Keep your eyes on the prize:
How to make penalty contracts work
Preliminary Version - do not cite or circulate

Frauke von Bieberstein, Andrea Essl, Kathrin Friedrich, Stefanie Jaussi∗
Institute of Organization and Human Resource Management, University of Bern,
Enghaldenstrasse 4, 3012 Bern, Switzerland

Abstract

Many lab experiments on incentive framing have found that penalties induce higher effort
than bonuses. However, there are also many studies that did not find this effort-enhancing
effect of penalties. In a first experiment, we consider the relevance of the upfront payment in
producing this effect of penalties. We find that penalty contracts where participants receive
the upfront payment physically before working on a real effort task induce more effort than
economically-equivalent bonus contracts. When comparing penalty contracts with cash upfront
payment and without, we find that the latter induce significantly less effort. One potential
reason could be the higher salience of the upfront payment when it is administered directly in
cash. In a second experiment conducted online, we show that a significant effort-enhancing effect
of penalty contacts can be observed when payments are sufficiently salient, even when there
is no actual money transfer upfront. This is achieved by visualizing payments with images of
dollar bills. In treatments where payments are only verbally described, penalty framed contracts
do not lead to higher effort provision than bonus contracts. We conclude that penalty contracts
can induce higher effort than bonus contracts if the payments at stake are salient enough.

Keywords: contract framing, loss contract, loss aversion, cash upfront payment, laboratory
experiment

JEL codes: C91, J24, J33, M52

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are ours.
1 Introduction

Incentive contracts are commonly used to motivate employees (Prendergast 1999) and research shows that framing affects their effectiveness. In particular, experimental evidence reveals that negatively framed incentive contracts, that penalize poor performance, induce more effort than economically-equivalent, positively framed incentive contracts rewarding good performance (e.g., Hannan et al. 2005). One explanation for the effort-enhancing effect of negatively framed incentives is loss aversion around a reference point, formalized in prospect theory (Kahneman and Tversky 1979).

However, while some experiments find large framing effects in the laboratory with Hedges’ g statistics around 0.50 (e.g., Hannan et al. 2005, Armantier and Boly 2015, Imas et al. 2016, von Bieberstein et al. 2020), other studies report only marginally significant effects (e.g. Brooks et al. 2012), and still others do no find any statistically significant effect of contract framing on effort at all (e.g. Grolleau et al. 2016, de Quidt et al. 2017, DellaVigna and Pope 2018). Searching for systematic differences potentially explaining the diverse results, de Quidt et al. (2017) suggest that whether participants can check if they meet a performance target while performing the task, or not, influences the effectiveness of contract framing. However, they did not find any causal evidence supporting this conjecture and the authors acknowledge that there are many other differences between the studies they considered in their review of the literature. Taking additional laboratory studies into account (Church et al. 2008, Hochman et al. 2014, de Quidt et al. 2017, Essl and Jaussi 2017, von Bieberstein et al. 2020), we propose that whether or not participants receive a cash payment upfront before performing the task potentially explains the mixed results.

Thus, the first aim of this study is to examine whether we find the effort-enhancing effect of penalty contracts if we physically pay out the cash payment upfront but not if the payment is only announced but paid out later. Our between-subject laboratory experiment comprises two stages. In both stages, participants work on a real effort task. In stage 1, they receive a fixed wage independent of performance and in stage 2, they work under a framed incentive contract. Depending on the treatment, the incentive contract is either a bonus contract, a penalty contract with cash upfront payment, or a penalty contract without cash upfront payment. All contracts are economically equivalent and participants receive a substantially higher payoff when meeting an announced performance target (15 CHF vs. 5 CHF). As expected, we find that penalty contracts with physical cash upfront payment elicit significantly more effort than economically-equivalent bonus contracts. Comparing both types of penalty contracts, we find that penalty contracts with cash upfront payment elicit significantly more effort than penalty contracts without cash upfront payment.

There are several potential reasons why the cash upfront payment could be important for producing the effort-enhancing effect of penalty contracts. First, people might regard an upfront payment

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1 An overview of laboratory experiments analyzing the effect of bonus and penalty framing on effort provision is available in Table A.1 in Appendix A.

2 At the time of the experiment 1 CHF equaled about 1 US$. 
of cash as a kind act by the experimenter and reciprocate this kindness with higher effort (Fehr and Gächter 2000). However, we do not find a similar effect in stage 1, where the payment was independent of performance and where the timing of the cash payments mirrored stage 2. Thus, we conclude that reciprocity does not seem to be the driver of our effect. Second, handing out the cash upfront could affect participants’ beliefs that it is highly likely or the norm to reach the target. However, while we cannot rule out this possibility, we believe that it is rather unlikely, given that participants got well acquainted with the task in stage 1 and received feedback about their own performance, allowing them to use this knowledge in their assessment of stage 2. Finally, our preferred interpretation is that our results are due to an increase in the salience of the upfront payment which in turn reinforces the feeling of ownership and induces a greater fear of losing the money.

Showing the strong effect of handing out the cash payment upfront is an important finding for researchers studying contract framing in person in the lab. However, in recent years, many researchers have started to conduct their lab experiments online, where the physical upfront transfer of cash is not possible. Thus, the second aim of this study is to examine whether we can produce a similar effort-enhancing effect of penalty contracts online. In our online experiment, we employed a 2x2 between-subject design, varying the incentive framing (bonus vs. penalty) and the salience of the payment (visual vs. verbal only). In the visualized treatments, participants saw images of the respective dollar bills in their current account on the top of the screen while working on the real-effort task. In the verbal only treatments, the same information was given verbally. We find that penalty contracts induce higher effort than bonus contracts online in the visual treatments where the payment is more salient. In contrast, we do not find a similar effect when comparing the verbal only treatments.

Taken our two experiments together, we conclude that penalty contracts can induce higher effort than bonus contracts if the higher upfront payment of penalty contracts that is at risk to be lost is salient enough for the participants. We identified two different ways to increase this salience: through physical possession or through visualization. Our results are important for experimental research on framed incentives and more generally for research on the effects of increases in salience.

The remainder of this paper is organized as follows. In Section 2.1 we explain the design and procedure of Experiment 1 and we show the results in Section 2.2. In Section 3.1 we explain the design and procedure of Experiment 2 and we present the corresponding results in Section 3.2. We discuss our overall results and conclude in Section 4.

3Of the researchers who studied contract framing online so far, most did not find an effort-enhancing effect (de Quidt et al. 2017, DellaVigna and Pope 2018). The only study we are aware of that found higher effort under penalty compared to bonus contracts is de Quidt (2018). However, he studied contract take-up rates and thus his study entails selection effects. He proposes that the higher take-up rate of penalty contracts is due to the higher salience of the incentive pay.
2 Experiment 1

2.1 Experimental design and procedure

In a lab experiment, we examine the importance of physical possession of the money at stake as a potential driver of the effort-enhancing effect of penalty contracts in a real effort encryption task\footnote{The ethical standard of the study was approved by the Faculty of Business Administration, Economics and Social Sciences of the University of Bern. The experimental details were pre-registered on the American Economic Association’s registry for randomized controlled trials with the unique identifying number: AEARCTR-0005303.}. We implemented three treatments with three differently framed incentive contracts which are economically equivalent rendering the same payoff for same performance. In the Bonus Cash treatment, participants received 5 CHF as a upfront payment and when meeting the predefined target, they earned an additional bonus of 10 CHF. In the Penalty Cash and Penalty No Cash treatments, participants received 15 CHF upfront and had to pay a penalty of 10 CHF in case of missing the target. In the Bonus Cash and the Penalty Cash treatments, participants were physically paid out their upfront payment in cash prior to the task, whereas in the Penalty No Cash treatment, they were only informed about the upfront payment, but did not physically received the money until the end of the experiment.

At the beginning of the lab experiment, we assessed individual loss aversion (Gächter et al. 2010), followed by two stages, where participants worked on a Word Encryption task with Double Randomization (WEDR task) (Benndorf et al. 2019). Participants had to encode words as numbers and could only proceed with the next word if they encoded all letters correctly. Effort was measured as number of solved words. We chose this task for several reasons: it requires no special knowledge or cognitive abilities, learning possibilities are trivial, there is no scope for guessing, and it is gender-neutral (Benndorf et al. 2019). In stage 1, participants worked on the encryption task for 3 minutes and received a fixed wage of 5 CHF, irrespective of the number of solved words. Participants familiarized themselves with the task and we obtained a measure of baseline performance capturing motivation and ability. In stage 2, they had 4 minutes to encode a maximum of 20 words.

Payment was performance-based and tied to an announced target. If participants solved at least 12 words, they received 15 CHF, otherwise their payment was 5 CHF. Solving 12 words corresponds to the 80th performance percentile under piece-rate incentives in a similar experiment (von Bieberstein et al. 2020), such that we chose it as challenging, but feasible target. In our experiment, participants solved on average 10.09 words (S.D.=1.7), and 19% reached the target of 12 words. While working in stage 2, participants were always informed about the number of correctly coded words. To keep payment procedures consistent over both stages of the experiment, the fixed wage of 5 CHF in stage 1 was always executed in the same way as the upfront payment in stage 2. This means that participants in the Bonus Cash treatment and the Penalty Cash treatment physically received their fixed wage before working on the real effort task. In the Penalty No Cash treatment, the fixed wage was not distributed in advance, but only at the end of the experiment. Moreover, to

\footnote{Experimental instructions including a screenshot of the task are available in Appendix B.}
ensure confidentiality and comparability across all treatments, the bonus payments and the returned penalty payments in the treatments with physical possession were administered via envelopes. This way neither the experimenter distributing and collecting the payments, nor any other participant could infer if the target was met.

The experiment was conducted in the Aare-Lab of the University of Bern between December 2019 and February 2020. Subjects were recruited via Sona-Systems, and the experiment was computerized using z-Tree (Fischbacher 2007). In total, 195 students from various disciplines participated. Based on prior research, we expected a medium sized effect of contracting framing on productivity (Cohen’s d=0.54 in von Bieberstein et al (2020)). Thus, with at least 64 participants per treatment, we have 80% power to detect such an effect at a 5% level of significance. The subjects were randomly assigned to one of the three treatments, which in turn were randomized over morning, midday and afternoon sessions. Participants received written instructions for the real effort encryption task and had to answer control questions to ensure that they understood the performance-based incentives in stage 2. Each session lasted about 45 minutes and average earnings were 17 CHF including a show-up fee of 4 CHF. The experiment concluded with a short questionnaire on demographics.

2.2 Results of Experiment 1

2.2.1 Effort-enhancing effects of penalty contracts

To analyze the effect of physical possession of the base pay on effort provision, we compare the number of correctly solved words across treatments. Table 1 reports descriptive statistics for the number of words solved in stage 2 and the baseline performance measured by the number of words solved in stage 1. Participants who worked under a penalty contract with physical upfront payment solved significantly more words than those who worked under a bonus contract (p=0.003) or under a penalty contract without physical upfront payment (p=0.024).

The descriptive results are supported by estimates of an OLS regression. Table 2 presents the results. In specification 1 of Table 2, we regress the number of solved words in the encryption task of stage 2 on the treatment dummy variable, which takes the value 0 for Bonus Cash treatment and 1 for Penalty Cash. We also include Baseline performance, which is the number of solved words under baseline performance.

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6The experimental procedure was not double blind since another experimenter disbursed the outstanding payments at the end of the experiment.
7Our experiment was always followed by one of two other experiments such that the total session duration was either 60 minutes or 90 minutes. As expected, neither the number of words solved in stage 1, nor in stage 2 differ statistically significantly between the shorter and longer sessions (stage 1: p=0.332, stage 2: p=0.853; Mann-Whitney rank sum tests, two-sided.)
8We used two-sided Mann-Whitney rank sum test for the analysis.
9We use effort provision as outcome measure, as we chose a challenging target and only 19% (14% in the Bonus Cash, 25% in the Penalty Cash, 20% in the Penalty No Cash) reached the target of 12 words. An alternative outcome measure is whether participants meet the performance target. Using this dummy variable instead, we do not find a statistically significant differences between any two treatments (Bonus Cash vs. Penalty Cash: p=0.119, Bonus Cash vs. Penalty No Cash: p=0.414, Penalty Cash vs. Penalty No Cash: p=0.441, Chi²-Tests). As we chose a challenging, but feasible target, only 19% reached the target of 12 words.
Table 1: Descriptive statistics: Encryption task

<table>
<thead>
<tr>
<th></th>
<th>Bonus Cash (n=64)</th>
<th>Penalty Cash (n=64)</th>
<th>Penalty No Cash (n=67)</th>
<th>BC-PC</th>
<th>PC-PNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Stage 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>9.80</td>
<td>10.48</td>
<td>9.99</td>
<td>0.003</td>
<td>0.024</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.54</td>
<td>1.57</td>
<td>1.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>6.44</td>
<td>6.69</td>
<td>6.60</td>
<td>0.457</td>
<td>0.841</td>
</tr>
<tr>
<td>S.D.</td>
<td>1.39</td>
<td>1.39</td>
<td>1.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: The table presents means and standard deviations across for the Bonus Cash (BC), the Penalty Cash (PC), and the Penalty No Cash (PNC) treatments. The last two columns report p-values obtained from two-sided Mann-Whitney rank-sum tests.

The fixed wage in stage 1. As expected, participants’ baseline performance in stage 1 positively predicts the number of solved words under performance-based incentives. In line with the descriptive statistics and previous literature, the results show that when cash upfront payments is in place, penalty contracts induce significantly more effort than economically-equivalent bonus contracts. In specification 2, we further include Loss aversion, which is represented by the number of rejected lotteries in the loss aversion test, and whether the participant is Female, or not. Including these controls does not alter the results.

Table 2: Treatment effects on effort in the encryption task

<table>
<thead>
<tr>
<th></th>
<th>No. of words (1)</th>
<th>No. of words (2)</th>
<th>No. of words (3)</th>
<th>No. of words (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penalty Cash</td>
<td>0.511** (0.221)</td>
<td>0.489** (0.227)</td>
<td>-0.423* (0.233)</td>
<td>-0.406* (0.242)</td>
</tr>
<tr>
<td>Baseline performance</td>
<td>0.708*** (0.080)</td>
<td>0.713*** (0.085)</td>
<td>0.848*** (0.090)</td>
<td>0.855*** (0.091)</td>
</tr>
<tr>
<td>Loss aversion</td>
<td>-0.034 (0.090)</td>
<td>-0.169 (0.102)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-0.367 (0.231)</td>
<td>-0.095 (0.241)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>5.240*** (0.536)</td>
<td>5.529*** (0.588)</td>
<td>4.816*** (0.655)</td>
<td>5.238*** (0.695)</td>
</tr>
</tbody>
</table>

N 128 121 131 124  
R² 0.427 0.427 0.461 0.479

Notes: The table presents the results of an OLS regression with robust standard errors in parentheses. The dependent variable is the performance measured as the number of solved words in stage 2. The dummy variable Penalty Cash is 1 if subject participated in the Penalty Cash treatment and 0 for participants in the Bonus Cash treatment (Specifications 1 and 2) and the Penalty No Cash treatment (Specifications 3 and 4). Loss aversion is represented by the number of rejected lotteries in the loss aversion test. Female indicates whether the participant is female (=1) or not (=0). The sample sizes differ, because we excluded 7 participants due to inconsistent lottery choices. *, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

Next we investigate the question of whether the money at stake is paid out in cash upfront is a driver for the effort-enhancing effect under penalty framed incentive contracts. We therefore run an OLS regression comparing the effect of the two loss contracts. In specifications 3 and 4 of Table 2
reports the corresponding estimates. Note that in specification 3 and 4 the dummy variable *Penalty Cash* is 1 if subject participated in the *Penalty Cash* treatment and 0 for participants in the *Penalty No Cash* treatment. Results show that penalty contracts without physical upfront payment induce significantly less effort than penalty contracts with physical upfront payment. We therefore conclude that cash upfront payment is crucial for enhancing effort under loss contracts.

### 2.2.2 Reciprocity as a driver of effort provision

It could be that positive reciprocity in response to receiving a cash payment prior the task might increase effort (Rabin 1993, Fehr et al. 1993, Falk and Fischbacher 2006). Reciprocity means that people respond favorably to intentional actions perceived as positive, whereas they respond unfavorably to those perceived as negative (Fehr and Gächter 2000). Thus, if people regard the cash upfront payment as a kind action, they might return more effort. Therefore, one possibility is that positive reciprocity in response to receiving a upfront cash payment induces higher effort irrespective of any fear of losing the money. To analyse this possibility, we use stage 1 of the experiment and examine the effect of upfront cash payments on effort under a fixed wage. In the *Bonus Cash* treatment and the *Penalty Cash* treatment, the fixed wage of 5 CHF was physically paid in cash before participants started working on the real effort task. In contrast, in the *Penalty No Cash* treatment, the fixed wage was paid only at the end of the experiment.

Table 1 presents the means and standard deviations of the number of solved words under the fixed wage in stage 1 across the three treatments. Pairwise comparisons reveal that there are no statistically significant differences in baseline performance across the treatments. Therefore, we suggest that the effort-enhancing effect of the physical upfront payment under penalty contracts is not due to a positive reciprocation of cash upfront payment, as effort provision in stage 1 is not affected by physical possession of the CHF 5.

### 3 Experiment 2

#### 3.1 Experimental design and procedure

To test whether simply increasing the salience of the payoffs leads to higher effort provision under penalty contracts, we conducted an online study on Amazon Mechanical Turk (MTurk). In this experiment, we employed a $2 \times 2$ between-subject design, varying the incentive framing (bonus contract vs. penalty contract) and the salience of the payment (visual vs. verbal only). In contrast to Experiment 1, participants in this experiment were only informed about the respective payments

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10 The ethical standard of the study was likewise approved by the Faculty of Business Administration, Economics and Social Sciences of the University of Bern. As in Experiment 1, the experimental details were pre-registered on the American Economic Association’s registry for randomized controlled trials with the unique identifying number: AEARCTR-0006299.
on their screen, but did not receive any upfront money transfers. To increase salience, we visualized payments and showed participants images of the respective dollar bills on the top of the screen while working on the task (Bonus Visual treatment and Penalty Visual treatment). In the treatments with lower salience (Bonus Verbal and Penalty Verbal), we only verbally described payments and participants saw plain figures instead of visualized dollar bills.

In Experiment 2, participants were asked to count the number of 8s in a table consisting of 8s and 6s (Liu 2019). Each table had 12 rows and 12 columns, resulting in a total of 144 numbers. According to Liu (2019), this represents a "hard" task and participants need on average roughly a minute to complete such a task. For the reward mechanism, we followed de Quidt (2018). Participants were informed that after completing 15 tables in the main stage of the experiment, one of the tables would randomly be chosen for checking. As in de Quidt (2018), they would receive the additional bonus or avoid the penalty, if the selected table was solved correctly. In the treatments with penalty contracts, participants received a base pay of 2 USD and could lose 1 USD, if the selected task was not solved correctly. In the treatments with bonus contracts, participants received a base pay of 1 USD and could earn an additional bonus of 1 USD for correctly solving the chosen table.

The experiment was conducted online on MTurk between July 30th and August 19th, 2020. The experiment was computerized using Qualtrics. Based on a two-sided Wilcoxon-Mann-Whitney test, an error probability of 0.05, and a power of 0.80, we require approximately 180 participants per treatment to detect an effect of Cohen’s d of 0.30. Therefore, a total of 790 subjects participated. For our analysis, we exclude 82 participants who did not solve any table correctly.

Participants received instructions for the counting task and had to solve a control table to ensure that they understood the modalities of the task. The main stage was designed to take around 15 minutes of focused work, while participants were not put under time pressure and could take more time to complete the task if desired. Average participation recorded for the full study was about 30 minutes and average earnings were 2.50 USD including a flat payment of 1 USD for participating in the experiment. The experiment concluded with a short questionnaire on demographics.

### 3.2 Results of Experiment 2

We start with examining if penalty contracts outperform bonus contracts in an environment without physical possession of the money, but with relatively high salience through visualisation of the respective payments with images of dollar bills. Table 3 shows descriptive statistics for the number of tables solved in Experiment 2. In the treatment Bonus Visual, participants solved, on average, 8.32 tables. In the treatment Penalty Visual, effort provision was, on average, 1.1 tables higher, with 9.41 tables being solved correctly. This difference is statistically significant (p=0.025, Mann-Whitney rank sum test).

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11 In Appendix B, screenshots of the instructions are shown.
12 On average, 10.4% of participants did not solve any table correctly (Bonus Verbal: 11.8%, Penalty Verbal: 10.8%, Bonus Visual: 11.3%, Penalty Visual: 7.6%). There is no significant difference between treatments (p=0.507, chi2-test). Participants who were excluded spent significantly less time on the study (637.34 seconds vs. 1328 seconds, p<0.001, Mann-Whitney rank sum test), and therefore did not spend enough time on the tasks to calculate the numbers correctly.
rank sum test). In the two other treatments, we only verbally described earnings. In contrast to the above results where showed images of dollar bills, in the treatment Penalty Verbal, effort provision is not statistically significantly different from effort levels observed in treatment Bonus Verbal \((p=0.686, \text{Mann-Whitney rank sum test})\).

**Table 3:** Descriptive statistics: Counting task

<table>
<thead>
<tr>
<th></th>
<th>Bonus Verbal ((n=180))</th>
<th>Penalty Verbal ((n=183))</th>
<th>Bonus Visual ((n=164))</th>
<th>Penalty Visual ((n=181))</th>
<th>BVer-PVer</th>
<th>BVis-PVis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct Tables</td>
<td>Mean 8.43</td>
<td>8.67</td>
<td>8.32</td>
<td>9.41</td>
<td>0.686</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>S.D. 4.89</td>
<td>4.66</td>
<td>4.60</td>
<td>4.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Notes:* The table presents means and standard deviations for the Bonus Verbal (BVer), the Penalty Verbal (PVer), Bonus Visual (BVVis), and the Penalty Visual (PVVis) treatments. The last two columns report \(p\)-values obtained from two-sided Mann-Whitney rank-sum tests.

The descriptive results of Experiment 2 are supported by estimates of an OLS regression. Table 4 summarizes the results. In specifications 1 and 2 of Table 4, we regress the number of solved tables on the treatment dummy variable Penalty Verbal, which takes the value 0 for Bonus Verbal treatment and 1 for Penalty Verbal. We do not find a significant treatment effect in this setting. Specifications 3 and 4 analyze effort provision in treatments with higher salience, namely with visualization of payments with dollar bills. We regress the number of solved tables on the treatment dummy variable Penalty Visual, which takes the value 0 for Bonus Visual treatment and 1 for Penalty Visual, and find a statistically significant higher effort provision in penalty compared to bonus contracts. The inclusion of gender and age does not alter this result. Specifications 5 and 6 report OLS estimates from our combined data set. We regressed the number of solved tables on a vector consisting of the treatment dummy variables. The omitted category is Bonus Verbal treatment. Results show a statistically significantly higher effort provision in the Penalty Visual than in the Bonus Verbal treatment. Thus, we conclude that making payments at risk more salient through visualisation can produce an effort-enhancing effect of penalty versus bonus contracts.
### Table 4: Effect of payment salience on effort: OLS regression

<table>
<thead>
<tr>
<th>No. of tables</th>
<th>No. of tables</th>
<th>No. of tables</th>
<th>No. of tables</th>
<th>No. of tables</th>
<th>No. of tables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verbal (1)</td>
<td>Verbal (2)</td>
<td>Visual (3)</td>
<td>Visual (4)</td>
<td>All (5)</td>
</tr>
<tr>
<td>Penalty Verbal</td>
<td>0.239</td>
<td>0.027</td>
<td>0.239</td>
<td>0.108</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.502)</td>
<td>(0.494)</td>
<td>(0.502)</td>
<td>(0.495)</td>
<td></td>
</tr>
<tr>
<td>Penalty Visual</td>
<td>1.092**</td>
<td>1.094**</td>
<td>0.976**</td>
<td>0.864*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.490)</td>
<td>(0.493)</td>
<td>(0.494)</td>
<td>(0.489)</td>
<td></td>
</tr>
<tr>
<td>Bonus Visual</td>
<td>-0.116</td>
<td>-0.198</td>
<td></td>
<td></td>
<td>-0.198</td>
</tr>
<tr>
<td></td>
<td>(0.511)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.719***</td>
<td>0.308</td>
<td>1.015***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.497)</td>
<td>(0.508)</td>
<td>(0.356)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.027</td>
<td>0.020</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.023)</td>
<td>(0.017)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.364)</td>
<td>(0.965)</td>
<td>(0.359)</td>
<td>(0.900)</td>
<td>(0.364)</td>
</tr>
</tbody>
</table>

**Notes:** The table presents the results of an OLS regression with robust standard errors in parentheses. The dependent variable is performance measured as the number of solved tables. The dummy variable *Penalty Verbal* is 1 if subject participated in the *Penalty Verbal* treatment and 0 for participants in the *Bonus Verbal* treatment (column 1 and 2). The dummy variable *Penalty Visual* is 1 if subject participated in the *Penalty Visual* treatment and 0 for participants in the *Bonus Visual* treatment (column 2 and 3). In column 3 and 4, the *Penalty No Cash* treatment serves as reference group. Female indicates whether the participant is female (=1) or not (=0). *, **, and *** document significance at the 10%, 5%, and 1% levels, respectively.

### 4 Discussion and conclusion

Experimental evidence on the effectiveness of loss framed contracts is ambiguous (see Table A.1 in Appendix A). Many experiments reveal that penalty contracts induce more effort than economically-equivalent bonus contracts as they find framing effects, which are statistically significant and meaningful in size. Still, other laboratory studies identify considerably smaller effects, or even no effect. We contribute to the ongoing methodological debate by testing increased salience of the payments at stake as a potential driver of framing effects.

In our first experiment, we examine physical possession of the money when working under framed contracts in light of its potential performance-enhancing effect. We employed three treatments with differently framed incentive contracts: A *Bonus Cash* treatment with physical upfront payment of the base pay and two negatively framed treatments, *Penalty Cash* and *Penalty No Cash*. For the penalty treatments, we varied whether participants received a physical cash upfront payment or whether they were only verbally informed about the payments at stake. As expected, the penalty contract with physical possession of the money before working on the task elicited significantly more effort than the bonus contract. However, the effort-enhancing effect of penalty contracts seems to crucially depend the saliency of the upfront payment that we varied by 'putting money on the table': In treatment *Penalty No Cash*, participants solved significantly less tasks as compared to the identical loss contract with cash upfront payment in place. Based on our findings, we conclude that...
the effort-enhancing effect of loss framed contracts is considerably driven by a cash upfront payment prior to working on the task.

Online platforms became an important channel to conduct studies on the driving forces behind labor effort. While online platforms allow for fast collection of large data sets, it is not possible to administer physical cash upfront payments. Our second experiment is therefore conducted online on MTurk, addressing other possibilities to increase the salience of the upfront payment when working under bonus versus penalty contracts. In a 2x2 design, we vary the incentive framing (bonus vs. penalty) and the salience of the payment (visual vs. verbal only). Showing participants images of the money at stake induces a significant effort-enhancing effect of penalty over bonus contracts. When information is only verbally given to participants, penalty contracts do no longer outperform equivalent bonus contracts.

Our different treatment specifications allow discussing several explanatory factors. First, we can exclude that participants were not fully aware of payment options in the verbal treatments, as they had to answer several control questions to ensure complete understanding of the payoff consequences of their performance. Second, due to a design element that we have chosen in Experiment 1, we can exclude that general positive reciprocity in response to receiving a cash payment drives the results. Our study showed that paying a fixed wage upfront in cash in contrast to only paying it at the end of the experiment does not affect effort provision. Finally, physically handing out the cash prior to working on the task could affect participants’ beliefs regarding the success probability. However, we argue that participants form concrete beliefs about their chances to reach the performance target based on their experience in stage 1 of the experiment and thereby rather preclude differences in probabilistic beliefs as main cause of a potential shift of the reference point.

To sum up, while uncovering the underlying mechanisms requires further research, our contribution to the methodological discussion about the implementation of framing experiments in the laboratory on site as well as online is straightforward. In order to use scarce resources efficiently, we recommend making payment sufficiently salient when aiming for eliciting a framing effect, or analyzing its consequences. Further research could deepen our understanding of the driving factors behind framing effects. As such, we believe that the choice and parametrization of the incentive contracts conditioning a substantial fraction of the maximum payoff on a challenging, yet achievable, performance target are conductive to inducing a relatively large framing effect. Learning more about framing effects in different tasks or with different targets could prove to be an important avenue for future research.

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13 See, e.g., the study of DellaVigna and Pope (2018), a large-scale experiment with eighteen different treatments, or de Quïdt (2018), an online study consisting of six experiments studying preferences over framed contracts).
References


Appendix A: Additional analysis
### A.1

**Table 5: Overview of laboratory experiments on contract framing**

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Subjects</th>
<th>N, B, P</th>
<th>Task</th>
<th>Fixed pay</th>
<th>Variable pay B, P</th>
<th>Target</th>
<th>Cash upfront</th>
<th>Cash</th>
<th>Effect size Hedge’s g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hochmann (2014, Exp. 2A)</td>
<td>Israel</td>
<td>Students</td>
<td>25, 25</td>
<td>Answering Questionnaires</td>
<td>None</td>
<td>7 or 9 NIS</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>Hannan et al. (2005)</td>
<td>US</td>
<td>Students</td>
<td>35, 33</td>
<td>Chosen effort</td>
<td>$20</td>
<td>$10</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>0.54</td>
</tr>
<tr>
<td>von Bieberstein et al. (2020)</td>
<td>Germany</td>
<td>Students</td>
<td>33, 34</td>
<td>Encrypting letters</td>
<td>€ 10</td>
<td>€ 0.50 per task</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td>0.54</td>
</tr>
<tr>
<td>Imas et al. (2017)</td>
<td>US</td>
<td>Students</td>
<td>40, 43</td>
<td>Slider task</td>
<td>None</td>
<td>t-shirt (cost $9)</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>0.49</td>
</tr>
<tr>
<td>Grolleau et al. (2016)</td>
<td>France</td>
<td>Students</td>
<td>150, 150</td>
<td>Finding numbers</td>
<td>None</td>
<td>€ 1.50 per task</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td>0.03</td>
</tr>
<tr>
<td>Armantier and Boly (2015)</td>
<td>Burkina Faso</td>
<td>Students</td>
<td>29, 34</td>
<td>Grading exams</td>
<td>FCFA 500</td>
<td>FCFA 1500/2500/4500</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>0.55</td>
</tr>
<tr>
<td>Armantier and Boly (2015)</td>
<td>Canada</td>
<td>Students</td>
<td>58, 56</td>
<td>Grading exams</td>
<td>C$ 2.08</td>
<td>C$ 6.25/10.42/18.75</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>0.46</td>
</tr>
<tr>
<td>Church et al. (2008)</td>
<td>Canada</td>
<td>Students</td>
<td>36, 32</td>
<td>Encrypting symbols</td>
<td>$ 10</td>
<td>$ 10</td>
<td>Yes</td>
<td>No</td>
<td>n/a</td>
<td>0.46</td>
</tr>
<tr>
<td>Brooks et al. (2012)</td>
<td>Switzerland</td>
<td>Students</td>
<td>72, 73</td>
<td>Chosen effort</td>
<td>CHF 20</td>
<td>CHF 5</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>0.26</td>
</tr>
<tr>
<td>de Quidt et al. (2017)</td>
<td>US</td>
<td>MTurkers</td>
<td>429, 424</td>
<td>Encrypting letters</td>
<td>$ 0.50</td>
<td>$ 1.50</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>DellaVigna and Pope (2018)</td>
<td>US</td>
<td>MTurkers</td>
<td>545, 532</td>
<td>Pressing a-b keys</td>
<td>$ 1</td>
<td>$ 0.4</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Essl and Jaussi (2017)</td>
<td>Switzerland</td>
<td>Students</td>
<td>34, 30</td>
<td>Counting zeros</td>
<td>None</td>
<td>CHF 0.4 / 0.6</td>
<td>No</td>
<td>No</td>
<td></td>
<td>0.30</td>
</tr>
</tbody>
</table>

The table presents details of the experimental designs of previous studies. It is taken from [de Quidt et al. (2017)](supplementary material, p.1) and extended. B=Bonus, P=Penalty, C$=Canadian Dollar, FCFA=CFA Franc, e=Euro, NIS=New Israeli Shekel, CHF=Swiss Franc, US Dollar.
Appendix B: Instructions

Instructions for Experiment 1

![General instructions]

Welcome.

Please read the instructions carefully. All participants get the same information:

- In this experiment, you will be paid in cash according to your decisions.
- All decisions, answers and payments are anonymous, i.e. no participant will know the amount of money the other participants receive.
- The experiment consists of 4 parts and a questionnaire.
- You are not allowed to communicate with other participants, use a mobile phone, or start any computer application. If you violate these rules, you will be excluded from the experiment and the payments.
- If you have any questions, please raise your hand. An experimenter will then come to you and answer your question.

Thank you very much for participating and have fun!

Please start reading the instructions for part 1 of the experiment on your computer screen now.
Part 2

In part 2, we ask you to encode capital letters into three-digit numbers. You have 3 minutes and receive 5 CHF.

- Each task consists of 5 capital letters to be coded.
- Coding means that a three-digit number must be assigned to each of the 5 capital letters.
- An encryption code indicates the numbers to be assigned to the respective letters.
- You can find the encryption code in a table below the letters to be coded.

Here you see one task as an example:

<table>
<thead>
<tr>
<th>Letter</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>326</td>
</tr>
<tr>
<td>X</td>
<td>983</td>
</tr>
<tr>
<td>Y</td>
<td>443</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Letter</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>230</td>
</tr>
<tr>
<td>C</td>
<td>271</td>
</tr>
</tbody>
</table>

- In this task, the participant has to code the 5 letters: "I", "X", "Y", "T" and "C". The solution can be taken directly from the encryption code:
  - The correct number for "I" is 326 (see participant’s entry in the example)
  - The correct number for "X" is 983 (see participant’s entry in the example)
  - The correct number for "Y" is 443 (see participant’s entry in the example)
  - The correct number for "T" is 230
  - The correct number for "C" is 271
- To make an entry, please click in the blue entry field below the respective letter.
- With the tab key you can switch from one entry field to the next.
- When you have completed a task, i.e. when you have coded all 5 letters into 3-digit numbers, please click the OK button.
- Only after you clicked the OK button, you will learn whether you solved the task correctly.
- If you solved the task correctly, you can start with the next task. Please note that a new encryption code is generated for each task.
- If you solved the task incorrectly, you will be asked to solve the same task again.
If you have any question, please raise your hand. The experimenter will then come to you and help.

If you have no further questions, please click "Next" on your computer screen.
Part 3

In part 3, you face the same exercise as in part 2.

- You receive a total of 20 tasks.
- You have exactly 4 minutes to complete these tasks.
- It is exactly the same type of task as you did in part 2.
- Again, one task consists of 5 capital letters to be coded. In each task, a 3-digit number must be assigned to each of the 5 letters. The input mask and the general conditions correspond to those of part 2 (see instructions for part 2).
- In contrast to part 2, your payment in part 3 depends partly on how many tasks you complete.

Your payment

- You receive 5 CHF.
- If you solve at least 12 tasks, you will receive an additional 10 CHF and your payment is 15 CHF.
- If you solve less than 12 tasks, you will not receive any additional payment.

Examples:

- Assume you solve between 12 and 20 tasks, then you receive additional 10 CHF on top of your 5 CHF.
- Assume you solve between 0 and 11 tasks, then you do not receive an additional payment on top of your 5 CHF.

We now ask you to answer 2 comprehension questions on the screen. Afterwards, you receive 5 CHF from the experimenter and you can start with part 3.

If you have no further questions, please klick "Next" on your computer screen.
In part 3, you face the same exercise as in part 2.

- You receive a total of **20 tasks**.
- You have **exactly 4 minutes** to complete these tasks.
- It is exactly the same type of task as you did in part 2.
- Again, one task consists of 5 capital letters to be coded. In each task, a 3-digit number must be assigned to each of the 5 letters. The input mask and the general conditions correspond to those of part 2 (see instructions for part 2).
- In contrast to part 2, your payment in part 3 depends partly on how many tasks you complete.

**Your payment**

- You receive **5 CHF**.
- If you solve **at least 12 tasks**, you **may keep the 15 CHF**.
- If you solve **less than 12 tasks**, you must **pay back 10 CHF** and your payment is **5 CHF**.

*Examples:*

- Assuming you solve **between 12 and 20 tasks**, you **keep your 15 CHF**.
- Assuming you solve **between 0 and 11 tasks**, you have to **pay back 10 CHF** of your **15 CHF** and keep **5 CHF**.

We now ask you to answer 2 comprehension questions on the screen. Afterwards, you receive **5 CHF** from the experimenter and you can start with part 3.

If you have no further questions, please klick "Next" on your computer screen.
Instructions for Experiment 2
HIT Description (the same for all treatments)

This HIT is about studying the behavior of workers. Data on your answers in the following task will be collected and analyzed by researchers at the University of Bern, Switzerland.

Your participation is anonymous and no sensitive data will be collected. In addition, worker IDs will be deleted from any published data. Participation is voluntary and you can choose to stop at any time. There are no risks expected from your participation.

We would like you to complete a counting task and a short survey. For an average counting speed this should take around 20 minutes to complete. At the end you will be given a completion code. Please copy and paste the code into the HIT on MTurk to be paid.

The flat payment for completion of the HIT is 1 USD. In addition, you will earn 1-2 USD for the counting task.

If you like to participate, please click "ACCEPT".
Task description (the same for all treatments)

Welcome!

Thank you for participating in our HIT. In this HIT we will ask you to work on a counting task and a short survey.

Your task is to count 8s in tables consisting of 6s and 8s. There are 15 tables to solve.

Please look at the following example:

<table>
<thead>
<tr>
<th>6</th>
<th>8</th>
<th>8</th>
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<th>6</th>
<th>6</th>
<th>8</th>
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<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
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<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

How many 8s are in the table?

77
Payment in treatment *Bonus Visual*

Payment

On top of the flat payment of 1 USD for completing the HIT, you receive an additional payment for working on this task.

**The basic payment for the counting task is 1 USD.** At the end of the study, we will randomly select one of the 15 tables for checking. If you have counted the number of 8s **correctly** for the selected table, **you will gain 1 USD** (basic payment 1 USD + gain 1 USD).

![Image of 1 USD banknotes]

If you count the number of 8s correctly:

![Image of 1 USD banknotes]

If you count the number of 8s incorrectly:

![Image of 1 USD banknotes]

Note that you will **not** receive feedback while working on the task. When you are ready to start, click "CONTINUE".
Payment

On top of the flat payment of 1 USD for completing the HIT, you receive an additional payment for working on this task.

The basic payment for the counting task is 2 USD. At the end of the study, we will randomly select one of the 15 tables for checking. If you have counted the number of 8s incorrectly for the selected table, you will lose 1 USD (basic payment 2 USD - loss 1 USD).

If you count the number of 8s correctly:

If you count the number of 8s incorrectly:

Note that you will not receive feedback while working on the task. When you are ready to start, click "CONTINUE".
Payment in treatment *Bonus Verbal*

**Payment**

On top of the flat payment of 1 USD for completing the HIT, you receive an additional payment for working on this task.

**The basic payment for the counting task is 1 USD.** At the end of the study, we will randomly select one of the 15 tables for checking. If you have counted the number of 8s **correctly** for the selected table, **you will gain 1 USD** (basic payment 1 USD + gain 1 USD).

<table>
<thead>
<tr>
<th>If you count the number of 8s correctly:</th>
<th>If you count the number of 8s incorrectly:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 USD</td>
<td>1 USD</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>1 USD</strong></td>
<td><strong>1 USD</strong></td>
</tr>
</tbody>
</table>

Note that you will **not** receive feedback while working on the task. When you are ready to start, click "CONTINUE".
Payment

On top of the flat payment of 1 USD for completing the HIT, you receive an additional payment for working on this task.

The basic payment for the counting task is 2 USD. At the end of the study, we will randomly select one of the 15 tables for checking. If you have counted the number of 8s incorrectly for the selected table, you will lose 1 USD (basic payment 2 USD - loss 1 USD).

If you count the number of 8s correctly:

<table>
<thead>
<tr>
<th>2 USD</th>
</tr>
</thead>
</table>

If you count the number of 8s incorrectly:

<table>
<thead>
<tr>
<th>1 USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
<tr>
<td>1 USD</td>
</tr>
</tbody>
</table>

Note that you will not receive feedback while working on the task. When you are ready to start, click "CONTINUE".