Who Should Set the Goals: Employers or Workers?*

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Abstract

We examine how performance is affected by goal setting, depending on who sets the goal. We first propose a theoretical model of a worker-employer game and then conduct a laboratory experiment to test our theoretical predictions. The game starts with either the worker or the employer setting a goal on output, and then the worker selects a costly (and unobservable) effort level which in turn determines both output and the employer's income. The worker's monetary earnings depend on neither goal achievement nor output. Our theory predicts that (i) the worker sets the minimum possible goal, (ii) the employer sets a higher goal than the worker does; (iii) effort is the highest when the employer sets a goal, the lowest when there is no goal at all, and in between when the worker sets a goal. Consistent with our theoretical predictions, our experimental results confirm that the employer sets a higher goal than the worker does. Moreover, the worker's effort level is the highest when there is goal setting and the employer sets it. However, we find deviations from our other theoretical predictions. We propose modifications to our original model to account for these deviations.

Keywords: Goal setting, Self-Set, Assigned, Output, Laboratory experiment
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1 Introduction

The effects of goals on performance have attracted attention both in psychology and economics. A robust finding is that individuals perform better in the presence of goals (Locke and Latham, 2002). However, the impact of goal setting on selected goal and performance levels in the workplace, depending on who sets goals, is not well understood (as will be discussed in Section 2 in detail). To increase our understanding, this paper provides a comprehensive analysis on how goal levels and workers' performances differ when workers set goals themselves versus when employers assign goals to workers.

We first provide a theoretical model and then test its predictions using an incentivized laboratory experiment. We consider a simple three-stage game played between a worker and an employer. In the first stage, goals are set either by workers (*self-set*) or employers (*assigned*). In the second stage, workers choose costly but unobservable effort levels which in turn determine output levels. Finally, in the third stage, employers send non-binding feedback to workers. To isolate the intrinsic effects of goals on workers' effort choices, we focus on an environment where we rule out any extrinsic motivation that are direct (such as bonus payments to workers based on goal achievement) or indirect (such as increases in worker's earnings with output levels).

The first part of the paper is devoted to studying this game theoretically. In our game-theoretic model, workers earn a flat wage partially used to cover the costs of effort levels they have selected. Moreover, workers receive some intrinsic utility that is composed of two parts: (i) utility from employers' feedback, and (ii) reference-dependent utility from the output where the selected goal acts as a reference point. Employers, on the other hand, are solely concerned with output levels and view goals as a means to influence workers' effort choices. To create benchmark predictions, utility functions here do not depend on who sets the goal.[1] This ensures that our theory does not impose a behavioral difference just because goals are set by workers or employers. Our model generates the following predictions. In a Subgame Perfect Nash Equilibrium, workers set the lowest possible goal, while employers set a higher goal than workers. Workers exert a greater effort when employers set a goal compared to when the goal is self-set, and both effort levels are higher compared to when there is no goal at all.

In the second part of the paper, we report results from a laboratory experiment specifically designed to test hypotheses based on our theory. Consistent with our theoretical predictions, employers set higher goals compared to workers. Moreover, workers' effort levels are the highest when goals are set by employers. In contrast to our theoretical predictions, workers set positive goals instead of the lowest possible goal of zero, and there is no significant difference in effort levels when workers set goals compared to when there is no goal at all. We discuss potential reasons for these deviations and propose a modified theoretical framework to accommodate them. Lastly, we make three important observations from the experimental data. First, workers' effort levels increase with goals assigned by employers up to a certain level. However, when the assigned goal is extremely high, it backfires, leading workers to decrease their effort levels. This is in line with our theory. Second, we demonstrate that higher effort levels being observed when goals are assigned by employers is not solely due to employers setting higher goals than workers. We also identify a direct effect of goal setting. Specifically,

[1] Relaxing this assumption does not change the qualitative predictions of our model (see Section 6).

for a given goal level, workers exert greater efforts simply because it is employers who set goals. Finally, our experimental data reveals that when employers set goals, their feedback depends on both the output level and the gap between the output and the goal, whereas feedback depends only on the output when there is no goal or when workers set goals. These last two additional findings challenge some of the theoretical assumptions in our benchmark model. We explain how we modify our original assumptions to accommodate the observed behavior. Importantly, these modifications do not change the qualitative predictions of our theory.

The rest of the paper is organized as follows. Section 2 presents a review of the related literature. Section 3 provides our theoretical model and its results. Section 4 outlines the experimental design and our hypotheses based on our theoretical predictions. Our main findings regarding goal and effort levels are presented in Section 5.1 and some additional findings are presented in Section 5.2. Section 6 provides a discussion on the deviations we observe and alters the model to accommodate these deviations. Finally, Section 7 concludes. Proofs of the theoretical results are provided in the Appendix. Additional data analyses, the modified theoretical model and its proof, and experimental instructions are presented in Appendix A, Appendix B and Appendix C, respectively, which can be found in the online supplement.

2 A Comparison of Our Paper with the Related Literature

Goal setting has recently attracted attention from scholars in economics. Yet, to our knowledge, our paper is the first to study the impact of who sets the goal on goal and performance levels comprehensively. First, we compare goal levels when goals are set by workers (self-set) and by employers (assigned). Second, we compare workers' performances when goals are self-set versus assigned. This allows us to observe how performance varies based on the goal setter, encompassing not only situations where both goal levels are constrained to be the same but also scenarios where employers and workers have the flexibility to set distinct goals. Hence, our paper studies the full effects of goal setting on workers' performances depending on who sets goals.

The goal and effort comparisons we study here are novel contributions to the economics literature. While there are some related studies that also consider self-set and assigned goals (Goerg and Kube, 2012; Akın and Karagözoğlu, 2018; Fan et al., 2020), these papers typically restrict goal levels to be the same across settings (i.e., assigned goals are not endogenously chosen by employers but they are generally set at the same level as self-set ones). Moreover, their focus is entirely different than ours. Instead of studying the impact of goal setting on performance depending on who sets it, the focus of this literature is to study how self-set and assigned goals interact with other factors such as monetary incentives (Goerg and Kube, 2012), feedback (Akın and Karagözoğlu, 2018), and past achievement (Fan et al., 2020). Therefore, based on this literature, we have little to no understanding of how goal levels differ based on the goal setter and how workers respond to assigned goals that may or may not be the same as self-set ones. Conversely, our paper allows us to answer both of these questions.

Table 1 provides a comparison of important features between our study and related work in the experimental economics literature. Like most of the related studies in this literature,

Table 1. Related studies in the experimental economics literature

	Type of Goals				**Type of Payment**			**Cost Function**	**Type of Feedback**	
	No goal[2]	Self-set goal	Exogenously assigned goal	Endogenously assigned goal	Wage-relevant goals	Piece-rate payment	Flat payment	Controlled for	Objective feedback	Subjective feedback
Our paper	+	+	-	+	-	-	+	+	-	+
Corgnet et al., 2015	+	-	-	+	-	+	-	-	-	-
Corgnet et al., 2018	+	-	-	+	-	+	-	-	-	-
Fan et al., 2020	+	+	+	-	-	+	-	-	-	-
Brookins et al., 2017	+	+	-	-	-	+	+	-	-	-
Dalton et al., 2016	+	+	-	-	+	+	-	-	+	-
Gonzalez-Jimenez et al., 2020	+	+	-	-	+	+	-	-	+	-
Goerg and Kube, 2012	+	+	+	-	+	+	-	-	-	-
Akın and Karagözoğlu, 2018	+	+	+	-	+	+	-	-	+	-

Explanations of the columns:

- Regarding the type of goals, "no goal" stands for no goal being set, "self-set goal" stands for subjects setting goals for themselves, "exogenously assigned goal" stands for goals being assigned by the experimenter, and "endogenously assigned goal" stands for goals being assigned by another subject in the experiment.
- Regarding the type of payment, "wage-relevant goals" represent a payment that depends on whether or not the goal is achieved, "piece-rate payment" represents a payment that is determined by multiplying the total output with a per-unit rate, and "flat payment" represents a fixed payment that depends on neither output level nor whether the goal is achieved.
- The cost function column reports whether the cost of effort is controlled for in a study.
- Regarding the type of feedback, "objective feedback" stands for feedback on a subject's absolute or relative performance compared to others, "subjective feedback" stands for feedback that is determined by another subject (such as an employer) in the experiment to convey their thoughts/feelings regarding their opponent's overall performance/decisions.

[2] The "no goal" situations in Corgnet et al. (2015, 2018) are formed endogenously (based on employers' decisions) in the experiment while other studies create a "no goal" treatment exogenously.

our work combines a theory and an experiment. Moreover, our theoretical set-up aligns with those studies in which the intrinsic effect of a goal is modeled through reference-dependent utility, where the goal serves as a reference. As shown in Table 1, our paper primarily differs from the literature in four aspects: settings in which goals are determined, how workers are paid, whether a specific cost function is imposed for effort, and the type of feedback provided to workers. We discuss each aspect in detail below.

In our paper, we simultaneously use the following settings: a setting with no goal (as a benchmark), a setting where goals are set by workers, and a setting where goals are assigned by employers in the game. The *endogeneity* in our assigned setting, where goals are assigned by another player in the game, enables the possibility of assigned goal levels being different from self-set goals. This approach allows for a comprehensive analysis of goal setting depending on who sets it, which is the main contribution of our paper to the literature, as discussed previously.

Our study differs from most of the previous papers in terms of its payment structure. In our setting, workers receive only a flat payment that does not depend on the output level, unlike a piecewise rate. Additionally, the payment is not contingent on goal achievement, unlike wage-relevant goals. This approach enables us to examine the effectiveness of goals even when there is no monetary consequence directly motivating workers to exert effort.

Unlike the previous literature, our experimental design includes a control for the cost of effort. We achieve this by imposing the same cost function across all subjects through a chosen effort task, rather than utilizing a real effort task. This approach strengthens the connection between the theory and the experiment, as it ensures that subjects adhere to a specific cost function derived from the theory. We discuss further advantages of this methodology in Section 4.1 in detail.

At the end of each round in our experiment, employers send feedback to workers, adding a degree of realism to our set-up. The type of feedback we use differs from those studies that also provide feedback. Instead of objective feedback, such as workers' absolute or relative performance, we employ subjective feedback, where employers select an emoji from a predefined list. The existence of feedback in the experiment aligns with our model and enables us to uncover new insights that have not been previously identified in the literature.

In the theoretical economics literature, self-set goals are also modeled as a self-control tool in multi-period decision settings for an agent with present-biased preferences (Koch and Nafziger, 2011; Hsiaw, 2013; Suvorov and Van de Ven, 2008). However, our work differs from these studies in several aspects. First, unlike multi-period settings in this literature, our model uses a one-shot setting. Next, while this literature considers scenarios with potential long-term benefits that agents can attain (such as losing weight after enduring certain costly actions), in our model exerting effort imposes only extrinsic harm (without offering any benefits at all) on workers. This is because effort is costly, and workers' pay is a flat fee net of this cost. Therefore, there is no need for a commitment tool, as the detrimental consequences of effort already serve as a disincentive.

Goal setting has also been examined in psychology literature. However, in contrast to self-set goals we examine in this paper, the psychology literature primarily focuses on participative goals, which are goals that workers agree upon together with their employers or

experimenters.[3] Several studies in the psychology literature find that participative and assigned goals do not lead to significantly different performances when keeping the goal level constant (Latham and Saari, 1979b; Latham et al., 1982; Latham and Steele, 1983; Lozano and Stephens, 2010) or when allowing for the goal levels to vary (Latham and Yukl, 1976). However, there are also studies that reach opposite findings, either when the goal level is kept constant (Latham and Saari, 1979a; Erez et al., 1985) or when the goal levels are allowed to vary (Latham and Yukl, 1975; Latham et al., 1978; Latham et al., 1982). Locke and Latham (2002) argue that these mixed findings in the literature may be attributed to various factors such as the lack of feedback, failure to measure self-set goals, inability to establish goal commitment, and others (Latham and Yukl, 1975; Erez et al., 1985; Latham et al., 1988). In addition, studies in this literature typically employ real effort tasks, which may introduce signaling effects related to ability or intelligence through workers' high performances or high goals that they set. While signaling aspects might be desirable in certain settings, they are not ideal when studying the isolated impact of goal setting itself, free from the confounding effects of signaling higher ability and/or intelligence.

3 Theoretical Framework

In this section, we study a principal-agent problem with unobserved effort in a one-shot game. We rely on Subgame Perfect Nash Equilibrium (SPNE) to solve for optimal goal and effort levels in three different scenarios: (i) when there is no goal at all, (ii) when the worker sets a goal, (iii) when the employer sets a goal. Proofs of all our theoretical results are presented in the Appendix.

We start by introducing our benchmark model, which we call "NoGoal." There are two players: a risk-neutral employer (principal) and a worker (agent). The worker selects a costly effort level $e \in [0,1]$. The cost of effort to the worker is given by $c(e) = \frac{1}{2}e^2$.[4] The effort, together with a random shock ε that is drawn from a uniform distribution on $[-1,1]$, determines output y. Formally, $y = e + \varepsilon$. The employer observes only the output, but not the effort the worker has selected. In the end, the employer gives feedback f to the worker based on the observed output. Since this is a one-shot game, there is no reason for the employer to have strategic considerations when giving feedback to the worker. Hence, the feedback function is the employer's truthful reflection of the observed output. For simplicity, we assume the feedback function to be $f(y) = y$.

The employer receives a flat endowment $K > 0$ and output y as their earnings.[5] Out of these earnings, the employer pays a flat wage $w > 0$ to the worker. Formally, the employer's utility Π is as follows.[6]

[3] In participative goal setting, it is typical that the experimenter or employer directs the worker to set a difficult but attainable goal. Since our focus is on self-set goals, we refrain from providing such a direction when workers set goals for themselves.

[4] While in the text we focus on this specific cost function for simplification purposes, in the Appendix we prove all our results under a more general cost function $c(e) = \frac{1}{2}e^x$ where $x > 1$.

[5] While a positive endowment is not essential for our theoretical results, it makes the theoretical framework consistent with the experimental set-up we designed in a way to guarantee that subjects incur no monetary losses.

[6] To simplify the representation of the employer's utility, we exclude the utility they receive from feedback. One can easily modify the employer's utility function such that giving a truthful feedback will be optimal. For example, suppose $\Pi(y, w) = K + y - w + s\mathbb{I}$ where $s \in \mathbb{R}_{++}$ and $\mathbb{I} = 1$ if the feedback is truthful and $\mathbb{I} = 0$ otherwise. In order to gain the positive additive utility in this one-shot game, the employer will prefer to give feedback that is a truthful reflection of their feelings based on observed output.

$$\Pi(y, w) = K + y - w$$

The worker derives extrinsic utility from their flat wage, net of the cost of effort they have selected. Moreover, the worker derives intrinsic utility from the employer's feedback. This feedback utility is weighted by $a \in (0,1]$ to reflect the fact that a worker might not fully internalize the employer's feedback. Formally, the worker's utility u is as follows.

$$u(w, e, y) = w - c(e) + ay$$

Note that, while we interpret ay as the worker's utility from feedback, our model is general enough to accommodate alternative behavioral motivations. For example, ay might also be interpreted as utility derived from altruism or social image concerns. To simplify the presentation, we focus on the feedback utility interpretation.

We now solve for the worker's optimal effort level. Proposition 1 provides the effort level the worker chooses in an SPNE.

Proposition 1. *When there is no goal, the optimal effort is*

$$e^*_{NoGoal} = a$$

Proposition 1 states that, in the absence of a goal, the worker's optimal effort equals the feedback coefficient a. Therefore, the optimal effort is positive and, secondly, the more the worker cares about feedback, the more effort they exert.

We now introduce an initial step of *goal setting* into the benchmark game. Specifically, at the outset of that game, either the worker or the employer sets a goal $g \in [0,2]$ for the output. Then, the benchmark game is played as usual. The goal set here is wage-irrelevant, that is, whether the goal is achieved does not yield any monetary consequences to any party.

We assume that the worker receives an intrinsic reference-dependent utility v where the goal g serves as the reference point. To make the exposition simpler, we assume standard reference-dependent preferences. Specifically,

$$v(y, g) = \begin{cases} (y-g)^{0.5} & if\ y \geq g \\ -(g-y)^{0.5} & if\ y < g, \end{cases}$$

Our results are robust to allowing for the v function to exhibit loss aversion as in Tversky and Kahneman (1991). In the Appendix, we conduct our theoretical analyses under that generalization.[7] All our results hold independently of the loss aversion parameter.

Considering both extrinsic and intrinsic utilities, the worker's utility in the presence of a goal is:

$$U(w, e, y, g) = w - c(e) + ay + bv(y, g)$$

[7] This is following Heath et al. (1999) who show in an experimental study that goals serve as reference points and affect outcomes in ways that are consistent with Tversky and Kahneman's (1991) loss averse value function, and others in the literature that model intrinsic effects of goals via loss aversion (e.g., Wu et al., 2008, Corgnet et al., 2015, 2018, and Brookins et al., 2017).

Note that the value function v is weighted by $b \in (0,1]$ to allow for varying degrees of reference dependence. Throughout the text, we further assume $a + b < 1$. When this sum is larger than or equal to one, the worker already has high intrinsic motivation. This would induce the worker to exert the highest possible effort independent of whether a goal exists and its level. Therefore, this is not an interesting case for studying the effects of goal setting. Nevertheless, in the Appendix, we work with a more general setting and solve our model for any $a, b \in (0,1]$.[8]

For simplification purposes, we also assume that the employer uses "goals" *only* as a tool to influence the worker's effort choice—the employer's utility is not reference-dependent. Hence, in the presence of a goal, the utility function of the employer is the same as in the benchmark model.[9]

We first concentrate on the scenario in which the goal is set by the worker and call it "WorSet". Proposition 2 below identifies the optimal goal and effort levels in an SPNE.

Proposition 2. *When the goal is set by the worker,*

1. *the optimal goal is* $g^*_{WorSet} = 0$
2. *the optimal effort is*

$$e^*_{WorSet} = \hat{e}, \quad \textit{where } \hat{e} \textit{ satisfies } -2\hat{e} + 2a + b((1-\hat{e})^{0.5} + (1+\hat{e})^{0.5}) = 0$$

Proposition 2 shows that it is optimal for the worker to select the lowest possible goal, namely zero. This is because the worker receives positive utility upon achieving the goal and negative utility upon failing to achieve it. While it may not be clear at first sight, optimal effort function is also quite intuitive in the sense that the optimal effort increases with the feedback coefficient a and with the reference-dependent value function coefficient b (see Figure A.1 in the Appendix).

Finally, we study the scenario in which the goal is assigned by the employer and call it "EmpSet". Proposition 3 below provides the optimal goal and effort levels in an SPNE. Here, the employer strategically sets the goal to make the worker exert more effort, and the optimal goal and effort levels are the same.[10]

Proposition 3. *When the goal is set by the employer,*

1. *the optimal goal is*

[8] As the Appendix shows, our results are robust to solving the model for any $a, b \in (0,1]$. Note that in the general case, the highest possible effort can be selected by the worker in some cases and, therefore, in the comparison of optimal goal and effort levels across treatments, some of the strict inequalities in the text are then replaced with weak inequalities in the Appendix.

[9] This assumption is consistent with our experimental data when the worker sets a goal. However, the employer's utility function seems to be reference-dependent when the employer sets a goal. In Section 6 and Appendix B, we modify this assumption to incorporate a reference-dependent utility when the employer sets the goal. We show that our main qualitative results still hold.

[10] As can easily be seen, the worker's optimal effort increases with a and b here as well.

$$g^*_{EmpSet} = a + b$$

2. *the optimal effort is*

$$e^*_{EmpSet} = a + b$$

The main question we ask in this paper is whether it is possible to rank goal and effort levels across three settings: NoGoal, WorSet, and EmpSet. Proposition 4 shows that one can do this independent of the parameters.

Proposition 4. *Goal and effort levels across settings can be compared formally as:*

1. $g^*_{EmpSet} > g^*_{WorSet} = 0$
2. $e^*_{EmpSet} > e^*_{WorSet} > e^*_{NoGoal} > 0$

Proposition 4 shows that, independent of the model's parameters, both goal and effort levels are higher when the goal is set by the employer rather than the worker. Moreover, the optimal effort level is higher when there is a goal compared to when there is not.

In Section 4.1, we develop an incentivized laboratory experiment to formally test our main theoretical result, Proposition 4, and compare goal and effort levels experimentally among NoGoal, WorSet, and EmpSet treatments.

4 Experiment

4.1 Design and Procedures

We conducted a computer-based experiment at the experimental laboratory of Ozyegin University in Turkey during March – April 2019. The computer program was coded using z-Tree (Fischbacher, 2007). Subjects were recruited via Sona Systems from the participant pool at Ozyegin University. A total of 168 subjects participated in our experiment.

The experiment was composed of two parts where Part 1 was a *worker-employer game* to play and Part 2 was a questionnaire to fill out. Upon the arrival of subjects into the lab, the experiment started with reading Part 1's instructions out aloud to ensure common knowledge and subjects' exposure to complete instructions. Then, subjects were asked to take a quiz to test their understanding of the game. After receiving the answer key, participants were given time to compare it with their own answers and were allowed to ask questions, if any. Each subject's question was answered individually. Then, subjects played the worker-employer game. After Part 1 was over, instructions for Part 2 (questionnaire) were read out loud and the experiment ended after subjects completed this part.

The experiment did not use any experimental currencies. All of the earnings were in Turkish Lira (TL). At the end of the experiment, each subject was paid a show-up fee of 10 TL and their earnings from Part 1. Subjects did not earn any money from the quiz or questionnaire.

The average total payment per subject was 31 TL.[11] Subjects received their payments in private. The entire process lasted approximately 90 minutes.

To simplify our experiment, we use a discrete setting rather than a continuous one as in the theory. In addition, because we want to provide a clean test of our theory by minimizing the confounding factors, we use a *chosen effort* task instead of a real effort task. A chosen effort task guarantees the use of a particular cost function that comes from the theory so that we can form predictions for our experimental study based on our theory. Imposing the same cost function across all subjects leaves the experimental design agnostic to ability differences.[12] In addition, keeping the cost function the same over repetitions ensures that any observed changes in the effort level over periods cannot be attributed to subjects getting more experienced in the task. Finally, since a chosen effort task is relatively quick, we can maximize the number of observations we collect.

The worker-employer game is played between a worker and an employer for 14 rounds. The existence of multiple rounds is important to capture learning effects. Before rounds start half of the subjects in a session are randomly assigned the role of a worker and the others are assigned the role of an employer, and these roles are fixed until the end of all rounds. Then, in each round, a worker and an employer are randomly matched to play the game and each specific match occurs only once throughout the experiment. In other words, our experiment uses the *perfect stranger* design. This design guarantees that each round gives us a one-shot game (as analyzed theoretically in Section 3). Subjects' earnings from Part 1 are determined by the random selection of one round at the end of the experiment.

The worker-employer game in a round starts with each worker and employer receiving an endowment of 18 (TL) and then four stages follow. In **Stage 1**, the worker chooses their *effort* (e) from the set $\{0, 6, 12, 18\}$ and it is unobservable to the employer.[13] Moreover, effort is costly to the worker and the cost is convex. Subjects are provided with the following cost table:[14]

Table 2. Effort Levels and Their Costs

e	0	6	12	18
$c(e)$	0	1	4	9

The worker's earnings are $18 - c(e)$. In **Stage 2**, a number is randomly drawn from $\{-18, -12, -6, 0, 6, 12, 18\}$ where each number is equally likely. The total output, y, is the sum of the effort and the random number. The employer's earnings are $18 + y$. In **Stage 3**, each worker and employer are shown tables with different pieces of information. The employer is shown the total output and their own earnings from that round. So, the employer knows only the resulting total output, but not the effort level the worker has chosen or the realized random

[11] In March-April 2019, the average exchange rate was about \$1=5.60 TL. The opportunity cost of students in our subject pool was approximately 7 TL per hour. In addition, net *daily* minimum wage in Turkey in 2019 was 67.35 TL.

[12] In addition, a high performance in a chosen effort task does not create any signaling effect regarding workers' ability (such as intelligence and attention).

[13] Note that effort choice set in the experiment is discrete with only four possible options. Moreover, the range for choices is between 0 and 18, instead of between 0 and 1 as in the theory. These together make the instructions much simpler and the differences between choices more salient in the experiment.

[14] To keep the theoretical and experimental settings equivalent to each other, the cost function in the experiment is adjusted accordingly. We use the cost function $c(e) = \frac{1}{36}e^2$.

number. On the other hand, the worker is shown all the details: random number and total output, the employer's earnings as well as their own earnings from that round. Finally, in **Stage 4**, the employer sends feedback to the worker by choosing an emoji among angry (😡), sad (☹️), neutral (😐), happy (🙂), bravo (👏), and the game ends.

Our experimental design consists of three treatments. We follow a *between-subjects* design. Subjects are randomly distributed across different treatments. While Stages 1-4 are common in all arms, treatments differ depending on whether a goal on total output level is set prior to Stage 1 and, if so, by whom. In Treatment NoGoal, no goal is set, and the game is played between a worker and an employer with Stages 1-4 directly. This is our benchmark. In Treatment EmpSet, there is a **Stage 0** where the employer chooses a goal on total output from the set $\{0, 6, 12, 18, 24, 30, 36\}$, the worker is informed regarding the chosen goal level, and then Stages 1-4 are played between the two as usual. In Treatment WorSet, in **Stage 0**, it is the worker who sets a goal on total output from the set $\{0, 6, 12, 18, 24, 30, 36\}$ and the employer is informed regarding the chosen goal level, and then Stages 1-4 are played between the two. We conducted two sessions for each treatment and each session consisted of 28 participants. A summary of treatments is provided in Table 3.

Table 3. Summary of Treatments

	NoGoal	WorSet	EmpSet
Total # of Subjects	56	56	56
Total # of Workers	28	28	28
Total # of Employers	28	28	28
Stages Played	1-4	0-4	0-4
Is There a Goal?	No	Yes	Yes
Who Sets the Goal?	--	Worker	Employer
Total # of Goal Observations	--	392	392
Total # of Effort Observations	392	392	392

4.2 Hypotheses

We investigate five main hypotheses which we form based on our theoretical analyses in Section 3. Specifically, Proposition 4 gives rise to all our hypotheses below.

We first concentrate on goal levels. Our theory predicts that it is optimal for the worker to set the lowest possible goal. Based on this theoretical prediction, our first hypothesis is given as follows.

Hypothesis 1. The goal level in WorSet will be zero.

Our second hypothesis compares the goal levels when set by the worker and the employer.

Hypothesis 2. The goal level in EmpSet will be higher than the one in WorSet.

Next, we focus on effort levels. Our third hypothesis states that, independent of the treatment, the worker always exerts a positive effort level.

Hypothesis 3. The effort level in all treatments will be positive.

Then, we compare effort levels across our treatments. In line with our theoretical predictions, we hypothesize that effort will be the highest when the employer sets a goal and this is stated in Hypothesis 4. Finally, Hypothesis 5 says that the worker exerts a higher effort when the goal is self-set compared to when there is no goal at all.

Hypothesis 4. The effort level in EmpSet will be higher than those in WorSet and NoGoal.

Hypothesis 5. The effort level in WorSet will be higher than that in NoGoal.

5 Experimental Findings

5.1 Main Findings

In this section, we study first goal levels and then effort levels observed in our treatments.[15] Table 4 shows the mean and median goals (as well as standard errors in parentheses) in each treatment.

Table 4. Summary Statistics for Goals

	Goals		No. of obs.
	Mean	Median	
WorSet	14.02	12	392
	(0.61)		
EmpSet	23.08	24	392
	(0.50)		

Note: Standard errors in parentheses.

The mean (median) goal is 23.08 (24) when goals are set by employers while the mean (median) goal is 14.02 (12) when goals are set by workers. Wilcoxon Signed-Rank tests reject the hypotheses that median goals in WorSet and in EmpSet are each zero (p-value = 0.00 for each test). A Mann-Whitney test rejects the hypothesis that goals in Treatments EmpSet and WorSet come from the same distributions (p-value = 0.00). Figure 1 displays the histogram of goals in each treatment.

[15] Throughout the paper, to be consistent in all analyses we do, we always report two-sided p-values. Note that, however, our hypotheses are appropriate for one-sided testing. If we were to report one-sided p-values corresponding to our hypotheses, statistical significance of our results would be stronger.

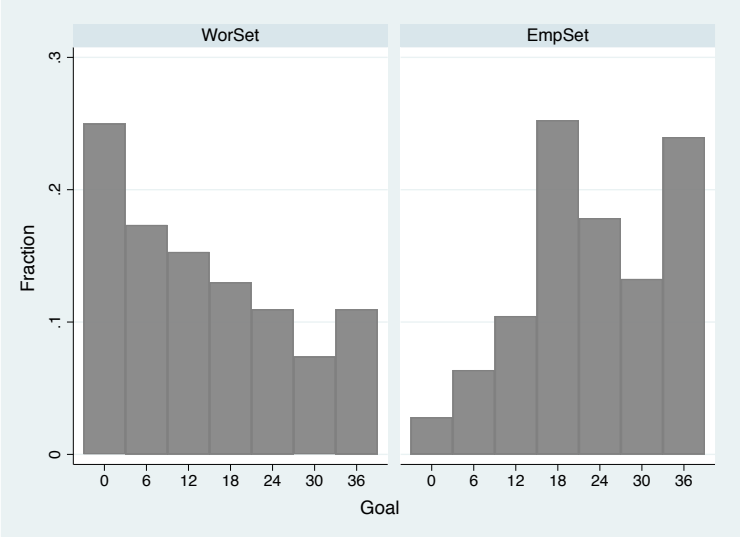

Figure 1. Histograms of Goals in Treatments

In addition, to study whether goal levels in the two treatments are different, we use regression analyses (Table 5). Unless otherwise noted, throughout the paper when we conduct regression analysis, we use robust standard errors clustered at the subject level.[16] The independent variable EmpSet is a dummy that takes value 1 if the treatment is EmpSet. Our similarly formed dummy, WorSet, is left out as the base category. The variable Round indicates the round that the game is played. Specifications (1), (2), and (3) are OLS analyses where the dependent variable Goal denotes goal levels chosen by employers or workers in each round.[17] Note that the constant in the OLS regression in Specification (1) captures the average goal level in the WorSet treatment and is significantly different than zero. This finding as well as Wilcoxon Signed-Rank test reported above contradict to Hypothesis 1. We discuss possible reasons behind this deviation in Section 6. OLS Regressions also reveal that goals in EmpSet are higher than in WorSet, and the difference is significant at the 1% level, both with and without control variables. This is consistent with Hypothesis 2. Finally, OLS analyses find no significant impact of Round (see also Figure 2).

Table 5. Regressions to Analyze Goals

	OLS Regression			Logistic Regression		
Dependent Var:	Goal			PositiveGoal		
	(1)	(2)	(3)	(4)	(5)	(6)
EmpSet	9.06***	9.06***	8.85***	11.55***	11.55***	11.68***
	(1.83)	(1.83)	(1.80)	(6.42)	(6.42)	(6.30)
Round		-0.02	-0.02		0.99	0.99
		(0.10)	(0.10)		(0.03)	(0.03)
Constant	14.02***	14.14***	23.19**	3.00***	3.18***	301.79*
	(1.34)	(1.45)	(11.24)	(0.90)	(1.01)	(1008.44)
Controls Added	No	No	Yes	No	No	Yes

[16] We cluster at the subject level because an employer and a worker never match together more than once and there is no direct interaction within workers or within employers.
[17] We conduct OLS regressions due to the ease of interpretation. However, our results are robust to ordered logit as well.

N	784	784	784	784	784	784
R^2	0.14	0.14	0.17	-	-	-

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, are in parentheses. Logistic Regressions (3) and (4) report odds ratios. Added controls are Age and Female.

While workers in WorSet treatment do not pick the lowest goal as predicted by Hypothesis 1, the fraction of zero goals is much higher in WorSet than in EmpSet, as can be seen in Figure 1. To analyze this formally, we conduct logistic regression analyses (see Specifications (4), (5), and (6) in Table 5). The dependent variable PositiveGoal is a dummy variable which takes 1 if goals chosen by employers or workers are positive, and 0 otherwise. Results confirm that the positivity of goals is significantly different (with and without control variables) in WorSet and EmpSet treatments. Odds that goals are positive are statistically significantly higher (or equivalently, odds that goals are zero are significantly lower) when goals are set by employers rather than workers themselves. All these results regarding observed goal levels are summarized in Result 1.

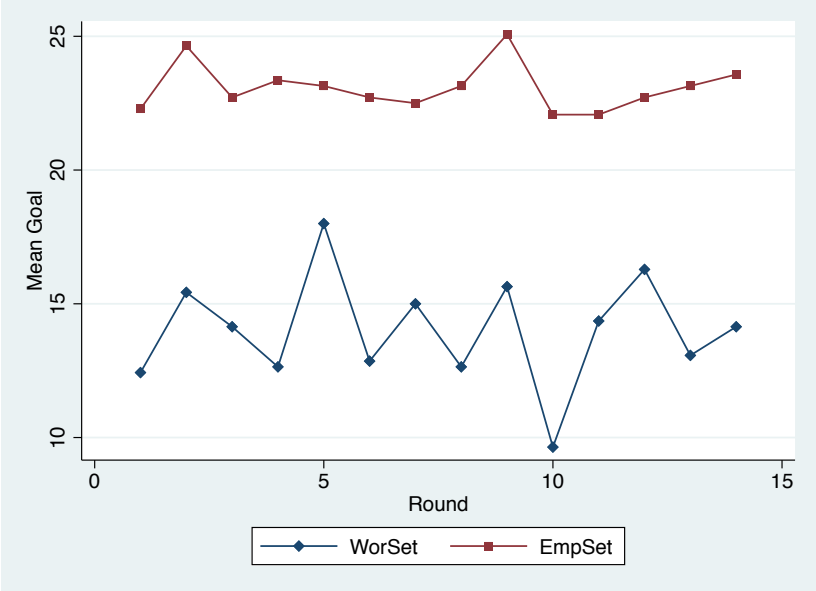

Figure 2: Mean Goal over Rounds in Treatments

Result 1. *While both workers and employers set positive goals on average, employers set significantly higher goals than workers do. In addition, the odds of goals being positive are significantly higher when employers set goals relative to when workers set goals.*

We now study effort levels. Table 6 shows the mean and median effort levels (as well as standard errors in parentheses) in each treatment.

Table 6. Summary Statistics for Effort

	Effort		
	Mean	Median	No. of obs.
NoGoal	5.92	6	392
	(0.32)		
WorSet	5.45	6	392
	(0.32)		
EmpSet	8.04	6	392
	(0.31)		

Note: Standard errors in parentheses.

In the benchmark treatment NoGoal, the mean (median) effort exerted by workers is 5.92 (6). The mean (median) effort is 5.45 (6) when workers set goals and 8.04 (6) when goals are set by employers. Wilcoxon Signed-Rank tests reject the hypotheses that median effort in each treatment is zero (p-value = 0.00 for each test). While a Mann-Whitney test cannot reject the same distribution hypothesis for Treatments WorSet and NoGoal (p=0.657), it rejects the hypotheses that effort levels in Treatments EmpSet and WorSet (p-value = 0.048) and effort levels in Treatments EmpSet and NoGoal (p-value = 0.068) come from the same distributions. Hence, only employers' goal setting makes a difference in workers' effort choices. Histograms of effort levels are depicted in Figure 3.

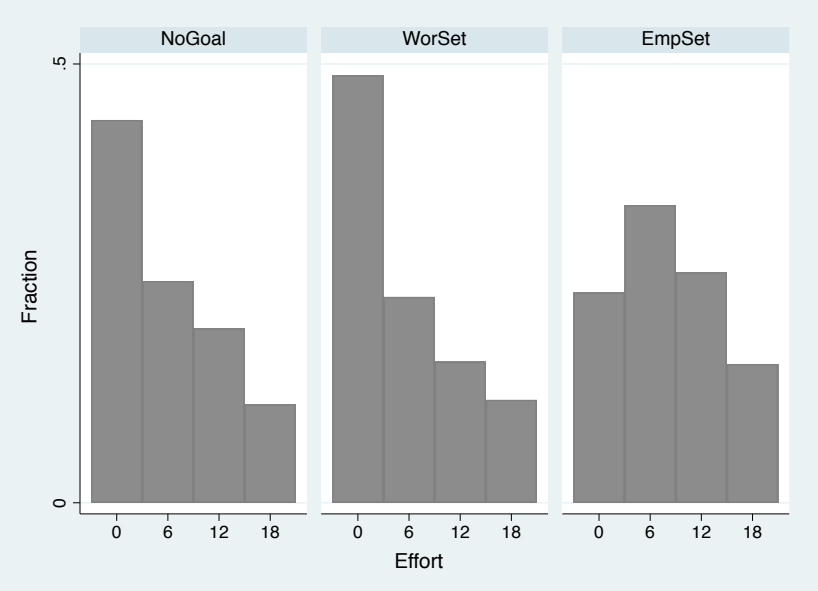

Figure 3. Histograms of Effort in Treatments

We now conduct regression analyses to study effort levels in more detail (Table 7). Specifications (1), (2), and (3) are OLS analyses where the variable Effort denotes effort levels picked by workers in each round. WorSet is again left out as the base category and we use dummy variables NoGoal and EmpSet to specify other treatments. Note that the constant in the OLS regression in Specification (1) captures the average effort level in the WorSet treatment and is significantly different than zero. While not shown here, we have also confirmed that effort levels in NoGoal and EmpSet are significantly different than zero (p-value = 0.00 for

both). This finding as well as Wilcoxon Signed-Rank tests reported above for all treatments are in line with Hypothesis 3.

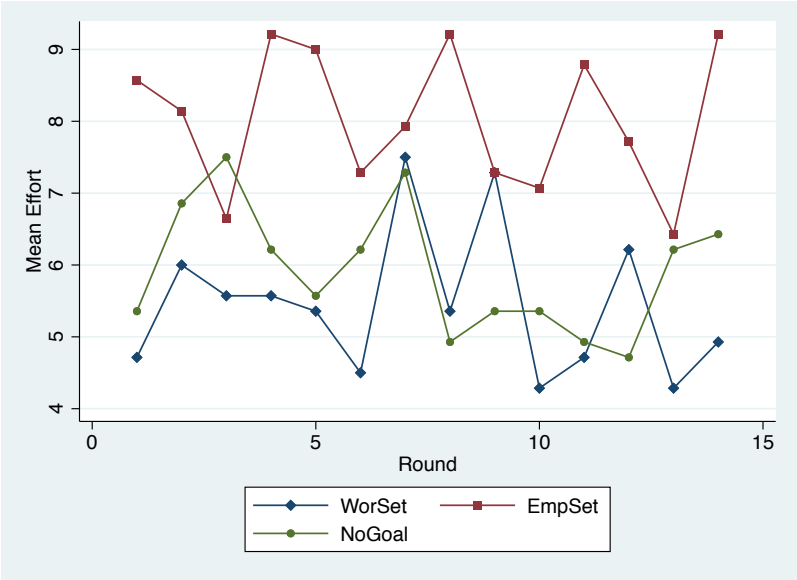

Figure 4: Mean Effort over Rounds in Treatments

Table 7. Regressions to Analyze Effort

	OLS Regression			Logistic Regression		
Dependent Var:	Effort			PositiveEffort		
	(1)	(2)	(3)	(4)	(5)	(6)
NoGoal	0.47	0.47	0.49	1.23	1.23	1.24
	(1.17)	(1.17)	(1.21)	(0.47)	(0.47)	(0.48)
EmpSet	2.59**	2.59**	2.55**	3.01***	3.02***	3.00***
	(1.03)	(1.04)	(1.01)	(1.05)	(1.05)	(1.01)
Round		-0.04	-0.04		0.98	0.98
		(0.04)	(0.04)		(0.01)	(0.01)
Constant	5.45***	5.78***	9.47**	1.05	1.21	4.63
	(0.82)	(0.86)	(4.00)	(0.28)	(0.32)	(7.59)
Controls Added	No	No	Yes	No	No	Yes
N	1176	1176	1176	1176	1176	1176
R^2	0.03	0.03	0.04	-	-	-
Wald tests for specification 1 (specification 2) (specification 3) (specification 4) (specification 5) (specification 6)						
H_0 : NoGoal = EmpSet, p-value = 0.046 (0.046) (0.057) (0.011) (0.011) (0.011)						

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, are in parentheses. Logistic Regressions (4)-(6) report odds ratios. Added controls are Age and Female.

The variable Round and control variables are additionally included in the analyses in Specification (2) and Specification (3), respectively. We find that, with and without control variables, effort levels in EmpSet are significantly higher than those in WorSet and NoGoal. This is consistent with Hypothesis 4. The same analysis shows that effort levels in WorSet are not significantly different than those in NoGoal. This is not in line with our Hypothesis 5. We

provide a discussion about this deviation from theory in Section 6. Finally, OLS analysis finds no significant impact of the variable Round on effort levels (see also Figure 4).

From Figure 3, it is evident that the fraction of zero effort is smaller in EmpSet compared to the two other treatments. To analyze this, we also run logistic regressions. In Specifications (4), (5), and (6) of Table 7, PositiveEffort is a dummy variable which takes 1 if effort levels are positive and 0 otherwise. Results confirm our observation from Figure 3 (with or without control variables). Odds of providing positive effort are significantly higher (or equivalently, odds of providing zero effort are significantly lower) in EmpSet than in WorSet and NoGoal, whereas the odds in the latter two treatments are not significantly different from each other. Our experimental findings regarding effort level comparisons are summarized in Result 2.

Result 2. *Effort levels (as well as the odds of providing positive effort) are the highest when goals are set by employers, and not significantly different from each other when workers set goals and when there is no goal at all.*

To summarize, our main findings show that effort and goal levels are significantly the highest when employers set goals, and effort levels are always positive. These are consistent with Hypotheses 2, 3, and 4. However, in contrast to Hypotheses 1 and 5, workers set positive goals (not the lowest possible level) and effort levels are not significantly different when workers set goals and when there is no goal. In Section 5.2, we delve into analyzing effort and goal levels in more detail so that we can grasp a better understanding of our experimental observations. Then in Section 6, we improve our theoretical framework based on the results discussed in Sections 5.1 and 5.2.

5.2 Additional Findings

As shown in Section 5.1, both goal and effort levels are higher in EmpSet than in WorSet. Now, the question is: do we observe a higher effort in EmpSet just because goals are higher there (indirect effect) or does the mere fact that employers are setting goals also have an impact on effort levels on its own (direct effect)? To answer this question, we focus on WorSet and EmpSet treatments, and carry out a two-level mediation analysis via generalized structural equation modeling (GSEM) shown in Table 8. We assume that effort levels may be affected by the variables EmpSet, Goal, and Round, and we introduce a latent variable at workers' subject level. Moreover, we assume that goals may be affected by EmpSet and Round, and we introduce a latent variable at the level of subjects who set goals.

Table 8. Two-Level GSEM to Analyze Direct and Indirect Effects of Goal on Effort

Dependent / Indep Var	(1)	(2)
Effort /		
Goal	0.10***	0.10***
	(0.02)	(0.02)
EmpSet	1.65*	1.66*
	(0.99)	(0.95)

Round	-0.03	-0.03
	(0.04)	(0.04)
Constant	4.21***	15.32***
	(0.81)	(4.85)
Goal /		
EmpSet	9.06***	8.85***
	(1.81)	(1.82)
Round	-0.02	-0.02
	(0.08)	(0.08)
Constant	14.14***	23.19**
	(1.42)	(11.71)
Controls Added	No	Yes
N	784	784

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Standard errors, clustered at the subject level, are in parentheses. Added controls are Age and Female.

Table 8 analyzes two channels through which effort might be affected. First, goals are significantly higher in EmpSet than in WorSet, and in turn higher goals are associated with significantly higher effort. This is the indirect effect of the treatment on effort and is significant at the 1% level ($p = 0.00$). In addition, EmpSet has a positive direct effect on effort: the mere fact that employers are setting goals leads to an increase in effort. This direct effect is marginally significant ($p = 0.08$). The total effect of EmpSet on effort is also positive: effort levels are significantly higher by a total of 2.57 ($p = 0.007$) when goals are set by employers rather than workers. This corresponds to a total of 47.15% increase when employers set goals compared to when workers set goals. 0.92 (16.88%) of this total effect comes from the indirect effect and 1.65 (30.27%) of it comes from the direct effect.

Result 3. *Goal setting has both direct and indirect effects on effort. Both effects are positive and large in magnitude.*

Section 5.1 demonstrated that, in settings like ours, it is best if goals are set by employers. Can this research also inform us about how employers should set goals? Our purpose now is to gain a deeper understanding of the relation between effort and goal levels in the EmpSet treatment. Figure 5 depicts that mean effort increases with goals until the goal reaches 30, but it then declines when the goal is further increased to 36. This is consistent with our model which predicts a positive relationship between effort and goal initially, and then a decline in effort with goals (see Claim 2 in the proof of Proposition 3 in the Appendix).

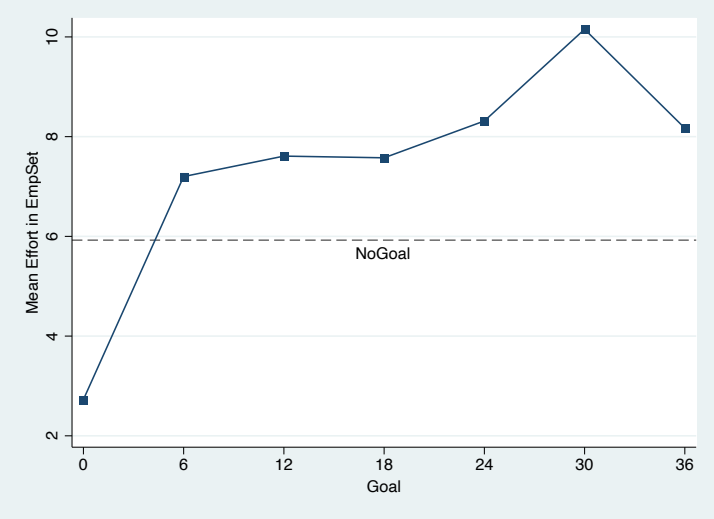

Figure 5. Mean Effort over Goal for Treatment EmpSet

Concentrating on the EmpSet treatment, we run OLS regressions with and without control variables (Table 9). Effort is the dependent variable; Goal and Round are independent variables, defined as before. Specifications (1) and (2) find no significant overall impact of goals on effort. However, things change when we additionally include in the analyses the dummy variable Goal36 which takes value 1 if employers set the maximum possible goal (36) and takes 0 for any other goal level. Specifications (3) and (4) reveal that higher goals lead to significantly higher efforts but, consistent with our theory, increasing the goal to 36 backfires. In particular, we see that the motivational effect of goals on efforts either disappears or reverses when the goal level is further increased from 30 to 36 (see also Table A.1 in Appendix A for a robustness check). Therefore, for goals to be effective, employers should not set them too high as they may discourage workers.

Result 4. *Effort significantly increases with the goal unless the employer sets it too high.*

Table 9. OLS Regressions to Analyze the Relationship between Effort and Goal in Treatment EmpSet

Dependent Var: Effort in EmpSet	(1)	(2)	(3)	(4)
Goal	0.08	0.08	0.16***	0.15**
	(0.05)	(0.05)	(0.06)	(0.06)
Round	-0.03	-0.03	-0.03	-0.03
	(0.07)	(0.07)	(0.06)	(0.07)
Goal36			-2.48**	-2.21*
			(1.04)	(1.08)
Constant	6.41***	21.23***	5.26***	19.92***
	(1.23)	(4.73)	(1.15)	(4.93)
Controls Added	No	Yes	No	Yes
N	392	392	392	392
R^2	0.02	0.10	0.03	0.12

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, are in parentheses. Added controls are Age and Female.

Finally, we analyze the employer's feedback in each treatment and whether/how it relates to other variables in our experiment. We define the variable Feedback such that it takes a value of 0 if the emoji employers send stands for angry, 1 if sad, 2 if neutral, 3 if happy, and 4 if bravo.[18] Note that this was the same order (from left to right) we presented emojis to subjects in the experiment. Table 10 provides summary statistics for employers' feedback.

Table 10. Summary Statistics for Feedback

	Feedback		
	Mean	Median	No. of obs.
NoGoal	1.96	2	392
	(0.07)		
WorSet	2.10	2	392
	(0.07)		
EmpSet	2.14	2	392
	(0.07)		

Note: Standard errors in parentheses.

In all treatments, the median feedback is 2. The mean feedback provided by employers is 1.96 in NoGoal, 2.10 in WorSet, and 2.14 in EmpSet. A Mann-Whitney test rejects the same distribution hypothesis for Treatments EmpSet and NoGoal at the 10% significance level (p=0.09), but cannot reject it for other pairwise comparisons of treatments (p=0.23 for NoGoal and WorSet, p=0.70 for WorSet and EmpSet).

To analyze the connection between feedback and other variables, we run OLS regressions for each treatment separately (Table 11). In all these analyses, while Feedback is always the dependent variable, the set of independent variables varies. Total Output and Round are the only independent variables in the analyses of NoGoal treatment (Specifications (1) and (2)). In the analyses of EmpSet and WorSet treatments (Specifications (3) to (6)), the additional variable Gap is introduced to analyze whether feedback depends on how large total output is relative to the goal. Formally, we define Gap as Total Output minus Goal.

In all treatments, we find that Total Output has a positive significant effect on employers' feedback: the higher the resulting total output, the better feedback employers send to workers. The effect of Gap on feedback, however, differs depending on who sets goals. Employers' feedback become significantly better as Gap increases when employers assign goals, and feedback is not affected by Gap when workers set goals.[19]

Table 11. OLS Regressions to Analyze Feedback

	NoGoal		EmpSet		WorSet	
Dependent Var: Feedback	(1)	(2)	(3)	(4)	(5)	(6)
Total Output	0.07***	0.07***	0.05***	0.05***	0.07***	0.07***

[18] Our results in this section are robust to defining Feedback as 0 for neutral, -1 for sad or angry, and 1 for happy or bravo.
[19] Goal level is not included in the regression analyses in Table 11 due to multicollinearity. Table A.2 in Online Appendix A shows that when goals are set by workers, goal level has no significant impact on employers' feedback.

	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Round	0.00	0.00	-0.02	-0.02	-0.03**	-0.03**
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
Gap			0.02***	0.02**	0.01	0.01
			(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.51***	0.90	2.25***	2.84**	1.99***	2.06**
	(0.14)	(0.75)	(0.24)	(1.14)	(0.18)	(0.76)
Controls Added	No	Yes	No	Yes	No	Yes
N	392	392	392	392	392	392
R^2	0.51	0.51	0.45	0.46	0.58	0.59

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, are in parentheses. Added controls are Age and Female.

Result 5. *In all treatments, employers send more positive feedback as total output increases. In addition, the gap between output and goal has a significant (and positive) effect on employers' feedback only when employers set goals.*

As indicated in Result 5, total output has a strong and positive effect on feedback. This is consistent with our theoretical assumption regarding feedback. On the other hand, in the experiment, how total output levels compare relative to goals are observed to have a significant (positive) effect on employers' feedback when employers set goals and this is not in line with our theoretical assumption. We will discuss this further in Section 6.

6 Discussion

Recall our findings that employers set higher goals than workers do, and workers exert the highest effort when employers set goals. These align perfectly with our theoretical predictions. However, we also observe some deviations from our other predictions. In this section, we highlight these deviations, explore potential reasons behind them, and discuss how we can adjust our theoretical model based on the insights we gained from our experiment. For a formal construction of the modified model introduced in this section and its proofs, please refer to Online Appendix B.

Our experimental findings deviate from our main hypotheses in two specific aspects. First, observed effort levels in WorSet and NoGoal are not significantly different from each other (Result 2), whereas our theory predicts that effort levels in the WorSet treatment would surpass those in the NoGoal treatment (Hypothesis 5). Second, workers, on average, set positive goals in the experiment (Result 1), whereas our theoretical model predicts that workers should set zero goals in the WorSet treatment (Hypothesis 1).

One potential explanation for the first deviation is that our assumption regarding the absence of a reference point in the NoGoal treatment is incorrect. It is plausible that the worker always maintains a reference goal level in mind, even when *not* explicitly asked to report it. If the worker possesses a positive reference goal level, their optimal effort level would surpass the level predicted by our original theoretical model. Furthermore, if the reference points in the NoGoal and WorSet treatments are identical or similar, optimal effort levels in these two treatments would also be comparable.

One might ask why the worker has a positive reference goal in the NoGoal treatment and why this reference point is identical or similar to that in the WorSet treatment. The presence of a positive reference goal in the NoGoal treatment could stem from the worker's belief regarding what constitutes an acceptable level of output. This same goal level may then become a reasonable target even in the WorSet treatment, particularly if the worker has self- or social-image concerns.[20] In other words, it is plausible that in the WorSet treatment, the worker sets the goal truthfully, revealing the reference goal level in mind, or at the very least, being heavily influenced by what they consider to be an acceptable goal level. This explanation is consistent with both the WorSet and NoGoal treatments sharing the same or similar reference goal levels, as well as the worker setting a positive goal in the WorSet treatment, thus accounting for the second deviation observed.

In Online Appendix B, we update our original model and prove that it is possible to explain the observed deviations in our experiment. Specifically, if we consider a modification where the worker, in both the NoGoal and WorSet treatments, employs the same or similar reference goal levels (derived from their belief regarding what constitutes an acceptable level of output) and exhibits reference-dependent behavior when determining their effort level, then we can account for both of the main deviations discussed above.

Now, it is natural to ask which goal level will serve as the reference point in the EmpSet treatment. It is not unreasonable to expect that the employer, for strategic reasons, will set a higher goal than the reference goal in the worker's mind. Therefore, the actual reference goal level employed in the EmpSet treatment could be either the original reference goal in the worker's mind, or the goal assigned by the employer, or something in between. It is not necessary to make a definitive claim regarding this as the optimal effort in the EmpSet treatment would still be higher than that in the WorSet treatment in any case.

Finally, our experimental findings reveal two additional interesting results that challenge our initial theoretical assumptions, even though they do not affect our main theoretical predictions if we modify these assumptions accordingly. First, we observe that goals have a positive direct impact on effort levels only when goals are set by employers and not by workers (Result 3). This contrasts with our model's assumption that the worker's concern for the gap between output and goal (represented by the b coefficient in our model) is identical in both EmpSet and WorSet treatments. Result 3 can be reflected in our model by assuming b coefficient in the worker's utility to be greater in EmpSet than that in WorSet. Additionally, we discover that feedback in the EmpSet treatment is influenced by both the output and the gap (Result 5). This challenges our theoretical assumption that feedback is solely contingent on the output. Therefore, the employer's feedback function in EmpSet can be modified to depend on both the output and the gap. It is important to note that these modifications do not affect the qualitative predictions of our theory regarding goal and effort level comparisons (as shown in Appendix B).[21]

[20] In a survey conducted at the end of the experiment, subjects are asked to rate their self- and social-image concerns in life. Analyzing these ratings, we find that in the WorSet treatment, goal levels and workers' image concerns are positively correlated. The correlation is 0.19 for social-image and 0.15 for self-image.

[21] Note that modifications based on Results 3 and 5 are also consistent with each other. Because the worker not only cares about the gap (intrinsically) but also may infer that the employer's feedback is conditional on the gap in EmpSet but not in WorSet, thereby strengthening the gap's impact (b) on the worker's utility in EmpSet compared to that in WorSet. While it is not clear whether the employer's utility function in EmpSet should also be modified to include utility they could possibly obtain from the gap, qualitative results from our (original or modified) model continue to hold independent of this.

7 Conclusion

In this paper, we propose a game theoretic model and conduct an incentivized laboratory experiment to study how goal levels and their effects on effort levels differ depending on by whom they are set. Ruling out any extrinsic motivation, our work guarantees that any observed effects of goals are due to intrinsic motivation.

In the experiment, while both employers and workers set positive goals on average, employers set higher goals than workers do. We find that effort levels are the highest when employers set goals, but effort levels are not significantly different from each other when workers set goals and when there is no goal at all. The original theory we presented in Section 3, together with some modifications discussed in Section 6, can explain our experimental findings. According to that modified theory, the worker always has a reference goal level in mind and uses the same/similar goal level as their reference when asked to set a goal and when there is no goal at all; and may update that reference when the employer sets a different goal.

Our experimental data gives rise to other additional interesting findings. For example, we show that workers' effort levels are higher when employers set goals because of two reasons: goals are higher there (indirect effect) and employers are the ones who assign goals (direct effect). Therefore, our paper not only provides information on the total effect of goal setting on performance but also disentangles it into direct and indirect effects. Both effects turn out to be positive and large in magnitude. Next, employers' feedback depends on the output and its distance from the goal when employers set goals, whereas it depends only on the output in the presence of self-set goals and in the absence of a goal. Finally, workers' effort levels increase with goals unless employers set goals too high. Therefore, in settings like ours, while it is best for managers to set goals, managers should select goals carefully at levels that are challenging enough but not too high either.

We view our study as an initial step to understanding the full effects of who sets goals in a clean and simple design, possibly at the expense of some degree of realism. To rule out possible confounding effects that may arise due to the nature of the task such as ability differences and possible signaling effects through high performance/goals, our experiment uses a chosen effort task rather than a real effort one. A future research agenda could investigate several different types of real effort tasks and how the type of the real effort task interacts with goal and effort levels.

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APPENDIX

In this section, we prove all our theoretical results under a general case where

1. In all treatments, the cost of effort to the worker is $c(e) = \frac{1}{2}e^x$ where $x > 1$.
2. In treatments where there is a goal (WorSet and EmpSet), we allow for the worker's reference-dependent value function v to exhibit Tversky and Kahneman's (1991) loss aversion ($\lambda > 1$) as well as the standard reference-dependence preference ($\lambda = 1$). Formally,

$$v(y,g) = \begin{cases} (y-g)^{0.5} & if\ y \geq g \\ -\lambda(g-y)^{0.5} & if\ y < g \end{cases}$$

3. For any $a, b \in (0,1]$

Note that the assumptions we make throughout the main text are to simplify the exposition of the paper and gives us a special case of this general model we prove here.

Proof of Proposition 1. When there is no goal, given the flat wage, w, the worker chooses their own effort, e. The worker's problem is to maximize the expected utility with respect to effort. The utility of the worker is $U = w - c(e) + ay$. Then, the expected utility becomes $EU = w - c(e) + ae$ as $y = e + \varepsilon$ and the random shock ε is distributed uniformly on $[-1,1]$. The optimal effort level for the worker is $e^*_{NoGoal} = \underset{e}{\text{argmax}}(w - c(e) + ae)$. Since, $\frac{\partial^2 EU}{\partial e^2} = -\frac{\partial^2 c(e)}{\partial e^2} < 0$ for all parameter values, at the optimal e, we have $e^{x-1} = \frac{2a}{x}$ as long as $e \leq 1$. Then, the optimal effort satisfies $e = \exp\left(\frac{1}{x-1}\ln\left(\frac{2a}{x}\right)\right)$ if $a \leq \frac{x}{2}$ holds. Otherwise, $e^*_{NoGoal} = 1$. So, the worker's optimal effort function is as follows:

$$e^*_{NoGoal} = \begin{cases} \exp(\frac{1}{x-1}\ln(\frac{2a}{x})) & if \quad a \leq \frac{x}{2} \\ 1 & if \quad a > \frac{x}{2} \end{cases}$$

Specifically, when $\lambda = 1$, $x = 2$, and $a + b < 1$, Proposition 1 is proved. ■

Proof of Proposition 2. When the goal is set by the worker, given the flat wage, w, the worker chooses their own effort, e as well as the goal. The worker's problem is to maximize the expected utility with respect to effort and goal. The utility of the worker is $U = w - c(e) + ay + bv(y,g)$ where $v(y,g) = (y-g)^{0.5}$ if $y \geq g$ and $v(y,g) = -\lambda(y-g)^{0.5}$ if $y < g$. The expected utility is $EU = w - c(e) + ae + \frac{b\lambda}{3}\left(-(1+g-e)^{3/2} + (-1+g-e)^{3/2}\right)$ if

$e \leq g-1$ and $EU = w - c(e) + ae + \frac{b\lambda}{3}\left(-(1+g-e)^{3/2} + (1-g+e)^{3/2}\right)$ if $g-1 \leq e \leq g+1$.

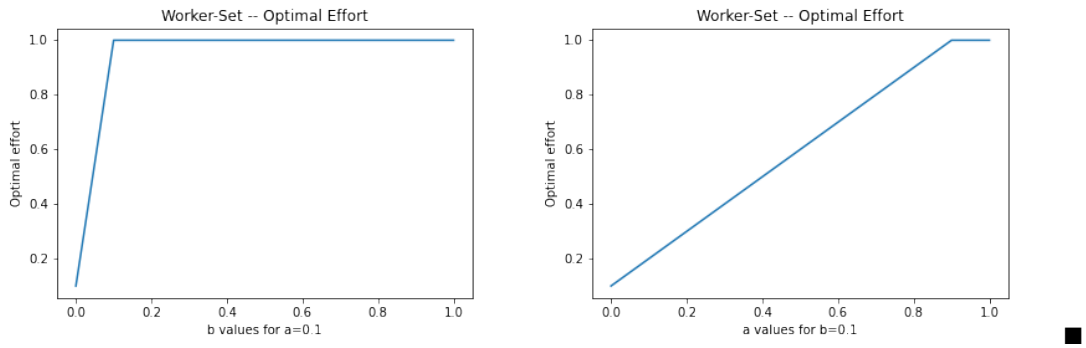
First, we observe that as the goal increases, the expected utility of the worker decreases; $\frac{\partial EU}{\partial g} < 0$ holds for all e. Then, the optimal goal is $g^*_{WorSet} = 0$. Given that $g^*_{WorSet} = 0$, we have $e^*_{WorSet} = \underset{e}{\text{argmax}}\left(w - c(e) + ae + \frac{b\lambda}{3}\left(-(1-e)^{3/2} + (1+e)^{3/2}\right)\right)$ as $\frac{\partial^2 EU}{\partial e^2} = -\frac{\partial^2 c(e)}{\partial e^2} + \frac{b\lambda}{4}\frac{-\sqrt{1+e}+\sqrt{1-e}}{\sqrt{1-e^2}} < 0$ holds true for all parameter values. When $e^*_{WorSet} \in [0,1]$, then e^*_{WorSet} satisfies the first order condition $-xe^{x-1} + 2a + b\lambda((1-e)^{0.5} + (1+e)^{0.5})) = 0$. Second, we establish that $\frac{\partial e^*_{WorSet}}{\partial a} = -\frac{2}{\frac{\partial^2 EU}{\partial e^2}} > 0$ and that $\frac{\partial e^*_{WorSet}}{\partial b} = -\frac{\lambda((1-e)^{0.5}+(1+e)^{0.5})}{\frac{\partial^2 EU}{\partial e^2}} > 0$. Then, for the set of parameters satisfying $-x + 2a + b\lambda\sqrt{2} > 0$, we have $e^*_{WorSet} = 1$. So, the worker's optimal effort function is as follows:

$$e^*_{WorSet} = \begin{cases} \hat{e} & if \;\; a \leq \frac{x}{2} - b\lambda\frac{\sqrt{2}}{2} \\ 1 & if \;\; a > \frac{x}{2} - b\lambda\frac{\sqrt{2}}{2} \end{cases}$$

where $-x\hat{e}^{x-1} + 2a + b\lambda((1-\hat{e})^{0.5} + (1+\hat{e})^{0.5}) = 0$.

Specifically, when $\lambda = 1$, $x = 2$, and $a + b < 1$, Proposition 2 is proved. For these specific values of λ and x, Figure A.1 shows the relation between optimal effort levels and parameters a and b. The graph on the right shows how optimal effort changes with the parameter a, for a given value of b (for example, when $b = 0.1$) and the graph on the left shows how optimal effort changes with the parameter b, for a given value of a (for example, when $a = 0.1$).

Figure A.1: How the optimal effort changes with respect to a and b



■

Proof of Proposition 3. When the goal is assigned by the employer, then the optimization problem of the employer becomes $\max_g(E\Pi)$ subject to $e^*_{EmpSet} = \underset{e}{\text{argmax}}(EU)$. As the wage of the worker depends on neither the performance nor the goal, $E\Pi = e + K - w$. Then, the employer will choose the goal that would maximize the effort of the worker. As

established in Proposition 2, The expected utility is $EU = w - c(e) + ae + \frac{b\lambda}{3}\left(-(1+g-e)^{3/2} + (-1+g-e)^{3/2}\right)$ if $e \le g-1$ and $EU = w - c(e) + ae + \frac{b\lambda}{3}\left(-(1+g-e)^{3/2} + (1-g+e)^{3/2}\right)$ if $g-1 < e \le g+1$. Given the goal, the worker determines their own effort. Then, $\frac{\partial EU}{\partial e} = -\frac{\partial c(e)}{\partial e} + a + \frac{b\lambda}{2}\left((1+g-e)^{1/2} + (1-g+e)^{1/2}\right)$ if $g-1 < e \le g+1$ and $\frac{\partial EU}{\partial e} = -\frac{\partial c(e)}{\partial e} + a + \frac{b\lambda}{2}\left((1+g-e)^{1/2} - (-1+g-e)^{1/2}\right)$ if $e \le g-1$.We establish that $\frac{\partial^2 EU}{\partial e^2} \le 0$ for all $g \le e + \gamma$ where $\gamma \ge 0$. Otherwise, if the employer sets a goal level that is higher than a certain threshold, the worker chooses to exert no effort. When $g-1 < e \le g+1$, we have $\frac{\partial EU}{\partial e \partial g} = \frac{b\lambda}{4}\left((1+g-e)^{-1/2} - (1-g+e)^{-1/2}\right)$ and when $e \le g-1$, we have $\frac{\partial EU}{\partial e \partial g} = \frac{b\lambda}{4}\left((1+g-e)^{-1/2} - (-1+g-e)^{-1/2}\right)$.

Claim 1: The optimal effort and goal must satisfy $g-1 < e \le g+1$.

Proof of Claim 1: When $e \le g-1$, as goal increases the optimal effort decreases, i.e., $\frac{\partial e^*}{\partial g} < 0$. Hence, the employer would never choose a goal that would make the worker choose such an effort level that satisfies $e + 1 \le g$.

Claim 2: When the goal is determined by the employer, we have

- $\frac{\partial e^*(g)}{\partial g} > 0$ for $g < e^*(g)$
- $\frac{\partial e^*(g)}{\partial g} < 0$ for $g > e^*(g)$

Proof of Claim 2: For a given goal, the optimal effort is determined by $\frac{\partial EU}{\partial e} = -\frac{\partial c(e)}{\partial e} + a + \frac{b\lambda}{2}\left((1+g-e)^{1/2} + (1-g+e)^{1/2}\right) \le 0$. We can identify how the optimal effort of the worker responds to the goal level of the employer by $\frac{\partial e^*(g)}{\partial g} = -\frac{\frac{\partial EU}{\partial e \partial g}}{\frac{\partial^2 EU}{\partial e^2}}$. As $\frac{\partial^2 EU}{\partial e^2} < 0$, the sign of $\frac{\partial e^*(g)}{\partial g}$ is the same as that of $\frac{\partial EU}{\partial e \partial g}$. We have $\frac{\partial EU}{\partial e \partial g} = \frac{b\lambda}{4}\left((1+g-e)^{-1/2} - (1+g+e)^{-1/2}\right)$. We observe that we have $\frac{\partial EU}{\partial e \partial g} > 0$ for all $g < e^*(g)$ and that we have $\frac{\partial EU}{\partial e \partial g} < 0$ for all $g > e^*(g)$.

Claim 1 and Claim 2 establish that at the optimal effort and goal combination we must have $g^*_{EmpSet} = e^*_{EmpSet}$. If we solve $= -\frac{\partial c(e)}{\partial e} + a + \frac{b\lambda}{2}\left((1+g-e)^{1/2} + (1-g+e)^{1/2}\right) = 0$ and $g = e$, we can identify the optimal goal and effort. We have $g^*_{EmpSet} = e^*_{EmpSet} = \exp\left(\frac{1}{x-1}\ln\left(\frac{2(a+b\lambda)}{x}\right)\right)$ if $\frac{1}{x-1}\ln\left(\frac{2(a+b\lambda)}{x}\right) > 0$. That is, we have an interior solution exists, if $a \le \frac{x}{2} - b\lambda$ holds. Otherwise, regardless of the value of the goal, $e^*_{EmpSet} = 1$. So, the employer's optimal goal and worker's optimal effort functions are as follows:

$$g^*_{EmpSet} = \begin{cases} \exp\left(\frac{1}{x-1}\ln\left(\frac{2(a+b\lambda)}{x}\right)\right) & if\ \ a \le \frac{x}{2} - b\lambda \\ g \in [0,2] & if\ \ a > \frac{x}{2} - b\lambda \end{cases}$$

$$e^*_{EmpSet} = \begin{cases} \exp\left(\frac{1}{x-1}\ln\left(\frac{2(a+b\lambda)}{x}\right)\right) & if\ \ a \le \frac{x}{2} - b\lambda \\ 1 & if\ \ a > \frac{x}{2} - b\lambda \end{cases}$$

Specifically, when $\lambda = 1$, $x = 2$, and $a + b < 1$, Proposition 3 is proved. ■

Proof of Proposition 4. The proof of the goal comparison is as follows. When the goal is set by the worker, $g^*_{WorSet} = 0$ for all parameter values. However, when the goal is set by the employer, $g^*_{EmpSet} = \exp\left(\frac{1}{x-1}\ln\left(\frac{2(a+b\lambda)}{x}\right)\right)$ as long as $a \le \frac{x}{2} - b\lambda$ holds. That is, for $a \le \frac{x}{2} - b\lambda$, we have $g^*_{WorSet} < g^*_{EmpSet}$. However, for $a > \frac{x}{2} - b\lambda$, g^*_{EmpSet} can be any value. That is, for $a > \frac{x}{2} - b\lambda$, we have $g^*_{WorSet} \le g^*_{EmpSet}$.

The proof of the effort comparison is as follows. Given the effort level of the workers under different goal-setting cases, we establish that $0 < e^*_{NoGoal} < e^*_{WorSet} < e^*_{EmpSet}$ for $a \le \frac{x}{2} - b\lambda\frac{\sqrt{2}}{2}$. As $e^*_{NoGoal} = \exp\left(\frac{1}{x-1}\ln\left(\frac{2a}{x}\right)\right)$ for $a \le \frac{x}{2}$, we have $e^*_{NoGoal} > 0$.

For $\frac{x}{2} - b\lambda\frac{\sqrt{2}}{2} \le a \le \frac{x}{2}$ we have $0 < e^*_{NoGoal} < e^*_{WorSet} = e^*_{EmpSet} = 1$ and for $\frac{x}{2} < a$ we have $e^*_{NoGoal} = e^*_{WorSet} = e^*_{EmpSet} = 1$. That is, the optimal effort of the worker is weakly higher when there is a goal compared to when there is not and the optimal effort is weakly higher when the goal is set by the employer compared to when the goal is set by the worker.

Specifically, when $\lambda = 1$, $x = 2$, and $a + b < 1$, we have $g^*_{WorSet} < g^*_{EmpSet}$ and $0 < e^*_{NoGoal} < e^*_{WorSet} < e^*_{EmpSet}$.■

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APPENDIX A: Additional Data Analyses

We now conduct OLS regression analyses specifically for the EmpSet treatment (Table A.1) to study the relation between observed effort and goal levels. Effort selected by workers in the EmpSet treatment is the dependent variable. The variables Round and GoalX constitute independent variables where GoalX is a dummy that takes a value 1 if the goal assigned to a worker is X and takes 0 otherwise. Goal30 is left out the as the base variable. The variable Round is defined as usual. Results show that a goal of 30 works best to motivate workers to exert effort.

Specification (1) and (2) show that the observed effort level when the goal is 30 is either significantly higher or not significantly different than the effort observed at any other level of goal. Note that, in particular, setting a goal at the highest possible level, namely 36, backfires as the effort is marginally significantly lower in that case compared to what a goal of 30 can achieve (p=0.067 in Specification (1) and p=0.103 in Specification (2)).

Table A.1 OLS Regression Analyses

Dependent Var: Effort in EmpSet	(1)	(2)
Goal0	-7.43***	-7.22***
	(2.10)	(2.22)
Goal6	-2.97*	-2.82•
	(1.70)	(1.67)
Goal12	-2.55*	-1.94
	(1.36)	(1.36)
Goal18	-2.57**	-2.41**
	(1.07)	(1.01)
Goal24	-1.84•	-1.6
	(1.13)	(1.14)
Goal36	-1.99*	-1.69•
	(1.04)	(1.00)
Round	-0.03	-0.03
	(0.06)	(0.07)
Constant	10.35***	24.61***
	(1.33)	(4.86)
Controls Added	No	Yes
N	392	392
R^2	0.04	0.13

Note: • indicates statistical significance at the 15% level, * at 10%, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, in parentheses. Added controls are Age and Female.

Focusing specifically on the WorSet treatment, we now analyze the impact of goals on employers' feedback. Table A.2 presents OLS regression analyses where we use employers' feedback as the dependent variable; TotalOutput and Round as independent variables defined as before. In addition, we introduce the independent variable Goal to indicate goal levels selected by workers. Analyses show that goals have no significant impact on employers' feedback.

Table A.2. OLS Regression Analyses

Dependent Var: Feedback in WorSet	(1)	(2)
TotalOutput	0.08***	0.08***
	(0.00)	(0.00)
Round	-0.03**	-0.03**
	(0.01)	(0.01)
Goal	-0.01	-0.01
	(0.01)	(0.01)
Constant	1.99***	2.06**
	(0.18)	(0.76)
Controls Added	No	Yes
N	392	392
R^2	0.58	0.59

Note: * indicates statistical significance at the 10% level, ** at 5%, and *** at 1%. Robust standard errors, clustered at the subject level, in parentheses. Added controls are Age and Female.

APPENDIX B: Modified Model

In this section, based on our discussions in Section 6, we modify our original theoretical model and then prove that the modified model's predictions are consistent with our experimental findings.

We consider the same theoretical set-up as in the original model introduced in Section 3. The worker selects a costly effort level $e \in [0,1]$ where $c(e) = \frac{1}{2}e^2$. The output is $y = e + \varepsilon$ where ε is a random shock that is drawn from a uniform distribution on $[-1,1]$. The employer receives a flat endowment $K > 0$ and output y as their earnings, and pays a flat wage $w > 0$ to the worker.

Unlike in the original model, we now also assume that the worker always has a goal level $g^R > 0$ in their mind and always has the following reference-dependent preferences with respect to a reference goal g (here, g may be equal to g^R or a different goal level, depending on the treatment).

$$v(y,g) = \begin{cases} (y-g)^{0.5} & if\ y \geq g \\ -(g-y)^{0.5} & if\ y < g \end{cases}.$$

When there is no explicit goal-setting (NoGoal), the worker uses the reference goal level g^R in their mind to calculate their reference-dependent utility. To incorporate this, we

modify the utility function of the worker (U^{NG}) while we keep the utility function of the employer (Π^{NG}) the same as in the original model. Formally,

$$\Pi^{NG}(y,w) = K + y - w$$
$$U^{NG}(w,e,y) = w - c(e) + ay + bv(y,g^R)$$

Here, $b \in (0,1]$ is the weight of the function v that allows for varying degrees of reference dependence. We again assume $a + b < 1$ as before.

When the worker is asked to set a goal explicitly (WorSet), they simply reveal the reference goal level g^R in mind rather than setting a strategic goal. The utility functions of the employer (Π^{WS}) and the worker (U^{WS}) in this scenario are as follows:

$$\Pi^{WS}(y,w) = K + y - w$$
$$U^{WS}(w,e,y,g^R) = w - c(e) + ay + bv(y,g^R)$$

Note that the utility functions in NoGoal and WorSet are exactly the same. The only difference is that in WorSet the worker announces the goal level in their mind when asked to set a goal and in NoGoal the worker does not announce it since they are not asked to set a goal explicitly.

Finally, we analyze the case where the employer assigns a goal g to the worker (EmpSet). Given that the worker already has a reference goal g^R in their mind, it is not clear what the new reference goal for the worker will be. So, we solve our model under the assumption that the new reference goal can be any convex combination of g and g^R. Moreover, based on our discussions in Section 6, we make the following additional assumptions. First, we modify the employer's utility function to include the reference-dependent utility from the gap, and weight it by $d \in [0,1]$ to allow for an affect at varying degrees. Next, we assume that the worker cares about the gap between the output and goal weakly more in EmpSet than in WorSet, so $b^{ES} \geq b$. The modified utility functions for the employer (Π^{ES}) and the worker (U^{ES}) in the EmpSet treatment are as follows:

$$\Pi^{ES}(y,w,g) = K + y - w + dv(y, \alpha g^R + (1-\alpha)g)$$
$$U^{ES}(w,e,y,g) = w - c(e) + ay + b^{ES}v(y, \alpha g^R + (1-\alpha)g),$$

where $b^{ES} \geq b$, $\alpha \in [0,1]$, $d \in [0,1]$.

Proposition B.1. There exist $\bar{g}$ and $\bar{d}$ such that for all $g^R \leq \bar{g}$ and $d \leq \bar{d}$, the optimal goal and effort levels are such that

1. $g^*_{EmpSet} > g^*_{WorSet} = g^R > 0$
2. $e^*_{EmpSet} > e^*_{WorSet} = e^*_{NoGoal} > 0$

Proof of Proposition B.1.
When there is no goal, the worker chooses their own effort to maximize their expected utility. Then, the optimal effort becomes $e^*_{NoGoal} = \underset{e}{argmax} E(w - c(e) + ay + bv(y,g^R))$. When the goal is set by the worker, the worker determines both their goal and effort. As $g^*_{WorSet} =$

g^R by the design of the setting, we have $e^*_{WorSet} = \underset{e}{argmax} E(w - c(e) + ay + bv(y, g^R))$. Hence, $e^*_{WorSet} = e^*_{NoGoal}$ holds. It is trival to show that the effort is positive as effort increases with goal. Since the goal here is positive, the effort under the modified model is slightly higher than the one in the original model.

When the goal is set by the employer, given a goal level the worker maximizes their own utility, and the objective of the employer becomes $\underset{g}{max} E\big(K + e^*_{EmpSet} + \varepsilon - w + dv(e^*_{EmpSet} + \varepsilon, \alpha g^R + (1-\alpha)g)\big)$ subject to $e^*_{EmpSet} = \underset{e}{argmax} E(w - c(e) + ay + b^{ES} v(y, \alpha g^R + (1-\alpha)g))$. Suppose $G = \alpha g^R + (1-\alpha)g$. Then, the problem can be written as $\underset{G}{max} E\big(K + e^*_{EmpSet} + \varepsilon - w + dv(e^*_{EmpSet} + \varepsilon, G)\big)$ subject to $e^*_{EmpSet} = \underset{e}{argmax} E(w - c(e) + ay + b^{ES} v(y, G))$. The expected utility is $EU^{ES} = w - c(e) + ae + \frac{\mathrm{b^{ES}}}{3}\big(-(1 + G - e)^{3/2} + (-1 + G - e)^{3/2}\big)$ if $e \le G - 1$ and $EU^{ES} = w - c(e) + ae + \frac{\mathrm{b^{ES}}}{3}\big(-(1 + G - e)^{3/2} + (1 - G + e)^{3/2}\big)$ if $G - 1 < e \le G + 1$. Given the goal, the worker determines their own effort. Then, $\frac{\partial EU^{ES}}{\partial e} = -\frac{\partial c(e)}{\partial e} + a + \frac{\mathrm{b^{ES}}}{2}\big((1 + G - e)^{1/2} + (1 - G + e)^{1/2}\big)$ if $G - 1 < e \le G + 1$ and $\frac{\partial EU^{ES}}{\partial e} = -\frac{\partial c(e)}{\partial e} + a + \frac{\mathrm{b^{ES}}}{2}\big((1 + G - e)^{1/2} - (-1 + G - e)^{1/2}\big)$ if $e \le G - 1$. Similar to the original setting, we establish that $\frac{\partial^2 EU^{ES}}{\partial e^2} \le 0$ for all $g \le e + \gamma$ where $\gamma \ge 0$. Otherwise, the worker chooses to exert no effort. When $g - 1 < e \le g + 1$, we have $\frac{\partial EU^{ES}}{\partial e \partial G} = \frac{b\lambda}{4}\big((1 + G - e)^{-1/2} - (1 - G + e)^{-1/2}\big)$ and when $e \le G - 1$, we have $\frac{\partial EU^{ES}}{\partial e \partial G} = \frac{b\lambda}{4}\big((1 + G - e)^{-1/2} - (-1 + G - e)^{-1/2}\big)$. If the employer wants to receive a positive effort, the optimal effort and goal must satisfy $G - 1 < e \le G + 1$. One can prove this in a similar way to Claim 1 in the proof of Proposition 3. Additionally, as previously established in Claim 2 in the proof of Proposition 3, the following still holds: $\frac{\partial e(G)}{\partial G} > 0$ for $G < e(G)$ and $\frac{\partial e(G)}{\partial G} < 0$ for $G > e(G)$. Hence, the optimal goal is equal to 0 if $G > e(G)$ or equal to $e(G)$ where $e(G)$ solves $-e + a + \frac{\mathrm{b^{ES}}}{2}\big((1 + G - e)^{1/2} + (1 - G + e)^{1/2}\big) = 0$ if $G \le e(G)$. The expected utility of the employer $E\Pi^{ES} = e(G) + \frac{\mathrm{d}}{3}\Big(-\big(1 + G - e(G)\big)^{3/2} + \big(1 - G - e(G)\big)^{3/2}\Big)$ if $G - 1 < e(G) \le G + 1$. Then, $\frac{\partial E\Pi^{ES}}{\partial G} = \frac{\partial e(G)}{\partial G} - \Big(1 - \frac{\partial e(G)}{\partial G}\Big)\frac{d}{2}\Big(\big(1 + g - e(G)\big)^{1/2} + \big(1 - g + e(G)\big)^{1/2}\Big)$. Hence if d is sufficiently high, the employer prefers the lowest goal. Otherwise, the employer is going to choose a goal such that $G = max\{G_1, G_2\}$ where G_1 solves $\frac{\partial e(G)}{\partial G} - \Big(1 - \frac{\partial e(G)}{\partial G}\Big)\frac{d}{2}\Big(\big(1 + g - e(G)\big)^{\frac{1}{2}} + \big(1 - g + e(G)\big)^{\frac{1}{2}}\Big) = 0$ and G_2 solves $G < e(G)$. Then, since $G = \alpha \mathrm{g^R} + (1 - \alpha)\mathrm{g}$, the optimal g, g^*, depends on the value of the reference goal g^R. If $g^R > max\{G_1, G_2\}$ then $g^* < g^R$ otherwise, $g^* = \frac{max\{G_1, G_2\} - \alpha g^R}{(1-\alpha)}$. Additionally, as the optimal effort increases with the goal, we have $e^*_{EmpSet} > e^*_{WorSet}$. Hence, under this modified

utility functions, our predictions (1) $g^*_{EmpSet} > g^*_{WorSet} = g^R$ and (2) $e^*_{EmpSet} > e^*_{WorSet} = e^*_{NoGoal} > 0$ hold only if $g^{\mathrm{R}}$and d are sufficiently small. ■

APPENDIX C: Instructions

Recall that the experiment is composed of two parts: the partnership game in Part 1 and a questionnaire in Part 2. While Part 1 differs across treatments, Part 2 is the same for all subjects. First, we will present the instructions for Part 1 for each treatment and then finally, we will present the instructions for Part 2.

INSTRUCTIONS FOR PART 1 (Worker-Employer Game)

NoGoal Treatment

In this part, half of the participants will take the role of a "worker" and the other half will take the role of an "employer". Your role will be determined randomly in the beginning of the experiment and will stay constant throughout the experiment. Note that your identity will be kept anonymous throughout the experiment, so you will play with other participants anonymously.

There will be 14 rounds in this experiment. At the beginning of each round, an employer and a worker will be randomly matched. In this pair, you will play the following game once. After each round, you will be matched with another person and play the following game again. This will repeat 14 times. You will never be matched with the same person more than once throughout the experiment. Once the experiment is over, one of these 14 rounds will be randomly chosen and your net payoff in section 1 will be based on that selected round.

Three types of output production will occur in each round in the experiment: sure output, random output, and total output. The values of the output levels to be realized during the experiment will be expressed in TL. The experiment will proceed through the following steps, in order:

1. The worker will choose the sure output value.
2. The computer will determine the random output value.
3. The total output will be the sum of the sure output and the random output values.
4. The payoff levels will be shown to the worker and the employer.
5. The employer will select a feedback level to be sent to the worker.
6. The worker will see the feedback sent by the employer on the screen.

Below presents how to determine sure and random output values and the steps mentioned above in detail.

In every round, workers and employers will each be given an endowment of 18 TL.

Every round will start with the worker. The worker will choose one of the following options to determine **the sure output values.**

- Option 1 generates a *sure output* of 0TL.
- Option 2 generates a *sure output* of 6TL.

- Option 3 generates a *sure output* of 12TL.
- Option 4 generates a *sure output* of 18TL.

After an option is submitted, it cannot be changed. The option submitted by the worker will be kept private and hence will not be revealed to the employer.

Each option is costly to the worker. This cost will be deducted from the worker's endowment in each round. Hence, for a given round, **the net payoff for the worker = 18 TL – the cost of the selected option**. See Table 1 below.

Table 1. Possible option choices and the corresponding sure output, cost and payoff levels for the worker

Option	1	2	3	4
Sure Output	0 TL	6 TL	12 TL	18 TL
Cost of the Option to the Worker	0 TL	1 TL	4 TL	9 TL
The Worker's Net Payoff	18 TL	17 TL	14 TL	9 TL

The Effect of the Option Chosen by the Worker on the Net Payoff of the Worker: As shown above, the option chosen by the worker affects the net payoff of the worker only through the cost of the option. The sure output value generated by the chosen option has no effect on the worker's net payoff.

The Effect of the Option Chosen by the Worker on the Net Payoff of the Employer: The option chosen by the worker will result in a sure output value and this realized sure output value will be used to determine the net payoff of the employer. Therefore, the worker will directly affect the employer's net payoff with the option he/she chooses. This effect is described in detail below.

The computer will select a *random output* from the set {-18, -12,-6, 0, 6, 12, 18}. Each number is equally likely to be selected. This random output determined by the computer and the sure output determined by the option selected by the worker will together give rise to a *total output:*

Total Output = Random Output + Sure Output

See Table 2 for all possible output values. In the table, total output values are shown in red. In the end of each round, both the employer and the worker will learn the amount of the realized total output. However, the employer will not be told the amount of sure output or random output.

Table 2. Possible Total Output Values

(All the values in the table are in TL)

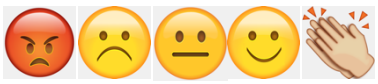
Sure Output / Random Output	0	6	12	18
-18	-18	-12	-6	0
-12	-12	-6	0	6
-6	-6	0	6	12
0	0	6	12	18
6	6	12	18	24
12	12	18	24	30
18	18	24	30	36

For a given round, **the net payoff for the employer = 18 TL + Realized Total Output**. See Table 3 for the net payoff levels the employer is likely to receive.

Table 3. Possible payoff levels for the employer (18TL + Realized Total Output)
(All values in the table are in TL)

Sure Output / Random Output	0	6	12	18
-18	0	6	12	18
-12	6	12	18	24
-6	12	18	24	30
0	18	24	30	36
6	24	30	36	42
12	30	36	42	48
18	36	42	48	54

Employer Choosing a Feedback for the Worker: In each round, after production and payoff levels are revealed, the employer will be asked to select one feedback to be sent to the worker. The employer will make this feedback selection among the following emojis:



We would like to remind you that the selected feedback will have no effect on the calculation of the employer's and worker's net payoffs.

SUMMARY

Each round will progress through the following steps:

Step 1: The worker will choose between Options 1, 2, 3, and 4 to determine the sure output value.

Step 2: The computer will select a random output value from the set {-18TL, -12TL,-6TL, 0TL, 6TL, 12TL, 18TL}.

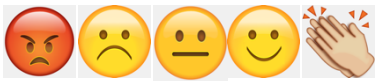
Step 3: Total output will be determined: Total Output = Sure Output + Random Output.

Step 4: A payoff table will be shown to the employer and worker. In these tables

- The employer will be informed about the realized total output value at the end of the round and his own net payoff.

- The worker will be informed about the random output value, the total output value at the end of the round, the worker's own net payoff, and the employer's net payoff.

Step 5: The employer will select a feedback to be sent to the worker. This feedback will be one of these emojis:



Step 6: The worker will see the feedback sent by the employer on their own screen.

At the end of the experiment, one round will be randomly selected from the 14 rounds that have been played. Each participant will receive their own net payoff, which they see in the table on the 4th step of this selected round, as part 1 payoff of the experiment. That is,

- The worker will be given the remaining money after the cost of the option chosen in this round is deducted from the 18 TL given to him/her at the beginning of the round. That is, the worker's net payoff is:

18 TL - Cost of the Option Chosen by the Worker

- The employer will be given money equal to the total amount of production realized in this round and the sum of 18 TL given to him at the beginning of the round. So the employer's net payoff is:

18 TL + Total Realized Output

<u>EmpSet Treatment</u>

In this part, half of the participants will take the role of a "worker" and the other half will take the role of an "employer". Your role will be determined randomly in the beginning of the experiment and will stay constant throughout the experiment. Note that your identity will be kept anonymous throughout the experiment, so you will play with other participants anonymously.

There will be 14 rounds in this experiment. At the beginning of each round, an employer and a worker will be randomly matched. In this pair, you will play the following game once. After each round, you will be matched with another person and play the following game again. This will repeat 14 times. You will never be matched with the same person more than once throughout the experiment. Once the experiment is over, one of these 14 rounds will be randomly chosen and your net payoff in section 1 will be based on that selected round.

Three types of output production will occur in each round in the experiment: sure output, random output, and total output. The values of the output levels to be realized during the experiment will be expressed in TL. The experiment will proceed through the following steps, in order:

1. The employer will select a total output goal for the worker.
2. The total production goal chosen by the employer will be announced to the worker.
3. The worker will choose the sure output value.
4. The computer will determine the random output value.
5. The total output will be the sum of the sure output and the random output values.
6. The payoff levels will be shown to the worker and the employer.
7. The employer will select a feedback level to be sent to the worker.
8. The worker will see the feedback sent by the employer on the screen.

Below presents how to determine sure and random output values and the steps mentioned above in detail.

In every round, workers and employers will each be given an endowment of 18 TL.

Every round will start with the employer. The employer will set a goal for **the total output value** that can be realized. After a goal selection has been submitted, it cannot be changed.

The worker will receive a message on their screen that shows the goal amount selected by the employer.

Next, the worker will choose one of the following options to determine **the sure output value**.

- Option 1 generates a *sure output* of 0TL.
- Option 2 generates a *sure output* of 6TL.
- Option 3 generates a *sure output* of 12TL.

- Option 4 generates a *sure output* of 18TL.

After an option is submitted, it cannot be changed. The option submitted by the worker will be kept private and hence will not be revealed to the employer.

Each option is costly to the worker. This cost will be deducted from the worker's endowment in each round. Hence, for a given round, **the net payoff for the worker = 18 TL – the cost of the selected option**. See Table 1 below.

Table 1. Possible option choices and the corresponding sure output, cost and payoff levels for the worker

Option	1	2	3	4
Sure Output	0 TL	6 TL	12 TL	18 TL
Cost of Option to the Worker	0 TL	1 TL	4 TL	9 TL
The Worker's Net Payoff	18 TL	17 TL	14 TL	9 TL

The Effect of the Option Chosen by the Worker on the Net Payoff of the Worker: As shown above, the option chosen by the worker affects the net payoff of the worker only through the cost of the option. The sure output value generated by the chosen option has no effect on the worker's net payoff.

The Effect of the Option Chosen by the Worker on the Net Payoff of the Employer: The option chosen by the worker will result in a sure output value and this realized sure output value will be used to determine the net payoff of the employer. Therefore, the worker will directly affect the employer's net payoff with the option he/she chooses. This effect is described in detail below.

The computer will select a *random output* from the set {-18, -12,-6, 0, 6, 12, 18}. Each number is equally likely to be selected. This random output determined by the computer and the sure output determined by the option selected by the worker will together give rise to a *total output:*

Total Output = Random Output + Sure Output

See Table 2 for all possible output values. In the table, total production values are shown in red. In the end of each round, both the employer and the worker will learn the amount of the realized total output. However, the employer will not be told the amount of sure output or random output.

Table 2. Possible Total Output Values
(All the values in the table are in TL)

Sure Output / Random Output	0	6	12	18
-18	-18	-12	-6	0
-12	-12	-6	0	6
-6	-6	0	6	12
0	0	6	12	18
6	6	12	18	24
12	12	18	24	30
18	18	24	30	36

For a given round, **the net payoff for the employer = 18 TL + Realized Total Output**. See Table 3 for the net payoff levels the employer is likely to receive.

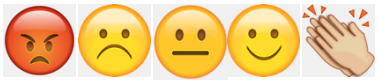
Table 3. Possible payoff levels for the employer (18TL + Realized Total Output)
(All values in the table are in TL)

Sure Output / Random Output	0	6	12	18
-18	0	6	12	18
-12	6	12	18	24
-6	12	18	24	30
0	18	24	30	36
6	24	30	36	42
12	30	36	42	48
18	36	42	48	54

Setting a Goal for the Total Output: We would like to remind you that each round will start with the employer setting a goal for the total ouput value. The employer will be asked to determine this goal for the value of the total output from the set {0TL, 6TL, 12TL, 18TL, 24TL, 30TL, 36TL}. The level of this total output goal will not play a role in calculating the net payoffs of the employer and the worker.

The Total Output Goal and the Realized Total Output: If the realized total output at the end of the round is greater, less than or equal to the total output goal set at the beginning of the round – that is, whether the total output goal has been achieved or not - will not play a role in the calculation of the net payoffs of the employer and the worker.

Employer Choosing a Feedback for the Worker: In each round, after production and payoff levels are revealed, the employer will be asked to select one feedback to be sent to the worker. The employer will make this feedback selection among the following emojis:



We would like to remind you that the selected feedback will have no effect on the calculation of the employer's and worker's net payoffs.

SUMMARY

Each round will progress through the following steps:

Step 1: The employer will select a goal for the total output value from the set {0TL, 6TL, 12TL, 18TL, 24TL, 30TL, 36TL}.

Step 2: The goal chosen by the employer will be communicated to the worker.

Step 3: The worker will choose between Options 1, 2, 3, and 4 to determine the sure output value.

Step 4: The computer will select a random output value from the set {-18TL, -12TL,-6TL, 0TL, 6TL, 12TL, 18TL}.

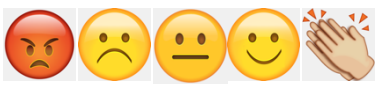
Step 5: Total output will be determined: Total Output = Sure Output + Random Output.

Step 6: A payoff table will be shown to the employer and worker. In these tables

- The employer will be informed about the total output goal set by himself at the beginning of the round, the realized total output value at the end of the round, and his own net payoff.

- The worker will be informed about the random output value, the total output value at the end of the round, the total output goal set by the employer at the beginning of the round, the worker's own net payoff and the employer's net payoff.

Step 7: The employer will select a feedback to be sent to the worker. This feedback will be one of these emojis:



Step 8: The worker will see the feedback sent by the employer on their own screen.

At the end of the experiment, one round will be randomly selected from the 14 rounds that have been played. Each participant will receive their own net payoff, which they see in the table on the 6th step of this selected round, as part 1 payoff of the experiment. That is,

• The worker will be given the remaining money after the cost of the option chosen in this round is deducted from the 18 TL given to him/her at the beginning of the round. That is, the worker's net payoff is:

18 TL - Cost of the Option Chosen by the Worker

• The employer will be given money equal to the total amount of production realized in this round and the sum of 18 TL given to him at the beginning of the round. So the employer's net payoff is:

18 TL + Total Realized Output

WorSet Treatment

In this part, half of the participants will take the role of a "worker" and the other half will take the role of an "employer". Your role will be determined randomly in the beginning of the experiment and will stay constant throughout the experiment. Note that your identity will be kept anonymous throughout the experiment, so you will play with other participants anonymously.

There will be 14 rounds in this experiment. At the beginning of each round, an employer and a worker will be randomly matched. In this pair, you will play the following game once. After each round, you will be matched with another person and play the following game again. This will repeat 14 times. You will never be matched with the same person more than once throughout the experiment. Once the experiment is over, one of these 14 rounds will be randomly chosen and your net payoff in section 1 will be based on that selected round.

Three types of output production will occur in each round in the experiment: sure output, random output, and total output. The values of the output levels to be realized during the experiment will be expressed in TL. The experiment will proceed through the following steps, in order:

1. The worker will select a total output goal for herself/himself.
2. The total production goal chosen by the worker will be announced to the employer.
3. The worker will choose the sure output value.
4. The computer will determine the random output value.
5. The total output will be the sum of the sure output and the random output values.
6. The payoff levels will be shown to the worker and the employer.
7. The employer will select a feedback level to be sent to the worker.
8. The worker will see the feedback sent by the employer on the screen.

Below presents how to determine sure and random output values and the steps mentioned above in detail.

In every round, workers and employers will each be given an endowment of 18 TL.

Every round will start with the worker. The worker will set a goal for **the total output value** that can be realized. After a goal selection has been submitted, it cannot be changed.

The employer will receive a message on their screen that shows the goal amount selected by the worker.

Next, the worker will choose one of the following options to determine **the sure output value**.

- Option 1 generates a *sure output* of 0TL.
- Option 2 generates a *sure output* of 6TL.
- Option 3 generates a *sure output* of 12TL.
- Option 4 generates a *sure output* of 18TL.

After an option is submitted, it cannot be changed. The option submitted by the worker will be kept private and hence will not be revealed to the employer.

Each option is costly to the worker. This cost will be deducted from the worker's endowment in each round. Hence, for a given round, **the net payoff for the worker = 18 TL – the cost of the selected option**. See Table 1 below.

Table 1. Possible option choices and the corresponding sure output, cost and payoff levels for the worker

Option	1	2	3	4
Sure Output	0 TL	6 TL	12 TL	18 TL
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The Worker's Net Payoff	18 TL	17 TL	14 TL	9 TL

The Effect of the Option Chosen by the Worker on the Net Payoff of the Worker: As shown above, the option chosen by the worker affects the net payoff of the worker only through the cost of the option. The sure output value generated by the chosen option has no effect on the worker's net payoff.

The Effect of the Option Chosen by the Worker on the Net Payoff of the Employer: The option chosen by the worker will result in a sure output value and this realized sure output value will be used to determine the net payoff of the employer. Therefore, the worker will directly affect the employer's net payoff with the option he/she chooses. This effect is described in detail below.

The computer will select a *random output* from the set {-18, -12,-6, 0, 6, 12, 18}. Each number is equally likely to be selected. This random output determined by the computer and the sure output determined by the option selected by the worker will together give rise to a *total output:*

Total Output = Random Output + Sure Output

See Table 2 for all possible output values. In the table, total production values are shown in red. In the end of each round, both the employer and the worker will learn the amount of the realized total output. However, the employer will not be told the amount of sure output or random output.

Table 2. Possible Total Output Values
(All the values in the table are in TL)

Sure Output / Random Output	0	6	12	18
-18	-18	-12	-6	0
-12	-12	-6	0	6
-6	-6	0	6	12
0	0	6	12	18
6	6	12	18	24
12	12	18	24	30
18	18	24	30	36

For a given round, **the net payoff for the employer = 18 TL + Realized Total Output**. See Table 3 for the net payoff levels the employer is likely to receive.

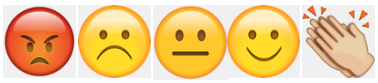
Table 3. Possible payoff levels for the employer (18TL + Realized Total Output)
(All values in the table are in TL)

Sure Output / Random Output	0	6	12	18
-18	0	6	12	18
-12	6	12	18	24
-6	12	18	24	30
0	18	24	30	36
6	24	30	36	42
12	30	36	42	48
18	36	42	48	54

Setting a Goal for the Total Output: We would like to remind you that each round will start with the worker setting a goal for the total ouput value. The worker will be asked to determine this goal for the value of the total output from the set {0TL, 6TL, 12TL, 18TL, 24TL, 30TL, 36TL}. The level of this total output goal will not play a role in calculating the net payoffs of the employer and the worker.

The Total Output Goal and the Realized Total Output: If the realized total output at the end of the round is greater, less than or equal to the total output goal set at the beginning of the round – that is, whether the total output goal has been achieved or not - will not play a role in the calculation of the net payoffs of the employer and the worker.

Employer Choosing a Feedback for the Worker: In each round, after production and payoff levels are revealed, the employer will be asked to select one feedback to be sent to the worker. The employer will make this feedback selection among the following emojis:



We would like to remind you that the selected feedback will have no effect on the calculation of the employer's and worker's net payoffs.

SUMMARY

Each round will progress through the following steps:

Step 1: The worker will select a goal for the total output value from the set {0TL, 6TL, 12TL, 18TL, 24TL, 30TL, 36TL}.

Step 2: The goal chosen by the worker will be communicated to the employer.

Step 3: The worker will choose between Options 1, 2, 3, and 4 to determine the sure output value.

Step 4: The computer will select a random output value from the set {-18TL, -12TL,-6TL, 0TL, 6TL, 12TL, 18TL}.

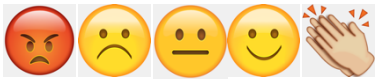
Step 5: Total output will be determined: Total Output = Sure Output + Random Output.

Step 6: A payoff table will be shown to the employer and worker. In these tables

- The employer will be informed about about the total output goal set by the worker at the beginning of the round, the realized total output value at the end of the round, and his own net payoff.

• The worker will be informed about the random output value, the total output value at the end of the round, the total output goal set by himself/herself at the beginning of the round, the worker's own net payoff and the employer's net payoff.

Step 7: The employer will select a feedback to be sent to the worker. This feedback will be one of these emojis:



Step 8: The worker will see the feedback sent by the employer on their own screen.

At the end of the experiment, one round will be randomly selected from the 14 rounds that have been played. Each participant will receive their own net payoff, which they see in the table on the 6th step of this selected round, as part 1 payoff of the experiment. That is,

• The worker will be given the remaining money after the cost of the option chosen in this round is deducted from the 18 TL given to him/her at the beginning of the round. That is, the worker's net payoff is:

18 TL - Cost of the Option Chosen by the Worker

• The employer will be given money equal to the total amount of production realized in this round and the sum of 18 TL given to him at the beginning of the round. So the employer's net payoff is:

18 TL + Total Realized Output

INSTRUCTIONS FOR PART 2 (Questionnaire)

Please fill in the questionnaire on the screen.

When you are done, you will see the payment screen. After you examine the details of your payment, please raise your hand and wait for the assistant to fill in your payment form.

(On the screen, the following questions are displayed)

1. "I care about my social image (i.e. what others will think of me) when making a real-life decision"
   To what extent, do you agree with the above statement?
   Not at all
   Not so much
   Neutral
   Some
   Completely

2. “I care about my self-image (i.e. how I will feel about myself) when making a real-life decision”
   To what extent, do you agree with the above statement?
   Not at all
   Not so much
   Neutral
   Some
   Completely

3. Age?

4. Gender?
   a) Female
   b) Male

5. Program
   a) Undergraduate
   b) Masters
   c) Ph.D.

6. Year
   a) English Preparatory School
   b) 1st year
   c) 2nd year
   d) 3rd year
   e) 4th year
   f) 5th year or more

7. Major

8. Family income (per month)?
   a) Less than 2,500TL
   b) 2,500TL – 5,000 TL
   c) 5,000 TL – 10,000 TL
   d) 10,000 TL – 20,000TL
   e) More than 20,000TL

9. Any feedback for us?