

Ostermaier, Andreas

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Reciprocity and honesty in capital budgeting: Positive spill-over effects of reporting

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Reciprocity and honesty in capital budgeting: Positive spill-over effects of reporting

1 Introduction

Reporting is often combined with capital rationing to prevent the creation of slack in capital budgeting. The ambivalence of trust in managers' reports and distrustful capital rationing creates an interesting tension. On the one hand, managers have been found to justify owners' trust and exhibit substantial degrees of honesty in reporting. On the other hand, economic research suggests that they reciprocate distrust and retaliate against owners for rationing their capital. How do managers then respond when trust and control combine in capital budgeting? We predict and find that managers misreport their information to sabotage feasible investments and thus reciprocate owners' distrust. Hence, reciprocity exacerbates the underinvestment that capital rationing brings about. Reporting elicits in turn managers' honesty and curbs misreporting and sabotage. More than that, honesty spills over to suppress the effect of negative reciprocity on sabotage.

We consider a firm where the owner funds and the manager realizes an investment. The owner cannot observe the cost and must rely on the manager's report instead, but she can cap the refundable cost *ex ante*. She thus hazards a profitable investment, but reduces potential slack if the investment is made. The manager, in turn, can create slack by overstating the cost. In particular, he can misstate the cost to exceed the cap, although it does not, to sabotage a feasible investment. He punishes the owner thus for capping the cost as he cheats her out of her payoff, but forfeits also any potential payoff from slack. The manager's report depends on his honesty and his inclination to reciprocate the owner's choice of the cap, as well as concerns about the fairness of the outcome that his report entails. We develop an analytical model and design an experiment to disentangle how these factors produce or prevent the sabotage of feasible investments.

Our model assumes that the manager cares about his payoff, but that he is also averse to inequity and lying and reciprocates distrust. From this model, we derive three predictions. First, we predict that the manager takes capital rationing to signal distrust, which he spitefully reciprocates with sabotage. High-cost investments, which offer little potential to create slack to compensate the manager's spite and result in unequal payoffs, are particularly hit by sabotage. Second, reporting decreases sabotage in turn, as it elicits the manager's honesty. Honesty restrains the manager from misreporting, and especially sabotage, which involves heavy misreporting. Third, reporting inhibits, in addition, spiteful reciprocity. Spite permits low-cost investments only, and as the cost of the investment is low, the cost of lying to sabotage it is high. This makes sabotage costly for the spiteful but honest manager. Honesty spills thus over to mitigate spite.

For our design, we draw on related experiments (Evans et al., 2001; Rankin et al., 2008), but allow sabotage. Participants are either the owner or manager of a firm, who can make an investment with random cost and certain revenue. The manager observes the cost and can create slack; the owner can cap the cost to reduce slack (Antle and Eppen, 1985). We manipulate, first, whether the owner decides to cap the cost or it is capped for him. Specifically, we replicate owners' cost caps

from earlier sessions in the control condition, so that managers face the same caps, but owners do not make any decision to be reciprocated. We disentangle thus the effects of reciprocity and fairness concerns. Second, we have managers either report the cost or allocate profits. Reporting implies a factual assertion and requires the manager to lie to create slack or sabotage the investment; without reporting, the manager's aversion to lying does not matter (Rankin et al., 2008).

The results support our predictions. First, provided that the cost is capped, a substantial portion of investments is sabotaged, but sabotage is much higher when costs are capped by owners. Hence, sabotage is largely driven by reciprocity, even though it results also from fairness concerns. Second, sabotage is lower with reporting than without. Although managers overstate their costs, honesty prevents sabotage. Third, reciprocity leads sabotage to increase less with reporting than without, which implies that honesty inhibits managers from reciprocating. Beyond the spill-over effect, which is not trivial to predict, the sheer portion of sabotage is remarkable. When costs are capped by owners, almost forty percent of the feasible investments are sabotaged. Even with reporting, sabotage is at about fifteen percent. Sabotage exacerbates indeed the underinvestment that arises from capital rationing, but reporting reduces sabotage substantially.

This study contributes to the accounting literature in several ways. First, we offer evidence that managers interpret capital rationing to show distrust, which they reciprocate. In particular, we disentangle negative reciprocity from fairness concerns to show its incremental effect.¹ Second, we find that honesty spills over to inhibit negative reciprocity. As reporting activates managers' preference for honesty, it restrains them from retaliating against owners who they feel are unfair toward them. Honesty is known to matter in capital budgeting, but it is not unconditional (Rankin et al., 2008; Douthit and Stevens, 2015). It is therefore interesting to see how honesty dominates negative reciprocity. Third, while prior research has focused on budgetary slack to measure honesty, we introduce sabotage to document the effects of reciprocity and honesty. This design choice allows us to show that honesty has economically significant effects beyond reducing slack.

These findings have managerial implications. It is easy to imagine subtle ways for managers to sabotage investments. For example, the implementation of an investment requires usually effort (Dutta and Fan, 2009, 2012). The manager may refrain from providing this effort because he resents the owner's distrustful control or because he does not feel motivated by an outcome that he anticipates to be unfair. The owner may in turn accept budgetary slack to accommodate the manager. The prevention of sabotage is an intuitive explanation why we see mixed empirical support for theoretical results on capital rationing, such as lenient hurdle rates (Dutta and Fan, 2009). Moreover, the spill-over effect of honesty on reciprocity explains why capital rationing and reporting are combined. Inhibiting sabotage, even more than reducing slack, may motivate the owner to require the manager to report and thus activate his preference for honesty.

This paper unfolds in four steps. First, we provide theoretical background and derive our hypotheses (Section 2). Next, we describe the design of our experiment (Section 3). We then report our results (Section 4). Finally, we conclude with a discussion of our results and their implications (Section 5).

¹Related research on trust and control focuses rather on positive reciprocity. There is considerable evidence that people reciprocate trust with increased effort Christ et al. (2012); Maas et al. (2012). Conversely, positive reciprocity has been found to be crowded out by control that signals distrust (Falk and Kosfeld, 2006; Christ, 2013). Christ (2013) finds indeed that the signal of distrust prevails when combined with a signal of trust.

2 Theory

2.1 Setting

For the setting of our experiment, we draw on Antle and Eppen’s (1985) canonical model, which is widely used in experimental research on participative budgeting (e.g., Evans et al., 2001; Rankin et al., 2003, 2008; Douthit and Stevens, 2015). We consider a firm that consists of an owner and a manager. The manager can realize an investment if the owner provides funding to cover the cost. The investment generates a certain revenue of ECU 100, while the cost c is uniformly distributed over $\{0, 1, 2, \dots, 100\}$. Both the owner and the manager know the revenue and the distribution of c , but only the manager observes c . The manager submits a report on his cost to the owner. Since the owner cannot verify this report, she must trust it and cover the reported cost. Hence, the manager can overstate the cost to create and consume slack. The owner’s and manager’s payoffs are $100 - \hat{c}$ and $\hat{c} - c$, where \hat{c} is the reported as opposed to the actual cost.

If the manager cares only about his own payoff, he reports the cost to be ECU 100, whatever it actually is, and thus maximizes slack. Antle and Eppen’s (1985) model suggests therefore that the owner caps in turn the cost that she will refund at ECU 50 and refuses to fund any investment with a reported cost above ECU 50.² On the one hand, she reduces thus the slack that the manager can possibly create. To realize the investment, the manager cannot report the cost to exceed ECU 50, which increases the owner’s payoff to at least ECU 50. On the other hand, the investment cannot be made half of the time, although it is still profitable even when it costs more than ECU 50 because of the certain revenue of ECU 100. Capital rationing reduces slack, but precludes profitable investments and thereby causes underinvestment. The cap on the refundable cost at ECU 50 balances this trade-off and maximizes the owner’s expected payoff.

Antle and Eppen’s (1985) model fails to capture two sources of variance in the manager’s report, though. First, the manager’s response to the cap can be more benign than assumed. There is evidence that managers create less slack than the model predicts because they are reluctant to lie. Honesty restrains managers from misreporting the cost as much as they could (e.g., Evans et al., 2001; Rankin et al., 2008; Hannan et al., 2006). Second, however, the manager’s response can also be more malign: rather than create slack, he can sabotage the investment. Specifically, the manager can overstate the cost to exceed the cap although it does not. He thus prevents what he considers an unfair split of the profit (sabotage leaves both himself and the owner with nothing instead) or reciprocates the owner’s choice to cap the cost (Falk et al., 2003). The manager sacrifices thus any payoff he could earn from creating slack to cheat the owner out of hers.

Sabotage is interesting from a managerial viewpoint because it prevents profitable investments. Even without sabotage, capital rationing causes underinvestment. In our specific setting, half of the investments cost more than the cap allows and cannot be realized although this is inefficient ex post. Sabotage aggravates underinvestment as it blocks, in addition, investments that meet the cap. Sabotage is also interesting from a psychological viewpoint. Both slack and sabotage hurt the owner as they reduce her payoff. Sabotage is in fact the most severe punishment the manager can inflict on her. However, unlike slack, which earns the manager money, sabotage costs him money.

²Let \bar{c} be the cost cap as the maximal reported cost of the project that the owner funds. A self-interested manager who maximizes slack will always report $\hat{c} = \bar{c}$ as long as the actual cost is below the cap. With $c \sim \mathcal{U}\{0, 100\}$, $\bar{c} = 50$ maximizes the owner’s expected payoff, which is $\frac{\bar{c}}{100} \cdot (100 - \bar{c})$.

Unlike the mechanism suggested by Antle and Eppen (1985), ours is not truth-inducing. However, it guarantees the owner at least the same payoff as the truth-inducing mechanism, where the owner transfers ECU 50 to the manager for any report $\hat{c} \leq 50$. We adopt thus Evans et al.’s (2001) Modified Trust Contract to our experiment.

While sabotage has monetary implications, it arises undeniably from non-monetary motives. We are not aware of prior evidence to quantify sabotage, which is certainly hard to identify in the field, but has not even been investigated in experimental research on budgeting.³

This study addresses this gap as it examines how sabotage depends on the manager’s preferences for fairness, reciprocity, and honesty, along with his payoff. We design a theoretical model and conduct a laboratory experiment to show that, on the one hand, capital rationing causes managers to reciprocate and sabotage investments. On the other hand, reporting requirements elicit managers’ honesty and reduce sabotage. We manipulate, first, whether the owner can choose to cap the cost or this choice is made for him. We recover thus reciprocity and disentangle it from fairness, which may also motivate sabotage. Second, we have the manager either report the cost or just allocate payoffs to elicit his honesty (Rankin et al., 2008; Douthit and Stevens, 2015). We contribute to the accounting literature in that we identify how negative reciprocity matters in budgeting and how honesty combines with it to mitigate sabotage and underinvestment.

2.2 Theoretical model

We develop a parsimonious model to derive predictions on how negative reciprocity and honesty lead the manager to make or sabotage the investment. The owner chooses between a modified trust contract, which implements the optimal cap according to Antle and Eppen (1985), and a trust contract without any cap (Evans et al., 2001).⁴ With both contracts, the manager’s payoff depends on his report. To predict sabotage, the model focuses specifically on the situation where the manager can sabotage the investment. Sabotage can arise if the cost is capped and does not exceed the cap. In turn, if it is capped and exceeds the cap, the investment cannot be made, whether the manager would like to sabotage it or not. If it is not capped, the investment is always made. We assume that the manager is risk-neutral and strives to maximize his utility, which depends on his preferences for fairness, reciprocity, and honesty, but also his payoff.

Irrespective of the owner’s motive in capping the cost, the cap affects payoffs heavily. Provided that the investment can be made ($c \leq 50$), capital rationing leads to an outcome that the manager likely considers unfair. Except for $c = 0$, which is theoretically possible, the manager’s payoff is smaller than the owner’s ($\hat{c} - c \leq 100 - \hat{c}$), even when the manager reports $\hat{c} = 50$ to maximize slack. While there is rich evidence that people tend to take more than half of the payoff if they can (Fehr and Schmidt, 2006), few would consider less than half to be fair. If the manager cares about fairness in addition to his payoff, he considers both his own and the owner’s share, or the difference between them, which is $(100 - \hat{c}) - (\hat{c} - c) = 100 + c - 2\hat{c}$. Inequity creates a cost that the manager charges against his payoff (Fehr and Schmidt, 1999). This cost depends both on inequity and on how much the manager cares about it (i.e., his inequity aversion).

We assume that the cost of inequity is convex in the difference between the payoffs (Mohnen et al., 2008; Englmaier and Wambach, 2010). Specifically, we let the cost of inequity be $\alpha(100 + c - 2\hat{c})^2$, where α captures the manager’s inequity aversion. If the manager overstates the cost, he increases his payoff and reduces the difference between the payoffs and thus the cost of inequity. Nevertheless, the creation of slack alone does not produce a fair outcome. By contrast, if the manager sabotages the investment, both the owner and the manager himself receive zero payoffs,

³It seems that sabotage is technically possible in Rankin et al.’s (2003) experiment. Unfortunately, the authors do not report this outcome as an estimate of how serious sabotage is.

⁴The owner cannot choose any other cap than ECU 50. This assumption keeps the model tractable and allows clear predictions. However, different caps allow the owner to anticipate the manager’s non-monetary preferences, such as honesty (Mittendorf, 2006). We discuss this potential extension in the conclusion.

which is an equal and therefore fair outcome. Depending on the cost of the investment and his inequity aversion, any possible outcome of the investment may be unacceptable for the manager just because of his inequity aversion. Hence, the trade-off between maximizing his payoff and reducing the cost of inequity alone may lead the manager to sabotage the investment.

The cap tells the manager also that the owner distrusts him. In addition to potentially increasing the owner's at the expense of the manager's payoff, it results in underinvestment, which reduces the payoffs of both. Capping the cost does not pay off for the owner unless she anticipates that the manager will build up excessive slack. The manager infers therefore from the cap that the owner expects him to lie heavily.⁵ If she trusted him to give her her due, she would never cap the cost and risk the investment, which then decreases her own along with the manager's expected payoff. People tend to punish selfish and distrustful behavior even when this is costly (Fehr and Schmidt, 2006). In particular, the manager can punish the owner by overstating the cost to sabotage a feasible investment. However, sabotage must offer some benefit to compensate the manager for the lost payoff. We refer to this benefit as spite and add γ to the manager's utility.⁶

Prior evidence argues for the value of information systems that elicit managers' honesty in budgeting (e.g., Evans et al., 2001; Hannan et al., 2006; Rankin et al., 2008; Douthit and Stevens, 2015). Although they fail to reveal managers' private information truthfully, they still reduce slack. Lying is apparently costly and managers trade off the benefit of lying for the cost, which explains their partially honest reports. We assume that this cost depends on the manager's aversion to lying and is convex in the size of the lie, which is $\hat{c} - c$ (Kartik, 2009; Abeler et al., 2014). We include the term $\beta(\hat{c} - c)^2$ to account for this cost, where β is the manager's aversion to lying. Unlike the cost of inequity and spite, the cost of lying arises both when the manager sabotages the investment (because he must overstate the cost to sabotage it) and when he realizes it, but creates slack. The following model summarizes the manager's options in terms of his utility u :

$$u = \begin{cases} (\hat{c} - c) - \alpha(100 + c - 2\hat{c})^2 - \beta(\hat{c} - c)^2, & \hat{c} \leq 50; \\ \gamma - \beta(\hat{c} - c)^2, & \hat{c} > 50. \end{cases}$$

If the manager realizes the investment and reports $\hat{c} \leq 50$, he retains the payoff $\hat{c} - c$ from slack but suffers from inequity because his and the owner's payoffs are unequal. On the contrary, sabotage leaves him without any payoff from slack, but avoids the cost of inequity. In addition, it offers him the benefit γ of punishing the selfish and distrustful owner. Whether the manager creates slack or sabotages the investment, he incurs a cost from lying. Hence, slack and the cost of inequity drive the manager to overstate the cost for any c , because slack increases and his cost

⁵Suppose that the manager misreports the cost dishonestly to maximize slack ($\hat{c} = 50$ if $c \leq 50$ and $\hat{c} = 100$ otherwise). With $c \sim \mathcal{U}\{0, 100\}$, the owner's expected payoff is $\Pr(c \leq 50) \cdot (100 - 50) = 0.5 \cdot 50 = 25$ with cap compared to 0 without. If the manager reports the cost honestly ($\hat{c} = c$), in turn, the owner's expected payoff is $\Pr(c \leq 50) \cdot (100 - \mathbf{E}(c \mid c \leq 50)) = 0.5 \cdot 75 = 37.5$ with cap compared to $100 - \mathbf{E}(c) = 50$ without.

To generalize, let $\pi \in [0, 1]$ denote the manager's expected percentage of honesty (the slack he does *not* create although he could; see Evans et al., 2001), where the owner expects the manager to maximize slack for $\pi = 0$. The owner caps the cost if $\Pr(c \leq 50) \cdot (50 + \pi(50 - \mathbf{E}(c \mid c \leq 50))) > \pi(100 - \mathbf{E}(c)) \Leftrightarrow 0.5 \cdot (50 + \pi(50 - 25)) > \pi(100 - 50) \Leftrightarrow \pi < \frac{2}{3}$. Hence, capital rationing suggests serious doubts about the manager's honesty.

⁶There is no standard way of modeling reciprocity (see Fehr and Schmidt, 2006, Section 3.3, for an overview). We benefit from our simple setting, where the owner's intention and the harm that punishment causes to her are obvious, to model negative reciprocity or spite conveniently. The harm to the owner is best measured in terms of her lost payoff, which is invariably ECU 50. We let $\gamma := 50\gamma'$, where γ' is the manager's inclination to reciprocate, as α and β are his inequity aversion and aversion to lying.

from inequity decreases in \hat{c} .⁷ By contrast, the cost of lying increases in \hat{c} and thus restrains him from overstating the cost of the investment. Spite, unlike slack and the cost from inequity, does not vary in \hat{c} . Nevertheless, spite motivates the manager to overstate the cost as well because he cannot benefit from spite unless he overstates the cost to exceed ECU 50.

For any given $c \leq 50$, the manager compares the benefits of both options. These benefits are conditional on his best report to either realize or sabotage the investment, which is in turn a function of his inequity aversion α , his aversion to lying β , his spite γ , and the cost c (see Appendix A). A low cost offers a high potential for slack. Depending on his aversion to lying, the manager can then overstate the cost and create slack to earn money, reduce inequity, and compensate his spite. Conversely, if the cost is too high for the manager to create enough slack, he sabotages the investment. Hence, there is a maximum cost that allows the manager to realize rather than sabotage the investment, but which depends on his combination of α , β , and γ . The following proposition retains this result and describes the manager's threshold cost c^* to make the investment as a function of α , β , and γ (see Appendix A for the proof).

Proposition. There exists a threshold cost $c^*(\alpha, \beta, \gamma)$ such that the manager sabotages the investment if $c > c^*$.

Figure 1 depicts the threshold cost from the proposition for two levels of spite ($\bar{c} := c^*$ for $\gamma = 0$ and $\underline{c} := c^*$ for $\gamma > 0$). It varies the aversion to lying and holds the inequity aversion constant. While the figure does not support general conclusions, it offers nevertheless some insights for the predictions to be derived in the next section. First, spite can be seen to incite sabotage. Specifically, the manager needs a lower cost to make the investment when he is spiteful than when he is not ($\underline{c} < \bar{c}$ for any β). With a low cost, he can create more slack to compensate him for his spite. It turns thus out that spite can cause sabotage. If the cost is anywhere between \bar{c} and \underline{c} , then the manager makes the investment if he is unspiteful but not if he is spiteful. Since the cost is uniformly distributed over $\{0, 1, \dots, 50\}$, it is less likely to fall below \underline{c} than below \bar{c} .⁸ As a result, spite increases indeed the probability that the investment is sabotaged.

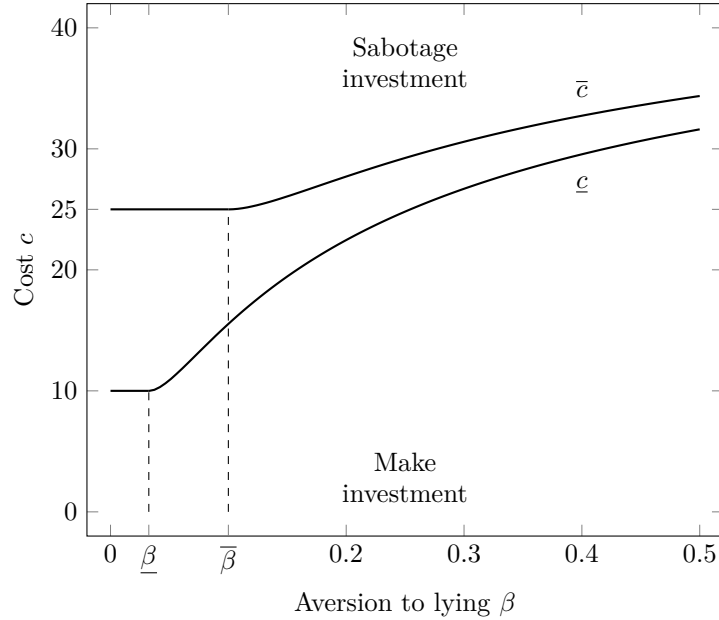
Second, aversion to lying bridles in turn sabotage. The manager's threshold cost increases once his aversion to lying is high enough (e.g., $\beta > \bar{\beta}$ for $\gamma = 0$). Aversion to lying can thus prevent the manager from sabotaging the investment. Suppose that the cost c and the manager's aversion to lying β place him east of \bar{c} . The manager will then make the investment if his preference for honesty is activated, but sabotage it, if it is not (which moves him northwest of \bar{c} to $\beta = 0$). Again, the cost is more likely to fall below c^* if c^* is higher. Aversion to lying reduces therefore the probability that the investment is sabotaged. Third, aversion to lying mitigates apparently the effect of spite. While spite leads the threshold cost to decline for any aversion to lying β , it declines less as β increases. Depending on the cost, spite may thus cause the same manager to sabotage the investment if he does not mind lying, but not so if sabotage requires him to lie.

Investments with low costs are generally more worthwhile for the manager and therefore less likely to be sabotaged. First, low costs allow the manager to create slack and increase his payoff. This argues against sabotage, which leaves the manager without any payoff. Second, low costs permit a less unequal split of the profit. While the owner's exceeds the manager's payoff, the difference decreases as the manager's payoff increases. Low costs put thus into perspective what

⁷Lying decreases rather than increases inequity because the manager's cannot exceed the owner's payoff, no matter what the manager reports the cost to be ($\hat{c} - c \leq 100 - \hat{c}$).

⁸The cost is uniformly distributed over $\{0, 1, \dots, 100\}$. However, sabotage cannot occur unless the cost is capped at ECU 50, which restricts the distribution in the case that the model captures.

FIGURE 1
Threshold cost to realize the investment



Unspiteful managers sabotage the investment if $c > \bar{c}$; spiteful managers sabotage it if $c > \underline{c}$. The numerical example assumes $\alpha = 0.04$ and $\gamma = 36$ in case of sabotage.

the manager who resents inequity appreciates about sabotage: it produces a fair outcome as both he and the owner receive nothing. Third, the cost of lying to sabotage the investment increases as the cost of the investment decreases, because it depends on the size of the lie. Sabotage requires the manager to misreport the—however low—cost to exceed ECU 50. If the manager realizes the investment instead, he can adjust his report and lie less to reduce his cost of lying.

2.3 Predictions

The model implies that capital rationing and reporting, as they elicit spite and aversion to lying, affect the manager’s decision whether to sabotage or realize the investment and, as a result, the extent of underinvestment. Specifically, the cost cap causes spite, which incites the manager to sabotage the investment. By contrast, aversion to lying restrains him from overstating the cost and thus impedes sabotage. These effects are both intuitive. Still, they are not trivial to see because inequity aversion and payoffs factor also into the model, in addition to aversion to lying and spite. Moreover, it is not obvious how aversion to lying and spite interact. In order to derive predictions, we examine the effects of spite, aversion to lying, and their combination separately. Accordingly, the experiment manipulates independently whether spite and aversion to lying matter for the manager’s decision but holds the other factors constant.

Spite makes sabotage more worthwhile for the manager. The spiteful manager, compared to the

unspiteful manager, must therefore be compensated for not sabotaging the investment. Compensation includes specifically a higher payoff. If the manager cares about fairness ($\alpha > 0$), a higher payoff compensates him indeed twice because it implies less inequity. A low cost allows the manager to create more slack, which increases his payoff and results at the same time in a less unequal split of the profit. As a result, the threshold cost c^* to realize the investment is lower for the spiteful than the unspiteful manager ($\underline{c} < \bar{c}$). This is true both when the manager does not mind lying ($\beta = 0$) and when he does ($\beta > 0$). Lying does not change the game, because no matter how much the manager lies to create slack as he realizes the investment, sabotage requires him to lie at least as much. Corollary 1 summarizes this argument (see Appendix A for the proof).

Corollary 1. For all $\alpha, \beta \geq 0$, the threshold cost c^* for the manager to realize the investment is decreasing in spite ($\frac{dc^*}{d\gamma} < 0$).

The corollary implies that the owner’s choice to cap the cost drives the manager to sabotage the investment. While sabotage may arise from inequity aversion and spite, the corollary suggests, in particular, an incremental effect of spite. For example, imagine a manager who makes the investment with a given cost reluctantly; while the cap leaves him with a payoff of $50 - c$ at most and the owner with at least ECU 50, he finds the inequity tolerable as he receives a sufficient payoff from slack ($c < \bar{c}$). If the same manager is in addition spiteful against the owner because of her capping the cost, he may well sabotage the same investment instead ($c > \underline{c}$). The cost must be lower so that he can create more slack to compensate him, in addition, for his spite. Hence, spite causes managers to sabotage investments that they would realize otherwise. With the same distribution of the cost, spite will thus lead more investments to be sabotaged.

Rankin et al. (2008) note that capital rationing resembles technically ultimatum games, where a proposer suggests how to split some amount and a receiver either accepts or rejects the proposer’s offer. The outcomes of ultimatum games support the argument that the cap results in sabotage and argue especially for spite as a motive. Receivers have been found to reject offers by selfish proposers more often than equivalent random “offers” (Blount, 1995; Offerman, 1999). Likewise, the proposer’s choice of one option over others can reveal selfishness (Brandts and Solà, 2001; Falk et al., 2003) or distrust (Falk and Kosfeld, 2006; Christ, 2013). For example, Falk and Kosfeld (2006) find that control, which is technically equivalent to a cost cap, crowds out positive reciprocity. They have principals choose whether to claim a minimum share from agents or just let agents allocate cash. Agents consider control to signal distrust and give principals less than without control, where principals’ claims are exogenous rather than chosen.

Like the proposer, the owner makes an “offer” to the manager on how to split the profit; the manager can reject this offer by sabotaging the investment. The owner’s choice to cap the cost is certainly as selfish and distrustful as in Falk and Kosfeld (2006). It increases the owner’s share at the manager’s cost. Moreover, the owner risks indeed her and the manager’s payoffs because the cap prevents costly but profitable investments. If she trusted the manager to be fair, she would never cap the cost, and both would be better off. To disentangle the effects of inequity aversion and spite, suppose that the cost is capped, but not by the owner. The manager might still sabotage the investment to avoid inequity, but not because of spite.⁹ Hence, we expect to see some degree of sabotage when costs are capped, no matter how, but even more sabotage when costs are capped by owners, because of the additional effect of spite.

⁹Rankin et al. (2003) have owners set the cap but do not report how often managers sabotaged investments. Moreover, unlike Falk and Kosfeld (2006) and others, they do not include conditions where the cost is capped exogenously rather than by the owner to disentangle inequity aversion and spite.

Hypothesis 1. Investments will be sabotaged more often when costs are capped by owners than when cost are capped, but not by the choice of owners.

Aversion to lying, as opposed to spite, inhibits rather than fuels sabotage. If the manager’s aversion to lying is high, he is reluctant to overstate the cost, and especially to sabotage the investment, which requires him to overstate the cost even more. Specifically, the manager must misreport the cost to exceed ECU 50 to sabotage the investment, but his report must not exceed ECU 50 to allow it to be realized. This difference matters to the extent that the manager minds lying, and sabotage becomes therefore less worthwhile compared to making the investment as aversion to lying increases. A manager with a high aversion to lying is willing to realize even a costly investment to avoid sabotage, although this leaves him with a lower payoff and a more unequal split of the profit. As a result, the threshold cost c^* to keep the manager indifferent between making and sabotaging the investment increases in aversion to lying.

The manager’s aversion to lying does not directly map into his report, though, which trades off the cost from lying for the foregone payoff and the cost from inequity. If the manager does not mind lying or cannot lie indeed because he is not required to make any factual assertion about the cost ($\beta = 0$), his best report would be above ECU 50.¹⁰ However, the cap obliges him to report either ECU 50 and realize the investment or more than ECU 50 and sabotage it. Once the aversion to lying is high enough (e.g., $\beta > \bar{\beta}$ for $\gamma = 0$), it drives the manager to report a cost below ECU 50 to make the investment. He thus sacrifices potential payoff from slack and accepts more inequity to reduce the cost from lying. Hence, the threshold cost c^* to make the investment is constant if β is low and increases if it is high ($\beta > \bar{\beta}$). Overall, the threshold cost is non-decreasing in the aversion to lying. Corollary 2 summarizes this result (see Appendix A for the proof).

Corollary 2. For all $\alpha, \gamma \geq 0$, the threshold cost c^* for the manager to realize the investment is non-decreasing in aversion to lying ($\frac{dc^*}{d\beta} \geq 0$).

The corollary implies that aversion to lying makes sabotage less likely. Specifically, the manager sabotages the investment if its cost exceeds his threshold c^* . However, the cost is less likely to exceed his threshold if his aversion to lying factors into his decision and increases the threshold. Prior research, which shows how honesty matters in budgeting (Young, 1985; Chow et al., 1988; Evans et al., 2001; Stevens, 2002; Hanman et al., 2006; Zhang, 2008), supports the result in the corollary. Specifically, Evans et al. (2001) find that managers refrain from misreporting their cost and create less slack than standard theory predicts. The variance in slack creation suggests that, rather than either report truthfully or untruthfully, managers incur an individual cost when lying, which they trade off against the additional payoff from slack. Lundquist et al. (2009) document that, as our model assumes, the cost of lying increases in the size of the lie.¹¹

The manager’s report, whether or not it results in sabotage, is driven by different factors in addition to his aversion to lying. Hence, aversion to lying must not be inferred from sabotage or slack alone. Rankin et al. (2008) develop a design to show that aversion to lying, or honesty, has an incremental effect on the creation of slack, beyond concerns about payoffs or fairness. Managers create less slack when they are required to report the costs of their investments than when they

¹⁰Without any aversion to lying, the report trades off inequity for payoff. Except for a cost of ECU 0, a report of ECU 50 does not even equalize payoffs, though, let alone account for the manager’s desire to increase his payoff.

¹¹People have been found to care not only about the size of lies, but also about consequences (Gneezy, 2005; Maas and van Rinsum, 2013). These findings argue in favor of our prediction. The manager might also refrain from sabotage because of the severe consequences for the owner. Slack still hurts her, but far less so than sabotage. In our model, however, the benefit from sabotage (i.e., γ) rather than the cost from lying captures this effect.

allocate profits without reporting, like in an economic dictator game. Unlike the allocation of profits, which is about payoffs and fairness only, the report activates managers' preferences for honesty. While they can reach the same outcomes either by misstating costs or allocating profits, they must make factual assertions and thus lie about their costs with reporting. The reduction in slack with reporting results thus clearly from managers' aversion to lying.

This design is not only helpful to single out the effect of managers' aversion to lying, but captures also organizational features of budgeting processes in firms. For example, the budgeting process can either be turned into an economic game, which tells managers that they are supposed to act selfishly, or show managers that they are trusted and thus activate their ethical preferences (Stevens, 2002). Although some managers may exploit processes which allow them to be honest but also dishonest, there is evidence that it can pay off for firms to rely on managers' honesty (Evans et al., 2001). Douthit and Stevens (2015) adopt Rankin et al.'s (2008) design to document that the effect of honesty on slack is even more robust than Rankin et al.'s results suggest indeed. Drawing on Corollary 2 and prior literature on honesty, especially in accounting, we predict that reporting elicits managers' honesty and leads sabotage to decline.

Hypothesis 2. Investments will be sabotaged less often when managers must report and thus make factual assertions about costs rather than split profits without factual assertions.

In summary, we predict that the owner's choice to cap the cost causes spite and fuels sabotage. Reporting elicits in turn the manager's honesty, causes him to lie less about the cost, and makes thus sabotage less likely. Since spite and aversion to lying have opposite effects on sabotage, it is unclear, though, how they combine. Figure 1 suggests that aversion to lying mitigates spite. Specifically, spite decreases the threshold cost for the manager to make the investment and thus increases the probability of sabotage when he does not mind lying ($c|_{\beta=0} < \bar{c}|_{\beta=0}$). When the manager does mind lying and his aversion to lying is high (e.g., $\beta = \bar{\beta}$), his threshold cost still increases ($c|_{\beta=\bar{\beta}} < \bar{c}|_{\beta=\bar{\beta}}$), but less so ($\bar{c}|_{\beta=\bar{\beta}} - c|_{\beta=\bar{\beta}} < \bar{c}|_{\beta=0} - c|_{\beta=0}$). Hence, while spite increases the probability of sabotage, whether the manager's aversion to lying is low or high, it increases the probability of sabotage less when his aversion to lying is high than when it is low.

To understand this effect, recall from Corollary 1 that the manager must be compensated for his spite to make the investment nevertheless. If the investment is costly, it does not offer enough potential for slack to compensate him, though. Hence, as a direct effect, spite precludes costly investments. However, it has also an indirect effect, which depends on the manager's aversion to lying: as the cost of the investment decreases and thus the gap between the actual and reported cost to sabotage the investment increases, sabotage becomes less worthwhile because of the high cost of lying. This indirect effect matters especially when the manager's aversion to lying is high. Hence, the manager who minds lying needs to create less slack to compensate him for his spite and the threshold cost to make the investment must thus decrease less than for the manager who does not mind lying. Corollary 3 summarizes this argument (see Appendix A for the proof).

Corollary 3. For all $\alpha \geq 0$, the incremental change of the threshold cost c^* in spite is non-decreasing in aversion to lying ($\frac{d^2 c^*}{d\gamma d\beta} \geq 0$).

Corollary 3 suggests that, while the owner's decision to cap the cost induces the manager to sabotage the investment, reporting mitigates this effect. This implication does not trivially follow from the model, which does not assume aversion to lying and spite to be interdependent. The intuition for this result is that honesty spills over to constrain spite. Reporting gives the manager the opportunity to lie or tell the truth and highlights thus the ethical dimension of his report.

It creates a situational cue, and these cues are crucial to activate norms when there are different norms conflicting (Bicchieri, 2006; Douthit and Stevens, 2015). If budgeting involves reporting so as to activate honesty, it restrains the manager from following his (negative) impulse of spitefully retaliating against the owner. We expect therefore a lower increase in sabotage due to spite when managers are required to report than when they split profits without reporting.

Hypothesis 3. The increase in sabotage when costs are capped by owners will be lower when managers must report and thus make factual assertions about costs rather than split profits without factual assertions.

Note that the argument that honesty mitigates reciprocity is new to the literature. It underlines positive effects of reporting that go beyond the well-known issues of disseminating private information and reducing slack. Hypothesis 3 does not predict that the manager reports the cost truthfully if he is to report the cost. Instead, reporting inhibits him from sabotaging the investment and thus reduces underinvestment toward the level that arises technically from capital rationing.

3 Experimental design

To test our hypotheses, we conducted a laboratory experiment. We employ a 2×2 factorial design, where we manipulate between subjects, first, whether the owner can cap the cost or the cost can be capped for her and, second, whether the manager reports the cost or assigns payoffs to himself and the owner. 374 students from a large European university participated in this study. Their age averages 21.38 years (SD 2.41), and 67 percent of the participants were male. The participants were separated by partitions and interacted anonymously through a computer network. Each of the four conditions involved four sessions of about one hour. Participants were paid €12.44 (\$16.55) on average.

3.1 Overview

Participants were randomly assigned to be either the owner or the manager of a firm, where the owner can fund and the manager can realize an investment. Owners and managers interacted anonymously for 20 rounds. They were randomly re-matched after each round so that the same owner–manager couple would never interact twice in subsequent rounds. To avoid wealth effects, one round was randomly chosen to determine compensation, where each round was equally likely to be drawn. We simulated thus repeated one-shot experiments. The sequence of costs was determined once and then used in all sessions so that we can easily compare results across conditions.

The design of our experiment is adopted from related work (Evans et al., 2001; Rankin et al., 2003, 2008; Hannan et al., 2006). The investment earns a certain revenue of ECU 100, while the cost ranges from ECU 0 to 100. ECU 3 convert into €1 (US\$1.33). In addition to any share of the profit he or she would earn from the investment, each participant was paid a fixed amount of ECU 10. The fixed payment made sure that no one left the experiment without any compensation. We thus follow similar experiments which all included fixed payments (Evans et al., 2001; Hannan et al., 2006; Rankin et al., 2008; Stevens, 2002). In particular, the fixed payment avoids excessive tension on managers who want to be honest (Rankin et al., 2008).

3.2 Dependent variable

We measure how likely or how often managers sabotage feasible investments. We focus therefore on cases where the cost is capped but the investment can still be made, and record whether the manager sabotages the investment. In related research, payoffs serve usually as measures of honesty or efficiency. Sabotage has not been examined yet although it is especially interesting for a number of reasons.¹² Sabotage matters from a managerial viewpoint because it exacerbates the underinvestment that capital rationing entails. It may cause relevant inefficiencies which the literature has not even foreseen (e.g., Antle and Eppen, 1985). Moreover, sabotage costs the manager money, whereas slack earns him money. Hence, the manager may create slack to punish the owner or just to enrich himself at the owner's expense. Sabotage is not only the harshest way for the manager to retaliate against the owner; it is also clear evidence of his non-monetary preferences.

3.3 Independent variables

We manipulate, first, whether the owner can cap the cost, to introduce reciprocity. In the condition with reciprocity, the owner chooses whether to refund any cost or only up to ECU 50. In the condition without reciprocity, this choice is made for her. Both conditions produce, on average, the same outcomes: the cost cap precludes the investment or constrains potential splits of the profit, regardless of whether it is the owner's choice. However, if it is the owner's choice, it allows the manager to infer her intentions in capping the cost, and to reciprocate. Specifically, the cap tells the manager that the owner distrusts him to split the profit fairly. While any investment is profitable, the owner hazards less profitable investments in order to increase her payoff at the manager's expense. Even if the owner does not anticipate sabotage, capital rationing does not pay off unless she expects the manager to leave her with less than ECU 25 on average.

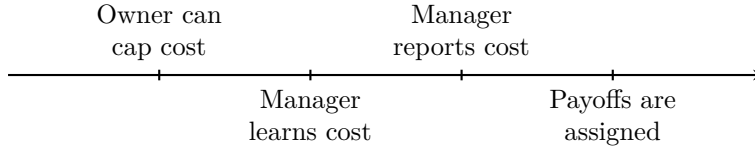
Provided that the cost is capped, the manager's response may vary depending on how much he cares about his payoff, as well as his own relative to the owner's payoff (i.e., concerns about fairness). For example, the manager may sabotage the investment because he prefers fair zero-payoffs for both himself and the owner to what he considers an unfair split of the profit. As reciprocity adds to any other motives that may lead the manager to sabotage the investment, sabotage should be higher with all other factors being held constant. To keep the conditions comparable, we replicate, in the condition without reciprocity, owners' choices from the condition with reciprocity. Similar designs have been used to identify reciprocity in ultimatum games (Blount, 1995; Offerman, 1999). More recently, Falk and Kosfeld (2006) recovered thus the hidden costs of control. Kachelmeier et al. (2014) employed a related design to show how intentions matter in auditing.

Second, we have the manager either report his cost or split the profit (Rankin et al., 2008). In the factual assertion condition, the manager submits a report about the cost to the owner after learning the actual cost. The owner does not learn the cost and refunds whatever cost the manager reports, conditional on whether the reported cost falls below ECU 50 if the cost is capped. If the investment is made, the owner receives ECU 100 less the reported cost, whereas the manager receives the reported less the actual cost. It is clear to both that the manager can overstate the cost and the owner will never find out.¹³ In the control condition, the owner requires a payoff of at least ECU 50 instead of capping the cost at ECU 50 and the manager shares the profit instead of reporting the cost. The conditions are equivalent because the manager can reach the same outcomes either way. However, the factual assertion requires him to lie to create slack.

¹²Rankin et al. (2003) allow sabotage. However, it is neither their focus nor do they report on it in much detail.

¹³The manager cannot understate the cost. Hence, he cannot leave the experiment with a net loss.

FIGURE 2
Timeline



Decision trees similar to the timeline illustrated the sequence of events to the participants. The wording was adopted to the conditions (e.g., the owner requires a minimum payoff and the manager shares the profit rather than the owner can cap and the manager reports the cost; the cost is randomly capped rather than the owner can cap the cost).

3.4 Session time line

Each session consisted of five steps. First, participants read through instructions which explained all the information and choices available to them. In particular, the instructions pointed out what was private information (i.e., the actual cost) and what was common knowledge (everything else). A decision tree illustrated the sequence of events (see Figure 2). Second, participants took six trial rounds where they assumed in turns the roles of the owner and the manager. They could thus familiarize themselves with the software and understand the situation and especially the choices of either. It was clear that their decisions in these two times three rounds would not affect their compensation. However, at the end of each round they were told what they would earn if this were not a trial but a paying round selected for compensation. Only then were they told whether they would be an owner or a manager throughout the experiment.

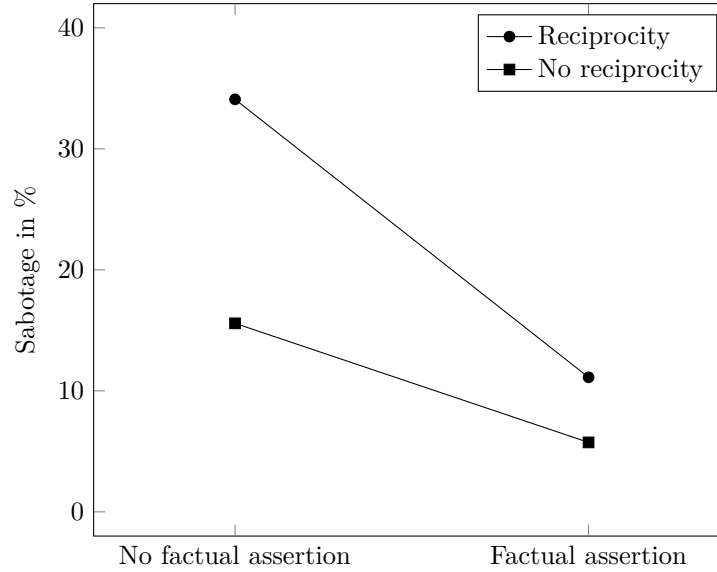
Third, after learning about their role, the participants took a multiple-choice quiz. The quiz asked questions both about general features of the experiment (e.g., confidentiality, re-matching, or compensation) and especially the information and choices available to them as the owner and those available to the manager and vice versa. The questions and answers were slightly adapted to the specific conditions. (For example, they talked either about cost caps or minimum payoffs.) Whenever participants would choose the wrong answer, they were told so and explained why a different answer would have been correct. Fourth, participants finally took 20 paying rounds. At the end of each round, they were told how much they would earn if this round was selected for compensation. Fifth, after the last round, they answered a short post-treatment survey. They were then remunerated in private with cash.

4 Results

4.1 Summary statistics

The manager can sabotage the investment if the cost is capped but the cap does not bind. How often managers could sabotage investments in the experiment depends therefore on their costs and on whether these were capped. Variance in the combination of costs and caps suggests the percentage of sabotaged investments as an instructive statistic, which relates the number of times a manager sabotaged the investment to the number of times he could sabotage it. Figure 3 displays

FIGURE 3
Summary statistics



this percentage, averaged over managers, for each of the four conditions. For example, provided that costs were capped, managers who had to report their costs and thus make factual assertions sabotaged about 11 percent of all investments that they could possibly sabotage with reciprocity (i.e., when costs were capped by owners). By contrast, they sabotaged about 5 percent of these investments without reciprocity (when costs were capped, but not by owners).

Table 1 complements the percentages from Figure 3 with further statistics. Along with the means, it tabulates the standard deviations within the conditions. These are large because they reflect a rather limited number of binary choices whether to make or sabotage investments. The owners' and managers' payoffs are reported for completeness. Unlike the percentages of sabotage, the payoffs account for all rounds. They result in fact from the investments that managers did not or could not sabotage. The payoffs are of limited interest, though, because the conditions with random caps and without reporting serve indeed to recover the effects of reciprocity and honesty on sabotage. The sabotage statistics show that reciprocity increases sabotage, whereas reporting, which implies factual assertions, decreases it. Moreover, reporting decreases sabotage more with than without reciprocity. Qualitatively, these results confirm our predictions.

4.2 Effects of the treatments

For Hypothesis 1, we argue that the manager sabotages the investment to reciprocate the distrust that the owner's choice to cap the cost conveys. Hence, sabotage is driven by the owner's choice to cap the cost rather than the cap alone. The manager may still sabotage the investment if the cap is not the owner's choice. In particular, sabotage prevents what the manager considers arguably an unfair split of the profit. However, provided that costs are capped, there should be more sabotage

TABLE 1
Summary statistics

	Reciprocity		No reciprocity	
	Factual assertion	No factual assertion	Factual assertion	No factual assertion
Sabotage (%)	11.12 (15.18)	34.09 (32.65)	5.74 (7.64)	15.58 (21.41)
Owners' payoff (ECU)	19.17 (4.14)	15.94 (3.06)	20.23 (3.57)	17.95 (3.72)
Managers' payoff (ECU)	17.68 (3.58)	22.86 (6.45)	18.07 (3.49)	24.30 (5.54)
Owners/managers (#)	47	46	47	46

The percentages of sabotage relate to cases where sabotage is possible (cost is capped but cap does not bind). The standard deviations are averaged over rounds and conditions.

if they are capped by owners and negative reciprocity adds thus to any other motives for sabotage. From Table 1, the percentage of sabotage is, on average, much higher in the reciprocity condition, where costs are capped by owners, than in the control condition, where they are capped randomly. As a matter of fact, sabotage is about twice as high with reciprocity, both when managers have to report their costs and thus make factual assertions and when they have not.

Table 2 reports the results of an analysis of the variance of sabotage to test the differences between the conditions for significance. From Panel A, the percentage of sabotaged investments is indeed significantly higher with reciprocity than without, whether or not managers have to make factual assertions ($F = 14.75$, $p < 0.001$). Panel B shows, in addition, that sabotage is higher both with and without factual assertions ($F = 4.72$, $p = 0.033$, with factual assertion; $F = 10.34$, $p = 0.002$, without). This result confirms Hypothesis 1: provided that costs are capped, it matters to managers whether they have been capped by the choice of owners. Moreover, it supports our argument that managers care about owners' intentions rather than outcomes only. With concerns about payoffs and fairness held constant, the additional sabotage suggests that managers sabotage investments to punish owners for distrusting them to split profits fairly.

Hypothesis 2 predicts that investments will be sabotaged less often when managers are required to report their costs rather than allocate profits. Like the allocation of the profit, reporting allows the manager to sabotage the investment. However, it requires him also to make an untruthful factual assertion about the cost, which the allocation of the profit does not. (Instead, the manager allocates just less than the required ECU 50 to the owner, without asserting anything.) Unlike the blunt allocation of profits, reporting activates managers' preference for honesty, and honest managers feel uncomfortable with misstating their costs. Managers have thus been found to create less slack with reporting to reduce their costs from lying. We expect that this finding extends to sabotage, which requires the manager to lie even more than the creation of slack does. It is also more consequential for the owner, whose payoff is lost rather than reduced.

From the summary statistics in Table 1, sabotage is indeed about a third with reporting of what it is without, both with and without reciprocity. Specifically, reporting decreased sabotage from 34.09 to 11.12 percent when the costs were capped by the owners, and from 15.58 to 5.74 percent

TABLE 2
ANOVA and simple main effects

Panel A: ANOVA of sabotage on reciprocity and factual assertion

Factor	df	Mean sq.	<i>F</i> -statistic	<i>p</i> -value
Treatment	3	0.703	15.62	< 0.001
Reciprocity	1	0.664	14.75	< 0.001
Factual assertion	1	1.252	27.82	< 0.001
Reciprocity × factual assertion	1	0.200	4.45	0.036
Residual	182	0.045		

Panel B: Simple main effects

Factor	<i>F</i> -statistic	<i>p</i> -value
Reciprocity, within factual assertion	4.72	0.033
Reciprocity, within no factual assertion	10.34	0.002
Factual assertion, within reciprocity	19.06	< 0.001
Factual assertion, within no reciprocity	8.80	0.004

when they were capped, but not by owners. The results of the analysis of variance in Panel A of Table 2 show that the decrease in sabotage is significant across both reciprocity conditions ($F = 27.82$, $p < 0.001$). In fact, the differences are significant both with and without reciprocity, as reported in Panel B ($F = 19.06$, $p < 0.001$ and $F = 8.80$, $p = 0.004$). These results provide evidence in favor of Hypothesis 2. For whatever reason managers sabotage investments (namely for fairness and, depending on the condition, reciprocity), reporting leads sabotage to drop significantly, which is obviously because managers refrain from lying owners out of their payoffs.

While reciprocity results in sabotage both with and without reporting, Hypothesis 3 predicts that sabotage increases less with reporting than without. The intuition for this prediction is that reporting, in addition to its direct effect described in Hypothesis 2, has an indirect effect on sabotage, as it suppresses negative reciprocity. Specifically, the manager needs to overstate the cost and create slack to compensate him for realizing the investment despite the owner’s distrust. As a result, spite precludes costly investments, which allow but little slack. However, as the threshold cost for the investment to be made decreases, the cost of lying to sabotage it increases. Managers who mind lying refrain therefore from retaliating against owners, because lying makes retaliation costly. In brief, reporting restrains managers from retaliating against owners and sabotaging investments, because it activates honesty, which spills over to inhibit negative reciprocity.

The increase in sabotage is indeed smaller with reporting. From Table 1, sabotage raises without reporting by almost 20 percentage points (i.e., from 15.6 to 34.1 percent) as managers reciprocate. The requirement of making factual assertions reduces the increase in sabotage to 5 percentage points (from 5.7 to 11.1 percent). The difference of nearly 15 percentage points reflects the spill-over effect of honesty, which appears as the interaction between reciprocity and factual assertion in Panel A of Table 2. The analysis of the variance of sabotage reveals that this spill-over effect is actually significant ($F = 4.45$, $p = 0.036$), and it confirms therefore Hypothesis 3. Incidentally, managers sabotage nevertheless more than 11 percent of the investments that they can possibly

TABLE 3
Post-treatment questions

	Reciprocity		No reciprocity	
	Factual assertion	No factual assertion	Factual assertion	No factual assertion
Distrust	5.022 (1.844)	5.022 (2.006)	3.860 (2.111)	3.783 (2.086)
Punish distrust	3.841 (2.209)	3.913 (2.374)	1.935 (1.541)	1.733 (1.421)
Machiavellianism	3.383 (0.908)	3.196 (1.024)	3.227 (0.980)	3.145 (1.149)
Egoism	3.943 (1.232)	4.072 (1.449)	3.965 (1.314)	3.732 (1.503)

Managers' answers, ranging from 1 to 7. For the numbers of observations, see Table 1. Caps signal distrust to managers and managers intend to punish distrust with reciprocity more than without.

sabotage, although honesty restrains them from misreporting and prevents them from retaliating against owners who they feel are unfair toward them.

4.3 Additional analyses

The results in the previous section support our predictions. Sabotage is higher with reciprocity than without, as managers sabotage investments to retaliate against owners for capping costs. Reporting activates in turn managers' preference for honesty and reduces sabotage. Honesty impedes misreporting and it spills over to inhibit negative reciprocity. Managers' answers to post-treatment questions provide further insights into their motives, which the outcomes of the experiment alone cannot fully reveal. Specifically, managers were asked how they felt about costs being capped as well as their intentions toward owners. Moreover, they answered questions to capture personality traits, namely egoism and Machiavellianism, which might drive the observed sabotage along with the situational factors which we manipulate. Managers rated statements on 7-point Likert scales to indicate their agreement. Table 3 summarizes their answers.

It turns out that managers consider caps to signal distrust and intend to punish distrust more when costs are capped by owners more than when they are capped, but not by owners. Answers differ therefore significantly between the conditions with and without reciprocity ($F = 16.00$, $p < 0.001$, and $F = 50.70$, $p < 0.001$, for distrust and the intention to punish distrust; not tabulated), but not depending on whether managers make factual assertions about their costs. While we see that sabotage is higher with than without reciprocity, managers' answers support the argument that leads us to make this prediction: they infer indeed from owners' choice that these distrust them and sabotage investments to reciprocate this distrust. The differences between the conditions imply also that managers understood the manipulation. We extend the analysis of variance of sabotage from the previous section to include managers' intention to punish distrust.

Table 4 reprints the results of the analysis of variance from Panel A of Table 2 and contrasts them with the results when managers' intention to punish owners' distrust factors in. This covariate

TABLE 4
ANCOVA of sabotage on reciprocity, factual assertion, and covariates

Factor	ANOVA		ANCOVA w/ punishment		ANCOVA w/ interaction	
	Mean sq.	<i>F</i> -stat.	Mean sq.	<i>F</i> -stat.	Mean sq.	<i>F</i> -stat.
Model	0.703	15.62***	0.667	15.89***	0.559	13.47***
Treatments						
Reciprocity	0.664	14.75***	0.128	3.05*	0.125	3.01*
Factual assertion	1.252	27.82***	1.223	29.14***	0.102	2.45
Recipr. × f. a.	0.200	4.45**	0.216	5.13**	0.059	1.41
Covariates						
Punish distrust			0.556	13.23***	0.534	12.87***
Punish × f. a.					0.126	3.04*
Residual	0.045		0.042		0.042	

* $p < .1$. ** $p < .05$. *** $p < .01$.

explains much of the variance of sabotage ($F = 13.32$, $p < 0.001$) and absorbs the effect of the reciprocity manipulation (with mean squares decreasing from 0.664 to 0.128). Similarly, as we have the intention to punish distrust interact with factual assertion, the interaction turns out significant ($F = 3.04$, $p = 0.083$) and absorbs the interaction between the manipulations (mean squares drop from 0.216 to 0.059). Honesty, when activated by the requirement of factual assertions, curbs the effect of managers' intentions on sabotage. The effect of the intention to punish distrust alone remains significant, though. We take this evidence to support our arguments on how reciprocity results in sabotage (see Douthit and Stevens, 2015, for a similar argument).

People vary in how much they distrust others and reciprocate distrust. Table 3 reports measures to capture personality traits that might drive our results. The psychological construct of Machiavellianism reflects how cynical and deceitful individuals are and how much they put ends over means (Cristie and Geis, 1970). Items from the Mach-IV scale were administered to measure this trait (Gunnthorsdottir et al., 2002; Hartmann and Maas, 2010). Likewise, items on egoism were included. Egoists care primarily about their own payoff rather than fairness, reciprocity, and maybe honesty. However, neither Machiavellianism nor egoism differ significantly between conditions, which suggests that the randomization was successful. In addition, both are insignificant when included as covariates in an analysis of covariance. Sabotage seems thus to be much more a response to the owner's decision to cap the cost than a matter of managers' traits.

4.4 Panel analysis

The analysis of variance accounts for the variation between subjects, but discounts the effect of time. However, our prediction refers indeed to the probability for a manager to sabotage a specific investment with some given cost as he interacts once with some owner. We complement therefore the analysis of variance with a panel logit regression to confirm our results. Specifically, the logit regression estimates the effects of reciprocity and honesty on the probability rather than the per-

centage of sabotage. The dependent variable is whether or not the manager sabotages a specific investment when the cost is capped and does not exceed ECU 50. The independent variables are, again, whether the cost has been capped by the owner or randomly and whether the manager has to make a factual assertion about his cost. In addition, several covariates are included, which are either required in this specification of the model or provide further information.

With the sequence of costs being the same for all managers and aggregated decisions, there is no need to include the cost in the analysis of variance. For single investment decisions, however, it must be considered. It is clear from the model and the predictions that the probability of sabotage rises in the cost. If the investment costs more, it earns the manager less and leads the profit in addition to be split unequally. With little potential to create slack, the manager cannot be compensated for his spite, which does not depend on the cost but the manager's inclination to reciprocate only. Sabotage always costs the owner ECU 50. As the high cost leaves little potential for lying, the size of the lie is about the same, whether the manager lies to create slack or to sabotage the investment. There is no gap to argue against sabotage like with a low cost. Overall, for any (α, β, γ) combination, the manager is more likely to sabotage the investment if the cost is high.

Two covariates are included to examine how expectations, which managers may derive from prior rounds, affect sabotage. In particular, managers may respond differently to the cost being capped depending on whether they anticipate it. For example, the manager might be more disappointed and react more viscerally if the cap comes unexpectedly. We construct therefore a variable that averages the number of times the cost was capped over the prior rounds and that is updated after each round. A similar variable captures the manager's expected payoff, which we include although we do not expect an effect. At first glance, one might argue that managers become disinclined to sabotage yet another investment as they get used to unequal splits and small payoffs. However, their compensation would depend on one random round only and the expected payoff should therefore not matter. We still include it to control for unexpected wealth effects.¹⁴

Economic research on honesty or cheating has recently paid attention to how non-standard preferences, such as honesty, relate to gender. While both men and women have been found to lie, some studies find that men tend to lie more (Erat and Gneezy, 2012; Erat, 2013), especially in the allocation of payoffs (Dreber and Johannesson, 2008; Abeler et al., 2014). Overall, evidence does not seem to be conclusive yet. However, one possible argument for gender effects is that women and men differ in social preferences. Our study involves also distributional concerns, as payoffs are allocated and managers compare payoffs. Hence, while gender effects are not the focus of this study, we include gender nevertheless as a covariate to control for any effect it might have. We tend to expect that men reciprocate and lie more readily and are therefore more likely to sabotage investments. Table 5 reports the marginal effects along with the standard errors.

The results of the logit regression confirm those of the analysis of variance. First, the probability for managers to sabotage investments increases by 19 percentage points when costs are capped by owners compared to when they are capped, but not by owners. Second, factual assertions decrease the probability in turn by about 6 percentage points. Third, factual assertions inhibit managers from reciprocating and decrease their probability of sabotage by another 12 percentage points. Incidentally, the probability of sabotage increases unsurprisingly in costs. The increase falls below one percentage point and might thus appear small. However, this is for an ECU 1 increase in the cost. The remaining estimates are as suggested above. While the expected payoff has no significant effect, the manager is far more likely to sabotage if the cap comes unexpectedly. Finally, men are

¹⁴The payoffs from the three trial rounds where the managers assumed their future role as managers were considered because they might affect expectations. Expectations about caps and payoffs exist therefore for the first round already.

TABLE 5
Panel logit regression of sabotage on reciprocity and factual assertion

	Marginal effect	Standard error
Reciprocity	0.185	0.040***
Factual assertion	−0.063	0.028**
Reciprocity × factual assertion	−0.118	0.048**
Cost	0.006	0.001***
Expected payoff	−0.003	0.002
Expected cap	−0.226	0.078***
Male	0.083	0.020***
Observations		1,060

** $p < .05$. *** $p < .01$.

more likely to sabotage than women.

5 Conclusion

Firms require managers to report private information and use it to allocate resources in capital budgeting. However, firms rarely trust managers’ reported information only, but complement reporting with control mechanisms, such as hurdle rates or cost caps. The combination of reporting and control raises challenging questions. How can firms trust managers’ reports while distrustfully controlling them? Put differently, how useful can reports be in a distrustful environment? We find that reporting can be useful indeed beyond generating information. It curtails dysfunctional effects of control, such as the spiteful sabotage of investments. Reporting activates managers’ honesty, which restrains them from misreporting and, additionally, spills over to inhibit them from requiring control with sabotage. Incidentally, it is noteworthy in itself that managers sabotage investments, which aggravates the underinvestment that comes with capital rationing.

These findings shed light on how capital rationing and reporting or, on the underlying psychological level, reciprocity and honesty interact. Managers’ response to the tension that trust in reports and distrustful control create is not trivial to foresee. We develop therefore a parsimonious model to predict that honesty inhibits managers from retaliating against distrustful owners. We assume that managers care about payoffs, but have also non-monetary preferences for fairness and honesty, and that they reciprocate distrust. Honesty does not prevent misreporting, but makes it costly, and sabotage costs more than the creation of slack because it requires more misreporting. If a manager minds lying, he contents himself with less slack to compensate him for his spite, and sabotage becomes less tempting. Reporting impedes thus sabotage and inhibits, in addition, negative reciprocity in response to control from translating into sabotage.

Capital rationing is an established but costly means of control. It reduces budgetary slack, albeit at the price of underinvestment. This study suggests that there are further “hidden costs of control” (Falk and Kosfeld, 2006) to capital rationing, which have not been examined yet. In addition to the profitable investments that capital rationing necessarily precludes, managers may sabotage investments which meet the hurdle for funding to reciprocate the distrust that control makes them

experience. The example of capital budgeting illustrates how the hidden can be disentangled from the known costs of control. It is reasonable to assume that most means of control have hidden costs. The identification of these costs and especially the search for ways of reducing them are certainly promising avenues for research. For instance, this study suggests that reporting, rather than provide information, can reduce the hidden costs of control.

Experiments seem to be particularly suitable for this endeavor. While intuition suggests that preferences like those in this study, and especially reciprocity, are critical influences whenever firms employ control mechanisms, their effects remain difficult to capture. Capital rationing illustrates this well, as both underinvestment and, even more so, sabotage can hardly be quantified in the field. Experiments allow in turn sophisticated designs to recover and disentangle these effects. Hence, the method does not seem to be a serious limitation of this study, but rather a natural choice. In fact, it is easy to think of promising extensions. One exciting question is whether reciprocity depends on how strict controls are. In capital rationing, it might vary in the cap (which we held constant for convenience), and especially the choice of one cap over others. Another question of interest is whether owners anticipate the hidden cost of control.

A Proofs

Proposition 1

Let $u_i := (\hat{c} - c) - \alpha(100 + c - 2\hat{c})^2 - \beta(\hat{c} - c)^2$ and $u_s := \gamma - \beta(\hat{c} - c)^2$ be the manager's utility when implementing and sabotaging the investment. The manager invests if $u_i \geq u_s$, conditional on the report \hat{c}^* that maximizes u_i . $\frac{\partial u_i}{\partial \hat{c}} = 0$ yields

$$\hat{c}^* = \frac{1 + 400\alpha + 2c(2\alpha + \beta)}{2(4\alpha + \beta)},$$

subject to $\hat{c}^* \leq 50$. Note that $\frac{\partial^2 u_i}{\partial \hat{c}^2} = -2(4\alpha + \beta) < 0$.

To derive the condition under which the manager implements rather than sabotages the investment, we plug \hat{c}^* into u_i and solve $u_i \geq u_s$ for c . For convenience, we set $\hat{c} := 50$ in u_s , assuming that the manager reports the smallest c possible to minimize his cost from lying as he sabotages the investment.¹⁵ We thus have $u_i \geq u_s$ for $c \leq c^*$, where

$$c^* = \frac{2\alpha(100\beta + 1) + 100\beta^2 - \sqrt{(4\alpha + \beta)(4\beta\gamma(3\alpha + \beta) + \alpha(400\beta(25\beta - 1) + 1) - \beta)}}{2\beta(3\alpha + \beta)}.$$

If the constraint $\hat{c}^* \leq 50$ binds, the manager reports $\hat{c} = 50$. As we plug $\hat{c} = 50$ into u_i and solve $u_i \geq u_s$ for c (note that $-\beta(50 - c)^2$ cancels out on both sides), we have $u_i \geq u_s$ for $c \leq c^*$, where

$$c^* = \frac{\sqrt{4\alpha(50 - \gamma) + 1} - 1}{2\alpha}.$$

The constraint binds if β is low and the aversion to lying therefore does not restrain the manager from overstating the cost to obtain a more equal split. To find the threshold β , we require that

¹⁵More precisely, the manager reports $50 + \varepsilon$ to sabotage the investment, where $\varepsilon \rightarrow 0$.

$\hat{c}^* > 50$ while we keep c at $\frac{\sqrt{4\alpha(50-\gamma)+1}-1}{2\alpha}$. As we plug $c = \frac{\sqrt{4\alpha(50-\gamma)+1}-1}{2\alpha}$ into \hat{c}^* and solve $\hat{c}^* > 50$ for β , we have

$$\beta < \frac{\alpha(2\sqrt{4\alpha(50-\gamma)+1}-1)}{100\alpha+1-\sqrt{4\alpha(50-\gamma)+1}}.$$

Hence,

$$c^* = \begin{cases} \frac{\sqrt{4\alpha(50-\gamma)+1}-1}{2\alpha}, & \beta < \frac{\alpha(2\sqrt{4\alpha(50-\gamma)+1}-1)}{100\alpha+1-\sqrt{4\alpha(50-\gamma)+1}}; \\ \frac{2\alpha(100\beta+1)+100\beta^2-\sqrt{(4\alpha+\beta)(4\beta\gamma(3\alpha+\beta)+\alpha(400\beta(25\beta-1)+1)-\beta)}}{2\beta(3\alpha+\beta)}, & \text{else.} \end{cases}$$

Corollary 1

Let the manager be indifferent between implementing and sabotaging the investment. Thus,

$$\frac{\partial u_i^*}{\partial c} dc^* + \frac{\partial u_i^*}{\partial \beta} d\beta - \frac{\partial u_s^*}{\partial c} dc^* - \frac{\partial u_s^*}{\partial \beta} d\beta - \frac{\partial u_s^*}{\partial \gamma} d\gamma = 0,$$

where $u_i^* := u_i$ with $\hat{c} = \hat{c}^*$ and $u_s^* := u_s$ with $\hat{c} = 50$.

For any given β (i.e., $d\beta = 0$),

$$\frac{dc^*}{d\gamma} = \frac{\frac{\partial u_s^*}{\partial \gamma}}{\frac{\partial u_i^*}{\partial c} - \frac{\partial u_s^*}{\partial c}}.$$

We have $\frac{\partial u_i^*}{\partial c} = \frac{\partial}{\partial c} u_i(c, \hat{c}^*(c)) = \frac{\partial u_i}{\partial \hat{c}^*} \frac{\partial \hat{c}^*}{\partial c} + \frac{\partial u_i}{\partial c}$. In particular, $\frac{\partial u_i^*}{\partial c} = \frac{\partial u_i}{\partial c}$ because $\frac{\partial u_i}{\partial \hat{c}} = 0$ for $\hat{c} = \hat{c}^*$. Moreover, $\frac{\partial u_s^*}{\partial \gamma} = 1$. As a result, $\frac{dc^*}{d\gamma} = \left(\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c}\right)^{-1}$, where $\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c} = -(1 + 2\alpha(100 + c - 2\hat{c}^*) + 2\beta(50 - \hat{c}^*)) < 0$, and thus

$$\frac{dc^*}{d\gamma} < 0.$$

Corollary 2

From the total differential from the proof of Corollary 1, we have

$$\frac{dc^*}{d\beta} = \frac{\frac{\partial u_s^*}{\partial \beta} - \frac{\partial u_i^*}{\partial \beta}}{\frac{\partial u_i^*}{\partial c} - \frac{\partial u_s^*}{\partial c}}.$$

Following the same argument as in the proof of Corollary 1, $\frac{\partial u_i^*}{\partial \beta} = \frac{\partial u_i}{\partial \beta}$, and thus $\frac{\partial u_s^*}{\partial \beta} - \frac{\partial u_i^*}{\partial \beta} = -(50 - c)^2 + (\hat{c}^* - c)^2 \leq 0$. Together with $\frac{\partial u_i^*}{\partial c} - \frac{\partial u_s^*}{\partial c} < 0$, we have

$$\frac{dc^*}{d\beta} \geq 0.$$

Corollary 3

Technically, the mitigating effect of the aversion to lying on spite can best be seen in the decreasing effect of spite on the threshold cost c^* as the aversion to lying increases. That is, while c^* decreases in γ ($\frac{dc^*}{d\gamma} < 0$), this effect declines in β ($\frac{d^2c^*}{d\gamma d\beta} \geq 0$).

Differentiating $\frac{dc^*}{d\gamma} = (\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c})^{-1}$ with respect to β yields

$$\frac{d^2c^*}{d\gamma d\beta} = -\frac{\frac{\partial}{\partial\beta}(\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c})}{(\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c})^2},$$

where $\frac{\partial}{\partial\beta}(\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c}) = \frac{\partial}{\partial\beta}(-(1 + 2\alpha(100 + c - 2\hat{c}^*(\beta)) + 2\beta(50 - \hat{c}^*(\beta))))$. As $\frac{\partial\hat{c}^*}{\partial\beta} \leq 0$ ($\frac{\partial\hat{c}^*}{\partial\beta} = 0$ whenever the constraint $\hat{c}^* \leq 50$ binds and $\frac{\partial\hat{c}^*}{\partial\beta} < 0$ otherwise), we have $\frac{\partial}{\partial\beta}(\frac{\partial u_i}{\partial c} - \frac{\partial u_s^*}{\partial c}) \leq 0$, and hence

$$\frac{d^2c^*}{d\gamma d\beta} \geq 0.$$

B Instructions

The following instructions refer to the condition with reciprocity and factual assertion, where owners decided whether to cap the cost and managers reported the cost. After six trial rounds, where participants were by turns owners and managers, they took a quiz and then learned whether they would be owners or managers. After the 20 rounds, they took a test for risk aversion and a survey. The round used to determine the payoff was randomly determined for each participant.

Introduction

Welcome to this experiment! You will make decisions affecting other participants and respond to their decisions. However, you will remain anonymous as you enter your decisions on the computer.

Please do not speak during the experiment. Don't pay attention to the other participants. If you have any questions, raise your hand. The experimenter will join you to answer your questions *quietly*.

You will receive all information which is necessary and you will not be deceived. Only your decisions taken based on this information will be analyzed after the experiment.

You can earn money in this experiment. How much money you earn depends on the decision taken by the participants. The money will be confidentially paid to you in cash at the end of the experiment.

Overview

The participants in this experiment have different tasks. One half of the participants are the *owner*, the other half the *manager* of a firm. Participants will be assigned as owners or managers randomly.

The experiment consists of 20 rounds. In each round, random couples of owners and managers will be formed. You will never learn whom you have interacted with. You won't interact with the same participant in two subsequent rounds.

At the end of the experiment, you will be asked questions which you will answer on the computer. These questions help us interpret your decisions.

Task

In each round, the cost of a project is determined and communicated to the manager only. The amount is randomly drawn from the set $0, 1, 2, \dots, 100$ dollars. Each amount is equally likely to be drawn. The project yields 100 dollars if it is implemented.

The manager learns the actual cost, but the owner never learns it. All other information is available to both the owner and the manager.

Task of the owner

The owner decides at the beginning of the round between two options:

- *Option 1*: The project will be implemented, no matter how much it costs according to the report the owner will receive from the manager.
- *Option 2*: The project will only be implemented if it costs 50 dollars or less according to the manager's report. If the project costs more than 50 dollars, it cannot be implemented in this case.

The owner then receives from the manager a report on the cost. The owner finally receives a payoff based on the manager's report.

Task of the manager

The manager learns both the actual cost and which option the owner has chosen. Subsequently, the manager sends a report on the cost to the owner, which can be true or false.

- The report is true if reported cost = actual cost.
- The report is false if reported cost > actual cost.

The owner cannot verify whether the report is true or false.

The owner's and manager's payoffs depend on this report:

- Owner's payoff: 100 dollars – reported cost;
- Manager's payoff: reported cost – actual cost.

If the project is not implemented, both the owner and manager receive a zero payoff.

Pros and cons of both options:

- *Option 1*: The project is implemented for sure and the owner can receive a non-zero payoff. However, how much the owner's payoff is, depends on the manager's report about the costs only.
- *Option 2*: The project is maybe implemented and both the owner and the manager receive a zero payoff. However, if the project is implemented, the owner receives a payoff of 50 dollars at least.

Payoff

At the end of the experiment, one of the 20 rounds will be drawn at random. If the project was carried out in that round, the owner and manager receive their payoffs. In addition, both receive a fixed payoff of 10 dollars.

After the round is determined, the dollars are converted into euros and paid out in cash. The rate is 3 dollars = €1.

Trial stage

The next 6 rounds are trial rounds to make you familiar with the task. The trial rounds do not count as to the 20 rounds of the experiment.

During the trial rounds, you will be owner and manager by turns. Later you will remain either as an owner or as a manager during the whole experiment.

Like in the experiment, payoffs will be displayed. However, the trial rounds will be neglected when determining the round which is the basis for payoffs.

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