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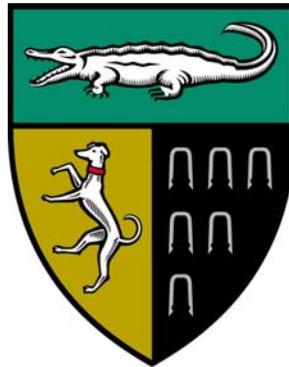
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Framing Contracts: Why Loss Framing Increases Effort

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Framing Contracts: Why Loss Framing Increases Effort

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Recent evidence from the field (Hossain and List, 2009) suggests that contracts framed in terms of a loss (a deduction is taken for failing to meet a threshold) lead to greater effort than contracts framed in terms of a gain (a bonus is given for meeting a threshold). We investigate two explanations for this framing effect in a laboratory setting. First, we find that the loss frame communicates the expectation that achieving the bonus is the default and that our subjects comply with this expectation. Second, we find evidence for an endowment effect, even though the bonus is just a monetary payment that subjects do not even have in their possession. (JEL: K12, C91, L14, J41)

1 Introduction

Contract theorists are just beginning to systematically unpack the behavioral implications of contract design and implementation, some thirty years after Daniel Kahneman and Amos Tversky (Kahneman and Tversky, 1979, 1981), Richard Thaler (1980), and others first described a variety of contract-relevant behavioral anomalies, including endowment effects and loss aversion. These anomalies, no doubt, extend beyond contracts, but given their immediate and practical applicability to contractual exchange, the delay is somewhat surprising. Practitioners struggle with these issues daily. Consider, for example, the contractual relationship between Oeresund A/S – a joint venture between the Swedish and Danish states, which was created to construct a link between Copenhagen (Denmark) and Malmö (Sweden) – and one of its contractors (Alterbaum et al., 2011). Given the size of the bridge and the sometimes adverse weather conditions, the bridge required special cables and

* Yale Law School, New Haven; UCLA Law School, Los Angeles (corresponding author); and Max Planck Institute of Economics, Jena. We are grateful to Björn Bartling, Ernst Fehr, Claudia Landeo, Kathy Spier, and Jeroen van de Ven for helpful discussions. We are also indebted to the audience of the 2011 *JITE* Conference on Testing Contracts held in Krakow. We gratefully acknowledge financial support from ETH Zurich and the Oscar M. Ruebhausen Foundation at Yale Law School. Part of the research was conducted while we were visiting ETH Zurich. We wish to thank Stefan Bechtold and Gérard Hertig for their hospitality.

damper technology to keep vibrations below a stipulated safe-and-sound threshold that exceeded the current state of the art. The company offered its contractor an attractive price with a schedule of deductions to be implemented to the extent that the contractor failed to achieve the stipulated, and never before achieved, threshold. Both the company and the contractor recognized that the likelihood of meeting the threshold was close to zero. Nonetheless, by exerting greater effort, the contractor could reduce the deductions. Contracts such as the one used by Oeresund A/S, where breach is almost a certainty, are sometimes called Cadillac contracts because they call for the highest possible quality level. In hindsight, company officials questioned whether the Cadillac clause undermined the contractor's performance by its very terms, which the contractor reported as unfair. Company officials now suggest they should have instead offered bonus payments for exceeding a less stringent and easier-to-reach threshold. In a fully rational framework, however, it should make no difference whether a contractor gets a bonus payment for meeting an appropriately specified benchmark or faces a deduction for failing to meet the benchmark, as long her payoff is the same for any given level of achievement. The only difference is framing. With the former, the contractor is exposed to a gain frame, whereas with the latter, a loss frame is salient. Nonetheless, Oeresund's observation that its contractor felt unfairly treated under the contract suggests that the loss frame triggered distinct behavioral effects.¹ It is not obvious, however, whether loss frames elicit lower or higher effort than gain frames do. Oeresund's contractor may indeed have been dissatisfied with the Cadillac clause, but still worked harder as a result of its loss frame.

Loss frames, as recently suggested by Hossain and List (2009), can have positive effects on effort. Hossain and List studied in a field experiment how Chinese factory workers react to two contracts that only differ in their framing. The first is framed in terms of a gain. Workers are told that in addition to a flat wage a bonus is given for meeting a threshold. The second is framed in terms of a loss. Workers are told that they get a flat wage and a bonus that is retracted if they fail to meet a threshold. In both cases, the total compensation is paid out at the end of the month. This setting is much simpler than the Oeresund A/S example described above. A company like Oeresund A/S, deciding between offering a bonus and offering a Cadillac contract, not only chooses between using a loss and a gain frame, but also, depending on the type of contract that is used, shifts the quality threshold. In fact, by shifting the quality threshold from the lowest to the highest level, parties continuously move from a pure bonus to a pure Cadillac contract. But both are examples of how framing is used in the field to increase the effort of workers or contractors.

Our experimental design is similar to the approach taken by Hossain and List (2009) in their study of contracts offered to Chinese factory workers. They employ a field experiment, which has the advantage of enhanced external validity; however, this advantage comes at the price of some loss of control and less flexibility in the design of tailored controls. In Hossain and List's experiment, a number of

¹ Luft (1994) finds a similar effect in the lab.

variable environmental factors were present. In particular, workers in their study faced a stochastic relationship between effort and output, which raises the possibility that the effect they observed was due to loss aversion. Indeed, the presence of loss aversion is the main explanation the authors offer for the observed phenomenon. However, it is unclear of what kind this uncertainty was. For example, we do not know whether the information structure was symmetric (the workers and their employer had the same information and beliefs about the distribution of outcomes) or asymmetric (one of the parties had superior knowledge). If asymmetry was present in Hossain and List's setting, it raises the possibility that the contracts were understood as providing information to the less informed party. Finally, the authors do not find a significant treatment effect on effort by individual workers if they are exposed to the different contract frames, but only on groups of workers. They speculate that a team might be influenced by the risk attitude of the most loss-averse group member. Along those lines, Landeo and Spier (2012) point out that coordination effects may play a big role in teams as well. In their field setting, Hossain and List are not able to disentangle those potential driving factors.

Making use of the advantage of control in the lab, we design a parsimonious and transparent experiment to disentangle the effects of framing. We offer *individual* lab subjects one of two contracts that differ only in their framing, in order to rule out any team effects, such as coordination. As in Hossain and List (2009), the first is framed in terms of a gain (a bonus is given for meeting a threshold), while the second is framed in terms of a loss (a deduction is taken for failing to meet a threshold). Subjects work with a technology possessing a *deterministic* relationship between effort and output, eliminating uncertainty. The information provided to subjects about the underlying production function is *symmetric*, eliminating the possibility of information leakage.

In line with Hossain and List (2009), we hypothesize that

HYPOTHESIS 1 *Individual subjects select effort levels greater than the payoff-maximizing choice. In particular, we expect (a) that more subjects will choose a bonus in the loss frame than in the gain frame,² and (b) that subjects will exert higher effort in the loss frame than in the gain frame.³*

Our main interest, however, is to identify the mechanism behind the selection of greater effort levels in the loss frame. We hypothesize that

HYPOTHESIS 2 *The loss frame communicates a stronger sense of the default expectations of the contractual partner than the gain frame.*

² When we say that subjects "choose a bonus," we mean that they choose to rent a machine that guarantees them a bonus. In other words, they choose to produce an output level that earns them a bonus under the gain frame and prevents them from losing the bonus under the loss frame.

³ Hypothesis 1(b) is related to Hypothesis 1(a) but not identical. The number of subjects choosing a bonus might not differ between treatments. Still, more subjects in the loss frame than in the gain frame may choose effort levels beyond the minimum effort level that would guarantee them a bonus.

That is, framing may be a subtle way of communicating the expectations of the party offering the contract. As the gain frame may appear to offer a “reward” and the loss frame to threaten a “punishment,” it may be that the subject thinks that expectations to meet the threshold are higher under the loss frame than under the gain frame. After all, a reward is often viewed as a kind of recognition for voluntary overperformance, while a punishment is more akin to a sanction for not meeting the client’s expectation.

In an additional treatment, we directly manipulate this communication effect of framing. We try to disentangle two channels through which the effect may unfold.

The first is motivational. As described above, the subject may think that the loss frame indicates that the party offering the contract has a higher expectation of her. She wants to fulfill this expectation and therefore invests more effort to meet it. In order to test for this motivational explanation, we use a *social desirability* questionnaire measuring the subject’s tendency to reply to expectations in a manner that will be viewed favorably by others (see Fischer and Fick, 1993).

HYPOTHESIS 3 If the motivational explanation is true, subjects with a stronger tendency toward social desirability will more often decide for the bonus and invest higher levels of effort.

In contrast, the mechanism might be cognitive rather than motivational. Subjects might not be able to distance themselves cognitively from the default expectations suggested by the contract. They choose a bonus and invest more effort, not because they want to please their contractual partner, but because they simply comply with the default. We use a *cognitive reflection* (CRT) questionnaire measuring the tendency of our subjects to respond to cognitive tasks impulsively rather than after some reflection (see Frederick, 2005). Consistent with the cognitive explanation, we hypothesize that:

HYPOTHESIS 4 Those subjects with a lower level of cognitive reflection will more likely comply with the default and choose the bonus than will those with a higher level of reflection.

We consider a second mechanism besides the expectation communication effect and hypothesize that:

HYPOTHESIS 5 Labeling a monetary amount a “bonus” and framing the compensation as an entity rather than a sum of separate payments transforms the stipulated payment into an endeared object (as opposed to just a monetary amount).⁴ If this is true, the loss frame will induce an endowment effect, which may lead to significantly higher effort through two distinct channels.

This can happen through two distinct channels. First, the endowment effect may have a direct effect on effort, as the subject will try hard not to lose an endeared

⁴ See Burson, Faro, and Rottenstreich (2011), who find that a box of pencils induces a stronger endowment effect than pencils scattered across a table.

object. Assuming that there is a robust relationship between loss aversion and the endowment effect,⁵ we measure loss aversion and test for the following hypothesis:

HYPOTHESIS 6 Those participants exhibiting higher loss aversion are more likely to choose a bonus or higher effort than neutral subjects.

Finally, we may have also picked up an interaction effect.

HYPOTHESIS 7 The endowment effect may strengthen the expectation communicated by the loss frame.

If the gain frame makes achieving the bonus appear as a reward, while the loss frame presents losing the bonus as punishment, a higher sense of endowment may lead to the perception of a stronger punishment: It means that an endeared object, rather than a mere sum of money, is taken from the subject if she does not meet expectations.

Summarizing our results, we observe that a nontrivial fraction of subjects select effort levels higher than the payoff-maximizing choice. We also see more subjects choosing a bonus under the loss frame than under the gain frame (Hypothesis 1(a)), but this finding would only be significant at the 10% level. However, we find that individual subjects choose higher effort levels significantly more often under the loss frame than under the gain frame (supporting Hypothesis 1(b)). Testing explanations for this framing effect, we find that when suppressing the expectation default, subjects choose a significantly lower effort level (supporting Hypothesis 2). Supporting this finding, subjects with a lower level of cognitive reflection tend to comply more readily with the default expectation and therefore choose significantly higher effort levels (supporting Hypothesis 4). We do not find evidence for a motivational effect of the loss-frame manipulation (no support for Hypothesis 3). Thus, we conclude that the default set by the loss frame influences subjects cognitively rather than motivationally. Secondly, we find evidence for an endowment effect, even though subjects do not have the bonus in their possession. On manipulating the label of the extra money by neutrally calling it a “payment” rather than a “bonus,” and on manipulating the perception of the bonus as an entity by presenting the amount in two figures rather than in one, subjects choose the bonus significantly less often and invest less effort (supporting Hypothesis 5). Measuring the loss aversion of subjects, we also find strong evidence that the frequency with which loss-averse and neutral subjects choose a bonus differs significantly (supporting Hypothesis 6), providing additional evidence for our finding that the endowment effect is present. Finally, we were not able to find support for the interaction effect between the endowment effect and the expectation communication effect (no support for Hypothesis 7).

The remainder of the paper is organized as follows. Section 2 describes our theoretical framework. Section 3 addresses our experimental design and procedure.

⁵ Loss aversion and the endowment effect are connected. For a long time loss aversion was even suggested to be the main explanation behind the endowment effect (see Tversky and Kahneman, 1991).

Section 4 presents the main results of our experiment. Section 5 offers extensions and further discussions. Section 6 concludes.

2 The Framework

Our motivating assumption throughout is that contracts do more than describe terms of agreements. Whether spoken or written, contracts are speech acts (Searle, 1969; Austin, 1955) having locutionary content, but also causing illocutionary and perlocutionary effects. How one expresses or frames a contract, moreover, may influence the behavior of relevant parties in a manner independent of the agreement's legal interpretation, its pure economic implications, and its social meanings. What we have in mind are well-known framing effects (Kahneman and Tversky, 1979).

Contracts specifying merely a price and a quantity are deceptively simple. Hidden behind these terms are implied clauses of quality as well as background damage and injunctive rules that may be invoked when quality falls short of what is required or when agreements are otherwise breached. Sophisticated parties, seeing through this thin veil, know there is more to their agreements. In fact, they often choose to make some of these implied clauses explicit, and they do so in a variety of ways. As economists, we are tempted to treat contracts – whether their terms are implied or expressed and however they are expressed – as equivalent when they lead to the same “strict” incentive schemes. However, morality, fairness, and behavioral effects may be triggered in variable ways through otherwise incentive-equivalent schemes. We focus on the behavioral consequences of framing contracts in terms of gains or losses. A contract, or perhaps more precisely an accepted offer, presents itself to agents in a particular frame, which we define in terms of the triple $[p(\bar{q}), \bar{q}, \theta(q)]$ where p is price, \bar{q} is a quantity or quality level as required under the contract, and $\theta(q)$ is the damage or bonus rule based on realized quantity, which is either explicitly stipulated in the contract or implicit from the background legal or customary rules.

The contract we implement in our experiment only conditions on whether or not the quantity or quality exceeds a threshold. In other words, while output can take different levels and may even be continuous, the contract only conditions on whether the produced output level v is higher than a threshold \bar{v} . In order to formalize, let us define the following index function:

$$q(v) \equiv \begin{cases} 1 & \text{if } v \geq \bar{v}, \\ 0 & \text{otherwise.} \end{cases}$$

Obviously we can construct two different types of contracts in this setting. Either the contract requires only low quantity or quality ($v < \bar{v}$) and takes the form $[p(0), 0, \theta(q)]$, or it requires high quantity or quality ($v \geq \bar{v}$) and takes the form $[p(1), 1, \theta(q)]$. We further specify the bonus or damage rule $\theta(q)$ as

$$\theta(q) = (q(v) - \bar{q})b = \underbrace{\min[q(v) - \bar{q}, 0]b}_{\text{damage}} + \underbrace{\max[q(v) - \bar{q}, 0]b}_{\text{bonus}},$$

where b is the bonus level. It should be recognized that $\theta(q) \leq 0$ for $\bar{q} = 1$ and $\theta(q) \geq 0$ for $\bar{q} = 0$, which is why we refer to the contract $[p(0), 0, \theta(q)]$ as the gain frame and to the contract $[p(1), 1, \theta(p)]$ as the loss frame. As we only want to study the framing effect of contracts, we further impose $p(0) = p(1) - b$. This guarantees equivalence of the seller's payoff π under the gain and loss frames:

$$\begin{aligned} \pi_{\text{gain}} &= p(0) + \underbrace{\min[q(v) - 0, 0]b}_{\text{damage}} + \underbrace{\max[q(v) - 0, 0]b}_{\text{bonus}} - e \\ &= p(0) + q(v)b - e \\ &= p(1) - b + q(v)b - e \\ &= p(1) + (q(v) - 1)b - e \\ &= p(1) + \underbrace{\min[q(v) - 1, 0]b}_{\text{damage}} + \underbrace{\max[q(v) - 1, 0]b}_{\text{bonus}} - e = \pi_{\text{loss}} . \end{aligned}$$

3 Design and Procedure

We conducted our experiments during March and April of 2011 in the labs of the University of Zurich and in the lab of ETH Zurich. Both labs share the same subject pool and recruiting mechanisms.⁶ A total of 264 student subjects participated in the experiment, and were randomly assigned to one of our two main treatments (a gain frame or a loss frame) or to one of two follow-up treatments, which are labeled “loss expectation” and “loss endowment” (see Table 1). Subjects received a flat fee of 10 Swiss francs (about 11.5 USD) for showing up and earned an additional 11 to 18 Swiss francs conditional on their performance in the experiment.⁷

Table 1
Treatments and Subjects per Treatment

Treatments	Frequency	Percent	Cum. percent
Gain frame	72	27.27	27.27
Loss frame	73	27.65	54.92
Loss expectations	58	21.97	76.89
Loss endowment	61	23.11	100.00
Total	264	100.00	

As noted above, our basic treatments compare effort between a loss and a gain frame. In both treatments, subjects are told to imagine being a supplier who has contracted to produce and deliver circuit boards to a client. For our manipulation,

⁶ For the recruitment, ORSEE was used (<http://www.orsee.org/>).

⁷ All payments were made at the conclusion of the experimental sessions.

we randomly assigned subjects to either the loss frame or the gain frame. In the gain frame, subjects are notified that, in addition to a base price of $p = 10,000$ CHF,⁸ they will get a bonus of $b = 2,500$ CHF if output exceeds $\bar{v} = 10,000$ circuit boards. In the loss frame, subjects are told that they get the same base price p and a provisional bonus of b , which will be retracted if output falls below the threshold quantity \bar{v} . Under both treatments, money was to be paid out after performance. So subjects did not hold the money in their hands in the loss treatment.

Machines had to be leased to fulfill the contract. The subjects' task consisted of choosing the machine they wanted to lease. They could choose from among six machines, which differed in price and performance (see Table 2). The higher the price, the lower the number of defective units and therefore the higher the output level.

Table 2
Performance and Cost of Machines

Machine	Performance	Cost (CHF)	Bonus
Effort 1	9,200	1,000	no
Effort 2	9,600	2,000	no
Effort 3	10,000	3,800	yes
Effort 4	10,400	5,000	yes
Effort 5	10,800	6,000	yes
Effort 6	11,200	7,000	yes
$N = 145$			

The relationship between the chosen machine and the produced output was deterministic. Thus, by choosing a machine, subjects could perfectly control whether they produced sufficient output to earn a bonus. They knew that by choosing machine 3, 4, 5, or 6 they would earn a bonus of $b = 2,500$ CHF, since these machines all produced quantities that exceed $\bar{v} = 10,000$, whereas neither machine 1 nor 2 possessed that production capacity.

The payoff for the subjects could be calculated by taking the base price of 10,000 plus a possible bonus of 2,500 minus the cost of leasing a machine. The payoffs were designed so that subjects could maximize their earnings by forgoing the bonus and leasing machine 1, the machine with the lowest output level. In other words, the marginal cost of leasing the lowest-cost machine capable of generating a bonus (i.e., machine 3) exceeded the bonus payment (i.e., $2,800 > 2,500$).

4 Basic Result

Table 3 depicts a frequency table that includes all of our treatments, the fundamental gain vs. loss treatment comparison as well as our two follow-up treatments:

⁸ The exchange rate from actual currency to experimental CHF was 1:500.

Table 3
Overall Distribution of Effort Levels

Machine	Frequency	Percent	Cum. percent
Effort 1	184	69.70	69.70
Effort 2	3	1.14	70.83
Effort 3	60	22.73	93.56
Effort 4	13	4.92	98.48
Effort 5	2	0.76	99.24
Effort 6	2	0.76	100.00
Total	264	100.00	

We observe that under both the gain and loss frame a nontrivial number of subjects selected effort levels that led to a bonus, despite the fact that increasing effort to get the bonus was not a payoff-maximizing strategy for the subjects. As Table 3 reveals, while 70% of the subjects selected the payoff-maximizing technology (i.e., machine 1, or equivalently effort level 1), all but 3 of the remaining subjects opted for a technology that leads to a bonus – most choosing the efficient machine or effort level, conditional on seeking a bonus (i.e., effort level 3).

In Hypothesis 1, we assumed that (a) subjects in the loss frame condition will choose the bonus more often, and that (b) the tendency to lease higher output machines is significantly stronger in the loss than in the gain frame. In other words, we hypothesize that the loss frame increases the effort subjects invest. We begin our analysis by simply dichotomizing the data into whether or not the subjects chose an effort level leading to a bonus. Table 4 shows the frequency table.

Table 4
Bonus Earned under Gain and Loss Frame

Bonus status	Gain frame	Loss frame	Total
No bonus	54	46	100
Bonus	18	27	45
Total	72	73	145

In line with our Hypothesis 1(a), Table 4 shows that one-third more subjects (27 compared to 18) opted for a bonus-generating machine under the loss frame. Testing the hypothesis that bonus-seeking is the same under both frames (using Fisher's exact test), we could not reject the presumption of equality at the 5% level (i.e., our 1-sided Fisher's exact = 0.084). Even though the effect is not significant, we observe a clear trend that is close to our agreed significance. Subjects in the loss frame seem to be more likely to choose the bonus.

So far we imagined that subjects would make efficient choices, conditional on seeking a bonus or not. That is, we expected subjects to either forgo the bonus and choose effort level 1 or go for the bonus and choose effort level 3. Other than implicitly assuming that all other effort levels would be equally rejected by the subjects, we made no prediction concerning the selection of effort levels 2, 4, 5, or 6. However, rather than merely choosing between meeting and not meeting the stipulated quality level, subjects can choose to overperform the contract by choosing effort levels higher than 3. Such behavior would be particularly plausible if subjects were motivated by complying with expectations. Think of a typical workplace scenario: The strongest way how a worker can comply with the employer's expectations is to overachieve them. Therefore instead of dichotomizing the data, we analyze the effort-level choices in the next step.

In line with our Hypothesis 1(b), Table 5 and the histograms in Figure 1 illustrate that higher effort levels are chosen under the loss rather than under the gain frame. As mentioned above, one-third more subjects (27 compared to 18) opted for a bonus-generating machine under the loss frame. Interestingly, one-third of those 27 subjects receiving the bonus in the loss frame did so by selecting a more costly technology (i.e., machine 4) than was necessary if all they cared about was the bonus.

Table 5
Effort Levels for Gain and Loss Frames

Machine	Gain frame	Loss frame	Total
Effort 1	51	46	97
Effort 2	3	0	3
Effort 3	16	18	34
Effort 4	1	9	10
Effort 5	1	0	1
Effort 6	0	0	0
Total	72	73	145

We test the statistical significance of the observed differences between the gain and loss frames. In a first step, we perform a Fisher test for independence in the contingency table. We can reject the null hypothesis that the tables stem from the same distribution using a two-tailed test with $p = 0.015$ supporting the basic intuition underlying Hypothesis 1 that the difference between framing a contract as a gain and framing it as a loss matters.

We confirm this result with a regression derived from the following simple equation,

$$\text{gainloss} = \vec{\beta} \cdot \text{effort}_i + \varepsilon,$$

where gainloss is a dummy variable equal to 1 for the gain frame and 0 for the loss frame, $\vec{\beta}$ is a vector of coefficients on effort levels, (i.e., effort_i for $i \in \{1, 2, 3, 4, 5\}$), and ε is an error term.

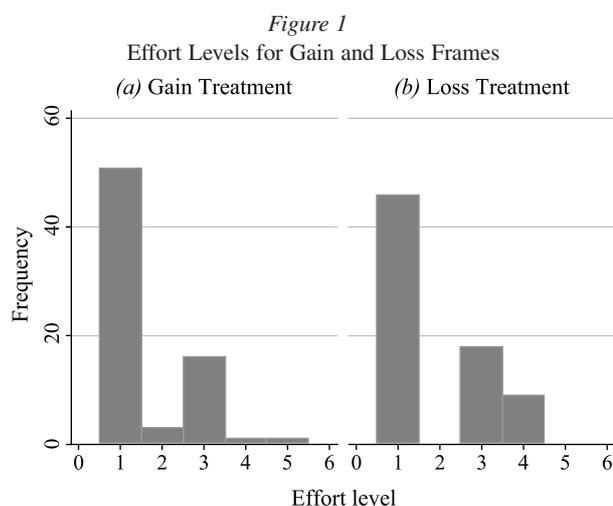


Table 6
Effort-Level Shares for Gain Frame

Ind. variable	Coefficient	Std. error
Effort 1	0.53	0.05
Effort 2	1	0.28
Effort 3	0.47	0.08
Effort 4	0.10	0.16
Effort 5	1	0.49
$N = 145$		
Adj. $R^2 = 0.52$		

Note: Dependent variable = gain frame dummy.

The coefficients, $\bar{\beta}_i$, are the fraction of subjects who choose effort level i under the gain frame (and so $1 - \bar{\beta}_i$ is the fraction choosing effort level i in the loss frame). If the gain and loss frames generated roughly comparable distributions of effort levels, the coefficients in Table 6 would approach 0.5, which appears to be the case for effort levels 1 and 3. Yet a joint significance test rejects at the 0.05 level the null that the coefficients are equal. The result of this test, however, is largely driven by the coefficient on effort level 4, which when tested against the mean of gainloss was rejected at the 0.01 level. That is, the distributions under the gain and loss frames differ significantly and the higher frequency of choosing effort level 4 in the loss frame is the driver of this difference.⁹

⁹ One might object to our use of T -tests here because (i) we do not have naturally interval scaled data; and (ii) the T -test assumes a normal distribution, which we

The Wilcoxon rank-sum (Mann–Whitney) test does not reject the null hypothesis that chosen effort levels under the loss and gain frame have equal means (i.e., our one-tailed test returned a p -value of 0.064). The null hypothesis is, however, close to being rejected at the 5% level, and replacing the outlier who selected effort level 5 under the gain treatment with the mean value of the gain treatment (effort = 1.57) leads to a significant result of $p = 0.49$. The Wilcoxon rank-sum (Mann–Whitney) test is principally robust against outliers since it calculates ranks. But in our study, the ranks are identical with the values; since values are effort levels from one to six, ranks also range from one to six. This explains why the one outlier can have a large influence on the result even though, we use the U -test. Therefore we think it is justified to replace the outlier and to calculate the effect with the mean choice of the gain treatment.

The significant results of the different test statistics strongly support Hypothesis 1. Still, the effect might be small. To analyze the size of the effect, we perform a regression with effort being the dependent variable. Table 7 reports the coefficients derived from the following regression formula.

$$\text{effort} = \beta \cdot (1 - \text{gainloss}) + \varepsilon.$$

Table 7
Linear Model: Effect of Loss Frame on Effort

Ind. variable	Coefficient	Std. error	Ind. variable	Coefficient	Std. error
Loss frame	0.28	0.18	Loss frame	0.33*	0.16
Cons.	1.86		Cons.	3.33	
$N = 145$			$N = 48$		
$R^2 = 0.02$			$R^2 = 0.02$		

Note: Dependent variable = effort level. * indicates significance at the 0.05 level. Robust standard errors reported.

Again, conditional on there being a distortion away from the individually rational choice (the lower part of the table), we find with significance that the loss frame induces higher levels of effort. However, the R^2 suggests that the treatment dummy loss versus gain can not explain much of the observed variance suggesting that the treatment effect is small. The treatment as an independent variable is not significant on the 5% level (upper part of Table 5). But if we replace the outlier choosing 5 in the gain frame with mean effort – as we have done above for the U -test – the R^2 slightly increases and the effect turns to significance ($p = 0.05$).

clearly do not have. Regarding the first objection, it is a commonly accepted convention to apply T -tests on Likert scales when there are at least 5 gradually structured items. We have 6 gradually structured effort levels, of which 5 are used by the subjects. With respect to the second objection, the test is robust to violations of the normal distribution assumption where, as in our case, N is larger than 50.

The fact that the effect is small is not surprising as we used a very parsimonious and transparent design. First, our setting was deterministic which implies that there was no room for loss aversion as expected payoffs and realized payoffs are the same. The absence of uncertainty is also likely to mute the expectation communication effect – discussed in the following section – as defaults usually have a larger impact in an uncertain environment (see Altmann, 2008). Nevertheless, in order to better isolate the different factors, we opted for the cleaner design.

Another reason why the size of the effect may be small is that we used a control question to verify that every subject was able to calculate his individual payoff. In order to stake the design and possible demand effects against us, we let subjects calculate the payoff for machine 1. This might have contributed to the relative stickiness of choices of machine 1. On the other hand the observed data may simply be the consequence of machine 1 being the payoff-maximizing decision.

5 Analyzing the Mechanism

5.1 Expectation Communication Effect

Hossain and List suggest that loss aversion is the sole driving factor behind the loss frame's inducing greater effort. However, in their field experiment, they were unable to test directly for this hypothesis. In Hypothesis 2, we proposed a different mechanism that may be driving greater effort under the loss frame, namely that the loss frame communicates a stronger sense of the default expectation of the party offering the contract.

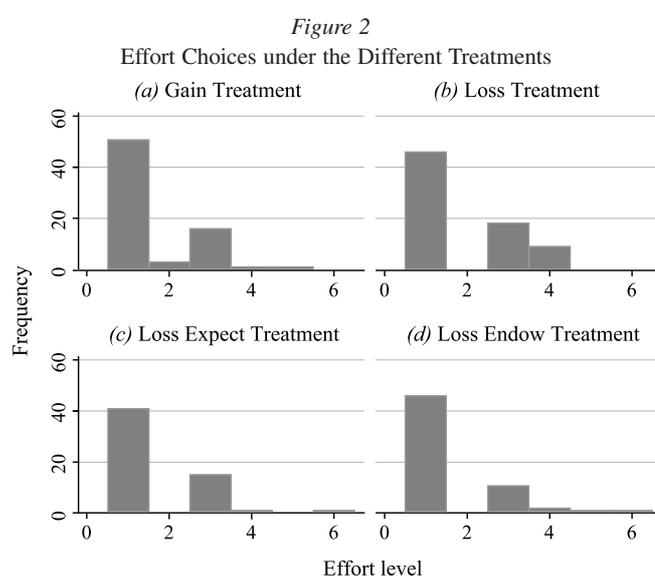
That is, separate from, and perhaps in addition to, loss aversion, another possible mechanism behind the selection of greater than individually rational effort in the loss frame may be that the framing is a subtle way of communicating expectations of the party offering the contract. In the gain frame the bonus may appear to be a reward, while in the loss frame taking it away seems like a punishment; as a result, it may be that the subject thinks that expectations for meeting the threshold are higher under the loss frame than under the gain frame.

To test our hypothesis that the loss frame induces the default expectation that subjects should (at least) achieve the bonus, we ran an additional treatment, labeled "loss expectation" (see Tables 1 and 8 and Figure 2). In this treatment, we informed subjects that the bonus is paid up front merely for tax and accounting reasons.¹⁰ The assumption was that on being provided this alternative explanation for the framing of the contract, subjects would be less likely to perceive the loss frame as communicating a higher default expectation. We compare this expectation treatment with the original loss condition. We hypothesize (Hypothesis 2) that under the

¹⁰ It is not unusual that parties in the real world structure deals in a particular way for tax reasons. For example, debt financing may sometimes be more attractive than equity financing because interest payments are deductible for tax purposes.

Table 8
Effort Levels for Loss, Loss-Expectation, and Loss-Endowment Frames

Machine	Loss frame	Loss expectation	Loss endowment	Total
Effort 1	46	41	46	133
Effort 2	0	0	0	0
Effort 3	18	15	11	44
Effort 4	9	1	2	12
Effort 5	0	0	1	1
Effort 6	0	1	1	2
Total	73	58	61	192



expectation treatment, subjects will choose lower effort levels than in the original loss condition.

We perform a Wilcoxon rank-sum (Mann–Whitney) test, but it does not reject the null hypothesis that both treatments induce the same choice of effort level at the 5% level ($p = 0.12$ one-tailed). Yet, Fisher's exact test, comparing the original loss treatment with the loss-expectation treatment (i.e., the first and second columns of figures in Table 6), returns a significant result ($p = 0.014$), suggesting that the two columns are not realizations of the same distribution. This is strong evidence in support of Hypothesis 2, suggesting an influence of the expectation default that the bonus sets.¹¹

¹¹ Note that we have a smaller N for this treatment, as we only conducted two instead of three sessions.

5.2 Motivation versus Cognition

So far we have seen evidence that the loss frame increases the subjects' effort level. Directly manipulating the expectation effect, we found support for Hypothesis 2 that subjects comply with the default expectation of the company more strongly in the loss frame. In this subsection, we want to disentangle whether the expectation communication effect is motivational or cognitive.¹²

5.2.1 Motivation: Short Scale for Social Desirability

First, we want to analyze whether a tendency to social desirability can explain the effect of the loss frame. It could be that subjects are motivated to please their client and therefore comply with the default expectation. In order to test this hypothesis, we measure subjects' tendency to reply to questions in a manner that will be viewed favorably by others.¹³ We dichotomize the data. The half with the lower score is called the low type; the other half is called the high type.¹⁴ The frequency table is given as Table 9.

Table 9
Effort with Scale for Social Desirability

	Low desire	High desire	Total
Effort 1	33	28	61
Effort 2	1	0	1
Effort 3	16	11	27
Effort 4	3	3	6
Effort 5	2	0	2
Effort 6	0	1	1
Total	55	43	98

For analyzing the table, we used the Fisher exact test for independence in the contingency table. We cannot reject the null hypothesis that the two samples result from an independent distribution ($p = 0.67$). The questionnaire results therefore do not support that the loss frame has a motivational effect on effort.

¹² See Krecké, Krecké, and Koppl (eds.) (2007) for the rising influence of cognitive rather than motivational concepts in economics.

¹³ We used a questionnaire containing four questions. Here is an example: "I am always willing to admit the mistakes that I have made" (see Fischer and Fick, 1993).

¹⁴ The questionnaire uses a Likert scale ranging from one to seven. One means "not at all," and seven means "strong agreement" with the given statement. Items 2 and 4 are scaled in opposition. While for answers 1 and 3 the highest score indicates strong social desirability of the given answer, for answers 2 and 4 the lowest score (1) is the strongest indicator. For forming the high and low types, we flipped the scales of items 2 and 4 and calculated 1 as 7, and 7 as 1. We then added the four items up and calculated a median split of subjects given their overall score.

While we cannot exclude that a motivational response towards framing has some effect in the real world, in our setting its influence is certainly weak. The motivation to please the client or employer may be stronger if the relationship is based on more intense and repeated personal contact than was present in our design, which asked subjects only to imagine their contractual partner.

5.2.2 Cognition: Cognitive Reflection Test

The second channel we analyze is cognition. Subjects might not be able to distance themselves cognitively from the default the contract suggests. We use a questionnaire that tests for cognitive reflection (CRT) to measure the tendency of our subjects to respond to cognitive tasks impulsively rather than after some reflection (see Frederick, 2005). We hypothesize (Hypothesis 4) that those subjects with a lower level of cognitive reflection will more likely comply with the default and choose the bonus. Prior research shows that participants who score low on this test comply more often with a default expectation, instead of questioning it (Altmann, 2008, observes this result in the domain of default contributions to public goods). Following Falk and Altmann, we assume that subjects with a low CRT are likely to choose a higher effort level than subjects with a high CRT. The score on this test is not reflective of different degrees of understanding the experimental setup. We implemented a control question right after the introductory instructions. Subjects had to answer this question correctly before they were allowed to move on in the experiment. Rather we assume that participants with a lower CRT comply with the expectation of the company more readily; they question default expectations less often than the types with a higher CRT. We hypothesize that they do what the structure of the contract suggests: In the loss treatment, when the bonus is already assigned, achieving it seems to be the default (so subjects invest more to secure the bonus and overachieve beyond the default), while in the gain treatment, it remains conditional (so subjects feel that they meet expectations by just realizing the bonus or even without achieving it.)

The cognitive reflection task (CRT) questionnaire presents a set of three quiz questions to the subject. Subjects have a total of 90 seconds to answer all three questions. Here is one of the three questions: "A bat and a ball cost £1.10 in total. The bat costs £1 more than the ball. How many pence does the ball cost?" The answer that pops immediately into one's mind is ten pence. But on second thought, this result is obviously wrong. The questionnaire measures the ability of subjects to question their first impulse and correct it. We assume that this ability predicts whether subjects will question the default the contract suggests and decide for their payoff-maximizing choice on second thought.¹⁵

We dichotomized the data, forming two player types, the high- and the low-reflection type. A subject answering either no or one question correctly was classified as the low type, while a subject getting either two or three questions right was

¹⁵ Altmann find this result in the different domain of public-good provision.

Table 10
Cognitive Reflection Test

	Low cognitive reflection	High cognitive reflection	Total
Effort 1	31	43	74
Effort 2	1	0	1
Effort 3	16	13	29
Effort 4	3	3	6
Effort 5	2	0	2
Effort 6	1	0	1
Total	54	59	113

classified as the high type. This classification leads us to a nearly perfect median split between the two groups (54 versus 59 subjects). Table 10 shows the frequencies.

To test whether the effort-level choices differ between the two groups (high and low reflection), we use the Mann–Whitney test for independent samples. The test statistic returns a significant effect ($p = 0.038$ one-tailed), rejecting the null hypothesis that high and low types are choosing the same effort levels. This result supports our Hypothesis 4 that low-reflection types are more likely to choose higher effort levels when those effort levels are implied by the default structure of the contract. Our results suggest that the channel through which the loss frame increases the subjects' effort investments is cognition rather than motivation.

This finding also shields our result against a methodological concern. One might be concerned that our effect is driven by an experimenter demand effect (see Zizzo, 2008). Instead of implementing a game with interactive roles, we confronted subjects with a contract and asked them to imagine their contractual partner. The subjects might therefore aim their choices at the experimenter and decide to comply with his assumed expectations. But if this had been the case here, our social desirability test should have shown some evidence for that. If the subjects wanted to please the experimenter instead of the fictitious client in our setting, the high-desirability types should have been more prone to the experimenter demand effect than the low types, and therefore we would expect to find a significant correlation between social desirability levels and effort choices.

5.3 Endowment Effect

Hossain and List (2009) assume loss aversion as the driving factor behind the effect of framing. But we did not allow for any uncertainty in our setting. Also, the bonus in our experiment is a monetary payment. The prior literature would suggest this monetary transfer does not induce an endowment effect (Kahneman,

Knetsch, and Thaler, 1990).¹⁶ We suspect, however, that people may treat a “bonus” more as an object and therefore differently from money per se. We assume that the endowment effect builds on two elements. First, the effect must relate to objects that are perceived as an entity. Think of loose pencils: If they are not bundled, subjects are unlikely to perceive the lot of them as an entity; but if bound together they are more likely to be seen as an entity (see Burson, Faro, and Rottenstreich, 2011). The second characteristic is that the entity must possess an element of endearment. Many experiments testing the endowment effect are conducted with university mugs. If those mugs are replaced by ordinary ones, the effect is at least weakened (see Boyce et al., 1992). So adding an endearing quality to the object can induce the endowment effect. We suggest that calling a payment a “bonus” leads to the two described effects: (1) it changes the sum of money into an entity, which is to say, “a bonus!” and (2) it creates an endearing object, since the term “bonus” carries the connotation of appreciation.

We compare the basic loss treatment with a new condition in which we eliminate these two effects. First, we suppressed the endearing effect of the bonus (i.e., as a positively connoted object) by removing the word “bonus”; second, we sought to transform the payment from a single entity by indicating the payment amount as a sum of two smaller figures. Specifically, we characterize the extra amount of money by splitting up the 2,500 CHF into 1,200 CHF and 1,300 CHF. The distribution of effort under this adjusted loss treatment, which we label *loss endowment*, is reported of Table 8, in the third column.

We test the hypothesis (Hypothesis 5) that labeling a monetary amount a “bonus” and framing the compensation as an entity induces an endowment effect that is triggered in the loss frame. Table 8 reveals that only one subject chose an effort level of 6, which is an outlier. Using the Wilcoxon (Mann–Whitney) test, we test (Hypothesis 5) whether effort levels under the original loss-frame condition are higher than under the new endowment treatment (i.e., the first and third columns of figures in Table 6). We cannot reject the null hypothesis that the effort choices of subjects in the two treatments result from distributions with the same mean ($p = 0.063$). However, Table 8 reveals that only one subject chose an effort level of 6, which is an outlier. Replacing the identified outlier with the median choice of the treatment, we get significance at the 5% level (viz., $p = 0.041$), supporting our hypothesis (Hypothesis 5) that labeling the payment as a bonus induces an endowment effect that increases effort.

5.3.1 Test for Loss Aversion and Endowment Effect

Loss aversion and the endowment effect are connected. For a long time, loss aversion was suggested to be the main explanation behind the endowment effect (see Tversky and Kahneman, 1991). Even though different explanations have been brought up since (see Glöckner, Tontrup, and Kleber, 2009), the relationship remains: Subjects

¹⁶ Rebecca R. Boyce et al. (1992) explore the idea of perceived intrinsic value of some goods.

who are strongly loss-averse are also prone to display an intense endowment effect. We thus assume that those subjects who are more loss-averse are also more likely to choose higher effort levels in our experiment.

To find additional support for our finding that the endowment effect increases subjects' effort investments under the loss treatment, we test our subjects for loss aversion.¹⁷ We hypothesize (Hypothesis 6) that those participants who are strongly loss-averse are likely to choose a higher level of effort.

Testing for loss aversion, we present subjects the opportunity to participate in two lotteries. The second lottery performs the first one six times, using the same payoffs. Both lotteries are designed so that a non-loss-averse subject should choose to participate. Still, subjects can lose parts of their earnings, even though, in expectation, participation in the lottery yields a gain. Subjects might reject the first lottery, but accept the second. Since the lottery is performed six times, the likelihood of suffering a loss is reduced. So slightly loss-averse subjects might reject the first but accept the second, repeated lottery. Here is the lottery: "If you participate in this lottery you win 8 CHF with a probability of 1/2 and you lose 5 CHF with a probability of 1/2."

For our analysis, we formed two player types: the loss-averse and the neutral type. If a player chose to participate in both lotteries, we classified her as the neutral type; if she rejected either the first or the second lottery, we treated her as loss-averse.¹⁸ This classification gave us a nearly perfect median split of subjects. We hypothesize (Hypothesis 6) that significantly more subjects who are of the strongly loss-averse type will choose the bonus than will subjects who are the neutral type. We included all sessions of the loss treatments (including those for the expectation and the endowment condition) in the analysis. In a first step, we dichotomized the data, treating all decisions choosing an effort level that did not lead to the bonus (effort levels 1 and 2) as 1, and all decisions that realized the bonus (effort levels 3, 4, 5, and 6) as 2. With this data set, we performed a Wilcoxon (Mann–Whitney) test and rejected the null that both types choose the bonus equally often ($p = 0.001$). We performed the same analysis with the dichotomous data of bonus choices. Again, we reject the null that the loss-averse type chooses the bonus as frequently as the neutral type ($p = 0.013$). We thus find strong evidence that using a bonus concept in contract design transforms the stipulated payment into an endeared object. If the contract is framed so that it puts subjects in a loss scenario, it induces an endowment effect leading to significantly higher effort-level choices. We did not test the mechanism behind this result in detail, since we were mainly interested in the behavioral response of participants, but we considered two separate factors in understanding the endowment effect: labeling the extra payment as the

¹⁷ The test was developed and used by Goette et al. (Goette, Huffman, and Fehr, 2004).

¹⁸ A few subjects chose to participate in the first, but not in the second lottery, which reveals inconsistent preferences. We did not eliminate these observations from the sample, since we only need to claim that those subjects are at least more loss-averse than participants who decide not to participate in either of the two lotteries. This claim seems very plausible, despite the inconsistent preferences.

endeared object “bonus,” and presenting it as an entity rather than a faceless sum of money.

Finally, we hypothesize (Hypothesis 7) that the endowment effect may affect the subject’s choice of effort by strengthening the default expectation. As noted earlier, subjects think expectations are higher for meeting the threshold in the loss frame than in the gain frame because in the gain frame the bonus appears to be a reward, while in the loss frame taking the bonus away seems like a punishment. Under this theory, as a stronger sense of endowment leads to greater perceived punishment, the endowment effect may indirectly increase effort. We performed a linear regression with effort as the dependent variable and the dummy variables Treatment, CRT, and Loss Aversion as the independent variables. We did not find any evidence for an interaction effect between the variables Loss Aversion and CRT. We thus conclude that, at least in our setting, we were not able to show that the endowment effect sharpens the perception of punishment in the loss frame and thus leads subjects to invest a higher level of effort.

6 Conclusion

Recent evidence from a field experiment by Hossain and List (2009) suggest that framing contracts in a manner that makes “losses” more salient than “gains” leads to greater effort. However, the mechanism through which greater effort is induced through the loss frame, at least over some range, is not well documented. We investigated two explanations for this framing effect in a laboratory setting. First, we assume that the loss frame communicates the expectation that achieving the bonus is the default, and that our subjects comply with this expectation. Defusing the expectation default in a control treatment, we find that subjects choose lower effort levels. Supporting this result, subjects with a lower level of cognitive reflection tend to choose significantly higher effort levels, more readily complying with the default expectation. We do not find evidence for a motivational effect. Whether subjects score high or low on a social desirability scale does not predict whether they are likely to choose higher effort levels. We conclude that the default influences subjects cognitively rather than motivationally. Moreover, we find evidence for an endowment effect, even though the bonus is just a monetary payment that subjects do not even have in their possession. We find that manipulating the label and entitative nature of the “bonus” has a significant effect on effort.

Our results suggest that the loss frame influences subjects’ effort choices through two distinct channels: by an endowment effect and by setting a default expectation that cognitively induces subjects to invest more effort.

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We test the hypothesis (H5) that labeling a monetary amount "bonus" and framing the compensation as an entity rather induces an endowment effect that is triggered in the loss frame, when participants are assigned the bonus and then threatened that it will be taken away from them. Table 8 reveals that only one subject chose an effort level of 6, which is an outlier. Using the Mann-Whitney we test (H5) whether effort levels under the original loss frame condition are higher than under the new endowment treatment (i.e., the first and third columns of figures in Table 6). We cannot reject the null hypothesis that the effort level choices of subjects in the two treatments result from the same distribution with the test returning a p-value of $p = 0.063$. However, replacing the identified outlier with the median choice of the treatment, we get significance at the 5% level (i.e., $p = 0.041$), supporting our hypothesis (H5) that labeling the payment as a bonus induces an endowment effect that increases effort.

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To find additional support for our finding that the endowment effect increases subjects

effort investments under the loss treatment we test our subjects for loss aversion.¹⁶ We hypothesize (H6) that those participants, who are strongly loss averse are more likely to choose a higher level of effort.

Testing for loss aversion we present subjects the opportunity to participate in two lotteries. The second lottery repeats the first one for six times using the same payoffs. Both lotteries are designed such that a non-loss averse subject should choose to participate. Still, subjects can lose parts of their earnings, even though in expectation participation in the lottery yields a gain. Subjects might reject the first lottery, but accept the second. Since the lottery is repeated six times, the likelihood of making a loss is reduced. So slightly loss averse subjects might reject the first but accept the second repeated lottery. Here is the lottery: "If you participate in this lottery you win 8 CHF with a probability of $\frac{1}{2}$ and you lose 5 CHF with a probability of $\frac{1}{2}$."

For our analysis we formed two player types, the loss averse and the neutral type. If a player chose to participate in both lotteries we classified her as the neutral type; if she rejected either the first or the second lottery we treated her as loss averse.¹⁷ This classification gave us a nearly perfect median split of subjects. We hypothesize (H6) that significantly more subjects of the strong loss averse type will choose the bonus than of the neutral type. We included all sessions of the loss treatments (including those of the expectation and the endowment condition) in the analysis. In a first step we dichotomized the data treating all decisions choosing an effort level that did not lead to the bonus (1 and 2) as 1 and all choices that realized the bonus (3, 4, 5 and 6) as 2. With this data set we performed a Wilcoxon (Mann Whitney) test and rejected the null that both types choose the bonus equally often ($p = 0.001$). We performed the same analysis with the dichotomous data of bonus choices. Again we reject the null that the loss averse type chooses the bonus as frequently as the

¹⁶The test was developed and used in Lorenz Goette, David Huffman and Ernst Fehr in 2004. Goette and Fehr (2004)

¹⁷A few subjects chose to participate in the first, but not in the second lottery, which reveals inconsistent preferences. We did not eliminate these observations from the sample, since we only need to claim, that those subjects participating in the first, but not the second lottery are at least more loss averse than participants, who decide not to participate in either of the two lotteries. This claim seems very plausible, even though the subjects revealed inconsistent preferences.

neutral type ($p = 0.013$).

We thus find strong evidence that using a bonus concept in contract design transforms the stipulated payment into an endeared object. If the contract is framed such that it puts subjects in a loss scenario, it induces an endowment effect leading to significantly higher effort level choices.

We did not test the mechanism behind this result in detail, since we were mainly interested in the behavioral response of participants, but we identified two separate factors in understanding the impact of the endowment effect: Labeling the extra payment as the endeared object "bonus" and presenting it as an entity rather than a faceless sum of money.

Finally, we assumed (H7) that the endowment effect may affect the subject's choice of effort by strengthening the default expectation. As seen the default expectations in the gain frame appears to be a "reward" while the loss frame is presented like a "punishment". Under this theory, as a stronger sense of endowment leads to higher perceived punishment the endowment effect may indirectly increase effort.

We performed a linear regression with effort as the dependent variable and the dummy variables "Treatment", "CRT" and "Loss Aversion type" as the independent variables. We did not find any evidence for an interaction effect between the variables Loss Aversion and the CRT type. We thus conclude that at least in our setting we were not able to show that the endowment effect sharpens the perception of punishment in the loss frame and thus leads subjects to invest a higher level of effort.

6 Conclusion

Recent evidence from a field experiment by Hossain and List (2009) suggest that framing contracts in a manner that makes 'losses' more salient than "gains" leads to greater effort. However, the mechanism through which greater effort is induced through the loss frame, at least over some range, is not well documented. We investigated two explanations for this framing effect in a laboratory setting. First, we assume that the loss frame communicates the expectation that achieving the bonus is the default and that our subjects comply to this

expectation. Defusing the expectation default in a control treatment we find that subjects choose lower effort levels. Supporting this result, subjects with a lower level of cognitive reflection tend to choose significantly higher effort levels more readily complying to the default expectation. We do not find evidence for a motivational impact. Whether subjects score high or low on a social desirability scale we presented to subjects does not predict whether subjects are more likely to choose higher effort levels. We conclude that the default influences subjects cognitively rather than motivational. Moreover, we find evidence for an endowment effect, even though the bonus is just a monetary payment that subjects do not even have in their possession. We find that manipulating the label and entitativity of "the bonus" has a significant effect on effort. Our results suggest that the loss frame influences subjects' effort choices through two distinct channels: by an endowment effect and by setting a default expectation that cognitively induces subjects to invest more effort.

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