers may not know exactly how their performance along different dimensions is valued. Such opaqueness could drive dissatisfaction with the process.⁸ This treatment mimics that. We note that we did not use the TA and TI labels in the experiment. We simply described the promotion criteria and left any determination of appropriateness to the subjects.

In our third treatment that we will call Self Selection (or SS), subjects choose to submit either their MT or PT scores to a ranking tournament which would be used to assign their role in the second phase of the experiment.⁹ Out of the participants who select the tournament for MT, the top 50% of the performers from among that group earn an advantaged position in the second phase. Out of the participants who select the tournament for PT, top 50% of them who prefer Klee paintings most strongly earn the boss position. Thus the manner in which the performance of a participant is judged is chosen by the participant rather than forced upon them. For the pairings in the second round, subjects were only paired with those who chose the same task in which to compete. In SS, a little

⁸One example of this phenomenon (though it fails to fit the other properties of the experiment) would be tenure decisions at universities. These often hinge on how senior faculty value different journals and their preferences may be quite heterogeneous and not clearly communicated to junior faculty. This is perhaps not all that different from knowing whether Klee or Kandinsky paintings are what the boss is looking for.

⁹There is a substantial prior literature examining the issue of selection into tournaments such as Eriksson, Teyssier, and Villeval (2009) or Niederle and Vesterlund (2007) though the focus of these papers is on examining the choice of participating in tournament based compensation mechanisms versus piece rate compensation mechanisms.

less than 83 percent of subjects selected to compete in the MT tournament.¹⁰

One might be concerned that most would want to choose the MT under the belief that were they a boss they might expect to earn more money due to the fact that they will be paired with a worker who was of the sort who would self-select into the MT. This is not a concern given the design of the experiment. At the time subjects were selecting into the tournaments, they only knew that the tournament winners would earn more in the second phase. They knew nothing about the worker's role in earning a bonus for the boss. Further, the thresholds for the bonus adapt to the ability of the worker meaning low and high ability workers should have approximately equal ability to hit the thresholds. Consequently not only did subjects not have the information to select on this basis, such a bias in favor of choosing the MT would have been inappropriate if they had complete information.

In the fourth treatment, Random Assignment (RA), subjects are assigned roles by a randomly generated number. Subjects still go through the initial phase of the three rounds of the MT and the one round of the PT just as in the other treatments but in this treatment phase 1 decisions have no impact on the second phase (and a connection between the two phases is never indicated to the subjects). Subjects are instead assigned a random number at the end of the first phase between 1 and 16 with those being assigned a number in the highest half, 9-16, being assigned the boss role. It is important to be clear that in this and all the other treatments, subjects are explicitly told the method by which they are promoted and instructions are modified across treatments to insure that subjects are not misled about the promotion mechanism.

The motivation for the TA, TI, and RA treatments are relatively straightforward. Some firms promote workers in an appropriate manner. That is, bosses earn their advantaged status due to their comparatively better record in an component to the job that is relevant to the firm's success. The corollary to this type of promotion scheme is that other firms do not. In some cases, the firm may have ad hoc promotions (RA) and others may promote based upon an irrelevant skill (TI). Finally, SS assumes workers have some idea about the promotion culture of various firms and can choose which firm they accept employment at based on their knowledge of the firm's promotion culture. This is important due to the fact that the acceptability of a mechanism may change based on a person having voluntarily chosen to be judged on that basis.

The experiment is programmed in zTree, Fischbacher (2007). Participants are all students enrolled at a major state university in the southern United States. The experiment takes place in a lab designated for economic experiments. Subject recruitment takes advantage of the ORSEE recruitment system, Greiner (2004). Subjects are only allowed to

¹⁰The SS treatment does present us with a challenge in that we can not guarantee that an even number of subjects will choose both tournaments. If there should be an even number of subjects choosing both then only those choosing the MT tournament are compared to others who have chosen that tournament and then in phase 2, only those in the MT group are paired as boss/worker. The PT group would be considered completely separate in terms of rankings and pairings. In case an odd number of subjects selected into the tournaments, one subject from each tournament type is placed into a hybrid group. The tournament used for the hybrid group is chosen randomly by the computer. Subjects are told prior to selecting their tournament that there is possibility that they will be placed into a group with a subject who selected a different tournament competition. Subjects are told if they are matched with a partner who selected a different tournament to compete in and if they are in a group with a partner who selected an identical tournament as themselves. While we will not address the issue in the main results section, in a separate appendix we will provide some basic analysis of the issue of tournament choice.

Treatment	Sessions	Subjects	Boss Earnings	Worker Earnings
TA	7	112	16.73	4.60
TI	7	110	13.55	5.99
SS	5	80	16.11	4.93
RA	5	78	14.20	5.69

Table 1: Summary of treatments.

participate in a single session. Sessions tended to last slightly more than one hour. Upon being seated for the experiment, subjects are given instructions. All but two sessions have 16 subjects; the other two have 14. In each session one boss was paired with one worker. All language is neutral; the word sabotage is never used. Subjects playing as the boss are told they have been given the “BLUE” role. Workers are given the “GREEN” role. A summary of the total numbers of sessions and subjects by treatment along with average earnings is found in Table 1.

After the instructions are completed the experiment begins. All sessions are run by the same experimenter wearing grey slacks and a blue shirt. At the conclusion of the experiment subjects go through a short demographic survey and are paid their earnings, in cash. On average subjects lucky enough to be selected as the boss, made \$15.15 while those playing as the worker made \$5.29. All subjects were paid an additional \$7 dollar show-up payment on top of those earnings.

3 Theory

We present a simple model of decision making in this environment that can be used to explain two different ways in which promotion mechanisms might affect behavior. The first way will be through the inducement of what we will term strategic sabotage. We will call this “strategic” sabotage to make it clear that this is a form of sabotage that is the result of purposive and intentional choice aimed at reducing the welfare of another. The second effect we will examine is the possibility of a worker being discouraged leading to the ability/willingness of the worker to engage in effort diminishing. The latter effect could also result in what could be seen as sabotage behavior due to a boss becoming less likely to receive their bonus, but that is not due to the discouraged worker intentionally choosing to deny the boss the bonus and should therefore be distinguished from the strategic notion of sabotage. While both will be contained in a single model, they make distinct predictions regarding behavior which will allow us to discriminate between which might better describe behavior.

To model the choice behavior in this environment we assume a worker receives a piece rate wage for the MT, w , and selects a level of effort, m_i , to engage in. To make the model simple, we assume m_i is the number of problems a worker solves correctly. Normally one would model effort choice problems by presuming some cost of effort, $c_i(m_i)$, with the cost of effort being different across individuals as a way to model differences in ability. Given the nature of this task, that seems unnecessary. Our subjects work on these problems for a short period of time and it seems unlikely that the psychic cost of solving another problem was

ever above the piece rate wage. Given that and the fact that we have no way of estimating a true $c_i(m_i)$, we will ignore this complication. We will instead model ability by assuming each subject has some maximum number of problems that he or she could complete in the time frame, $M_i(P)$ where P is a measure of how acceptable the worker finds the assignment criteria. This approach to modeling heterogenous ability will allow a more straightforward presentation of the model though one could of course redefine the model based on the $c_i(m_i)$ specification instead and reproduce all of the results we will show, just with more cumbersome notation. By allowing M_i to be a function of the treatment, P , we will be able to model a discouragement effect allowing for a worker's willingness to engage in effort to be harmed due to their unhappiness with the tournament design. We will return to discuss the nature of such an effect later.

In addition to the MT, our workers have the option of completing elements of the other task, DT, which also delivers a piece rate wage. Given the design, the incentives were such that in all cases working on another MT problem dominated a DT problem and so the only time a subject should choose to engage in the DT is if he or she is stopping the MT prior to achieving the threshold. To keep the model simple we will therefore assume that a worker only engages in this task if he fails to meet the threshold but could have as the threshold was below his maximum capacity. This suggests that the earnings on this task will be a declining function of how many of the MT problems were solved. We will specify these earnings as $D(x)$ such that $D' < 0$ and $D(x) = 0$ if $x \geq M_i$. Our assumption regarding the relative earnings on the two tasks is equivalent to assuming that either $wM_i \geq D(0)$ or $w \geq -D'(x)$ for $x \leq M_i$ (i.e. the wage for completing one more MT problem is greater than the earnings that could be achieved on DT problems in the time freed up by doing one less MT problem).

We will also allow for the possibility that a worker receives either utility or disutility from their boss receiving the bonus and allow for the value of this utility adjustment to depend on the treatment, $\alpha_i(P)$. It is through these two parameters, α_i and M_i , that we will be able to model the two different motivations for decreased effort due to the treatments. Our hypotheses will regarding behavior are equivalent to hypothesizing that $P_{SS} > P_{TA} > P_{TI}$ or that the SS treatment will be the most acceptable and TI the least. More generally though, this framework gives us a foundation for measuring the acceptability of different mechanisms. We assume that $\alpha'_i \geq 0$ and that $M'_i \geq 0$. The placement of P_R in that chain is more difficult to pin down and we will discuss this more later. We can allow $\alpha_i(P)$ to be positive or negative to indicate that the worker receives a utility increase or decrease from the boss receiving the bonus though in the model we will develop, positive values of $\alpha_i(P)$ will lead to behavior equivalent to $\alpha_i(P) = 0$. Therefore we will only discuss values $\alpha_i(P) \leq 0$. The boss receives the bonus in the event that the worker's effort choice, e , exceeds the threshold which we will denote as T . This gives us a basic choice problem of

$$\begin{aligned} \max_{m_i} w * m_i + D(m_i) + I(m_i|T) * \alpha_i(P) \\ I(m_i|T) = \begin{cases} 1 & \text{if } m_i \geq T \\ 0 & \text{if } m_i < T \end{cases} \quad (1) \\ \text{subject to } m_i \leq M_i(P). \end{aligned}$$

Given the setup, there are really only two possible choices for m_i which are $m_i^* = M_i(P)$ or $m_i^* = T - \varepsilon$. Since we are only going to allow discrete choices of m_i , $\varepsilon = 1$. If the threshold is higher than the capability of the worker, $M_i(P) < T$, then the worker will work on the MT to the maximum of his ability choosing $m_i^* = M_i(P)$ and receive utility equal to $w * M_i(P)$ with no chance of the boss receiving the bonus. This demonstrates the first way that treatments might affect behavior. If the maximum effort a worker is willing/able to engage in depends on the treatment and, as assumed, this maximum effort is positively related to the acceptability of the mechanism then the less acceptable is the mechanism the lower will be the effort by the worker. As work effort decreases, the boss may be less likely to receive the bonus. We will refer to this as the discouragement effect as it reflects the possibility of the promotion mechanism to demoralize a worker and decrease his motivation to engage in effort.

If $M_i(P) \geq T$ then the worker might choose $m_i^* = T - 1$ to intentionally keep the boss from receiving the bonus if doing so is worthwhile to him. We will refer to such behavior as strategic sabotage. If the worker does not sabotage then he receives utility of $w * M_i(P) + a_i(P)$. If the worker does sabotage then he receives $w * (T - 1) + D(T - 1)$. A worker will therefore choose to sabotage if

$$w * (T - 1) + D(T - 1) \geq w * M_i(P) + \alpha_i(P) \quad (2)$$

$$D(T - 1) - \alpha_i(P) \geq w * (M_i(P) - (T - 1)) \quad (3)$$

or if the benefit to sabotaging, $D(T - 1) - \alpha_i(P)$, is greater than the cost of sabotaging, $w * (M_i(P) - (T - 1))$. We assume $D(T - 1)$ to be relatively small in magnitude and it should not affect the decision much. What this means is that for very low values of T relative to $M_i(P)$, an individual must have a very strong disutility for the boss to receive the bonus in order to engage in sabotage. If, however, T is close to $M_i(P)$ then an individual can stop short of the threshold at little cost making doing so worthwhile for even lower values of $\alpha_i(P)$. At such levels of T close to $M_i(P)$ the value of $D(T - 1)$ will definitely be close to 0 as little time will be left to devote to DT problems after the worker has stopped working on MT problems to avoid triggering the bonus.

3.1 Hypotheses

The model above provides the support for several testable hypotheses. The first two describe how the two motivations for decreased work effort might be observed.

Hypothesis 1 *If subjects engage in Strategic Sabotage then they will cease work on the MT just below the threshold, otherwise they will work up to their full capability.*

Hypothesis 2 *If subjects suffer more from a discouragement effect in one treatment than another, this will lead to lower effort under all thresholds in the first treatment as compared to the second.*

The support for these two hypotheses is explained above. For hypothesis 1 this explains how strategic sabotage can be identified and as described above we should expect to find it most likely to occur for the intermediate thresholds. In the analysis we will check this

by examining how often workers work up to exactly $T - 1$ and then stop. The second hypothesis concerns what we should observe if workers are discouraged from the tournament and decrease work effort due to that rather than an attempt to explicitly sabotage their new boss. This hypothesis can only be tested in the context of the following hypotheses. The next two hypotheses suggest how the TI, TA and SS treatments should affect the work effort by the workers which in turn affects the probability of the boss receiving the bonus.

Hypothesis 3 *Subjects in the worker role will provide less work effort (and more sabotage effort) in the Task Inappropriate treatment than Task Appropriate. This will result in the boss receiving the bonus less often in Task Inappropriate than Task Appropriate.*

Hypothesis 4 *Subjects in the worker role will provide more work effort (and less sabotage effort) in the Self-Selection treatment than Task Appropriate. This will result in the boss receiving the bonus more often in Self-Selection than Task Appropriate.*

These two hypotheses are equivalent to the hypothesis that $P_{SS} > P_{TA} > P_{TI}$. Given hypothesis 1 we should only expect these two hypotheses to hold for intermediate threshold values if subjects are engaging in strategic sabotage but they should hold for all thresholds if subjects are discouraged due to the role assignment. What these hypotheses do not cover is how the RA treatment should be expected to affect behavior. There are conflicting suggestions from prior literature. As discussed in the introduction, Ku and Salmon (2014) found that subjects receiving a disadvantaged role were more willing to accept their position when the role was allocated randomly rather than earned through a meritocratic system. This result suggests that $P_{RA} > P_{TA}$. There are substantial contextual differences in the environments between the two studies that one might expect to reverse that relationship. The key difference is that in the current study, the meritocratic ranking in the TA treatment is based on the same task as the production in the subsequent phase. In Ku and Salmon (2014), the task in the second phase was not related to the basis for the meritocratic ranking as the meritocratic ranking was based on a pseudo-SAT exam while the second phase involved a stylized investment decision. One of the questions motivating the current study is whether aligning the meritocratic ranking methodology with the subsequent task can reverse the previous finding where the two are not so tightly linked. Conventional wisdom certainly suggests that meritocratic ranking would be preferred to random and so the issue here is to see what is required in order for that to be the case. In further support of the possibility of the random procedure being seen as fair, the procedural fairness literature previously discussed explicitly refers to random allocation as a fair mechanism and multiple prior studies find evidence in favor of that. This suggests that it should be seen as more acceptable than TI and could be seen as or more acceptable when compared with TA and SS. The procedural fairness literature largely deals with situations in which all individuals have equal claim on the advantaged position though which is not necessarily the case here. Thus it is not clear that the random mechanism should be considered fair in the environment of this experiment. All of this suggests that there is not a consensus hypothesis from prior literature regarding how the RA treatment might compare to the others. We will consequently specify a hypothesis to test consistent with the Ku and Salmon (2014) results while acknowledging that it is certainly not the only way one might reasonably structure

	Work	% Stops at $T - 1$	Sabotage	Boss Bonus	Avg Math	Obs
TA	10.28	NA	NA	0.35	9.20	56
TI	7.85	NA	NA	0.34	6.82	55
SS	Math	10.86	NA	0.33	9.77	31
	Paint	6.84	NA	0.32	5.89	9
RA		8.36	NA	0.35	6.95	39

Table 2: Summary statistics for bosses.

	Work	% Stops at $T - 1$	Sabotage	Boss Bonus	Avg Math	Obs
TA	4.09	0.102	4.34	0.35	5.50	56
TI	5.62	0.070	4.63	0.34	6.82	55
SS	Math	4.32	0.098	5.16	0.33	35
	Paint	3.29	0.057	4.49	0.34	5
RA		5.55	0.103	3.91	0.35	39

Table 3: Summary statistics for workers.

this hypothesis. To stay consistent with the other hypotheses we will specify the hypothesis of behavior in the RA treatment relative to the TA treatment.

Hypothesis 5 *Subjects in the worker role will provide more work effort (and less sabotage effort) in the Random treatment than Task Appropriate. This will result in the boss receiving the bonus more often in Random than Task Appropriate.*

4 Results

We begin by examining summary statistics regarding performance across treatments. Table 2 shows some basic statistics on the performance of bosses. We present the average number of math problems solved correctly during the second phase of the experiment, the percentage of times they received the bonus, their average score on math problems from the first phase and then the number of observations. There is a column for the number of times stopped just under the threshold and the number of the sabotage tasks the bosses performed to be consistent with the subsequent worker table but neither column is relevant for the bosses. For the SS treatment we separate those who chose to compete in the Math tournament versus those who preferred to be assigned their roles based on painting preference. While we will not analyze the boss behavior in much detail it is worth noting the substantial variation in the Average Math variable which is the average of the assessment phase performance.

Table 3 presents the same summary statistics but this time to summarize the behavior of the workers. Now the performance on the sabotage task and the percentage of times a worker stopped working on the MT at $T - 1$ are relevant and reported. There is an obvious problem with making much of any comparison based on simple comparisons of summary statistics and that is indicated by there being substantial heterogeneity in the Average Math scores of the subjects. The TI treatment which we hypothesized would result in lower work effort than TA actually appears in the summary statistics to deliver higher work effort.

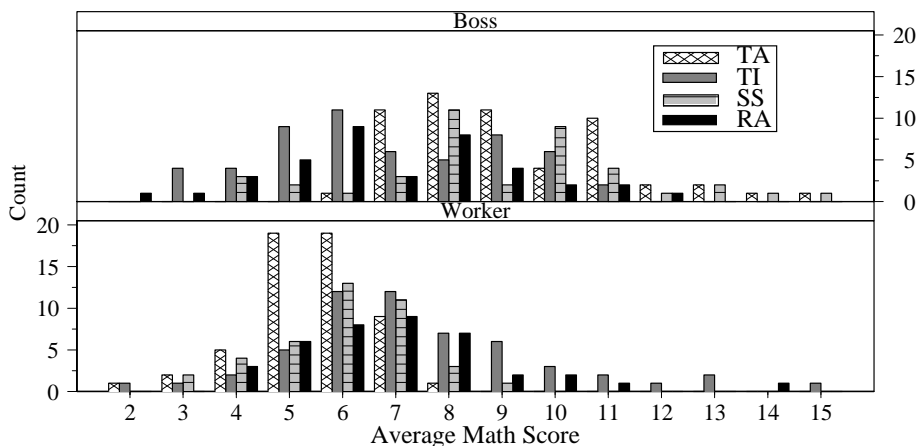


Figure 1: Histograms of average first stage math scores by type and treatment.

These values should not be compared so directly though. Due to the differences in how workers were selected between the two treatments, the average mathematical abilities of the two groups are different leading to different capabilities of workers and different threshold values between treatments. We present these summary statistics for completeness but we will engage in no statistical tests based on simple comparisons of these summary statistics as such analysis would be misleading.

A further look at the heterogeneity in subjects between treatments is shown in Figure 1 which contains histograms of the average assessment phase math scores of subjects in different treatments and roles. In the TA treatment, the distribution of math scores for the bosses is shifted far to the right relative to the scores of the workers but due to the selection criteria; this is to be expected. The same is true for those who chose to compete in the Math tournament in the SS treatment. In the TI and RA treatments, the distributions of bosses and workers appear quite similar due to the fact that both involve essentially random assignment. In our future analysis we will correct for this heterogeneity in several different ways.

The first way we will attempt to examine the behavior with some correction for cross treatment heterogeneity is shown in Table 4. This table segments subjects into those who are above or below the median average math score from the first phase of 7 and then provides some useful summary statistics for three different threshold groupings regarding the threshold they had to hit in a round. As a reminder, Group 1 refers to the low thresholds, $\{.25, .5, .75\}$, Group 2 consists of the intermediate thresholds, $\{1, 1.25\}$ and Group 3 contains the high thresholds, $\{1.5, 1.75\}$. The statistics include the percentage of times workers stopped at $T - 1$, how often the bonus was achieved as well as some information about the earnings the subjects could have achieved on the MT producing up to $T - 1$ versus how much they would earn from working at their average math level. This conveys some of the cost of choosing to sabotage. The main benefit in segmenting the subjects by average math scores is that those who are below the median are approximately the same across all treatments. This can be seen in Table 5 which provides a simple OLS regression of the

		$AM < 7$			$AM \geq 7$		
		Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
TA	T	2.99	6.07	8.71	4.03	8.10	12.15
	WorkPerf	3.32	4.12	4.41	4.43	5.45	5.85
	% Stop at $T - 1$	0.094	0.130	0.087	0.233	0.300	0.150
	Avg Math		5.15			7.10	
	Bonus/Chances	76/138 (0.55)	29/92 (0.31)	10/92 (0.11)	15/30 (0.50)	6/20 (0.30)	0/20 (0)
	\$ at $T - 1$	\$0.24	\$0.49	\$0.70	\$0.32	\$0.65	\$0.97
	\$ at Avg Math		\$0.41			\$0.57	
TI	T	3.00	6.14	8.83	4.84	10.06	14.79
	WorkPerf	2.03	2.40	2.60	7.06	7.41	8.84
	% Stop at $T - 1$	0.079	0.024	0.048	0.069	0.132	0.044
	Avg Math		5.24			8.79	
	Bonus/Chances	24/63 (0.38)	7/42 (0.17)	5/42 (0.12)	71/102 (0.70)	23/68 (0.34)	2/68 (0.03)
	\$ at $T - 1$	\$0.24	\$0.49	\$0.71	\$0.39	\$0.80	\$1.18
	\$ at Avg Math		\$0.42			\$0.70	
SS	T	2.99	6.08	8.80	4.13	8.37	12.5
	WorkPerf	2.92	2.70	3.76	5.16	6.67	6.67
	% Stop at $T - 1$	0.133	0.100	0.080	0.067	0.100	0.033
	Avg Math		5.20			7.33	
	Bonus/Chances	38/75 (0.51)	9/50 (0.18)	4/50 (0.08)	27/45 (0.60)	14/30 (0.47)	0/30 (0)
	\$ at $T - 1$	\$0.24	\$0.49	\$0.70	\$0.33	\$0.67	\$1.00
	\$ at Avg Math		\$0.42			\$0.59	
RA	T	3.04	6.21	8.94	4.56	9.43	13.95
	WorkPerf	3.59	4.06	4.00	5.98	7.05	8.00
	% Stop at $T - 1$	0.118	0.059	0.176	0.061	0.182	0.045
	Avg Math		5.29			8.27	
	Bonus/Chances	31/51 (0.61)	13/34 (0.38)	0/34 (0)	40/66 (0.61)	11/44 (0.25)	0/44 (0)
	\$ at $T - 1$	\$0.24	\$0.50	\$0.72	\$0.36	\$0.75	\$1.11
	\$ at Avg Math		\$0.42			\$0.66	

Table 4: Summary statistics by treatment broken out by above versus below median average math ability and by threshold grouping.

	All	$AM < 7$	$AM \geq 7$
TI	1.936*** (0.350)	0.086 (0.256)	1.694*** (0.594)
SS	0.500 (0.382)	0.048 (0.242)	0.233 (0.674)
RA	1.474*** (0.385)	0.142 (0.276)	1.173* (0.630)
Constant	5.500*** (0.246)	5.152*** (0.143)	7.100*** (0.522)
Observations	190	109	81

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Average math scores regressed on treatment dummies.

average math scores of the subjects with the treatment dummies as the regressors. We have provided separate regressions including one specification for all subjects and then two more separating out those who have above and below average, average math scores. What we see is that there are no differences in ability across treatments in the below average group but there are for the above average group and consequently for the overall sample. This means that the below median individuals are all comparable in the different treatments making comparisons among them more reasonable.

By examining Table 4 we can note several patterns in the data which will be helpful in interpreting the later regressions. First, for both groups in all threshold categories, the performance of the workers is less on average than the average of their performance in the first stage. This is an indication that the assignment treatments might have depressed work effort overall though inference on that is not clear. In the first stage subjects had two reasons to exert high effort; the piece rate wage and the possibility of earning the advantaged role for stage 2. In stage 2, they only have the wage portion. So it is possible that the decline in effort is due to the tournament element no longer being present. This is not a problem for our analysis because our interest is not in total performance levels or in comparison between first and second stage but rather in comparing second stage levels to each other. As the tournament is missing in the second stage in all treatments, any effect from the tournament not being present anymore should be the same for all treatments allowing us to identify any remaining differences in behavior as due to a treatment effect.

The second thing to observe from the table is that the bonus is rarely achieved at the high threshold levels. This is of course not surprising as the required threshold, T , is quite a bit above the average performance capability the subjects have previously demonstrated. In looking at the summary statistics for those below the median ability, it is useful to note that the average ability and the threshold requirements are approximately the same across treatments. If we look at the fraction of the bonuses achieved for the boss we can see that the TI treatment generally has a lower success rate while the others are quite similar. For those subjects above the median ability, there is more heterogeneity and there are no clear patterns regarding the likelihood of the bonus being achieved. The \$ at $T - 1$ row shows what the subjects would have earned from the main task had they earned as much as they

	Stop at $T - 1$		
	All	$AM < 7$	$AM \geq 7$
Group 1	-0.025 (0.020)	0.012 (0.026)	-0.076** (0.031)
Group 3	-0.0395* (0.021)	>-0.001 (0.025)	-0.093*** (0.034)
TI	-0.033* (0.018)	-0.044* (0.023)	-0.032 (0.029)
SS	-0.010 (0.026)	0.005 (0.035)	-0.035 (0.031)
RA	0.0002 (0.023)	0.008 (0.032)	-0.020 (0.030)
Average Math, AM	0.001 (0.006)	-0.012 (0.011)	0.007 (0.011)
Male	-0.019 (0.014)	-0.040* (0.021)	0.0132 (0.019)
Constant	0.125*** (0.036)	0.174*** (0.065)	0.102 (0.081)
Observations	1,330	763	567
Clusters	190	109	81

Clustered robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Random effects regressions of whether workers stopped just short of the threshold.

could have while keeping the boss from receiving the bonus but it does not indicate how much additional they could earn on the DT after choosing to stop at $T - 1$. The \$ at Avg Math row indicates how much the subject could have earned working at their average level. Note that for the low threshold cases, the subjects have to give up close to 50% of their expected earnings to sabotage and at the high thresholds the sabotage earnings would be better than they could likely achieve. For the middle thresholds, the subjects don't have to sacrifice much at all to sabotage.

Our first hypothesis indicated how subjects would choose if they were engaging in strategic sabotage. Essentially subjects should choose to work to the max of their abilities or to work up to $T - 1$ on the MT and then switch to the DT for the remainder of the time. The outcome from testing this hypothesis is contained in our first result.

Result 1 *Workers who are below the median in terms of their first stage math performance indicate little strategic sabotage behavior. Workers who are above the median exhibit behavior consistent with occasional strategic sabotage.*

There are two ways we can examine the data to determine if the prediction regarding strategic sabotage matches the behavior of the subjects. First, we can examine the row for % of Stops at $T - 1$ in Table 4. If subjects were engaging in strategic sabotage we should see this hit a higher level for the intermediate thresholds than the others as this

is where strategic sabotage should be most likely. We might also expect a relatively high percentage of choices of this sort. From examining the table, we do see that for subjects above the median in their math skills that the middle threshold category is the one in which stopping at $T - 1$ is most likely but this does not hold true for those below the median. For both groups the frequency with which this option is chosen is relatively low indicating that even if the high ability subjects do occasionally choose to sabotage, it is not very frequent. Table 6 presents a set of linear random effects regressions with clustered standard errors¹¹ to determine if the likelihood of a worker stopping within 1 problem of the threshold depends on the threshold group and the treatment. The test of the theoretical prediction is whether the dummy variables for the high and low threshold group are negative as this would indicate that this behavior occurs most often in the middle group. As indicated by the summary statistics, this pattern does not emerge for the low ability subjects but we do find a small effect for the high ability subjects. This provides an indication that high ability subjects may be engaging in strategic sabotage, albeit at a relatively low incidence.

Testing hypothesis 2 has to be done in the context of the other three hypotheses which are concerned with the effect of the treatments on behavior. Table 7 provides the regressions necessary to test these hypotheses. It contains a set of regressions separated out into the three different threshold groupings used in Table 4 and includes dummy variables to separate those who are above and below the median ability level. This table provides the support for results based on testing hypotheses 3-5.

Result 2 *Low ability workers robustly engage in less work effort (more sabotage effort) in TI than TA at all thresholds. High ability workers indicate no change in behavior between the TI and TA treatments.*

Result 3 *Both Low and High ability workers exhibit little behavioral differences between the SS and TA treatments though Low ability workers do exhibit less work effort and more sabotage in the middle threshold range.*

Result 4 *Both Low and High ability workers exhibit little behavioral differences between the RA and TA treatments.*

The coefficients on the base treatment dummies, TI , SS and RA , indicate how low ability individuals respond to the treatments relative to the TA treatment and the interaction terms, $H \times TI$, $H \times SS$ and $H \times RA$ indicate how those in the high ability category respond differently to the treatments than the low group. In the case of TI , we see that low ability individuals respond with decreased work effort in all threshold ranges as well as increased sabotage performance leading to a lower chance that the boss receives the bonus. Interestingly, while work effort decreases in the TI treatment, this happens while the frequency of times workers stop at $T - 1$ also drops at least for the intermediate threshold range. These

¹¹For these and subsequent regressions with the binary “Stop at $T - 1$ ” variable we use a simple linear probability model rather than a logit specification. This is mainly to keep a constant form across similar regressions and to allow for the clustering of observations in the standard error calculations. All regressions have also been conducted with the logit specification and while the p -values change slightly, the substantive interpretation is the same. We therefore present this standardized version but are happy to provide the logit specifications upon request.

	Stop at $T - 1$									Work Performance									Sabotage Performance									Boss Bonus								
	Group 1			Group 2			Group 3			Group 1			Group 2			Group 3			Group 1			Group 2			Group 3			Group 1			Group 2			Group 3		
TI	-0.0355	-0.110**	-0.0128	-1.401***	-1.866***	-1.940**	2.830***	3.557***	4.455***	-0.173**	(0.081)	(0.087)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)			
SS	(0.044)	(0.044)	(0.040)	(0.487)	(0.625)	(0.821)	(1.006)	(1.328)	(1.563)	(0.087)	(0.081)	(0.087)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)	(1.328)	(1.328)	(1.563)			
RA	-0.008	-0.030	0.039	-0.400	-1.440***	-0.675	0.948	2.716**	1.519	-0.042	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)			
	(0.054)	(0.055)	(0.045)	(0.500)	(0.559)	(0.738)	(0.973)	(1.158)	(1.358)	(0.081)	(0.081)	(0.081)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)	(1.158)	(1.158)	(1.358)			
	0.080	-0.068	0.019	0.362	-0.024	-0.408	0.057	0.674	0.432	0.069	(0.081)	(0.081)	0.674	0.674	0.432	0.069	0.674	0.432	0.069	0.674	0.432	0.069	0.674	0.432	0.069	0.674	0.432	0.069	0.674	0.432	0.069	0.674	0.432			
	(0.064)	(0.057)	(0.067)	(0.532)	(0.529)	(0.751)	(0.968)	(1.147)	(1.443)	(0.081)	(0.081)	(0.081)	(1.147)	(1.147)	(1.443)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)			
AM	0.0001	0.013	-0.003	0.541***	0.966***	0.848***	0.157	-0.346*	0.025	-0.014	(0.081)	(0.081)	-0.346*	-0.346*	0.025	-0.014	-0.014	0.025	-0.014	-0.014	0.025	-0.014	-0.014	0.025	-0.014	-0.014	0.025	-0.014	-0.014	0.025	-0.014	-0.014	0.025			
	(0.007)	(0.015)	(0.015)	(0.202)	(0.128)	(0.132)	(0.288)	(0.196)	(0.212)	(0.020)	(0.020)	(0.020)	(0.196)	(0.196)	(0.212)	(0.020)	(0.020)	(0.212)	(0.020)	(0.020)	(0.212)	(0.020)	(0.020)	(0.212)	(0.020)	(0.020)	(0.212)	(0.020)	(0.020)	(0.212)	(0.020)	(0.020)	(0.212)			
$AM \geq 7, H$	0.018	-0.007	-0.020	-0.024	-0.640	-0.278	0.007	0.554	-0.225	-0.029	(0.081)	(0.081)	0.554	0.554	-0.225	-0.029	-0.029	-0.225	-0.029	-0.029	-0.225	-0.029	-0.029	-0.225	-0.029	-0.029	-0.225	-0.029	-0.029	-0.225	-0.029	-0.029	-0.225			
	(0.071)	(0.083)	(0.057)	(0.994)	(0.952)	(1.136)	(1.750)	(2.176)	(2.213)	(0.112)	(0.112)	(0.112)	(2.176)	(2.176)	(2.213)	(0.112)	(0.112)	(2.213)	(0.112)	(0.112)	(2.213)	(0.112)	(0.112)	(2.213)	(0.112)	(0.112)	(2.213)	(0.112)	(0.112)	(2.213)	(0.112)	(0.112)	(2.213)			
$H \times TI$	-0.022	0.071	0.019	3.133***	2.215*	3.509**	-5.054**	-3.573	-6.724**	0.393***	(0.112)	(0.112)	-3.573	-3.573	-6.724**	0.393***	0.393***	-6.724**	0.393***	0.393***	-6.724**	0.393***	0.393***	-6.724**	0.393***	0.393***	-6.724**	0.393***	0.393***	-6.724**	0.393***	0.393***	-6.724**			
	(0.081)	(0.097)	(0.064)	(1.056)	(1.162)	(1.420)	(1.986)	(2.530)	(2.695)	(0.138)	(0.138)	(0.138)	(2.530)	(2.530)	(2.695)	(0.138)	(0.138)	(2.695)	(0.138)	(0.138)	(2.695)	(0.138)	(0.138)	(2.695)	(0.138)	(0.138)	(2.695)	(0.138)	(0.138)	(2.695)	(0.138)	(0.138)	(2.695)			
$H \times SS$	-0.057	-0.023	-0.037	0.970	2.405**	1.275	-1.575	-3.516	-2.338	0.144	(0.133)	(0.133)	-3.516	-3.516	-2.338	0.144	0.297**	-2.338	0.144	0.297**	-2.338	0.144	0.297**	-2.338	0.144	0.297**	-2.338	0.144	0.297**	-2.338	0.144	0.297**	-2.338			
	(0.088)	(0.105)	(0.072)	(1.114)	(1.222)	(1.447)	(2.032)	(2.521)	(2.677)	(0.134)	(0.134)	(0.134)	(2.521)	(2.521)	(2.677)	(0.134)	(0.133)	(2.677)	(0.134)	(0.133)	(2.677)	(0.134)	(0.133)	(2.677)	(0.134)	(0.133)	(2.677)	(0.134)	(0.133)	(2.677)	(0.134)	(0.133)	(2.677)			
$H \times RA$	-0.124	0.080	-0.017	0.376	0.303	1.431	-0.852	-0.898	-2.270	0.042	(0.139)	(0.139)	-0.852	-0.898	-2.270	0.042	-0.152	-2.270	0.042	-0.152	-2.270	0.042	-0.152	-2.270	0.042	-0.152	-2.270	0.042	-0.152	-2.270	0.042	-0.152	-2.270			
	(0.093)	(0.106)	(0.085)	(1.169)	(1.132)	(1.398)	(2.066)	(2.585)	(2.638)	(0.139)	(0.139)	(0.139)	(2.585)	(2.585)	(2.638)	(0.139)	(0.131)	(2.638)	(0.139)	(0.131)	(2.638)	(0.139)	(0.131)	(2.638)	(0.139)	(0.131)	(2.638)	(0.139)	(0.131)	(2.638)	(0.139)	(0.131)	(2.638)			
Thresh %	-0.253**	-0.021	0.179***	-2.832***	-3.663***	1.621**	-1.347	1.979	-1.874	-1.042***	(0.139)	(0.139)	-1.347	1.979	-1.874	-1.042***	-1.642***	-1.874	-1.042***	-1.642***	-1.874	-1.042***	-1.642***	-1.874	-1.042***	-1.642***	-1.874	-1.042***	-1.642***	-1.874	-1.042***	-1.642***	-1.874			
	(0.107)	(0.134)	(0.062)	(0.503)	(0.975)	(0.716)	(0.882)	(1.553)	(1.151)	(0.089)	(0.089)	(0.089)	(0.882)	(1.553)	(1.151)	(0.089)	(0.151)	(1.151)	(0.089)	(0.151)	(1.151)	(0.089)	(0.151)	(1.151)	(0.089)	(0.151)	(1.151)	(0.089)	(0.151)	(1.151)	(0.089)	(0.151)	(1.151)			
Male	-0.0460*	0.023	-0.021	0.789**	0.808**	0.583	-0.609	-1.067	-0.601	0.047	(0.139)	(0.139)	-0.609	-1.067	-0.601	0.047	0.102**	-0.601	0.047	0.102**	-0.601	0.047	0.102**	-0.601	0.047	0.102**	-0.601	0.047	0.102**	-0.601	0.047	0.102**	-0.601			
	(0.025)	(0.030)	(0.023)	(0.309)	(0.356)	(0.433)	(0.553)	(0.691)	(0.770)	(0.047)	(0.047)	(0.047)	(0.691)	(0.691)	(0.770)	(0.047)	(0.047)	(0.770)	(0.047)	(0.047)	(0.770)	(0.047)	(0.047)	(0.770)	(0.047)	(0.047)	(0.770)	(0.047)	(0.047)	(0.770)	(0.047)	(0.047)	(0.770)			
Constant	0.514***	0.080	0.027	1.641	2.945**	-2.818**	4.753***	4.062*	7.293***	1.123***	(0.139)	(0.139)	4.062*	4.062*	7.293***	1.123***	2.175***	7.293***	1.123***	2.175***	7.293***	1.123***	2.175***	7.293***	1.123***	2.175***	7.293***	1.123***	2.175***	7.293***	1.123***	2.175***	7.293***			
	(0.180)	(0.166)	(0.077)	(1.104)	(1.338)	(1.405)	(1.635)	(2.182)	(2.281)	(0.113)	(0.113)	(0.113)	(2.182)	(2.182)	(2.281)	(0.113)	(0.209)	(2.281)	(0.113)	(0.209)	(2.281)	(0.113)	(0.209)	(2.281)	(0.113)	(0.209)	(2.281)	(0.113)	(0.209)	(2.281)	(0.113)	(0.209)	(2.281)			
Obs	380	380	570	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380	570	380	380			
Clusters	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190			

Clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Random effect regressions of worker behavior.

results combined with the previous ones are consistent with low ability subjects being more demoralized in the TI treatment than in the TA treatment rather than the workers engaging in strategic sabotage more often in TI than TA. The hypothesis regarding the SS treatment is that subjects might be even less likely to sabotage than in the TA treatment. We find that generally there are no differences between TA and SS except for the fact that low ability individuals sabotage more often in the SS treatment in that key interior set of thresholds where sabotage is feasible but cheap. This could be consistent with those subjects engaging in strategic sabotage but the drop in output does not occur due to more people choosing to stop at $T - 1$. Consequently the drop in output in that case is not indicating an increase in strategic sabotage. Finally the fourth result is supported by the fact that we generally find the RA coefficients not to be significantly different from 0 for the low ability workers.

For the support on all three results regarding the high ability workers, we provide Table 8. Table 8 takes the coefficients regarding the high ability workers from Table 7 and constructs the total treatment effect for them (e.g. for the TI effect we display $TI + H \times TI$). Here we see no statistically significant shift in worker behavior due to treatments or based on the threshold bins. The indication is that the high ability workers do not alter their behavior based on the assignment treatment. There may be some strategic sabotage engaged in by these subjects as discussed in Result 1, but the incidence of it does not vary by treatment. Also while we appear to find a discouragement effect for the low ability workers in the TI treatment, we do not observe the same for the high ability workers. The fact that a discouragement effect exists for low ability while not high ability workers is consistent with the results found in Ku and Salmon (2012) which obtains a similar result.

5 Conclusion

Promotion tournaments are a common way to induce effort in firms, but they lead to the possibility of bad feelings by the loser of the competition. Since losers often remain at the firm, the effect losing has on the behavior of workers is an issue of importance to employers. A common belief is meritocratic promotion should be considered fair and lead to no bad feelings on the part of those who don't earn the promotion. While this may be the conventional wisdom, there is little prior evidence in favor of this claim and some evidence directly counter to it. The intent of this paper was to evaluate the effect of different promotion tournaments on behavior to determine what effect tournaments of different design would have on behavior.

Our key finding is that when a promotion tournament is based on what might be reasonably considered as criteria irrelevant to the productive task of the group, low ability workers who do not earn the boss role will decrease their work effort by more than if the promotion criteria is relevant or even than if the promotion is made at random. The result that random and meritocratic mechanisms are considered equally acceptable is consistent with the procedural fairness literature which often suggests that random allocation is "fair." In a context such as this with differentially demonstrated ability, one might expect that random allocation should be less likely to be considered as fair compared to the meritocratic tournament but our results demonstrate otherwise. The nature of the decreased work effort we find is more consistent with the speculation in Nalebuff and Stiglitz (1983) suggesting that promotion tournaments will demoralize workers and lead to lower effort rather than

	Stop at $T - 1$											
	Work Performance			Sabotage Performance			Boss Bonus					
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3			
$TI + H \times TI$	-0.058 (0.069)	-0.038 (0.084)	0.006 (0.050)	1.733* (0.945)	-0.348 (0.988)	1.569 (1.160)	-2.224 (1.707)	-0.015 (2.158)	-2.269 (2.189)	0.220** (0.108)	0.059 (0.101)	0.077** (0.033)
$SS + H \times SS$	-0.065 (0.070)	-0.054 (0.089)	0.001 (0.001)	0.570 (0.992)	0.964 (1.082)	0.599 (1.242)	-0.628 (1.777)	-0.800 (2.229)	-0.819 (2.303)	0.102 (0.106)	0.166 (0.106)	0.006 (0.009)
$RA + H \times RA$	-0.044 (0.070)	0.012 (0.090)	0.002 (0.054)	0.738 (1.036)	0.278 (0.997)	1.023 (1.176)	-0.795 (1.802)	-0.224 (2.279)	-1.838 (2.213)	0.111 (0.114)	-0.613 (0.101)	0.026* (0.016)

Table 8: Total treatment effects for high ability subjects calculated from Table 7.

workers lowering effort as a form of strategic sabotage. Separating between these two motivations for decreased work effort is important as the way one might think about dealing with discouraged workers is very different from how one might deal with workers who are actively sabotaging their bosses.

Another interesting aspect to our finding is that the tournament design doesn't seem to affect high ability workers, only lower ability ones. While we do find that high ability workers do engage in a small amount of behavior consistent with the model of strategic sabotage, this behavior is uncommon and does not vary with the tournament design. There are many possible justifications for that. One is that high ability workers are high ability in part due to a strong work ethic or some non-pecuniary preferences regarding work. If so then such individuals might choose to continue working despite being upset about the promotion outcome. Also it might be due to low ability individuals being more strongly affected by emotions like jealousy and envy.

Previous work demonstrates targets of envy are often likely to be very similar to the envious party (Festinger (1954); Goethals and Darley (1977)) due to the fact that absent the similarity, comparisons are difficult to make (Mussweiler (2003)). Schaubroeck and Lam (2004) finds some evidence of this hypothesis. In the TI treatment since role assignment is essentially random, low ability subjects in the worker role may reasonably see those in the boss role as no different from themselves triggering feelings of envy and therefore the negative response. However, if worker similarity (or envy) were the only factor determining the decrease in worker activity, then we would expect to observe work effort in the RA treatment similar to the TI treatment because role assignment is effectively random (with respect to ability in the main task) in both treatments. The fact that we do not indicates that more than just similarity is required to trigger this response. For a worker to be discouraged by a tournament outcome they must judge the mechanism as being unfair in some way. In our experiment, promotion in RA may still be perceived as fair as all subjects have an equal probability of being promoted. While ex-ante the skill level of the bosses in TI and RA should be approximately equivalent, the perception of the bosses ability, by the workers, may be different. Those in TI were promoted based on a their performance on task unrelated to production task. It is not unreasonable to assume that the seemingly arbitrary promotion mechanism may have inadvertently been interpreted as promoting poor performers rather than essentially randomly promoting workers.

Using a different experiment design to also examine post tournament behavior McGee and McGee (2013) found results different from those we present here. That study consists of two treatments which are similar to our Task Appropriate and Random Assignment treatments. They find that workers after a random assignment mechanism choose lower stylized effort levels in what is essentially a public goods game compared to when the role assignment has occurred through a tournament. The difference in the results between the two studies is certainly important to understand. There are multiple differences in the designs of the experiments which could account for the difference in the results. Our experiments used a real effort production task (and the same one) for both the assignment and the production phases whereas McGee and McGee (2013) used a stylized effort design for their tournament task in which subjects chose effort levels on a range between 0 and 6 with higher levels being more costly. The curious thing is that one would expect the real effort nature of our design to make subjects feel even more entitled to a preferred role assignment

in the tournament mechanism as they may feel that they earned that position through their own actual effort. This should make the random mechanism appear as substantially less fair. On the other hand perhaps subjects see scores on real effort tasks like ours as a function of innate ability which is itself the outcome of a (genetic) lottery. This might explain why the high ability subjects failed to respond to the treatments as perhaps they are more likely to believe in the genetic lottery story. The difference in such perceptions would be consistent with the findings of Ku and Salmon (2012) in which a similar split reaction is observed between high and low ability subjects due to the presence of wage inequality. In fact the result we find here of the low ability subjects being discouraged in the presence of wage inequality while high ability subjects fail to respond is has the same essential nature as the result found in Ku and Salmon (2012). While the cause for the difference between the current findings and those from McGee and McGee (2013) is unclear, the difference between the real effort design used here and the stylized effort design used there is an interesting one that bears further analysis in future research as this is an important methodological point.

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	All		Boss		Worker	
	$AM < 7$	$AM \geq 7$	$AM < 7$	$AM \geq 7$	$AM < 7$	$AM \geq 7$
Chose Paint	10	4	6	3	4	1
Chose Math	21	45	0	31	21	14
Total	31	49	6	34	25	15

Table 9: Subject tournament selection by ability and role

Appendix A: Analysis of Tournament Selection

In the main paper we did not analyze the determinants of tournament choice in the SS treatment as it was not a focus of the paper but in this appendix we briefly examine how subjects made these choices. In Table 9 we present the tournament choice in the SS treatment by high and low ability types. Predictably, subjects who are comparatively less skilled in the MT are more likely to elect to compete in the painting task.

In Table 10 we present the results of several probit regressions with tournament choice as the dependent variable (choice of MT is 1, PT is 0) and various demographic variables as the regressors. We have provided specifications including the entire sample as well as the sample split into low and high ability workers according to their performance on the math task in stage 1. For each regression we provide the regressions coefficients and their marginal effects. One issue it is important to note is that only 17.5 percent of subjects participating in the SS treatment selected to compete in the PT tournament indicating that this was not a common choice. Overall the demographic variables we were able to capture explain little about tournament choice. In a post experiment questionnaire, we asked a few questions about whether the math task was fun, had they taken a calculus class and the average number of hours per week they spend watching TV. The results show that subjects who viewed the MT as fun are about 40 percent more likely to compete in the MT tournament. Gender is not significant and we get a small effect indicating that subjects who report watching more TV are slightly less likely to select the math task.

	All Subjects		$AM \geq 7$		$AM < 7$	
	Probit	Marg Eff	Probit	Marg Eff	Probit	Marg Eff
Math Fun	1.487*** (0.481)	0.389*** (0.147)	1.159 (0.838)	0.155 (0.192)	1.967** (0.902)	0.656*** (0.231)
Male	0.692 (0.430)	0.136 (0.090)	0.331 (0.793)	0.0227 (0.068)	0.879 (0.704)	0.306 (0.221)
Took Calc	0.348 (0.456)	0.063 (0.083)	0.664 (0.748)	0.044 (0.057)	0.138 (0.755)	0.051 (0.279)
Age	-0.335* (0.176)	-0.060** (0.030)	-0.496 (0.354)	-0.029 (0.026)	-0.168 (0.273)	-0.062 (0.100)
TV	-0.029* (0.015)	-0.005* (0.003)	0.0747 (0.062)	0.004 (0.004)	-0.142** (0.070)	-0.053* (0.029)
Constant	6.896* (3.558)		9.957 (7.433)		3.925 (5.359)	
Observations	80		49		31	
R ²	0.319		0.355		0.4477	

Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table 10: Probit regression of subject’s tournament selection in SS treatments.

Appendix B: Instructions

Welcome to the experiment. I will read the instructions using this script to make sure that all sessions of the experiment receive the same information. Please feel free to ask questions as they arise. I ask that you do not talk to other participants or look at their monitors during the experiment. If you have a question or problem, please raise your hand and I will come and assist you. Please turn off your cell phones and put away your belongings. I will need your complete attention. The instructions of this experiment are

simple, and if you follow them carefully, you can earn a considerable amount of money, in addition to the 7.00 dollar show-up payment. All the money you earn is yours to keep, and will be paid to you, by cash, and in private, after the experiment ends. All pay records will be kept confidential and your earnings today will not be revealed to other participants or known to anyone other than the experimenter. This experiment will consist of 2 phases. In Phase 1 you will engage in multiple periods of a task based on answering math questions to earn money. After you have completed the mathematics task, we will next ask you to indicate your preference between 5 pairs of paintings. In phase 2, you will again engage in several periods of a task where you will be answering math questions but this time you will be in a group with another person. One member of the group will be labeled the BLUE member and the other will be the GREEN member. The BLUE member will be considered the group leader and will be in a position to earn more money than the GREEN member in phase 2.

Your type will be assigned to you at the conclusion of Phase 1 of the experiment and based on upon the decisions you make in Phase 1. There will also be multiple periods in phase 2 and in each period your type will remain constant as will the composition of your group. You will not be told the identity of the other member of your group. What you

will know is that if you are designated the GREEN member then the other member of your group is BLUE and if you are the BLUE member the other member is GREEN. Unless there are questions we will now begin the first phase of the experiment.

In this first phase, you will be asked to engage in two tasks which will allow you to earn money based on how well you perform in them. The first task is a mathematics based task. You will be asked to add 5 single digit numbers and you will earn 8 cents for each problem you solve correctly. You will see the digits to add in the middle of the screen and next to them a text box where you will enter your answer.

Once you have entered your answer, click the "SUBMIT" button. After you have clicked the "SUBMIT" button, a new problem will appear. You will have 60 seconds to complete as many addition problems as you can.

You will participate in the Mathematics Task for 3 periods.

After this first task is completed you will then engage in a second task. You will be shown 5 pairs of paintings. All we ask you to do is tell us which of the two paintings you prefer. You will be able to click on a button that corresponds to either painting A or B. Once you do so, press the CONFIRM button to move to the next pair of paintings. You will have 60 seconds.

Unless there are questions, we will now begin the Mathematics Task.

You have completed both tasks, the total number of correct answers you submitted for the Mathematics Task in Phase 1 will be compared to the totals achieved by others in today's session. If you scored in the top 50 % in the Mathematics Task you will be assigned the BLUE role for Phase 2. If you did not score in the top 50 % in the Mathematics Task you will be assigned to the GREEN role for Phase 2.

Please click the OK button to view your role.

Your role was assigned based on your choices in the Painting Preference Task. Each pair of paintings consisted of one painting by Paul Klee and one by Wassily Kandinsky. If you have been assigned to the BLUE role it is because you are among the top 50% of participants who indicated the strongest preferences for the paintings of Paul Klee in today's session. If you have been assigned to the GREEN role it is because you did not score in that range on the task. Please click the OK button to view your role.

You can now choose which task you wish to use to assign your role for Phase 2. You can choose between two selection methods, with one based on the Mathematics task and the other on the Painting Preference task. If you choose the Mathematics Task you will be assigned the more advantageous BLUE role if the total number of math questions you correctly answered is among the top 50 % of the people who have also chosen the Mathematics Task. You will be assigned the GREEN role if you are not among the top 50 % of that group.

In the Painting Preference Task, each pair of paintings you were shown consisted of one painting by Paul Klee and one by Wassily Kandinsky. If you choose the Painting Preference Task for role assignment, you will be assigned the more advantageous BLUE role if you are among the top 50 % of people who indicated the strongest preference for the paintings by Paul Klee otherwise you will be assigned the GREEN role.

In order to make groups even, it may be the case that 1 participant could be placed into a group where roles are set other than how they chose. When this occurs the affected participants will be ranked in that group according to their score in a randomly selected

task. You will be informed if you are, or are not, put into a group according to the task you selected.

Please click the OK button to select the task that will determine your role.

You can now choose which task you wish to use to assign your role for Phase 2. If you choose the Mathematics Task you will be assigned the more advantageous BLUE role if you are among the top 50 % of the people who have also chosen the Mathematics Task while you will be assigned the GREEN role if you are not among the top 50 % of that group.

If you choose the Painting Selection Task you will be assigned the more advantageous BLUE role if you are among the top 50 % of people who indicated a preference for paintings by Paul Klee otherwise you will be assigned the GREEN role. Please make your choice now.

Your role was assigned based on your performance in the Mathematics Task. If you have been assigned to the BLUE role it is because the total number of math questions you correctly solved was in the top 50% among those participating in today's session. If you have been assigned to the GREEN role it is because you did not score in that range on the task.

Your role was assigned based on your performance in the Painting Preference Task. If you have been assigned to the BLUE role it is because you are among the top 50% of participants who indicated the strongest preferences for the paintings of Paul Klee in today's session. If you have been assigned to the GREEN role it is because you did not score in that range on the task.

You chose to use the Mathematics Task/Painting Preference Task to determine your role assignment. Among those who also chose that task, your score on that task was/was not in the top 50 % and so you have been assigned the BLUE/GREEN role.

You chose to use the Mathematics Task/Painting Preference Task to determine your role assignment. It was not possible to match you in a group where all members submitted the same task as you. The computer has randomly selected to use the Mathematics Task/Painting Preference Task scores so grouping will be done by Mathematics Task/Painting Preference Task scores. Your score on that task was/was not the highest in your group so you have been assigned the BLUE/GREEN role.

You chose to use the Mathematics Task/Painting Preference Task to determine your role assignment. It was not possible to match you in a group where all members submitted the same task as you. The computer randomly selected to use the Mathematics Task/Painting Preference Task scores so grouping will be done by Mathematics Task/Painting Preference Task scores. Your score on that task was/was not the highest so you have been assigned the BLUE/GREEN role.

In this phase of the experiment, you will participate in a math based task where in each period you will be asked to complete as many addition problems as you can in 60 seconds. As before, once you have entered your answer, click the "SUBMIT" button. After you have clicked the "SUBMIT" button, a new problem will appear.

BLUE players will earn 15 cents for each problem solved correctly. GREEN players will earn 8 cents for each problem solved correctly. BLUE players will also be able to earn a bonus based on the productivity level of their group member. If the number of problems solved by the GREEN type sums to a given threshold during the production period, then the BLUE player will earn a bonus of 150 cents on top of his or her earnings from solving problems. Note, this threshold will change each period.

For those assigned to the GREEN role you also have a second way of making money. You will also be able to engage in a digit identification task. In the digit identification task, you will be shown a string of numeric characters (0 through 9). You will be asked to count the number of times a specific number occurs in that string and you will earn 4 cents by correctly identifying the total number of that number appearing in the string.

On the left hand side of the screen, GREEN players will see the Mathematics Task that is identical to the one seen in Phase 1 of the experiment. The digit identification task will appear on the right hand side of the screen. In the applicable input box you can enter your answers. Once you have entered your answer, click the "SUBMIT" button directly under the applicable input box. After you have clicked the "SUBMIT" button, a new number string or addition problem will appear. GREEN players can choose to divide their time in a production period between these two tasks in any manner they choose.

At the end of all periods, all players will be shown their earnings.

If you are a GREEN member, you will also see your cumulative earnings as well as whether or not the BLUE member of your group earned a bonus. If you are a BLUE member you will be shown your earnings as well as whether or not you earned a bonus.

At the conclusion of period 7 you will be shown your cumulative earnings for the experiment. Unless there are questions, we will now begin phase 2 of the experiment.

Game Screens

Your group: 1
Your member number: 2
Your Role: **GREEN**
Your Average Productivity in Phase 1: 0
Period: 1

PHASE 2

You have been assigned the **GREEN** role in your group based on your failing to score in the top 50% of today's participants on the Mathematics Task in phase 1. The **BLUE** member of your group was assigned that role because he or she did score in the top 50% on that task.

Below are the two tasks you may complete to generate earnings. You have 60 seconds to correctly answer as many questions as you can and you can engage in either task as much as you like. You will be paid **8** cents for each problem solved correctly in the Mathematics Task and you will earn **3** cents for each problem solved correctly in the digit identification task.

In this period, if the number of mathematics problems that the **GREEN** member solves is at least **0** then the **BLUE** member of your group will receive a bonus of 150 cents on top of the **15** cents per mathematics problem they complete correctly.

Mathematics Task

Below you have been given a string of numbers. Please find the sum of the numbers listed in the string below. You have 60 seconds to find the sum of as many strings as possible.

$9 + 5 + 1 + 9 + 4 =$

Digit Identification Task

How many 9's are there in the string below? Please enter your answer in the box below the string and press the Submit button. You have 45 seconds to correctly answer as many strings as possible.

9998578989

Figure 2: Phase 2 decision screen of worker.

Your group: 1
Your member number: 1
Your Role: **BLUE**
Period: 1

PHASE 2

You have been assigned the **BLUE** role in your group based on your scoring in the top 50% of today's participants on the Mathematics Task in phase 1. The **GREEN** member of your group was assigned that role because he or she did not score in the top 50% on that task.

Below is the task you may complete to generate earnings. You have 60 seconds to correctly answer as many questions as you can. You will be paid **15 cents** for each problem solved correctly in the Mathematics Task.

Below you have been given a string of numbers. Please find the sum of the numbers listed in the string below. You have 60 seconds to find the sum of as many strings as possible.

$1 + 1 + 9 + 7 + 7 =$

Figure 3: Phase 2 decision screen of boss.