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Hidden Benefits of Reward: A Field Experiment on Motivation and Monetary Incentives

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Hidden Benefits of Reward: A Field Experiment on Motivation and Monetary Incentives

Abstract

We conduct a field experiment in a controlled work environment to investigate the effect of motivational talk and its interaction with monetary incentives. We find that motivational talk significantly improves performance only if it is accompanied by performance pay. Moreover, performance pay reduces performance unless it is accompanied by motivational talk. By adding motivational sentences to an otherwise neutral explanation of the work task, the effect of performance pay goes from slightly negative to significantly positive. Hence, we find what we call a hidden benefit of monetary rewards: complementarity between performance pay and motivational talk.

JEL-Code: C930, M520, J330.

Keywords: verbal motivation, performance pay, field experiment.

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1 Introduction

There is ample evidence that monetary incentives do not always improve performance. In fact, performance pay like bonuses or piece rates can sometimes lead to lower effort. Psychologists refer to this as a “hidden cost of reward:” performance pay crowds out the workers’ intrinsic motivation, in particular by undermining workers’ confidence in their own abilities or in the value of the rewarded task (Deci (1975), Lepper and Greene (1978)).¹ But intrinsic motivation is not only affected by monetary rewards. Firms spend resources in order to facilitate and evoke the intrinsic motivation of their workforce, for example by paying and developing managers and leaders with motivational skills.² So a central question is: Will performance pay undermine a leader’s effort in motivating her workers? Or could monetary incentives instead complement and enhance the effect of a leader’s motivational efforts?

Theory does not provide a clear answer to this. One conjecture is that, when performance pay undermines intrinsic motivation, it will also undermine a leader’s attempt to evoke the workers’ intrinsic motivation. But recent theoretical work shows that crowding out can be due to some informational asymmetries. If agents are uncertain about their own ability, the value of the task, or the character of the principal, material incentives alone might create a negative signal that lowers the agents’ intrinsic motivation (Bénabou and Tirole (2003, 2006), Ellingsen and Johannesson (2008)).³ An implication is that, if the information asymmetry is resolved, performance pay improves performance rather than backfires. Related to this, Ellingsen and Johannesson (2008) remark that the negative signaling effect of material incentives might well not extend to a situation where the principal has multiple signals available. Our conjecture is that moti-

¹A seminal contribution is Deci (1971), who shows that some tasks may have own inherent rewards, making external monetary rewards unnecessary or even detrimental to effort. Using controlled laboratory and field experiments, economists have demonstrated negative effects of monetary incentives in a variety of settings, see Frey and Oberholzer-Gee (1997), Gneezy and Rustichini (2000a,b), Bohnet et al. (2001), Fehr and Rockenbach (2003), and Pokorny (2008). See also Gneezy and Rey-Biel (2011) for a nice review of this literature.

²See, e.g., Sims (1998) on management training and leadership development.

³A compensation scheme may also signal a social norm, which the agent might prefer to follow (Sliwka (2007)).

vational efforts by a leader telling his or her employees how diligent they are and how important their work is, can serve as such an extra signal, which potentially changes the perception of performance pay. Similarly, performance pay might change the perception of motivational efforts. For example, a leader’s visionary speeches or motivational pep talks might be perceived as more credible (and not just cheap talk) if he or she is willing to “put money behind the words.”

In this paper, we present results from a field experiment designed to investigate the interaction between performance pay and motivational efforts. We focus on “motivational talk,” words that potentially inspire workers to exert extra effort. On behalf of a research group at the University of Bonn, we hired students to enter data from ice hockey game reports into a database. The students, who were not aware that they were part of an experiment, were randomly assigned to one out of four treatments: with or without performance pay and with or without motivational talk (motivation, for short). In treatments with performance pay, subjects received a small piece rate (10 euro cents) on top of a fixed payment (20 euro) for each game report they were able to enter into the database. In treatments with motivation, subjects were exposed to simple motivational sentences in addition to a plain explanation of the task they were about to do.

We found that motivational talk significantly improved performance only if it was accompanied by performance pay. Moreover, performance pay reduced performance, unless it was accompanied by motivational talk. By adding motivational sentences to an otherwise neutral explanation of the work task, the effect of performance pay went from slightly negative to significantly positive – with an increase in average performance of about 20 percent. Hence, we found what we can call a hidden benefit of monetary rewards: complementarity between performance pay and motivational talk.

The advantageous combination of performance pay and motivation also carried over to the quality of work. Performance pay alone led to more mistakes. Adding motivational talk, however, made the difference. Although subjects were not rewarded for quality, performance pay had a positive effect on quality if it was accompanied by motivational talk.

Related literature: While economists have investigated motivation primarily through the lens of monetary incentives, psychologists have been

more interested in the effect of non-monetary motivators such as recognition, attention, and verbal feedback. An early lab experiment is Deci and Ryan (1971) showing that provision of praise increases students' willingness to work on a puzzle. Cameron and Pierce (1994) provide a survey of the subsequent lab-experimental literature. Stajkovic and Luthans (2003) give an overview of experimental field studies on performance dependent recognition and report strong positive effects in a variety of workplace contexts. More recent papers include Grant and Gino (2010), who study experimentally how a manager's verbal expression of gratitude affects employees' effort, and Kosfeld and Neckermann (2011), and Bradler et al. (2013), who investigate in field experiments how social recognition affects employee performance. All find substantial positive effects. Our paper differs from this literature in two respects: First, we focus on non-contingent verbal motivation prior to work instead of performance feedback and contingent non-monetary rewards. Second, we are particularly interested in the interaction between verbal motivation and monetary incentives, which to our knowledge has not been systematically investigated.⁴

While the formal literature on intrinsic motivation and crowding out (cited above) provides some possible implications for the effect of non-monetary motivation, there are only a few papers that explicitly address the optimal interaction between non-monetary motivation and monetary rewards. Marino and Zábojnik (2008) study the trade-off between work-related perks and incentive provision, and Dur et al. (2010) analyze how attention paid by the principal to the agent affects optimal incentive contracting. Furthermore, Kvaløy and Schöttner (2013) analyze optimal incentive provision when a motivator can exert motivational effort to reduce the effort costs of an agent. But none of these papers consider the direct negative effects of performance pay. In order to explicitly address the potential signalling effect of both performance pay and motivational talk, we adopt a variant of Bowles and Polanía-Reyes (2012) model on monetary

⁴Besides the experimental literature, there is also a large literature on organizational behavior using survey data in order to investigate employees' motivation and experience with performance pay. Some report a positive relationship between performance pay and intrinsic motivation. Babakus et al. (1996), Baldauf et al. (2002), Miao and Evans (2007), and DelVecchio and Wagner (2011) all find that more incentive pay leads to higher levels of intrinsic motivation for sales people.

incentives and social preferences for our theoretical framework.

The rest of the paper is organized as follows. Section 2 contains a model on the interaction of motivational talk and monetary incentives. In Section 3, we present the experimental design and procedure, while in Section 4 we present the results. Section 5 concludes.

2 Model

In this section, we present a simple principal-agent model with moral hazard to analyze how performance pay and motivational talk of the principal might affect the agent's effort choice and consequently his performance. We assume that the risk-neutral agent produces a verifiable output y . Output is a function of the agent's non-observable effort $e \geq 0$ and the realization of a non-observable random variable ε . Specifically, we assume that $y = \varepsilon e$ with $\varepsilon \geq 0$ and $E[\varepsilon] = 1$. The agent's private effort costs are $c(e) = \frac{e^2}{2}$. The principal pays the agent a fixed wage s and a piece rate $r \geq 0$ conditioned on output y . In addition, the principal can motivate the agent by exerting motivational effort (in the form of motivational talk) $a \geq 0$. Motivational effort is costly to the principal, e.g., due to opportunity costs of time.

We assume that the principal is better informed about the production environment than the agent. As a result, the principal's choice of monetary incentives and motivational effort constitutes a signal that allows the agent to better assess the circumstances of production. For example, performance pay might affect the agent's assessment of the task difficulty or his task-specific ability (Bénabou and Tirole (2003)), or of the principal's character and whether she is worth impressing (Bénabou and Tirole (2006), Ellingsen and Johannesson (2008)). Similarly, motivational talk can influence the agent's perception of the task, his ability, or the principal's type. For example, if a principal takes the time to engage in motivational talk, this might signal that the work is important or that she has social preferences/cares about the agent. However, motivational talk could also indicate that the task is likely to be unattractive because the principal sees the need for some extra motivation.

To take into account potential signalling aspects of performance pay and motivation, we consider a variant of the state-dependent utility function

proposed by Bowles and Polanía-Reyes (2012). Because these authors focus on monetary incentives, we extend their utility function to allow for a potential impact of motivational talk. We thus assume that the agent’s expected utility is

$$s + rE[y|e] - c(e) + e(\mu_0 + \mu_r r + \mu_a a + \mu_{ar} ar), \quad (1)$$

with the parameters $\mu_0 \geq 0$ and $\mu_r, \mu_a, \mu_{ar} \in \mathbf{R}$. The parameter μ_0 measures the agent’s baseline intrinsic motivation, i.e., his utility from exerting effort in the absence of motivation and performance pay. The remaining parameters reflect potential crowding effects of the piece rate r and the motivational effort a , respectively, due to the signal content of these instruments.⁵ When the principal employs either only performance pay or only motivational talk, the crowding effects are described by the parameters μ_r and μ_a , respectively. When performance pay and motivation are used simultaneously, however, the signal content of either instrument might change, so that the crowding effects are non-separable in performance pay and motivation. This is the case if μ_{ar} is different from zero.

The timing is as follows. The principal first announces the compensation scheme (s, r) . Afterwards, she exerts motivational effort a . The agent observes a and exerts effort e . Finally, y is realized and the principal pays the agent. Now consider the stage where the agent chooses effort to maximize his expected utility (1). The optimal effort choice $e^*(a, r)$ thus is

$$e^* = r + \mu_0 + \mu_r r + \mu_a a + \mu_{ar} ar. \quad (2)$$

From (2), we can derive the agent’s incentive responsiveness e_r^* and his “motivation responsiveness” e_a^* ,

$$e_r^* = 1 + \mu_r + \mu_{ar} a \text{ and } e_a^* = \mu_a + \mu_{ar} r. \quad (3)$$

By (2), if $\mu_0 > 0$, the agent exerts effort even if the principal neither employs performance pay nor motivational talk ($r = a = 0$). Now assume

⁵Variations in the fixed payment s might also provide a signal on the production environment. However, we abstract from this possibility because the fixed payment is identical in all treatments of our experiment.

that the principal introduces a piece rate in addition to the fixed wage ($r > 0$ and $a = 0$). By (3), the agent might respond by an effort increase ($e_r^* > 0$) or a weak decrease in effort ($e_r^* \leq 0$). In the former case, the piece rate either constitutes a favorable signal on the production environment and thus crowds in the agent's effort ($\mu_r > 0$), or the piece rate is an unfavorable signal that crowds out effort but this effect does not dominate the marginal utility from a larger expected monetary payoff ($0 > \mu_r > -1$). In contrast, the agent weakly reduces his effort under the piece rate if the crowding out effect is sufficiently strong ($\mu_r \leq -1$). If the principal engages in motivational talk in addition to the fixed wage ($r = 0$ and $a > 0$), the agent increases his effort if and only if $\mu_a > 0$, i.e., motivational talk provides a favorable signal on the production environment.

We are particularly interested in the interaction of performance pay and motivational talk. From (3), we obtain that the two instruments can be substitutes ($e_{ar}^* = \mu_{ar} < 0$) as well as complements ($e_{ar}^* = \mu_{ar} > 0$). First consider the case $e_{ar}^* < 0$. It implies that, if motivational talk crowds in effort ($\mu_a > 0$), incentives will make motivational talk less fruitful. For example, motivational talk alone might be a favorable signal on the principal's characteristics, which is, however, counteracted by a piece rate. If, on the other hand, motivational talk provides a signal that crowds out effort ($\mu_a < 0$), this signal will be amplified by performance pay. For example, the agent might assume that the principal exerts motivational effort to talk him into an unpleasant job. In both situations, the interaction of performance pay and motivational talk is detrimental to effort, which can be interpreted as a "hidden cost of reward."

In the more interesting case $\mu_{ar} > 0$, a piece rate enhances the effectiveness (or reduces the defectiveness) of motivational talk, which can be termed "hidden benefit of reward." For example, without performance pay, motivational talk might not be credible and thus only be seen as cheap talk, while performance pay shows that the principal is willing to "put money behind the words." Moreover, $\mu_{ar} > 0$ could also mean that motivational talk counteracts a potential unfavorable signal of performance pay ($\mu_r < 0$). The principal might even be able to use motivational talk to resolve the problem of asymmetric information on the production environment, that is responsible for the crowding out effect of performance pay. The latter is

then completely eliminated by motivational talk (i.e., $\mu_r + \mu_{ar}a = 0$).

Our rather general theoretical framework can tell us something about potential interaction effects between motivational talk and performance pay, but it cannot provide us with any obvious hypothesis in this respect. We will thus investigate the sign of e_{ar} empirically without stating any formal hypothesis.

3 Experimental design and procedure

3.1 General description

We conducted a field experiment to study the interaction between performance pay and motivational talk. On behalf of a research group at the University of Bonn, we hired students to enter data from official game reports of the German ice hockey league into a database (Microsoft Excel spreadsheet). This database needed to be extended for an ongoing research project. The task was rather simple but required a certain care and attention from the subjects.⁶

The subjects were not aware that they participated in an experiment. We recruited them using a written announcement, which we advertised on the university's job market website and the electronic newsletters of different faculties. Additionally, we distributed flyers in the two main cafeterias of the university for two weeks in a row. In the announcement, we advertised a one-time job opportunity for entering data for two hours. The compensation was stated as approximately 10 euro per hour which is slightly higher than the hourly wage of a student assistant.

Altogether 203 students applied. The students were randomly assigned to the treatments, taking into account that a few of them stated time restrictions in their application. We invited them via E-mail and asked them to confirm their appointment. Additionally, we sent a reminder with the date and time of their appointment two days before a session.⁷ The

⁶Similar data entry tasks are frequently used in field experiments because they allow measurement of performance and quality without frequent monitoring of the subjects (see, e.g., Kube et al. (2012), Kosfeld and Neckermann (2011), or Henning-Schmidt et al. (2010)). Monitoring might interfere with incentives from performance pay.

⁷We checked whether the observable characteristics of the participants such as gender,

experiment was conducted on four days in November and December 2012 at the University of Bonn. We executed two sessions for each of our four treatments with 17 to 20 subjects each (some subjects failed to show up for work), which provides us with 139 observations for our analysis (46 males and 93 females).⁸

To establish a work environment that was as natural as possible, the sessions were not conducted in the BonnEconLab but in a computer pool at the University of Bonn. Upon arrival each of the subjects was randomly placed in front of a computer terminal. On the desk next to the computer was a box which contained the official game reports from the German ice hockey league printed on paper. Each subject at a certain terminal, e.g., terminal 1, had to enter the same data as the subjects of other sessions sitting at the same terminal. The data entered was identical for each terminal but different between the terminals of one session. Hence, the difficulty of the data entering process was the same in all sessions. The subjects were able to see each other but because the printed reports were stored in a box and the finished ones had to be put in another box next to them, they could not observe how many reports the other subjects entered. The task was explained by the experimenter at the beginning of each session. The experimenter followed a detailed protocol and read the explanations aloud instead of reciting them from memory to ensure that the wording was exactly the same in each session. She also presented powerpoint slides with screenshots of the spreadsheet to demonstrate which data had to be entered in a certain cell. This procedure took about 15 minutes. The experimenter did not change her physical appearance (clothes, hair, etc.) to rule out a possible influence on the subjects' behavior.

The subjects had the opportunity to ask clarifying questions before the working period started. In all sessions the subjects asked how to adjust the zoom, the width of a cell, and how they could scroll through the document. They also asked how they could store the spreadsheet to save the results

age, and course of study are balanced across treatments with Pearson Chi Square and Kruskal Wallis tests. Overall, the characteristics are well balanced with the exception of participants who are enrolled in economics. They participated more often in the fixed-moti than in the other treatments. The results are available upon request.

⁸143 students participated in the experiment. Due to hardware failure, however, the data was not stored completely for 4 participants.

from time to time. After answering all questions in plenary, the experimenter left the room. We chose to leave the subjects alone during the 90 minute working period to rule out possible effects of monitoring. The subjects were informed that the experimenter would be available for questions next door. The subjects knew that the experimenter would interrupt them after 45 minutes and ask them to upload the data to a central storage to avoid data loss.

3.2 Treatments

We employed a 2×2 design: with or without performance pay and with or without motivational talk, as illustrated in Table 1:

Table 1: Overview treatments.

	Fixed payment	Performance payment
Neutral talk	fixed treatment	pfp treatment
Motivational talk	fixed-moti treatment	pfp-moti treatment

In the two treatments with motivational talk (called fixed-moti and pfp-moti) subjects were exposed to simple motivational sentences in addition to a plain explanation of the task they were about to do. Except for these sentences, the instructions for all treatments were identical. The motivational sentences were as follows:⁹

Beginning of instructions: *Welcome to the CIP Pool of the Juridicum. I am glad that you decided to support us to record the data for a research project. In the framework of a large research project, we analyze sports data, in this case ice hockey, to investigate the behavior of teams and competitive situations. We are certain that you, as competent students of the University of Bonn, are able to record the data fast and precisely.*

End of instructions: *I know that the work might be exhausting and tiring, but I also know that you are diligent students who are able to concentrate*

⁹The explanation translated into English with the highlighted motivational sentences can be found in the appendix.

on these kinds of tasks for longer periods. If you decide to leave the room, please try to be quiet to avoid disturbing your colleagues. You are welcome to adjust the screen to your convenience or to alter the zoom in the excel sheet. If there are no more questions, let's start working! In addition, when the subjects were interrupted to upload the data after 45 minutes, they were told: *Keep up with the good work!*

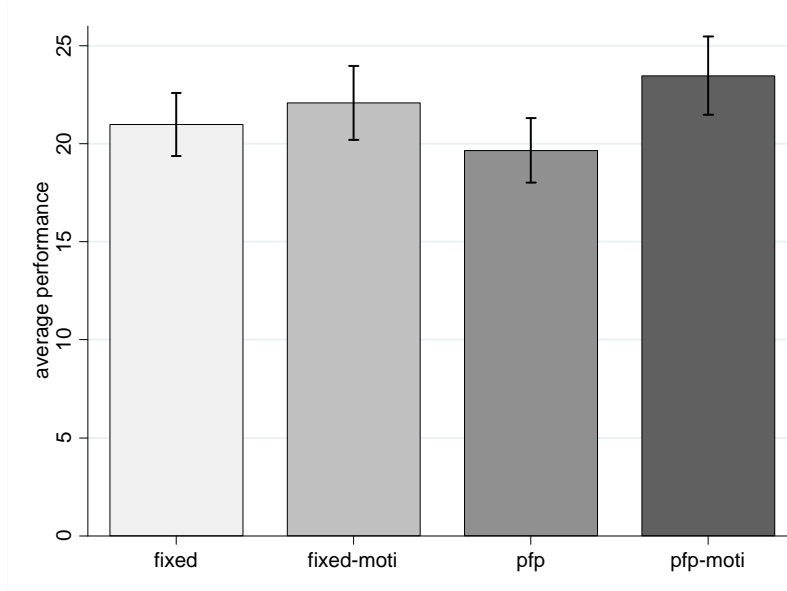
These sentences represent key aspects of a motivational leadership style (see, e.g., Robbins and Judge (2013), for an overview). The “leader” – represented by the experimenter – expresses purpose and meaning, positive expectations, and sensitivity to the workers’ needs.¹⁰ Subjects might deduce from these words that they participate in a valuable project and are likely to do a good job, which will be to the benefit of a (likable) principal.

In treatments with performance pay (called pfp and pfp-moti), subjects received a small piece rate (10 euro cents) on top of the fixed payment (20 euro) for each game report they entered in the spreadsheet. This compensation scheme resulted in performance pay of approximately 10 percent on top of fixed pay, which is quite common in practice. We informed the subjects at the end of the instructions about their payment.

We did not control the quality of the entered data but we checked the number of entered game reports at the end of the working period to determine the payment in the treatments with performance pay. We conducted the fixed payment sessions before sessions with performance pay to avoid that subjects expected to be paid by performance. On average, subjects earned 21.06 euro (20 euro in the treatments with fixed pay and 22.17 euro in the treatments with pay for performance).

¹⁰With respect to the latter, we did not want motivational talk to improve the subjects’ technology, i.e., to make the task easier. Hence, information about screen and zoom adjustment were made available in each treatment. However, in the motivational talk treatments it was made up front (showing sensitivity to workers’ needs), while in the neutral talk the information was given either as a response to or after practical questions by subjects (in plenary) before they started working.

Figure 1: Average performance over treatments



4 Results

Our key performance variable is the number of entered games in the spreadsheet (i.e., quantity).¹¹ In a second step, we also analyze the effects on the quality of the work.

The bar chart in Figure 1 show performance in the four treatments, as well as 95 percent confidence intervals. The subjects entered slightly more games in the fixed-moti (mean 22.08) than in the fixed treatment (mean 20.97), but this difference is not statistically significant (Mann-Whitney U test, $p = 0.377$).¹² However, adding motivation to pay for performance increases performance significantly (Mann-Whitney U test, $p = 0.004$). The mean performance is 19.66 in the pfp-treatment and 23.47 in the pfp-moti treatment.

This indicates that performance pay and motivational talk complement each other. But in order to investigate whether performance pay enhances the effect of motivational talk (and vice versa), one has to study the *in-*

¹¹To take into account that the number of filled cells varied between the games, we also used the number of filled cells as a robustness check. The results remain qualitatively the same and can be obtained from the authors upon request.

¹²All Mann-Whitney U tests are two-sided.

teraction between the variables. We thus estimate a linear regression with an interaction term. Motivational talk a and performance pay r are the independent variables (main effects) and the number of entered games y is the dependent variable:

$$y_i = \beta_0 + \beta_1 a_i + \beta_2 r_i + \beta_3 a_i r_i + \text{controls} + \varepsilon_i$$

Here, $a_i = 1$ if subject i was exposed to motivational talk (i.e., participated in fixed-moti or pfp-moti treatment), while $r_i = 1$ if subject i received performance pay (i.e., participated in pfp or pfp-moti treatment). Hence, β_1 shows the effect of motivation without performance pay, β_2 shows the effect of performance pay without motivation, while β_3 estimates the interaction between motivation and performance pay. We added additional control variables (gender, age, a dummy indicating if the subject is enrolled in economics, and session time¹³) and calculated robust standard errors clustered on sessions.

The results of the regressions are reported in Table 2.¹⁴ Column (1) shows the results for overall performance. We first see that motivational talk alone has no significant effect on overall performance. Moreover, performance pay alone actually has a significantly negative effect on performance when it is not accompanied by motivational talk. However, the experiment identifies what can be termed a “hidden benefit of reward”: The interaction coefficient $y_{ar} = \beta_3$ is positive and significantly different from zero, i.e., motivational talk and performance pay are complements. This implies both that performance pay makes motivational talk more efficient and motivational talk improves the effect of performance pay. In the appendix we also present regressions on treatment effects, showing that subjects in the pfp-moti treatment perform significantly better than subjects in any of the other three treatments (Table A1).

Next, we analyze the performance during the first 45 minutes of the working period (first half) and the performance during the second 45 minutes

¹³Each treatment had one morning session and one afternoon session.

¹⁴Note that the results remain qualitatively the same if we take into account that our dependent variable consists of non-negative integers and resembles count data and estimate negative binomial regressions instead of OLS. The results can be obtained from the authors upon request.

(second half) separately. This enables us to see whether the behavior of the subjects changed over the course of the working period. Recall that the subjects were interrupted after 45 minutes and told to store the data. In the two treatments with motivational talk, the experimenter added the phrase “Keep up with the good work” to all subjects in plenary before leaving the room.

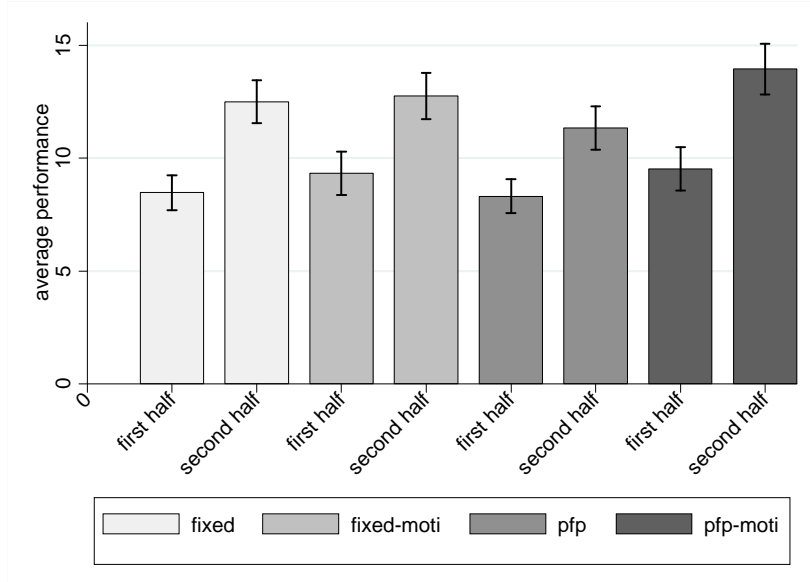
Table 2: Effects of motivation and piece rate on performance.

	Overall	First half	Second half
Motivation	0.763 (0.688)	0.667** (0.227)	0.096 (0.643)
Piece rate	-1.508** (0.568)	-0.295 (0.242)	-1.213** (0.347)
Motivation x piece rate	3.462** (0.992)	0.762* (0.373)	2.700** (0.839)
Female	-2.310* (1.156)	-1.447** (0.587)	-0.863 (0.599)
Age	-0.373* (0.186)	-0.197* (0.085)	-0.175 (0.106)
Enrolled in economics	-0.505 (1.064)	-0.459 (0.526)	-0.046 (0.641)
Morning session	0.772 (0.632)	0.364 (0.220)	0.409 (0.500)
Constant	30.97*** (3.685)	14.00*** (1.628)	16.97*** (2.219)
Observations	139	139	139
R^2	0.131	0.135	0.125

Note: This table reports OLS coefficient estimates (robust standard errors clustered on sessions in parentheses). The dependent variable is performance measured by the number of reported games. “Motivation” is a dummy variable indicating subjects were exposed to motivational talk. “Piece rate” is a dummy variable indicating subjects earned an additional piece rate. “Motivation x piece rate” is the interaction of both aforementioned dummy variables. We add dummy variables for females, subjects studying economics, and sessions executed in the morning as well as a control for age. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure 2 depicts the performance for the first and second half of the

Figure 2: Average performance during first and second half of the working period



working period. In all treatments, performance is significantly higher in the second half of the working period, which indicates learning effects that are quite common in such tasks (Wilcoxon signed rank test, $p = 0.000$ for all treatments).

From the regression in column (2) and (3) of Table 2, we see that both performance pay and motivational talk alone have weaker motivational effects in the second half than in the first half. Motivational talk alone (without pfp) has a significantly positive effect in the first half, but it disappears in the second half. Performance pay alone does not have a negative effect in the first half, but becomes significantly negative in the second half. However, the interaction coefficient is positive and significant in both halves, but considerably stronger in the second half. Hence, there is a “hidden benefit of reward” during the whole working period, but it becomes stronger in the second half.

Finally, we investigated how performance pay and motivational talk affected the quality of work. Figure 3 shows the ratio of mistakes (wrong cell entries) to the number of filled cells for each treatment.¹⁵ From the bar

¹⁵We analyze the ratio of mistakes to the number of filled cells to control for the

Figure 3: Average ratio of mistakes to number of filled cells over treatments

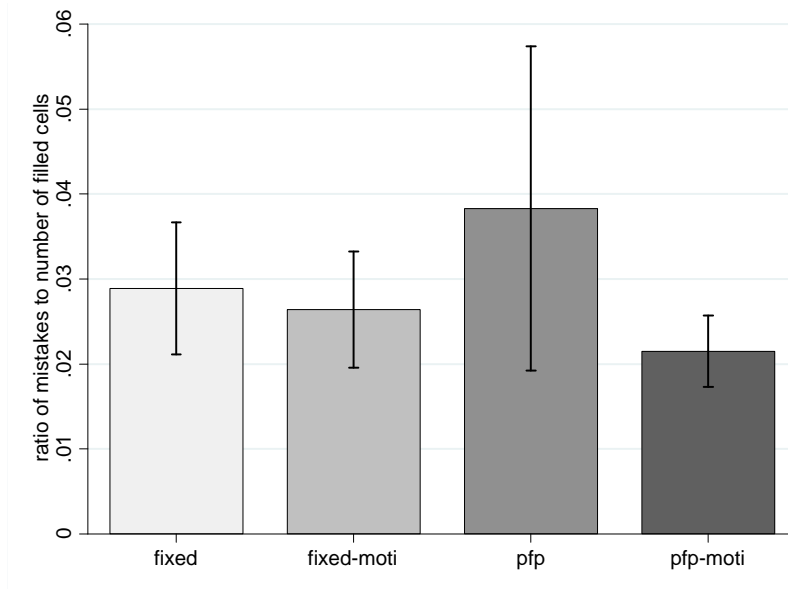


chart in Figure 3 we see that the means are lower when the subjects were exposed to motivational talk. We further see that the variation of the ratio is rather high in the pfp treatment, where some subjects seemed to have stopped caring about mistakes at all. Hence, performance pay alone did not only lead to lower performance but also to more mistakes per entered cell. But the difference is not significant ($p = 0.169$) and the regression in column (1) of Table A2 also shows no significant effects for the motivation and piece rate dummies as well as their interaction (p-value for the interaction effect is 0.142).

However, when we compare the pfp with the pfp-moti treatment while controlling for other factors, we observe a significantly lower ratio of mistakes to the number of filled cells in the pfp-moti treatment (F-test for $\beta_1 + \beta_3 = 0$, $F = 0.015$, the results for regressions with treatment dummies and pfp-moti treatment as the reference category are reported in column (2) of Table A2 in the appendix), indicating that indeed adding motivational talk to pay for performance makes the difference. The average ratio of mistakes to number of filled cells is 0.0383 in the pfp treatment while it is

differences in performance between the treatments, but the results are qualitatively similar if we simply look at mistakes.

0.0215 in the pfp-moti treatment. Hence, adding motivational talk to pay for performance leads to a reduction of the mistakes ratio of more than 40 percent. Furthermore, we find significant differences when comparing the fixed-moti with the pfp-moti treatment (F-Test for $\beta_2 + \beta_3 = 0$, $F = 0.036$ the results for regressions with treatment dummies and pfp-moti treatment as the reference category are reported in column (2) of Table A2 in the appendix). Hence, the analysis indicates some complementarity, even though the positive interaction coefficient is not significant in the regression in column (1) of Table A2. Although subjects were not rewarded for quality, performance pay had a significant positive effect on quality if it was accompanied by motivational talk.

5 Concluding remarks

Despite warnings from a number of bestselling business books about the hidden costs of monetary rewards,¹⁶ performance pay is increasingly popular (Lemieux et al. (2009)). However, firms usually do not rely on monetary incentives alone to motivate their workforce - non-monetary forms of motivation are ubiquitous. This raises the question of whether non-monetary motivation can mitigate potentially detrimental effects of performance pay, or whether non-monetary motivation is particularly effective in combination with monetary incentives.

In this paper, we present a field experiment designed to investigate the interaction between monetary incentives and a primal form of motivation, namely motivational talk - words that potentially evoke the workers' intrinsic motivation and inspire them to exert extra effort. We identify what can be termed a hidden benefit of reward: Subjects responded to motivational talk by increasing their performance only if they also received performance pay. Moreover, performance pay decreased performance unless it was accompanied by motivational talk. Consequently, performance pay and motivational talk were complements in enhancing performance. The advantageous combination of performance pay and motivation also carried over to the quality of work. Although subjects were not rewarded

¹⁶See, e.g., Nelson (2005) and Pink (2009) "Drive. The surprising truth about what motivates us."

for quality, performance pay had a positive effect on quality only if it was accompanied by motivational talk. The effects are strong. In treatments with performance pay, motivational talk increased output with about 20 percent and reduced the ratio of mistakes with more than 40 percent.

Our paper identifies the existence of an important complementarity effect, but we do not know how general it is, or exactly the mechanism behind. We propose a rather general model showing that motivational effort might enter the workers' utility function in such a way that it complements the effect of monetary incentives, and vice versa. A more specific model on the mechanism behind the complementarity effect might be worthwhile. The strict complementarity that we find, combined with a negative effect of performance pay alone, indicate that motivational talk affects the workers' perception of - or sympathy to - the piece rate scheme. It might also imply that performance pay affects the workers' perception of the motivational talk: For motivational talk to be more than just cheap talk, it might help to put money behind the words.

Our results thus have important implications for firm practice. First, communication is important in order to prevent monetary rewards from backfiring. Second, small piece rates, constituting only 10 percent of the total salary, can be rather effective when they are accompanied by simple forms of motivational talk.

6 Appendix

Table A1: Treatment effects on performance.

	Overall	First half	Second half
Fixed treatment	-2.716*** (0.702)	-1.133*** (0.288)	-1.583** (0.549)
Fixed-moti treatment	-1.954* (0.827)	-0.466* (0.218)	-1.487* (0.783)
Pfp treatment	-4.225*** (0.539)	-1.429*** (0.274)	-2.796*** (0.442)
Female	-2.310* (1.156)	-1.447** (0.587)	-0.863 (0.599)
Age	-0.373* (0.186)	-0.197* (0.085)	-0.175 (0.106)
Enrolled in economics	-0.505 (1.064)	-0.459 (0.526)	-0.046 (0.641)
Morning session	0.772 (0.632)	0.364 (0.220)	0.409 (0.500)
Constant	33.68*** (4.078)	15.13*** (1.789)	18.55*** (2.438)
Observations	139	139	139
R^2	0.131	0.135	0.125

Note: This table reports OLS coefficient estimates (robust standard errors clustered on sessions in parentheses). The dependent variable is performance measured by the number of reported games. We add dummy variables for each treatment with the pfp-moti treatment as the reference category. We add dummy variables for females, subjects studying economics, and sessions executed in the morning as well as a control for age. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A2: Effects of motivation and piece rate as well as treatment effects on mistakes.

	(1)	(2)
Motivation	-0.002 (0.007)	
Piece rate	0.010 (0.009)	
Motivation x piece rate	-0.014 (0.008)	
Fixed treatment		0.007 (0.008)
Fixed-moti treatment		0.005** (0.002)
Pfp treatment		0.016** (0.005)
Female	0.003 (0.002)	0.003 (0.002)
Age	-0.001 (0.001)	-0.001 (0.001)
Enrolled in economics	-0.004 (0.005)	-0.004 (0.005)
Morning session	0.009 (0.006)	0.009 (0.006)
Constant	0.052* (0.022)	0.052* (0.022)
Observations	139	139
R^2	0.064	0.064

Note: This table reports OLS coefficient estimates (robust standard errors clustered on sessions in parentheses). The dependent variable is the ratio of mistakes to number of filled cells. “Motivation” is a dummy variable indicating subjects were exposed to motivational talk. “Piece rate” is a dummy variable indicating subjects earned an additional piece rate. “Motivation x piece rate” is the interaction of both afore mentioned dummy variables. In the second column we add dummy variables for each treatment with the pfp-moti treatment as the reference category. We add dummy variables for females, subjects studying economics, and sessions executed in the morning as well as a control for age. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Instructions

The motivational sentences, which were only used in the motivational treatments, are in bold letters.

Dear students,

Welcome to the CIP Pool of the Juridicum. I am glad that you decided to support us to record the data for a research project. In the framework of a large research project, we analyze sports data, in this case ice hockey, to investigate the behavior of teams and competitive situations. We are certain that you, as competent students of the University of Bonn, are able to record the data fast and precisely. My name is XX and I will explain your task to you. If you have a question, please raise your hand.

During the next 90 minutes, you are supposed to enter data in an excel sheet. The excel sheet is located on a USB flash drive plugged into your computer and we have already opened it. Please save your work regularly to avoid the loss of data. Please make sure that you do not log out because all data not stored on the flash drive will be erased. Save your data on the flash drive after the 90 minutes.

To your left, you find a box with game reports from the German ice hockey league. A report can consist of several sheets of paper that are then stapled together. Each report has a unique identification number. We will now show you how the data should be recorded by using an example. You find the example game report on the top of the box on your left. Start with entering the ID of the game. You find the ID in the upper left corner on the first page of the game record. Here it is 1112_358. The date has to be entered in the second column, here it is 11.03.2012. You find the date here (showing the date on the screenshot in the powerpoint presentation). Enter the name of the home team into the next column. You find it on the first page denoted as the first team, here “Eisbaeren Berlin.” Then you enter the visiting team, this is the “Koelner Haie.” The number of spectators has to be entered into the next column and you find this number at the end of the game report in the section “additional information.” Please note that the comma indicates a thousand, hence we have 14200 spectators. Next

you enter the duration of the game which you can also find in the section “additional information.” Here you have to enter 02 : 25. Please be careful to enter the duration in the correct format.

Next we have the entries for the number of shot goals for each third. You will find the necessary information in the section “Results” on the first page. Please enter the number of shot goals for the home and visiting teams separately. If the game is tied at the end of the regular time, there will be a so-called overtime. This would be indicated by “OT” in the game report. If there is information available for an overtime, please enter it in the respective columns. In this example this would be zero for both teams. If a game is still tied after the overtime, there will be a penalty shooting. This would be indicated by “SO” in the game report and would have to be entered in the columns O and P as it is the case in this example. On the right side of the number of shot goals you find information regarding shots at goal which have to be entered next. Again this information has to be entered for each third and for each team separately. Again there might be information regarding an overtime or penalty shooting. Next you have to enter the goalie statistics, which you can find on the second page of the game report. Please start with the name of the first goalie of the home team, here R. Zepp. His name can be found on the left in the first column. Then you have to enter in the column denoted “MIN” the number of minutes the goalie has been in play. Enter the number of shots at goal and the safes into the next columns. If the goalie was changed in a game, the information regarding the second goalie has to be entered in the columns denoted with “Torhueter 2.” This is not the case in this example. The same is true for the goalie of the visiting team.

Now we look at the penalties. Here you will have to do some math. There are different kinds of penalties in hockey and their respective durations depend on the severity of the insult. You find the necessary information on the first page in the section “penalties.” Please start with counting the number of 2-minute penalties of the home team in the first third and enter the number in column AQ. Here we have one 2-minute penalty. Please enter the number of the penalties and not the minutes, hence if there was one 2-minute penalty you have to enter a “1” and not a “2.” Next count the number of 5-minute penalties of the home team in the first third and enter

it in column AR. Furthermore we have 10-minute penalties and 20-minute penalties. For each of those penalties we have two columns, 10A and 10D and 20A and 20D. The automatic 10-minute penalties which are always called together with a 2-minute penalty have to be entered in the column 10A. You can recognize automatic 10-minute penalties because the same player receives an identical penalty of 2 minutes at the exact same time. This is the case in the example game report. 10D penalties are 10-minute penalties that are ruled without an accompanying 2-minute penalty at the same time. Here you see an example from another game report (shown in the powerpoint slides). The same logic applies for the 20-minute penalties. Here you enter the penalty in the column 20A if it was ruled together with a 5-minute penalty. 20D are all penalties ruled without an accompanying 5-minute penalty. In the column "MP" you enter match penalties with a duration of 25 minutes. Please count the penalties for each team and each third separately and enter the number in the respective column. You will find a sheet with additional explanations regarding the penalties on your desk.

Now we come to the power plays which you can find on the first page of the game report. Enter the first number in the column "goals," here zero, and the second in the column "power," here 5. Next we have the information about the referees and linesmen, which you find at the end of the game report.

When you have finished a game report, please put the corresponding sheets of paper in the box to your right and save the data. Please do not change the order of the game reports. After 45 minutes, I return and ask you to store the data in an extra file. I will explain to you how exactly this works then.

During the next 45 minutes, you will work independently. If you have questions, you can come to the next room and ask me. Of course, you are allowed to leave the room to visit the ladies' or men's room. After 90 minutes you receive your payment of 20 euro in the room next door after you hand in the stick. (Only in pfp treatments: Additionally, we will pay you 10 euro cents for each game you entered. To determine the correct payment we will briefly check the number of games you have entered before we pay you.)

I know that the work might be exhausting and tiring, but I also know that you are diligent students who are able to concentrate on these kinds of tasks for longer periods. If you decide to leave the room, please try to be quiet to avoid disturbing your colleagues. You are welcome to adjust the screen to your convenience or to alter the zoom in the excel sheet. If there are no more questions, let 's start working!

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