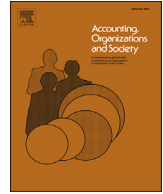


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Earnings benchmarks, information systems, and their impact on the degree of honesty in managerial reporting[☆]



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ABSTRACT

This paper provides experimental evidence about how the interaction between a company's earnings and its information system influences the degree of honest reporting by managers in a capital budgeting task. Specifically, the results show that participants overstate cost less when the manager's cost report determines whether the firm earns a gain or loss than when their report does not affect whether the firm earns a profit or loss (i.e., the firm always earns either a profit or loss regardless of the cost report). Further, the results suggest that the impact of the earnings situation on the degree of honesty depends on whether the firm uses an information system that improves its ability to detect misreporting. Specifically, the earnings situation has less effect on the degree of honesty when the firm uses an information system. This is because the information system decreases honesty when the manager's report determines whether the firm earns a profit or loss but increases it otherwise. This study provides important insights into the conditions under which information systems can crowd out prosocial behavior.

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1. Introduction

Research has demonstrated that in settings where managers are able to misrepresent cost reports, many managers still produce honest reports because their dishonest reporting may negatively affect the wealth of others (Evans, Hannan, Krishnan, & Moser, 2001). More evidence is however, needed on when managers more strongly pursue this motive to act honestly. This study shows that the company's earnings situation can serve as an important contextual feature. Specifically, I presume that the degree of honesty is higher when the manager's cost report determines

whether the firm earns a gain or a loss than when the manager's report does not affect the firm's earnings situation. Studying the effect of managerial influence on company's earnings is important. While many studies on earnings management have explored the impact of important earnings benchmarks on external reporting (Burgstahler & Dichev, 1997), the effects of these benchmarks on internal decisions like budgeting have received scant attention.

The lack of attention in prior studies is partially based on their focus on companies that earn profits from a manager's production (e.g., Rankin, Schwartz, & Young, 2003, 2008). I argue that considering the firm's profit situation can enrich our understanding of why information systems to detect misreporting are sometimes not effective (Christ, Emnett, Summers, & Wood, 2012; Salterio & Webb, 2006). I predict that information systems and the earnings of the firm interact such that the beneficial effects on honesty of the firm's earnings situation are mitigated once an information system is present. I use a capital budgeting task to test this prediction. The firm's earnings situation is manipulated as the first between-subject factor. In the gain/loss condition, the participant's cost report can determine whether the company earns a gain or a loss. In the two other conditions, labeled as the positive earnings condition and the negative earnings condition, the participant's cost report cannot affect the firm's profit situation; that is, the firm always earns a profit or a loss regardless of the manager's cost report. The second

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between-subject factor manipulates the absence or presence of information systems that improve the firm's ability to detect misreporting. Across all conditions, the pecuniary benefits of dishonesty for participants (and its costs for the firm) are held constant.

In the absence of an information system, the results show that the degree of honesty is greater when the participant's cost report can determine whether the firm earns a loss or profit (the gain/loss condition) than in the positive or negative earnings condition. In the gain/loss condition, a larger fraction of participants remain honest or even underreport their costs and thus sacrifice money to avoid losses and keep the company profitable. The reporting feature of deliberately understating costs has not received much attention but can be economically relevant (Erat & Gneezy, 2012). Results further show that reporting behavior does not differ between the positive and negative earnings conditions. Similar to earlier work (Evans et al., 2001; Hannan, Rankin, & Towry, 2006), many managers produce partially honest reports in these conditions. The results also show that the effect of the firm's earning situation interacts with the use of an information system that improves the firm's ability to detect suspicious reporting. Specifically, the information system decreases the degree of honesty when the manager's report determines whether the firm earns a profit or loss but increases it otherwise (i.e., the positive or negative earnings condition).

This study provides important insights into the conditions under which controls can reduce prosocial behavior. Prior work has shown that reliance on control systems to reduce misreporting may crowd out some of the preferences for honesty but nonetheless has shown that the firm's profit is still higher with a control system than without one. Rankin et al. (2008) showed that opportunities for principals to reject budget requests reduce the level of misreporting and thus are beneficial to the firm's profit. Hannan et al. (2006) also showed that when information systems are used to improve the firm's ability to detect misreporting, honesty is increased compared to when they are not used. This study, however, shows that the otherwise positive effects of information systems may not always materialize. It also offers a rationale for this crowding-out effect using the self-concept maintenance theory of Mazar, Amir, and Ariely (2008). In the gain/loss condition participants start to produce small dishonest reports, which the firm cannot detect as misreporting, once an information system is present instead of reporting behavior that could be beneficial to firm profit. If their reporting behavior has less influence on the firm's earnings situation, such as in the negative or positive earnings conditions, information systems to detect suspicious reporting still tend to reduce misreporting by reducing the range of dishonest reports.

The findings concerning these earnings benchmarks also offer many practical insights. Strong variations in earnings are often caused by changes in the economic condition, such as temporary fluctuations in prices or profit margins, or by the type of product that the business unit produces. For example, business units producing new products or products with spillover effects on other products are often close to breakeven.¹ If companies feel that the

manager can make a difference between experiencing losses or profits, it may be tempting for them to install systems that help the company to detect misreporting. Such detective forms of controls are often part of the firm's internal control procedures (Christ et al., 2012), and resorting to such systems maybe a natural response in case profits start to erode. The results show, however, that information systems to detect misreporting can be less effective, in particular when profits are under pressure.

Besides earnings levels, many other situations in a company may alter participants' views of the repercussions of their misreporting for the organization. Business units need to achieve certain targets before bonus pools are paid out to employees, firms need to meet or beat analyst expectations, and certain actions can hurt only a few but also many other business units. Prior work by Church, Hannan, and Kuang (2012) showed for example that people report more dishonest and thus care less about the firm when benefits of misreporting are shared with other managers in the company. This paper shows that considering these repercussions of managerial dishonesty on the firm is important, as doing so may help organizations to utilize their controls more effectively.

2. Theory and hypothesis development

Evans et al. (2001) showed that many agents in capital budgeting produce partially honest reports even when financial incentives for misreporting are fully present. Based on the finding that individuals value honesty, follow-up studies have focused on incentive mechanisms, monitoring systems, or other types of control systems that can help companies to improve honest reporting. For example, prior studies have investigated competition among agents or whistle-blowing by fellow agents in relation to honesty (Brüggen & Luft, 2011; Zhang, 2008) or examined the effects of social norms or peer behavior (Tayler & Bloomfield, 2011; Cardinaels & Jia, 2015). Other studies examine changes in economic incentives, opportunities for principals to reject budget proposals, or systems to reduce information asymmetry between the business owner and the agent in relation to truthful reporting (Evans et al., 2001; Hannan et al., 2006; Rankin et al., 2008).

However, fewer studies have focused on the organizational settings in which managers more strongly pursue honest reporting without touching upon costly incentive devices or control systems. An exception is, for example, Church et al. (2012), who documented that people are more honest when they fully bear the consequences of their dishonesty than when the benefits of their dishonesty are shared with other organizational members. This paper examines if the firm's earnings situation can also serve as an important contextual factor which may affect reporting behavior by managers. Considering this variation may offer additional insights into the crowding-out effects of information systems to detect misreporting. The first section will argue that participants overstate costs less when their reports can make a difference between gains or losses for the firm than in two other conditions where the company always realizes either positive or negative earnings regardless of the cost report. Next, I will discuss how the firm's profit situation interacts with information systems that companies use to detect misreporting.

2.1. The firm's earnings situation and the effect on honesty

Given the information asymmetry that exists between the agent and the principal in a capital budgeting context, agency theory would predict that the company's earning situation would not matter because agents will always try to profit from dishonesty. This study predicts that the degree of honesty - measured by the level of cost overstatements - is higher when participants' cost

¹ New products like, for example, new generations of smart phones are often not profitable. Nevertheless, once demand increases and learning takes place, profits start to accrue. Products with spillover effects are, for example, ink-jet printers. Typically these printers are sold for a small loss, but business units producing the cartridges that are used with them make a profit. Because firms often commit to a customer base, they sometimes need to accept small losses when prices are under pressure. On average, such firms expect to be profitable by serving their customer base, but temporary price fluctuations can lead to losses, profits, or profits that are close to zero. From a decision-control perspective (Zimmerman, 2009), various types of cost allocations and transfer-pricing policies may further lead to differences in the division's contribution to organizational profits.

reports can determine whether the company incurs a gain or a loss than when participants' reporting behavior does not change the company's earnings situation.² The arguments are two-fold.

The first argument rests on the theory of self-concept maintenance by Mazar et al. (2008). This theory argues that individuals try to derive some benefits of cheating while at the same time trying to maintain their positive self-concept of being an honest person. In other words, there is a potential range of dishonesty in which people will act dishonestly but their behaviors do not bear negatively on their self-concept. Mazar et al., however, hinted at the fact that this range may decrease and people may thus be shifted toward more honest behavior if the context makes it difficult for them to interpret a dishonest act as still being consistent with this positive self-concept. I predict that the range of dishonest reports that can be made without altering the individual's self-concept is smaller in the gain/loss condition than in the two other conditions.

In the negative earnings condition or the positive earnings condition, a dishonest report will negatively affect the other party's wealth, but it however, does not really change the firm's profit situation—that is, the firm will still either earn a profit or incur a loss regardless of the manager's report. This may offer room for participants to produce a larger range of partially dishonest reports, which would still be seen as consistent with the self-concept of being an honest person. In the situation where participants' reporting behavior can produce gains or losses for the firm, the agent, however, may observe that a dishonest act, sometimes even a small one, can turn profits into losses for the firm. When the firm would earn a profit for an actual cost draw, agents may avoid the dishonest choice of overstating costs because it may turn this profit into a loss. Conversely, if the company incurs a loss for an actual cost draw, agents can turn this loss into a profit by sacrificing part of their resources through submitting a cost that is less than the actual cost. Turning profits into losses through lying is difficult for agents to reconcile with a positive self-concept, while making small sacrifices to make the firm profitable can reinforce participant's self-concept of an honest person. Hence, the potential range of dishonest reports that can be reconciled with a positive self-concept is smaller in the gain/loss condition, and may shift participants toward prosocial behavior. Choices to underreport also occurred more frequently in the experiment of Evans et al. (2001), where participants received a hurdle contract.³ This paper argues that such behavior can become relevant (Erat & Gneezy, 2012) when participants perceive their reporting behavior to have stronger repercussions on the company's profit.

A second argument, leading to the same prediction, is that people may be intrinsically motivated to avoid losses for other actors. Indirect evidence from strategic games on cooperation (Cachon & Camerer, 1996; Drake & Haka, 2008; Feltoch, Iwasaki &

Oda, 2012) suggests that people behave differently when either one or more parties in the game can experience a loss than when all parties would only be able to realize positive pay-offs.⁴ Many agents then utilize socially rational strategies to avoid losses and expect other people to also avoid such points (Cachon & Camerer, 1996). In the gain/loss condition, participants observe that reporting behavior can make a difference between losses of profits for the other party. Individuals' own reactions to losses are often severe and most individuals would try to avoid them if possible. While in the setting, individuals do not experience the loss themselves, they nevertheless may still adapt their behavior vicariously (Welten, Zeelenberg, & Breugelmans, 2012; Wood & Bandura, 1989). That is, because they observe the consequences of dishonesty on the other party, people may refrain from dishonest reports that push the other party into a loss. This is labeled as vicarious loss avoidance behavior, which can only take place in the gain/loss condition, where participants can avoid losses for the firm.

2.2. Different earnings situation, information systems and their impact on honesty

Consistent with Hannan et al. (2006) and Schulze and Frank (2003), the information system provides the company with a narrower range of potential costs and thus enables the company to detect suspicious reporting if participants report a higher cost than the upper limit of the interval.⁵ Consistent with Hannan et al. (2006, p. 896), the information system also does not introduce a financial punishment for misreporting in order to ensure that incentives to misrepresent costs are equivalent across all conditions.

Prior work on capital budgeting has shown that people's preferences for honesty may diminish as a result of control systems. Rankin et al. (2008) showed that the participant's preferences for honesty are lower when principals have the authority to reject their budget requests. However, organizations still benefit from this authority because participants report more truthfully when rejection opportunities are present compared to when they are not. Similarly, Hannan et al. (2006) showed that the use of an information system that increases the firm's ability to detect misreporting is not necessarily bad news. When firms install information systems to reduce the information asymmetry, people can still give the impression of an honest appearance. In order to do so, they reduce their misreporting to a level that will not be detected by the information system. Overall, an information system still reduces

⁴ These strategic games use simple transformations to the players' pay-off matrix (which are irrelevant from a game-theoretic perspective) and show that behavior is different when such losses come into play. While the capital budgeting game involves little strategic interactions as the agent always decide about the report, the manipulation of the firm's earnings situation resembles the manipulations observed in these more strategic games. By manipulating the product's contribution margin, I focus on simple transformations, which would not change the economic self-interested outcome. Yet, the manipulations allow to differentiate between settings in which participant's cost report can make a difference between losses or profits for the company and where losses can thus be avoided and settings in which participant's report has less influence on company profits (i.e. positive or negative earnings conditions).

⁵ The information system is a form of detective control offering a warning for suspicious reporting (Christ et al. 2012). Section 3 describes the manipulation in detail. In short, when an information system is absent, participants made five reporting decisions under full information asymmetry. When an information system is present, the company can examine two reporting decisions for which the firm receives a narrower interval of potential costs. If reported cost are higher than the maximum cost of the interval, participants get a warning and they need to submit a new cost report to the firm on the basis of a new cost draw. Regardless of whether an information system is present or absent, all participants thus play five full rounds with information asymmetry, for which company earnings and their pay-offs are calculated. In each condition, the maximum pay-off is achieved when people lie to the full extent.

² Prior work has indirectly shown that earnings may influence prosocial behavior. In the study of Hannan (2005), agents act reciprocally toward higher wage offers of the principal by voluntarily delivering more than an optimal effort when earnings for the firm decreased (as, in such a case, higher wages are seen as a generous act) compared to when earnings increased. Although the firm is always profitable in this study, agents care about random shocks in the principal's profit. An unanticipated finding in Evans et al. (2001, p. 547, fn. 11) also hinted at the fact that agents behave differently depending on the context. Within the hurdle contract game, a setting in which production would not take place if costs are too high, a sizeable number of participants voluntarily sacrificed money by submitting reports for costs less than the actual costs. Participants may have had a social motive to understate the costs to ensure production, so that principals would earn some profit.

³ In Evans et al. (2001, p. 547, fn. 11), 34 out of 138 agents (24.6 percent) deliberately understate costs at the expense of their fixed wage when actual costs were above the production hurdle. In this way, production took place and the company would still make some money. Evans et al. (2001, p. 547, fn.11), also argue that subjects knowledgeably sacrifice part of their wealth to increase firm profit, to ensure that production would take place.

misrepresentation compared to not having one at all. Participants avoid large cost overstatements under both a coarse and precise information system, although a precise information system crowds out some of the motives to appear honest (Hannan et al., 2006).

In contrast to these prior studies, I presume that the impact of an information system, as a detective form of control, may depend on the earnings situation. That is, compared to the negative earnings or the positive earnings conditions, where information systems may still reduce misreporting, the same system may have a weaker impact or potentially increase misreporting if agents' reporting behavior can make a difference between losses or profits for the company.

Experimental economists argue that detective forms of control can have a flattening effect on dishonesty (Schulze & Frank, 2003). Even though they may crowd out some of the motives to act pro-social, selfish behavior is also reduced. Prior work by Hannan et al. (2006) showed that people are willing to give up some benefits of misreporting and thus report more honestly under the presence of systems that allow the company to make inferences regarding the manager's honesty level. Using self-concept maintenance theory (Mazar et al., 2008), I argue that such benefits are more likely to be realized in the negative or positive earnings situation. As previously argued, participants in these earnings situations may have a larger range of dishonest reports for which they can maintain their self-concept as being an honest person. Information systems that allow the firm to make some inferences about the honesty level of a participant may reduce this range. That is, to preserve their positive self-concept as an honest person, participants may reduce their misreporting and thus give up some benefits of misreporting by submitting cost reports that the information system cannot detect as instances of misreporting (Hannan et al., 2006; Schulze & Frank, 2003). By reducing their misreporting, participants can still appear to be honest to the company, which would be positively rewarded in their personal value system (Mazar et al., 2008).

The same information system may work differently when a participant's cost report is able to determine whether the company earns a profit or loss (gain/loss condition). As mentioned, self-concept maintenance theory would argue that the fact that participant's reporting behavior can make the difference between gains or losses for the company may already reduce misreporting and may potentially shift a participant's reporting towards more honest reporting behavior.

When an information system is present, participants, receive, as a result of the information system, an opportunity to reconcile dishonest reports that can lead to a loss for the company or that may prevent the company from earning profits, as still consistent with their positive self-concept. In particular, the detrimental effect of dishonest reports that would put the firm into a loss on the positive self-concept may be less significant when a company would use an information system (Matsushima, 2008, p. 354; Charness & Dufwenberg, 2006). The use of an information system can signal to the participant that the company detects and does not accept large cost overstatements. Nevertheless, as long as a person misreports by small amounts, which the information system cannot detect, people may reconcile their partially dishonest report as fine. The system allows participants to maintain a positive self-concept by appearing honest, even if such reports may not be beneficial to firm profit. As a result, in settings where the reporting behavior can make a difference to firm profits more partially dishonest reports may occur at the expense of honest reporting or choices to underreport cost to make the firm profitable. While information systems, as argued before, may reduce high levels of misreporting, such information systems may also justify small dishonest reports. In contexts, where earnings can vary between losses or profits for the firm, this can weaken the effect of an information system on misreporting.

Based on arguments of Tenbrunsel and Messick (1999), weak sanction systems, such as a detective information system, may also change the decision frame from a setting where people would worry about ethical concerns to a setting where people would worry more about ways to avoid penalty. Without such systems in place, stronger ethical concerns for the firm may arise in particular when people's behavior can make a difference between profits and losses for a company (e.g. people avoid losses vicariously), compared to when people cannot change the earnings situation. While an information system may reduce the range of misreporting because persons do want to be detected as a dishonest person, people in the gain/loss condition can also refrain from reports that may otherwise be beneficial for the company. People may submit partially dishonest reports that the firm cannot detect, and may worry less about consequences of their reports for the company's earnings. The concerns of a person to avoid losses for the company by reporting more honest can play a weaker role once an information system is present.

Both arguments would predict an interaction whereby the earnings situation has less influence on misreporting once an information system is present. Specifically, while an information system may reduce large cost misrepresentations in the negative or positive earnings conditions, the same information system in the gain/loss condition may reduce the reporting of choices which can be beneficial to firm profit. Hence, the net effect is that an information system has a less positive (or even a negative) impact on honesty in the gain/loss condition relative to the two other conditions.

Hypothesis. The effect of an information system on honest reporting is less positive (or potentially negative) when the manager's cost report determines whether the firm earns a gain or a loss than when the firm always realizes positive or negative earnings.

3. Experiment

3.1. Participants

A total of 186 participants from an accounting course in a business studies program at a large West-European university, participated in the study as part of the course requirement across two different administrations of the experiment. Most of the students were undergraduates in the last year of their bachelor degree (96.8%), although a minority were masters-level students (3.2%). Participants' average age was 21.23 years and 59.14% were male. They had on average taken 2.28 accounting courses and 74.7% of the students reported to have work experience (Their average part-time work experience was 19.4 months).

3.2. Experimental task

I used a capital budgeting task, similar to that of Evans et al. (2001). Participants assumed the role of a production manager (i.e., the agent) and worked for one of the divisions of Acazia headquarters (i.e., the principal).⁶ They received a fixed wage of

⁶ For reasons of task realism, I used a hypothetical company where consequences of dishonesty come at the cost of the experimenter (See also Evans et al. 2001, Evans, Moser, Newman, & Stikeleather, 2015). Experimental instructions mentioned that participants would work for one of the divisions of corporate headquarters. Depending on the earnings manipulation, headquarters would either always receive a loss, always receive a profit, or receive either a gain or a loss depending on the participant's cost report. This earnings manipulation is likely to have greater external validity when a common company is involved. Second, such a design gives dishonesty a strong change to survive. Any deviation against this agency prediction can then be attributed to a social motive to be honest.

250 lira (50 lira = 1 euro). Participants then submitted budget requests to headquarters to receive funding for the production of a lot of 500 units in each period. At the start of each period, both headquarters and the participants knew that the per-unit production cost was randomly drawn from a uniformly distributed cost interval between 4.00 and 6.00 lira, with increments of 0.05 (e.g., 4.00, 4.05, ..., 5.95, 6.00). Before submitting a cost report to headquarters, participants, however, received feedback from a private forecasting system, which offered them an accurate forecast of the actual production cost for the production period. Headquarters, however, would never learn the actual costs and thus can never assess if participants report honestly. Participants then submitted a cost report to headquarters. If participants reported a cost higher than the actual cost, they could keep the excess resources in addition to their fixed wage. In sum, a participant's earnings are equal to:

$$(1) \text{ Participant's earnings} = 250 \text{ lira} + 500 \text{ lira} * (\text{reported cost} - \text{actual cost})$$

Participants were told that the company earns a contribution on the output produced in each production period (i.e., the contribution margin will be manipulated between subjects; see next section). In sum, headquarters' earnings were calculated as follows:

$$(2) \text{ Headquarters' earnings} = 500 \text{ lira} * (\text{contribution per unit} - \text{reported cost}) - 250 \text{ lira}$$

Instructions also emphasized to participants that earnings are very important for headquarters and that higher (lower) cost reports would lead to lower (higher) earnings for the firm. If participants report less honest, their own payoffs would increase, but earnings for headquarters would decrease. To make this trade-off clear, the instructions given to participants provided examples of how budget requests affect their own earnings as well as their contribution to the firm's profit. In addition, participants received a payoff table based on an actual cost of 4.50 lira, showing all possible outcomes of headquarters' earnings and their own payoffs for all the potential cost reports they could submit, including all the combinations that were for costs less than actual costs. Participants then played five production periods. Before submitting their cost report, participants again received a full payoff table containing the pay-off and earnings consequences for the full range of possible cost reports for the respective actual cost draw, including also all combinations for less than actual costs.

3.3. Between-subjects manipulations

The study employs a 3×2 between-subjects design. As a first factor, I manipulated three different earnings situations. One-third of the participants were told that headquarters realizes a 4.00 lira contribution margin on each production unit. This scenario is labeled as the negative earnings (NE) condition because headquarters always realizes a loss. The loss can vary between –1250 lira and –250 lira depending on the submitted cost report. Another third of the participants were told that headquarters receives a contribution margin of 7.00 lira. This scenario is labeled as the positive earnings (PE) condition. In this scenario, headquarters will always realize a profit that can vary between 250 lira and 1250 lira. The rest of the participants were given the gain/loss (GL) condition with a contribution margin of 5.50 lira. Compared to the conditions where the firm will either earn a loss (NE) or a profit (PE) regardless of the manager's report, the GL condition is the only situation where the manager's report can determine whether the company

earns a loss or a profit. Earnings can vary from –500 lira to 500 lira and become negative when the reported cost is above 5.00 lira and positive when the reported cost is below 5.00 lira. In all cells, participants are also told that headquarters do not face any risk of failure.⁷ From a self-interested perspective, the firm's earnings situation would not matter. According to formula (1), participants will maximize their payoff when costs are fully overstated (6.00 lira). Consistent with the theory, however, I presume that when the report can determine whether the company earns a gain or a loss, dishonest reporting may be more difficult to reconcile with the participant's self-concept.

As a second between-subject manipulation, the study manipulated the presence or absence of an information system. When the information system was present, the company had some ability to make an inference about suspicious reporting of the participant. In this condition, participants were told that headquarters would check reports in two out of five production rounds (no more, no less). Consistent with Hannan et al. (2006), headquarters would merely receive a narrower range of potential costs if the report was examined. Participants were told production would be financed (suspended) if the cost falls within (outside) the range. Participants, however, received private information. They knew that the company's information system had the ability to reduce the information asymmetry with regard to potential cost to a range of 0.5 lira around the actual cost draw. For example, if a participant received an actual cost of 4.50 lira, headquarters' information system would display that the cost should be in the range of 4.25–4.75 lira rather than in the range of 4.00–6.00 lira. In the production runs, production was financed on the basis of reported costs for all costs below the maximum cost of this interval. If a participant submitted a report higher than the maximum cost, headquarters would send a warning message to the participant indicating that the report is suspicious and that production will be suspended. Participants would then receive a new cost draw for that production period and they again would need to submit a cost report on which basis production would be financed.

Similar to the information absent condition, participants in the information system present condition would thus always play five full production runs for which their own payoffs and their contribution to the firm's earnings are calculated.⁸ This was done to ensure economic comparability across all six cells. For the same reason, I do not attach a financial consequence to suspicious reporting. This approach is consistent with Hannan et al. (2006) and allows the researcher to attribute deviations from full dishonesty to the intrinsic motive of participants to report honestly. These information systems are labeled as detective forms of control (Christ et al., 2012). They are often part of a company's internal control procedures in which reports by managers are (randomly) checked and not accepted if the manager's report is perceived as suspicious. Such systems often also provide a warning if the report is considered to be suspicious (Christ et al., 2012).

3.4. Experimental procedures

Participants were randomly assigned to the experimental cells

⁷ To ensure that the NE or the GL condition are not perceived differently than the PE condition in terms of risk, the case states the firm does not experience any failure risk and that it has enough resources available from past activities.

⁸ In the experiment, headquarters checks the initial budget request of the second and fourth production run. Only when reported costs are higher than the upper limit, headquarters will suspend production. Participants are not aware of this. Similar to in the information absent condition, the agency prediction in the information system present condition is again to lie to the maximum amount possible, in which case earnings for the participant are maximized.

when entering the computer room.⁹ Sessions lasted an hour. Following Evans et al. (2001), participation was anonymous. To ensure full anonymity, students drew a ticket number, on which basis they could claim their payoff. Before starting the task, they provided background information on age, gender, work experience, the number of accounting courses they followed, etc. Then, they completed a nine-item instrument, which measured their social value orientation (see Van Lange, Bekkers, Schuyt, & van Vugt, 2007). This instrument classifies people into “competitive,” “individual,” and “prosocial” types of players and can pick up some of the innate preferences of people to act honestly. Prosocial people may care more about another person’s wealth.¹⁰ Next, participants played a distracter task and continued into the main task. Before making reporting decisions, they carefully read the case descriptions. Participants performed a true-false quiz about the case descriptions. To increase task understanding, participants always received feedback on the right answer for each question, before moving on to the next question. Participants then played five production runs, in which actual cost was randomly drawn by the computer from the uniform distribution of costs (4.00, 4.05, 4.10, ..., 5.95, 6.00 lira).

Consistent with Evans et al. (2001) and Hannan et al. (2006), participants knew that the earnings of one production period would be randomly selected and converted into real cash at the end of the experiment (50 lira = 1 euro). After participants finished the task, they filled out an exit questionnaire containing items on task understanding, motivation, etc. and some manipulation checks. The cash reward was collected two weeks after the last session. On average, participants earned 7.69 euro (the minimum was 3 euro, and the maximum, 25 euro).¹¹

⁹ I checked if randomization was successful ($n = 186$). I do not find significant effects of our manipulations for the variables age, the percentage of pro-socials, the percentage of people who report to have work experience, and the no. of accounting courses. Only when considering gender as dependent variable, I find a significant interaction of earnings * information system ($F_{(2, 180)} = 2.48, p = 0.086$). The negative and positive earnings conditions contained fewer males when information system was absent (48, 4% for NE and 54.8% for PE) compared to when it was present (67.7% of males for NE and 61.3% for PE). For the GL condition data shows an opposite pattern with 71.0% males in the IS absent condition and 51.6% in the IS present condition. The study also used two administrations of the experiment to increase sample size; 144 students (randomized across six cells) participated in Nov. 2007 and an additional 42 students (randomized across six cell) participated in Nov. 2009. Timing of administration did not have an impact on the level of misreporting ($M = 0.214, SD: 0.373$ ($n = 144$) vs. $M = 0.305, SD: 0.354$ ($n = 42$), $t_{184} = -1.40, p > 0.16$, two-tailed) nor on the aforementioned demographic variables (All p 's > 0.12 two-tailed). Except for gender results show that the first administration contained more males (62.50%) compared to the second (47.62%; $t_{184} = 1.73, p = 0.085$ two-tailed). Results are similar when Gender is added as covariate in Table 1; the covariate Gender is not significant.

¹⁰ The instrument is fully described in Van Lange et al. (2007). When applying this instrument, a small number of people could not be classified because they make inconsistent choices (Van Lange et al., 2007). In this study, 37.1% of the participants were classified as prosocial, 39.2% as individualistic, and 10.8% as competitive. The remainder of the participants (12.9%) could not be classified. Importantly, the distribution of people across categories (prosocial, individualistic, competitive, and unclassified) did not differ across the six experimental cells ($\chi^2(5, N = 186): 2.973, p = 0.704$), suggesting that randomization was successful. Consistent with the theory in Van Lange et al. (2007), correlations with the dependent variable show that people who are classified as prosocial (prosocial is 1; and zero otherwise) misrepresent costs less ($r = -0.156, p = 0.034$). Results do not qualitatively differ when I use an ANCOVA, controlling for the dummy prosocial as covariate. The covariate prosocial is significant ($F(1, 179) = 3.92, p = 0.05$). The results and significance levels in Tables 1 and 2 have similar magnitudes and significance levels.

¹¹ The maximum of 25 euro is achieved at a cost of 4 lira and a submitted report of 6 lira. Honest reporting results in a reward of 5 euro (=250 lira of fixed wage). By reporting a cost below the actual cost, some participants sacrificed part of their fixed wage or more than their fixed wage leading to a negative pay-off. If a round was drawn for pay-out in which payoffs were lower than 3 euro, participants still received 3 euros for participation. This was, however, not announced to them beforehand.

3.5. Manipulation checks

Participants' task understanding and task motivation did not vary across the manipulations.¹² Most participants (95.7%) understood that their participation was fully anonymous. In total 84.4% of the participants further agreed with the item “There is a clear trade-off. The more I misrepresent costs, the lower the earnings for corporate headquarters.” Importantly, I did not detect differences of the manipulations on the anonymity question nor on the trade-off question (all p 's > 0.15 , F -model ns). To check if results depend on attendance to these manipulation checks, Section 4.1 also reports the results for the hypothesis test using a reduced sample of participants who agreed with both these items ($n = 150$, or 80.6 percent of the sample).¹³

Participants' perceptions of the firm's contribution margin were directionally consistent with the earnings manipulation. One seven-point Likert scale item (1 = *completely disagree*, 7 = *completely agree*) asked participants whether they felt that the company earned a too low contribution. Only the main factor earnings was significant ($F_{(2, 180)} = 29.12, p < 0.01$). Participants in the NE condition achieved a higher score on this question ($M = 5.74, SD = 1.38$) than participants in the GL condition ($M = 4.60, SD = 1.37$) and participants in the PE condition ($M = 3.94, SD = 1.22$). The contrast differences between the NE and GL conditions ($F_{(1, 180)} = 22.86, p < 0.01$); the NE and PE conditions ($F_{(1, 180)} = 56.88, p < 0.01$); and the GL and PE conditions ($F_{(1, 180)} = 7.62, p < 0.01$) were all significant. The post questionnaire did not have a manipulation check for the between-subject factor information system, as it was obviously either present or absent.

4. Results

4.1. Hypothesis test

Consistent with Brügger and Luft (2011), I use the degree of misrepresentation of the private cost signal as the dependent variable, which is defined as the reported cost minus the actual cost. This measure perfectly correlates with the participant's earnings in the experiment. I use it to avoid losing the information value of choices where participants submitted reports for costs less than the actual costs. The frequency of such reports varies strongly across cells (see Section 4.2). Although Evans et al. (2001) view the choice to underreport a cost as inconsistent and set it as equal to honest reporting in their measure, such a choice can be driven by social

¹² Task understanding uses two seven-point Likert scale items in the post questionnaire (Cronbach's $\alpha = 0.74$). Results showed no significant effects of the manipulations (all p 's > 0.11 , F -model ns). Task motivation also uses two seven-point Likert-scale items (Cronbach's $\alpha = 0.66$). Again, the main effects and interactions are not significant (all p 's > 0.26 , F -model ns). Participants also indicate they had sufficient time to carry out the task (all p 's > 0.36 , F -model ns).

¹³ Note that the 36 people (who fail either one or both of these two items) misreport cost less compared to the 150 participants, who agreed with both items (mean level of misreporting $M = 0.064, SD: 0.326$ ($n = 36$) vs. $M = 0.275, SD: 0.368$ ($n = 150$), $t_{184} = 3.15, p < 0.01$). Results are driven by the answer on the trade-off question (correlation trade-off item (agree = 1; 0 otherwise) with level of misreporting $r = 0.297, p < 0.01$). More honest participants are less likely to agree with this item, because for them such a trade-off is less present. Demographic characteristics are relatively similar between the two groups with respect to age, gender, the percentage of pro-socials, and the no. of accounting courses (All p 's > 0.16 two-tailed) except for percentage of participants with work experience ($M = 86.1\%$ ($n = 36$) vs. $M = 72.0\%$ ($n = 150$), $t_{184} = -1.75, p = 0.081$); Task understanding as measured with two PEQ items also does not significantly differ ($M = 5.32, SD: 1.35$ ($n = 36$) vs. $M = 5.54, SD: 1.21$ ($n = 150$), $t_{184} = 0.94, p > 0.34$). The subsample however, does exclude one participant (outlier) in the NE/IS present condition who never realized a positive pay-off (i.e. he or she scarified the full fixed wage or more than the fixed wage in all five trials).

concerns. Participants may decide to underreport the cost to improve the earnings of the company.¹⁴ This measure thus also better captures the consequences of participant's behavior to firm profit.

Because there is less room to misrepresent costs at high levels of the actual cost, I also control for the actual cost in a second model (see also Brüggen & Luft, 2011). Table 1 presents the results of the full-factor ANOVA (Model 1) and a mixed model procedure (Model 2) with the actual cost as a time-varying covariate (i.e., 41 possible values between 4.00, 4.05, 4.10, ..., 5.95, and 6.00). In both models, the reporting period is treated as a within-subject effect. Results concerning the hypothesis test (i.e., Table 1) are based on two-tailed tests. Comparisons of the simple effects of the interaction using least-square means (i.e., Table 2) are based on one-tailed directional tests.

Panel A of Table 1 shows the cell means and the conditional means controlling for the actual cost. In all cells, participants on average overstate costs (i.e., misrepresentation > 0) and thus extract rents from the organization. Similar to Evans et al. (2001), participants strongly deviate from the full self-interested choice of reporting the maximum cost of 6 lira, in which case the degree of misrepresentation would be close to 1 (because the expected value of the actual cost is 5 lira). Importantly, the degree of misrepresentation differs strongly across cells.

The hypothesis predicts an interaction between earnings and information systems (E × IS), indicating that the effect of an information system on the degree of honesty is less positive (and potentially negative) in the settings where the cost report can determine whether the firm earns a gain or a loss (GL condition) compared to the two other conditions (NE or PE conditions). Panel B of Table 1 shows that the interaction E×IS is significant in both models at the 10% level ($p = 0.054$ in Model 1 and $p = 0.064$ in Model 2). The means in panel A of Table 1 indicate that both in the negative earnings (NE) and positive earnings (PE) condition, information systems reduce the degree of misrepresentation, whereas information systems increase misrepresentation in the gain/loss (GL) condition. The contrast analyses in panel B of Table 1 offer more detail on this interactive pattern. The interaction is significant when comparing the GL condition against the NE condition ($p = 0.023$ in Model 1 and $p = 0.039$ in Model 2), when comparing the GL condition against the PE condition ($p = 0.063$ in Model 1 and $p = 0.047$ in Model 2); and when comparing the GL condition with the pooled means of the PE and NE conditions ($p = 0.017$ in Model 1 and $p = 0.019$ in Model 2). Information systems have a less positive effect (i.e. a negative effect) on honesty in the GL condition compared to the two other conditions. The interaction is not significant when comparing the PE against the NE condition, because the information system reduces misreporting in both cases.¹⁵

Table 1
Hypothesis test.

Panel A: Summary statistics for misrepresentation (Y = reported cost – actual cost)							
	Negative earnings (NE)		Positive earnings (PE)		Gain or losses (GL)		
Info system absent	0.309		0.345		0.139		
	[0.296]		[0.375]		[0.142]		
	(0.340)		(0.327)		(0.451)		
	n = 31		n = 31		n = 31		
Info system present	0.132		0.222		0.262		
	[0.143]		[0.233]		[0.259]		
	(0.398)		(0.233)		(0.404)		
	n = 31		n = 31		n = 31		

Panel B: Full factor analysis with period as a within-subject factor								
	Model 1				Model 2			
	DF	MS	F Stat	Sign.	Num. DF	Den. DF	F Stat	Sign.
<i>Between subjects</i>								
Earnings (E)	2	0.58	0.86	0.424	2	180	1.46	0.234
Info. System (IS)	1	0.81	1.22	0.271	1	180	1.27	0.262
E*IS (H1)	2	1.98	2.97	0.054*	2	180	2.79	0.064*
Error	180	0.67	–	–	–	–	–	–
<i>Within subjects</i>								
Actual cost	–	–	–	–	40	680	11.89	<0.001***
Period	4	0.67	3.87	0.004***	4	680	4.74	<0.001***
Period * E	8	0.23	1.31	0.237	8	680	1.58	0.128
Period * IS	4	0.47	2.73	0.028**	4	680	2.43	0.047**
Period * E * IS	8	0.23	1.35	0.215	8	680	1.52	0.148
Error (Period)	720	0.17	–	–	–	–	–	–
<i>Between subject contrast of the interaction (H1)</i>								
E * IS (NE vs. GL)	1	3.50	5.23	0.023**	1	180	4.35	0.039**
E * IS (PE vs. GL)	1	2.34	3.51	0.063*	1	180	4.02	0.047**
E * IS (NE & PE vs. GL)	1	3.85	5.77	0.017**	1	180	5.57	0.019**
E * IS (NE vs. PE)	1	0.12	0.17	0.678	1	180	0.01	0.935

***, **, * indicate significance at the 1%, 5%, or 10% level (two-tailed). The dependent variable is the level of misrepresentation measured as the difference between actual cost – reported costs. Panel A presents the mean level of misrepresentation, [the conditional mean controlling for the covariate actual cost], (the standard deviation), and the number of participants n. Panel B presents the results for the hypothesis test on misrepresentation, with period as a within subjects factor, and the earnings (E) and information system (IS) manipulations as between subjects factors. The first model is a general ANOVA model. The second model uses a mixed module procedure to control for the actual cost per period as a time varying covariate. This model corrects for the fact that when the actual cost is low, there is more room for misrepresentation. The interaction effect (H1) is compared in detail via contrast analysis.

Panel B of Table 2 explores the means (i.e. conditional means) by comparing the simple effects of the interaction using the least square means procedure. When the information system is absent, the degree of misrepresentation is higher when comparing both the negative earnings and positive earnings conditions against the gain/loss condition (the NE vs. GL condition +0.170, $p = 0.034$ one tailed, or +0.154, $p = 0.047$ one-tailed when considering conditional means; and the PE vs. GL condition +206, $p = 0.014$ one tailed, or +0.234, $p = 0.006$ one-tailed when considering conditional means). This is consistent with the self-concept maintenance theory: individuals find it more difficult to misreport costs in the GL condition, where the cost report can determine whether the company earns a gain or a loss. The presence of an information system reduces the motive to report more honestly in the GL condition. When the information system is present, results show that the GL condition has higher degrees of misrepresentation and the level is comparable to or even higher than the negative or positive earnings conditions. The simple effects of information system in Panel B of Table 2 show that information systems marginally reduce misrepresentation in both the NE (–0.177,

¹⁴ 15.38% of the reports were for costs less than actual costs ($n = 186$). Also for the sample of participants who agreed with the two manipulation checks ($n = 150$), the frequency of underreporting is still close to the full sample (13.33% of the reports). Note that in Evans et al. (2001, experiment 1), around 6.4% of the submitted reports were for costs below actual costs. In the cells, where the information system is absent, Table 3 shows similar percentages as Evans et al. for the NE and PE conditions (4.5%–9% of the reports). For, the GL condition, however, Table 3 shows a higher incidence of such choices (around 30%). Evans et al. also reported a lot more of these choices under the hurdle contract (experiment 3; in total 34 out of 138 (24.6%) reports were for costs below actual costs). In the GL condition, choices to underreport make sense, as the cost report can make a difference between gains/losses for the firm.

¹⁵ The effects of the period and period × IS are also significant at the 1% level or 5% levels, respectively. Over trials, misreporting increases in both the information absent and information present conditions (the effect of period). The increasing trend is stronger in the IS absent than in the IS present conditions (the effect of period × IS).

Table 2
Pairwise comparison of the interaction.

Panel A: Display of the means [conditional means controlling for covariate actual cost]

Comparison	Means	Conditional means
	Info system absent	Info system present
	Effect (sign.)	Effect (sign.)
NE vs. GL	+0.170 (0.034)**	+0.154 (0.047)**
PE vs. GL	+0.206 (0.014)**	+0.234 (0.006)***
NE vs. PE	-0.036 (0.351)	-0.079 (0.193)
	Effect info system	Effect info system
	Effect (sign.)	Effect (sign.)
Neg. earnings (D-A)	-0.177 (0.029)**	-0.153 (0.048)**
Pos. earnings (E-B)	-0.123 (0.094)*	-0.142 (0.061)*
Gain or loss (C-F)	+0.123 (0.094)*	+0.117 (0.102)

Panel B: Comparison simple effects per earnings condition and per information system condition

***, **, * indicate significance levels of 1%, 5%, and 10% levels of significance using one-tailed directional tests. Panel A shows a graphical plot of the cell means of Table 1 (respectively the conditional means using actual cost as time varying covariate). Panel B performs a mean by mean comparison of the interaction earnings \times information system of Table 1 across information system condition or across earnings condition. Differences between the means are displayed first; the one-tailed p-values are shown between brackets and are based on directional test using the least squares means procedure within an ANOVA or mixed model procedure (conditional means).

$p = 0.029$ one tailed; -0.153 , $p = 0.048$ one tailed for conditional means) and the PE conditions (-0.123 , $p = 0.094$ one tailed; -0.142 , $p = 0.061$ one-tailed for conditional means). Conversely, the information system marginally increases misrepresentation in the GL condition when considering the means ($+0.123$, $p = 0.094$ one-tailed; effect conditional means $+0.117$, $p = 0.102$ one-tailed, ns).

The Appendix reproduces the hypothesis test for the 150 participants who agreed with both the items (1) that there was a clear trade-off between misreporting and headquarters' earnings and (2) that their participation was anonymous. Results are largely consistent. The interaction of E*IS is significant at the 10% level ($p = 0.078$ in model 1 and $p = 0.095$ in model 2) suggesting that earnings situation has less influence on misreporting once an information system is present. Similar as to Table 1, individual contrasts of E*IS for GL against PE ($p = 0.032$ in Model 1 and $p = 0.034$ in Model 2), and for GL against the pooled means of PE and NE ($p = 0.028$ in Model 1 and $p = 0.040$ in Model 2) are still significant. The notable difference in the contrast analyses is that the interaction of E*IS for the comparison between GL and the NE condition is weaker in model 1 ($p = 0.10$) and not significant anymore in model 2 ($p > 0.15$). Untabulated results of the mean comparison for this reduced sample show that results are similar as reported in Table 2. When the information system is absent, the degree of misrepresentation is higher in both NE and PE conditions compared to the GL condition (one-tailed $p = 0.06$ or less). Differences across earnings conditions are no longer significant (lowest one-tailed

$p > 0.17$) when the information system is present. In the GL condition, the information system marginally increases misreporting (one tailed $p = 0.05$ for the mean; one-tailed $p = 0.07$ for the conditional mean), whereas it marginally reduces misreporting in the PE condition (one tailed $p = 0.08$ for the mean; one-tailed $p = 0.06$ for the conditional mean). In contrast to Table 2, the decrease in misreporting as a result of information system for the NE condition is no longer significant (one-tailed $p > 0.24$ for the mean; one-tailed $p > 0.28$ for the conditional mean).

4.2. Supplementary analyses of choice behavior

Table 3 analyzes the frequency of reporting behavior that can be considered as beneficial to the company. I count the number of observations per participant over the five reporting periods where reported costs are equal to or below actual costs, labeled as total social choices in Panel A of Table 3 (is equal to the sum of honest reports (i.e., reports equal to actual cost) and altruistic reports (i.e., reports below actual costs)). The remainder are dishonest reports for which reported cost are higher than actual cost (total dishonest in Panel A of Table 3). The theory suggested that individuals may be more honest or underreport costs to improve the firm's profits and thus misreport less if their reports can determine whether the company earns a profit or loss (the GL condition) compared to negative and positive earnings conditions. Such behavior in the GL condition may occur less frequently

Table 3
Supplementary analyses of reporting choices.

Panel A: Summary statistics of choice behavior				
		Negative earnings (NE)	Positive earnings (PE)	Gain or losses (GL)
Info system absent	Altruistic (a)	9.03%	4.52%	30.32%
	Honest (b)	<u>29.03%</u>	<u>28.39%</u>	<u>24.52%</u>
Total social (a + b)		38.06%	32.90%	54.84%
Total dishonest		61.94%	67.10%	45.16%
		n = 31	n = 31	n = 31
Info system present	Altruistic (a)	18.06%	9.68%	20.65%
	Honest (b)	<u>24.52%</u>	<u>17.42%</u>	<u>14.84%</u>
Total social (a + b)		42.58%	27.10%	35.48%
Total Dishonest		57.42%	72.90%	64.52%
		n = 31	n = 31	n = 31
Panel B: Effect of information system per earnings condition (Y = total social choices)				
Effect info system		+4.52%	-5.81%	-19.35%
Chi-square (1, N = 62)		0.120	0.003	4.388**
(p-value)		(p = 0.73)	(p = 0.95)	(p = 0.04)

***, **, * indicate significance levels of respectively 1%, 5% and 10% level of significance (two-tailed). I dummy coded each choice on participant level as either social (i.e. 1 if cost equal to or below actual costs; 0 otherwise) and subsequently calculate for each participant the frequency of how many of the five reporting choices can be labeled as social (total social). The range of these variables on participant level is either 0%, 20%, 40%, 60%, 80% or 100%. The remainder (1–total social) are the frequency of dishonest choices. The table also constructed frequency variables on participant level based on choices classified as altruistic choices (i.e. equal to one if reported cost < actual cost; 0 otherwise) and honest choices (i.e. equal to one if reported cost equals actual cost; 0 otherwise). Panel A displays frequencies. Given that variables are based on frequencies, panel B shows for each earnings condition, the results of a Kruskal–Wallis test for differences in distribution in social behavior across the factor information system.

once an information system is present. I thus anticipate an interaction effect, suggesting that the effect of information system on this type of reporting behavior depend on earnings condition. A type 3 analysis, using frequency of social choices on participant level of as the dependent (multinomial response), shows, however, that the interaction of ExIS is not significant ($\chi^2(2, N=186) = 3.54, p = 0.17$). Also the main effects are not significant (information system $\chi^2(1, N=186) = 1.07, p = 0.30$; earnings $\chi^2(2, N=186) = 4.29, p = 0.12$). Contrasts show that the interactive pattern is significant at the 10% level when comparing the GL condition against the NE condition ($\chi^2(1, N=186) = 3.13; p = 0.08$) and when comparing the GL condition against the combined cells PE and NE ($\chi^2(1, N=186) = 3.44, p = 0.06$). The differential impact is not significant when comparing the GL condition against the PE condition ($\chi^2(1, N=186) = 2.08, p = 0.15$).

Panel B of Table 3 compares the effect of an information system on the frequency of social choices in each of the three earnings condition, separately. The effect of information system in the GL condition reduces the frequency of these reporting choices from 54.84% to 35.48% (i.e. reduction of minus 19.35% percent, $p = 0.04$). As such, the use of information system in the GL condition shifts participants towards dishonest reporting. In the NE or PE conditions there is no significant effect of information system on the frequency of social choices (i.e. respectively, +4.52%; $p = 0.73$ and -5.81%; $p = 0.95$). Further analyses show that in the information system absent condition, the frequency of social behavior of 54.84% in the GL condition differs from the respective frequencies of 38.06% and 32.90% observed in the NE and PE conditions (GL vs. NE, $\chi^2(1, N=62) = 2.71, p = 0.10$; GL vs. PE, $\chi^2(1, N=62) = 4.62, p = 0.03$). In the condition where the information system is present, the difference between the GL vs. the PE condition and the difference between GL vs. NE condition are no longer significant (p 's > 0.45). Panel A of Table 3 further shows that a large part of the social behavior in the GL condition, when information systems are absent, can be explained by altruistic choices in which reported costs are below actual costs. Specifically, 30.32% of the choices can be labeled as altruistic. This frequency differs from the percentages of 9.03% and 4.52% respectively observed in the NE and PE conditions (p 's < 0.01). Analyses reported in footnote

indicate that participants in the GL condition produce these altruistic reports to avoid losses and thus to keep the company profitable.¹⁶

Table 4 uses the mean of three items from a post-questionnaire to measure the participants' social concerns for the firm. Panel A of Table 4 shows that in each of the three earnings conditions, information systems reduce the social concerns for the firm. This is also confirmed by an ANOVA where only the main effect of information system is significant ($F_{(1, 180)} = 5.77; p = 0.017$). Results thus do not provide support for a differential impact of information systems across earnings conditions on the variable social concerns. Untabulated results show that neither the interaction of Ex IS, nor contrast tests of the interaction are significant (p 's > 0.32). Panel B of Table 4 shows, however, that the reduction of social concerns as a result of an information system is only significant in the GL condition ($p = 0.03$) and not in the NE condition ($p = 0.47$) or the PE condition ($p = 0.18$). This reduction in the GL condition may presumably arise because participants worry less about reports which are beneficial to firm profit, once headquarters uses an information system.¹⁷

Note that while these analyses provide some insights as to why information systems produce a negative effect on the degree of misrepresentation in the gain/loss condition, they do not explain why information systems still produce positive effects in the positive earnings or the negative earnings conditions. Consistent with Gneezy (2005) and Hannan et al. (2006), the next section presents histograms of participants' reporting choices to provide more insights on this issue.

¹⁶ I also calculate the conditional profit that headquarters would have realized if participants were to report honestly and compare this to the profit headquarters receives under the altruistic choice. In the scenario where the information system is absent, the loss for the firm would be equal to -162.23 lira if the participant would have reported honestly, but the firm realizes a gain of 40.43 lira because of the altruistic reporting. Participants still earn positive earnings of 47.34 lira. In the information system present condition, altruistic reporting also ensures that the company earned a profit of 2.34, rather than a loss of -116.41 if the participant would have been honest. Yet, fewer of these choices occur and also less is transferred to the firm, because agents still keep on average 131.25 lira.

¹⁷ The variables total social choices of Table 3 and the level of social concerns of Table 4 are positively correlated ($r = 0.48, p < 0.01$).

Table 4
Supplementary analysis on social concerns.

Panel A: Social concerns for the firm (3-items, Cronbach's alpha = 0.730)			
A. I did care about the earnings that Acazia's headquarters realized.			
B. I wanted to help to improve Acazia's earnings by reporting a production cost close to the actual cost.			
C. I felt guilty when I would not report the actual cost of production to Acazia's headquarters			
Average score on the three items per cell (items evaluated on 1 to 7 Likert scale).			
	Earnings condition		
	Negative earnings (NE)	Positive earnings (PE)	Gain or losses (GL)
Info system absent	4.43 (1.77) n = 31	4.50 (1.37) n = 31	4.35 (1.48) n = 31
Info system present	4.12 (1.61) n = 31	4.06 (1.21) n = 31	3.52 (1.54) n = 31
Panel B: Effect of information system per earnings condition (Y = social concerns)			
Effect info system	-0.31	-0.44	-0.84
t-test (Df: 60) (p-value)	t = -0.73 (p = 0.47)	t = -1.35 (p = 0.18)	t = -2.19** (p = 0.03)

***, **, * indicate significance levels of respectively 1%, 5% and 10% level of significance (two-tailed) and are based on simple t-tests that compare the difference in means between the information system absent and present conditions in each of the three earnings situations. Panel A displays the mean level of social concern based on the average of the three 7-point Likert scale items, the standard deviation between brackets, and number of participants. Panel B shows the t-test for differences across information system per earnings condition.

4.3. Reporting behavior and impact of an information system

Fig. 1 uses the 155 reports per cell (i.e. 31 participants each producing five reports) to further explore how information systems change the distribution of reports. Panel A of Fig. 1 shows the number of cost reports that are either (1) honest or altruistic (i.e., misreporting that was equal or below zero); (2) dishonest but for which the information system cannot detect misreporting (i.e. $0 < \text{misrepresentation} \leq 0.25$); or (3) dishonest to a level above the detection limit of the information system (i.e., the degree of misrepresentation > 0.25).

Consistent with the theory, panel A of Fig. 1 shows that in the negative and positive earnings conditions, presence of an information system (compared to absence of it) reduce the participant's range of dishonesty. The figures show a shift from the interval involving large dishonest reporting to the interval of dishonest reporting which cannot be detected by the information system, for which participants may still be able to maintain a positive self-concept. The test for differences in distribution of reports across the factor information system is significant both for the negative earnings condition ($\chi^2_{(1, N=310)} = 8.46, p < 0.01$) as well as the positive earnings condition ($\chi^2_{(1, N=310)} = 4.79, p < 0.05$). Conversely, in the gain/loss condition, participants reduce honest and altruistic reporting (as is evidenced in Table 3), and shift to more dishonest reports which are below the detection limit of the information system. The test for differences in distribution of reports across the three intervals for the factor information system is significant ($\chi^2_{(1, N=310)} = 3.402, p < 0.07$).¹⁸ When an information

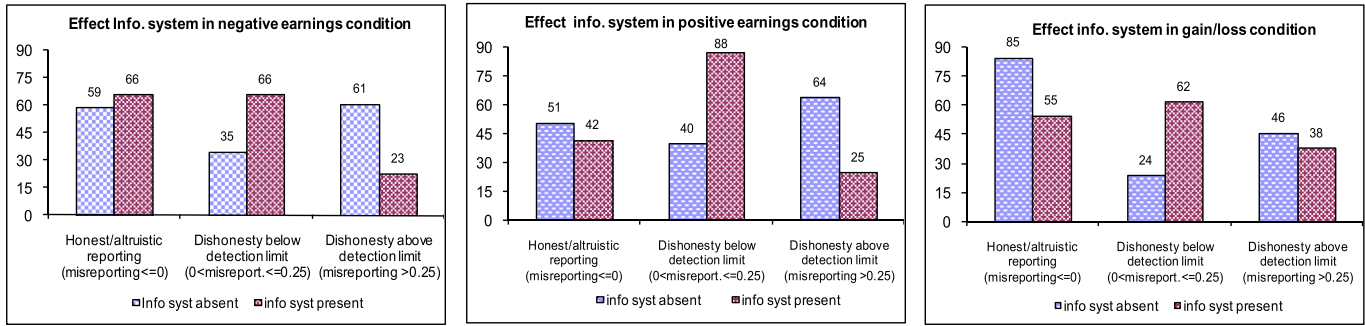
system is present, behavior that is intended to help the firm (e.g., avoid losses for the company) occurs less frequently in the gain/loss condition, presumably because an information system now also allows the participants to reconcile dishonest reports that cannot be detected as suspicious, as still being consistent with their positive self-concept.

Panel B of Fig. 1 shows histograms of the cost reports submitted by participants. Because costs come from a random interval between 4 and 6 lira, dishonest reporting should be reflected in the figure, by a distribution that is skewed to the highest cost reports. The distribution of cost reports is skewed to the right both for the negative and positive earnings conditions when information systems are absent. Nevertheless, the presence of an information system, reduce the number of very high cost reports in favor of more reports in the first two intervals. In the positive earnings condition, the test for differences in distribution of reports is significant ($\chi^2_{(1, N=310)} = 9.13, p = 0.003$). For the negative earnings condition, the test for differences in distribution of reports across the information system is, however, not significant ($\chi^2_{(1, N=310)} = 1.60, p = 0.206$). Yet the Mann–Whitney test for differences in number of cost reports that appear in the lowest cost interval is significant (the number of cost reports increase from 19 to 36 [+17], $z = -2.52, p = 0.01$).

In the gain/loss condition, however, the distribution of reports is not skewed to the right. Panel B of Fig. 1 shows that the modus of reported costs occurs at the second interval (4.55–5.00) when information systems are absent. Interestingly, this interval includes the report of 5 lira, for which headquarters' profit equals zero. This high number of reports is consistent with the self-concept maintenance theory and vicarious loss avoidance. When the actual costs are below five participants may have overstated the cost just a little instead of submitting very high cost reports in order to avoid a loss for the company. If actual costs are above five participants may have understated the cost in order to help the firm. As a result, more reports fall just below 5 lira, because such choices can still be reconciled as consistent with the self-concept of being a honest person. The use of an information system however shifts the distribution. The frequency of reports in the second cost interval decreases at the expense of more reports in the highest cost interval. The test for

¹⁸ Untabulated results also analyze the number of large cost overstatement on participant level in a way similar as Table 3. I dummy coded each choice on participant level as a large cost overstatement if misreporting is higher than >0.25 and 0 otherwise and subsequently calculate for each participant the frequency of how many of the five reporting choices can be labeled as large cost overstatement. The range on participant level is either 0%, 20%, 40%, 60%, 80% or 100%. The frequency of such choices is significantly different across the factor information system in the PE condition (from 64 (41.29%) reports to 25 reports (16.13%), or a reduction in frequency of 25.16% $\chi^2_{(1, N=62)} = 7.84, p < 0.01$) and in the NE condition (from 61 (39.35%) to 23 reports (14.84%), or a reduction in frequency of 24.52%, $\chi^2_{(1, N=62)} = 8.70, p < 0.01$). In the GL condition, the frequency of these reports does not differ across the factor information system (from 46 (29.68%) to 38 (24.52%) reports, or a reduction in frequency of 5.16%, $\chi^2_{(1, N=62)} = 0.50, p = 0.48$).

Panel A: Analyses on misreporting and effect of the information system



Panel B: Analyses of cost reports submitted by participants

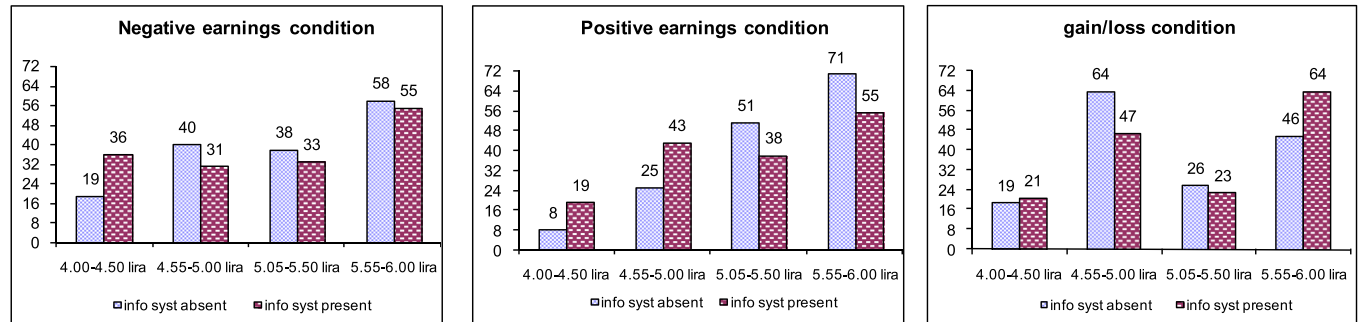


Fig. 1. Histograms of reporting behavior and the impact of information systems. Analyses use all the reports submitted by participants (31 participants multiplied by 5 reports is 155 reports per cell). Panel A shows how information systems affect misreporting behavior (altruistic/honest reporting choices, dishonesty below detection limit of the information system, and dishonesty above detection limit). Panel B shows the distribution of the cost reports submitted by participants. If participants are honest each interval should have about the same number of reports. More dishonest reporting would be reflected in the figure by a distribution that is skewed to the right.

differences in distribution of reports across the information system is marginal significant ($\chi^2_{(1, N=310)} = 2.73, p = 0.098$).¹⁹ Consistent with theory, increased monitoring in the GL condition crowds out some of the behavior that is intended to help the firm. An alternative theory which is also consistent with this latter observation, is that the GL condition causes people to think about whether they want to have goals that are aligned with goals of the company (i.e. avoid losses) or to detach completely (be dishonest). When the information system is absent, results show that such loss avoidance seem to take place as there are more reports just below 5. In the information present condition, more participants seem to detach from that goal, because they may not feel the same level of trust with the firm and hence the same sense of ownership for the company's goal to avoid losses.²⁰

5. Discussion

This study examines the impact of the company's earnings situation on the degree of honest reporting by managers. The

¹⁹ The Mann–Whitney test shows a significant reduction in the number of reports submitted in the second cost interval (from 64 to 47, $z = -2.01, p = 0.044$) when an information system is present. The highest cost interval shows a significant increase in the number of reports (from 46 to 64, $z = -2.13, p = 0.033$). Note that when the information system is absent, most of the reports (a total of 44) in the second cost interval are between 4.80 and 5.00 lira. This number reduces to 21 reports in the interval of 4.80 and 5.00 lira ($z = -3.20, p < 0.01$) when an information system is present.

²⁰ Note that tabulated results in Tables 3 and 4 are similar for the reduced sample ($n = 150$). Results in Fig. 1 are also similar, except that for the NE condition the shift in distribution as a result of information system (Panel A) from reports involving large dishonesty towards reports which the information system cannot detect or towards honest/altruistic reports is weaker ($\chi^2_{(1, N=240)} = 2.12, p = 0.14$ two-tailed, $p = 0.07$ one-tailed), consistent with the weaker results for the reduced sample for the NE condition as reported in Section 4.1.

results show that people overstate costs less when the manager's cost report is able to determine whether the company incurs a loss or a gain than when the company always earns a loss or a profit regardless of the manager's cost report. A larger fraction of managers also remain honest or underreport costs to help the company to remain profitable when their reports affect the firm's ability to realize profits. While such behavior has been observed in other studies such as in Evans et al. 2001 (i.e. in particular under the hurdle contract), this paper suggests that this behavior occurs more frequently in companies where managers perceive that misreporting can have more significant repercussions for the company.

The study further predicts and finds an interaction of the company's earnings situation and the use of information systems suggesting that the positive effects on firm profits of information systems that help a company to detect suspicious reporting (e.g., Hannan et al., 2006) do not always materialize. Results show that the earnings situation has less effect on the degree of honesty when the firm uses an information system. Information systems tend to reduce misreporting (i.e. reduce larger cost overstatements) in the condition where the company always incurs a loss or a profit, while it increases misreporting when the manager's report can determine whether the firm earns a gains or a loss. Using theories of Mazar et al. (2008), I presume that information systems in the gain/loss condition shift participants' behavior towards dishonest reports that the company cannot detect as suspicious at the expense of reporting behavior that is beneficial for firm profit.

The results offer important practical implications. Companies must carefully consider when to implement systems that help them to detect misreporting. For example, firms often use increased monitoring when earnings are under pressure (e.g., Prechel, 1994) or intensively use controls for business units that

have a lower profit potential. Assuming that such situations may stimulate managers to act in the best interest of their company, the use of information systems can be less effective. Besides earnings levels, future research can examine other situations which may alter the manager's view of the consequences of misreporting for the organization and may thus have an effect on the effectiveness of information systems. Business units need to reach cost-reduction targets, business units who sell the product can become profitable when production units report lower costs and the delegating of cost responsibility to lower level managers may enhance the manager's feeling of trust (Charness, 2000; Zimmerman, 2009).

The findings are further relevant for financial accounting. Earnings management studies often presume that managers try to avoid reporting losses just below zero because they directly benefit from positive earnings (Bergstresser & Philippon, 2006). Dechow, Richardson, and Tuna (2003) argued that managerial incentives do not fully explain the discontinuity in earnings around zero or around analysts' forecasts. This study shows that when company earnings are not formally incorporated into the participant's payoff function, people still change their reporting behavior in order to avoid losses or to secure small profits for the company. Empiricists may explore some of these social motives in order to test alternative predictions that may drive managerial behavior or explore conditions where employees or managers take more ownership of the company's goals.

This study is subject to limitations. First, consistent with Hannan et al. (2006), the information system only helps the company to improve its ability to detect suspicious reporting and provides a warning when the manager submits a suspicious report, but it does not produce any financial consequences for the manager. While these information systems are often part of the internal control procedures of a company (Christ et al. 2012), a logical next step is to explore control systems that introduce a sanction for misreporting. Such sanctioning systems may still not be able to perfectly detect misreporting but may potentially be perceived as more negative (Fehr & Falk, 2002). Tayler and Bloomfield (2011) showed that presence of strong initial controls reduces a person's willingness to contribute to the public good.

Second, I use an anonymous setting with a common company (see also Evans et al., 2001) to make sure that deviations from dishonesty can be attributed to the manager's intrinsic motivation to report more honestly. Future work can explore whether findings are stronger when social-distancing effects are made more salient. For example, reporting to a known superior in a face-to-face setting or to a manager of a similar position in the hierarchy rather than to a company could make the social context more salient. This may reinforce the effects of the manipulations.

Third, I only consider one business unit manager which reported to a hypothetical company. There are many organizational contexts in which multiple agents can observe and monitor each other (e.g., Zhang, 2008) or where the reporting behavior of one business unit manager can affect other business unit managers in the value chain (Church et al., 2012; Coletti, Sedatole, & Towry, 2005). Many other organizational factors can then influence how participants rationalize their dishonest reporting. For example, people may also adhere to descriptive norms established by peers (Tayler & Bloomfield, 2011; Cardinaels & Jia, 2015). Dishonest reporting may be difficult to reconcile with a positive self-concept when more peers are honest.

Appendix A1. Hypothesis test for the reduced sample (n = 150)

Panel A: Summary statistics for misrepresentation (Y = reported cost – actual cost)

	Negative earnings (NE)	Positive earnings (PE)	Gain or losses (GL)
Info system absent	0.328 [0.319] (0.323) n = 26	0.375 [0.395] (0.336) n = 23	0.159 [0.164] (0.469) n = 28
Info system present	0.254 [0.259] (0.354) n = 22	0.228 [0.233] (0.254) n = 26	0.328 [0.312] (0.414) n = 25

Panel B: Full factor ANOVA with period as a within-subject factor

	Model 1				Model 2			
	DF	MS	F Stat	Sign.	Num. DF	Den. Df	F Stat	Sign.
<i>Between subjects</i>								
Earnings (E)	2	0.25	0.37	0.692	2	144	0.57	0.566
Info. system (IS)	1	0.06	0.08	0.771	1	144	0.17	0.680
E * IS (H1)	2	1.75	2.60	0.078*	2	144	2.39	0.095*
Error	144	0.67		–				
<i>Within subjects</i>								
Actual Cost	–				40	536	10.57	<.001***
Period	4	0.60	3.31	0.011**	4	536	4.26	0.002***
Period * E	8	0.15	0.85	0.559	8	536	0.87	0.546
Period * IS	4	0.48	2.67	0.032**	4	536	1.28	0.277
Period * E * IS	8	0.22	1.24	0.275	8	536	1.36	0.213
Error (period)	576	0.18		–				
<i>Between subject contrast of the interaction (H1)</i>								
E * IS (NE vs. GL)	1	1.85	2.75	0.100*	1	144	2.04	0.155
E * IS (PE vs. GL)	1	3.16	4.69	0.032**	1	144	4.57	0.034**
E * IS (NE & PE vs. GL)	1	3.33	4.94	0.028**	1	144	4.29	0.040**
E * IS (NE vs. PE)	1	0.16	0.23	0.629	1	144	0.46	0.497

***, **, * indicate significance at the 1%, 5%, or 10% level (two-tailed). Of the 36 excluded participants, I lose 5 (16%), 8 (26%) and 3 (10%) participants in respectively the NE, PE, and GL conditions when the information system is absent and respectively 9 (29%), 5 (16%) and 6 (19%) in the NE, PE, and GL conditions, when the information system is present. The dependent variable in Panel A is the mean level of misrepresentation measured as the difference between actual cost – reported costs, [the conditional mean controlling for the covariate actual cost], (the standard deviation), and the number of participants (n). Panel B presents the results for the hypothesis test using a general ANOVA with period as a within subjects factor, and earnings (E) and information system (IS) manipulations as between subjects factors. The second model uses a mixed module procedure to control for the actual cost per period as a time varying covariate. The interaction effect (H1) is compared in detail via contrast analysis.

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