Essays on Behavioral Aspects of the Delegation and Limitation of Decision-Making Authority in Organizations

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PREFACE

This thesis consists of three experimental studies on the delegation of decision-making authority in organizations. Delegation of decision-making authority to lower levels of management enables organizations to benefit from specialized knowledge and information of lower level managers and intends to improve the decision-making process in organizations. However, by delegating decision-making authority to lower levels of management organizations also increase their reliance on managers to make decisions in the best interest of the organization. Prior research demonstrates that conflicts between decentralized divisions or judgmental biases of managers can undermine the decision-making process and, hence, organizational efficiency. Consequently, the delegation of decision-making authority may ultimately not lead to improved decision-making. In contrast, it may even give rise to new inefficiencies that require limitations on the decision-making authority granted to managers or the intervention of top-level management. It is, however, often difficult to determine to what extent limitations on the decision-making authority or top management interventions are required without unnecessarily undermining managers' flexibility to use their knowledge and information and without undermining their responsibility to make good decisions. Optimally trading off potential benefits against potential costs of delegating and limiting decision-making authority is thus an important source of increasing organizational efficiency.

Essay 1 focuses on the delegation of decisions regarding the internal transfer of goods and services in decentralized organizations. Specifically, Essay 1 investigates how the efficiency of negotiated transfer pricing is affected when corporate headquarters may intervene and become involved in transfer price negotiations between division managers, particularly after negotiations failed. Decentralized organizations often delegate the decisions about the transfer of internal goods and services to division managers by allowing them to negotiate transfer prices autonomously. In case of information asymmetries between divisions and corporate headquarters, organizational decision-making may be improved by delegating transfer decisions to better informed division managers. However, even when division managers are granted autonomy in transfer decisions, prior literature provides evidence that headquarters often do not abstain from becoming involved in transfer price negotiations. While the intention of headquarters' involvement is to overcome inefficiencies arising from conflicts between decentralized managers, experimental findings in Essay 1 suggest that such involvement has the unintended consequences of further reducing both, agreement frequency and the coordination efficiency of negotiated transfer pricing. Reduced agreement occurs because decentralized managers feel less responsible for the negotiation outcome when headquarters can become involved. Reduced efficiency results because misattribution and overconfidence lead headquarters to attribute negotiation failure to the wrong cause and to discount or ignore information from the negotiations. Essay 1 thus informs about a cost of headquarters becoming involved and resuming decision-making authority for once delegated decisions.

Essay 2 and 3 focus on the delegation of compensation decisions in organizations. Specifically, Essay 2 studies how the extent of superior discretion over the allocation of a bonus pool affects the output of a team when employees—besides exerting productive effort—can engage in unproductive influence activities. Granting superiors of a team high discretion in bonus allocations allows them to use non-verifiable information and personal observations in order to mitigate free-rider incentives in teams. Prior research, however, also suggests that discretion may give rise to unproductive influence activities of employees. That is, instead of contributing to team output, employees may waste valuable working time trying to bias the superior's bonus decision in their favor. The question, therefore, is whether organizations should limit superiors' discretion extent in order to mitigate the detrimental effects of influence activities in teams. Standard economic theory presumes that limiting the extent of discretion undermines the efficiency of discretionary bonus pools as it harms superiors' flexibility to use their personal observations in bonus decisions. Experimental findings in Essay 2, however, suggest that implementing limitations on the discretion extent over bonus allocations is important and can lead to increased team output because superiors do not sufficiently account for influence activities in their bonus decisions. Furthermore, Essay 2 examines under what conditions limitations on the extent of discretion may become more important in an environment with influence activities. Findings suggest that the positive effect of limiting the discretion extent is more pronounced in a workplace environment where employees can more directly monitor the behavior and activities of their peers. The reason is that influence activities of peers are more salient under a high degree of monitoring and thereby affect behavior and fairness perceptions of employees more strongly. The study, thus, identifies the degree of mutual monitoring in teams as an important factor influencing the efficacy of superior discretion over bonus decisions.

Similar to Essay 2, the experiment described in Essay 3 addresses the question of the extent of superior discretion over bonus allocations. The experiment in the previous study demonstrates the importance of limiting superiors' extent of discretion over bonus allocations in order to mitigate influence activities and to induce individual effort in teams. In the previous setting, limitations on the discretion extent are implemented by the organization while superiors of a team are not involved in the decision. However, organizations often let superiors of a team implement and communicate important specifics of a bonus plan. Correspondingly, organizations may establish guidelines that require superiors to specify and announce the discretion extent rather than limiting the extent of discretion by design. Experimental findings in Essay 3 suggest that superiors can use such announcements to control the expectations and behavior of their subordinates more effectively and, ultimately, to mitigate influence activities in teams. Announcement thereby helps to increase the link between individual effort and reward. Specifically, the findings suggests that announcement is effective in motivating effort and team output when the degree of mutual monitoring in teams is high. The experiment in Essay 3 thus provides further insights into how the efficacy of discretionary bonus pools can be improved when employees can engage in activities to distort the superiors' personal information in their favor.

ESSAY 1

The Unintended Consequences of Headquarters' Involvement in decentralized Transfer Price Negotiations: Experimental Evidence

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Abstract
This study investigates how headquarters involvement affects the efficient coordination of internal transfers in decentralized transfer price negotiations. Prior research explores decentralized managers who negotiate transfer prices autonomously. However, evidence suggests that headquarters can become involved in transfer price negotiations, particularly after negotiation failure. While the intention of headquarters involvement is to overcome inefficiencies arising from decentralized managers' inability to agree on a transfer price, we suggest that such involvement is likely to have the unintended consequences of further reducing both agreement frequency and the coordination efficiency of negotiated transfer pricing. Reduced agreement is likely to occur because decentralized managers are likely to feel less responsible for the negotiation outcome and may be overly optimistic about headquarters' decision. Reduced efficiency is likely to result because misattribution and overconfidence are likely to make headquarters attribute negotiation failure to the wrong cause and to discount or ignore information from the negotiation. In an experiment, we manipulate whether headquarters involvement is absent versus present. Nested within headquarters involvement present, we manipulate the degree of headquarters involvement as either "weak" or "strong". Consistent with our predictions, we find that headquarters involvement reduces the frequency of negotiation agreement and the coordination efficiency of transfer pricing. Additionally, we find that efficiency is reduced even more when headquarters involvement is strong rather than weak. We contribute to the research on negotiated transfer pricing by providing evidence about headquarters' biased perceptions of negotiation impasse and the unintended consequences of its involvement.

Keywords: Transfer price, negotiations, delegation, autonomy

[T]he group president of the Computer Group explained how divisions in his group purchased semiconductors from divisions in two other groups: Prices for these semiconductors are derived by negotiation, essentially on an arm's-length basis between the selling division and the buying division, with a little push here and there from us [the group general managers] if necessary.

Eccles and White (1988, p. 42)

Determination of transfer-price: […] Each MPC [Mini Profit Center] has independent discretion in their negotiations. […] Nevertheless, when no settlement is reached through independent negotiation, their boss will intervene and arbitrate a final determination.

Monden (2012, p. 470, about the transfer pricing system at Kyocera)

1 Introduction

One of the major functions of transfer pricing in firms is to assure efficient coordination of internal transfers between decentralized divisions when headquarters—due to information asymmetries—cannot efficiently coordinate these transfers itself (Hirshleifer 1956, Zimmerman 2014).[1] However, when determining transfer prices, external prices from competitive, well-functioning markets that would solve such coordination problems optimally (e.g., Abdel-Khalik and Lusk 1974) rarely exist for internally traded goods (Merchant and Van der Stede 2003, Borkowski 1990). Thus, transfer prices can be either set centrally by headquarters or negotiated between decentralized divisions (Horngren, Datar and Rajan 2012).

Prior research focuses either on autonomous transfer price negotiations between decentralized managers (e.g., Luft and Libby 1997; Kachelmeier and Towry 2002) or on transfer prices centrally set by headquarters (e.g., Avila and Ronen 1999; Bouwens and Steens 2016). However, as illustrated by our introductory statements and suggested in the literature (e.g., Drury 2004; Hansen and Mowen 2006), transfer price negotiations may not be fully autonomous, as headquarters can become involved in transfer pricing, particularly after negotiations have failed. This study investigates the effects of such involvement on the efficient coordination of internal transfers. Specifically, we investigate how headquarters involvement affects the

[1] For ease of exposition, we use female pronouns for the seller, male pronouns for the buyer and neutral pronouns for headquarters in the following.

agreement frequency of transfer price negotiations and the efficiency of internal transfers (hereafter, coordination efficiency), defined as the difference between actual and optimal firm profit.

Headquarters involvement is likely to have the *intended* consequence of solving inefficient negotiation impasses, thereby increasing the efficiency of internal transfers. The intention to improve the outcome of autonomous transfer price negotiations is justified as prior evidence indicates that managers' biased fairness perceptions can lead to negotiation failure even if transfers would be profitable (Kachelmeier and Towry 2002; Arnold, Gillenkirch and Hannan 2016). We predict, however, that headquarters involvement is likely to have the *unintended* consequences of further *reducing* both agreement frequency and coordination efficiency.

Agreement frequency is likely to decrease for two non-mutually exclusive reasons. First, either buyer or seller or both may feel that headquarters involvement will result in an outcome that is more favorable than a negotiated outcome and, therefore, may be reluctant to make concessions during negotiations (Starke and Notz 1981; Farber and Bazerman 1987). Second, headquarters involvement is likely to reduce decentralized managers' perceived responsibility for the negotiation outcome (Magenau 1983; Neale and Bazerman 1983).

Coordination efficiency of internal transfers is likely to decrease because the fundamental attribution error (Ross 1977) may lead headquarters to over-attribute negotiation failure to the managers' unwillingness to agree on a transfer price rather than the unprofitability of the transfer. Further, due to overconfidence, headquarters is likely to discount or ignore information from the negotiation with respect to the profitability of the transfer and to overestimate its own decision-making abilities. As a consequence, headquarters is likely to systematically make inefficient decisions when it becomes involved after negotiation failure.

Consistent with our predictions about the consequences of headquarters involvement, a recent survey finds that division managers' perceived effectiveness of transfer pricing and autonomy are positively associated (Chen, Chen, Pan and Wang 2015). However, as the results are based on a cross-sectional sample and relate to managers' perceptions, it remains unclear whether effectiveness and autonomy are simply artifacts of environmental circumstances or whether autonomy itself leads to more efficiency. Our study predicts and finds the latter.

We test our hypotheses in an experimental setting in which a coordination problem exists. The seller, representing the production division, produces the intermediate good and sells it to the buyer, representing the sales division. The buyer processes the good further and sells the final good externally. A coordination problem exists because transfers are profitable *on average*, but instances exist in which the production costs exceed the final selling price. In these cases, exchange of the good would result in a loss to the firm. Prior to production, buyers and sellers negotiate over the transfer price of the intermediate good that has either no external market or a market that lacks competitive prices.[2] If buyer and seller reach agreement on a transfer price, the transfer takes place at that price. If they fail to reach agreement, headquarters may become involved.

We use a setting that is likely descriptive of coordination problems in corporate practice. Specifically, the coordination problem exists owing to information asymmetries in the firm (e.g., Milgrom and Roberts 1992, Dikolli and Vaysman 2006; Dorestani 2007). Sellers have private information about the production cost of the good while buyers have private information about the price that can be realized when selling the final good externally to the final customer (hereafter, final selling price). Headquarters has less information about both production costs and the final selling price but receives information about the parties' negotiation and offers made therein before it potentially becomes involved. The existence of local, private information is likely to be common in practice (e.g., Dikolli and Vaysman 2006) and can include, for example, knowledge about product design tradeoffs or current and available technologies for the production division and knowledge about customer demand and product market dynamics or additional processing costs for the buying division. In transfer price negotiation settings in practice,

[2] There may be no market due to the intermediate good being sufficiently differentiated from substitutes. It could also be the case that the market may not have a sufficient number of buyers and sellers to have competitively determined prices (Abdel-Khalik and Lusk 1974).

like in our experiment, headquarters likely gathers some additional information about these parameters before becoming involved, particularly about buyers' and sellers' offers in the negotiation. However, this information is likely worse than that of decentralized divisions, implying that some information asymmetries likely persist even after acquiring the additional information (Amershi and Cheng 1990; Holmström and Tirole 1991; Wagenhofer 1994; Dikolli and Vaysman 2006).

Since headquarters' degree of involvement is a continuum in practice, as illustrated by our introductory examples, our experiment uses a nested design in which we compare one end of the continuum in which headquarters involvement is absent (no involvement – *NI*) to two conditions along the continuum in which involvement is present. In the NI condition, headquarters is a passive observer of the negotiation outcome. Nested within headquarters involvement present, we implement two degrees of headquarters involvement along the continuum that we label "weak involvement (*WI*)" and "strong involvement (*SI*)". Under WI, headquarters may suggest a transfer price, but both division managers must accept the suggested transfer price for the transfer to take place. Under SI, headquarters assumes full authority in the event of failed negotiations and determines whether the transfer is made or not and, if so, the price at which divisions must trade.

Consistent with our predictions, we find that headquarters involvement significantly reduces agreement frequency in negotiations, but negotiation agreement does not differ between WI and SI. Moreover, we also find that headquarters involvement significantly reduces coordination efficiency, and the reduction in efficiency is even greater when involvement is strong rather than weak. Additional analyses reveal that headquarters attributes negotiation failure too often to managers' bargaining capabilities rather than the possibility of unprofitable trade, consistent with a fundamental attribution error. Further, even though the additional information headquarters receives about negotiation offers is informative about the profitability of the transfer, due to overconfidence, headquarters does not effectively use this information. As a consequence, under SI, headquarters becomes involved too often and is unable to distinguish between profitable and unprofitable transfers. Under WI, headquarters often makes transfer price suggestions that are not beneficial for *both* divisions, leading to the rejection of profitable transfers.

Our findings have important implications for both theory and practice. From a theoretical perspective, our study contributes to the stream of research investigating frictions in transfer price negotiations and their causes (e.g., Luft and Libby 1997; Kachelmeier and Towry 2002; Arnold et al. 2016). Whereas prior research focuses primarily on *decentralized managers* and effects of their fairness preferences on negotiation failure, we provide evidence about *headquarters'* biased perceptions as a source of coordination inefficiencies. Additionally, we inform theory about the effects of misattribution and overconfidence as an important factor in delegated versus centralized decision making in firms. As organizations do not seem to delegate decisions optimally (e.g., Coats and Rankin 2016; Gallo 2012), it is important to understand the reasons for this phenomenon. By providing evidence for suboptimal central decision-making and its causes in a transfer pricing setting, our study helps to build this stream of research.

From a practical perspective, our study informs organizations about a cost of becoming involved in decentralized transfer price negotiations. If firms organize their activities in a decentralized way and delegate tasks to better informed managers, risks of interference by headquarters include underestimating the value of committing to treating divisions autonomously and overestimating its own decision making abilities (e.g., Wruck and Jensen 1994; Pfeffer, Cialdini, Hanna and Knopoff 1998). This is particularly important when headquarters not only interferes by making suggestions or giving advice, but resumes decision authority for once delegated tasks. Our results suggest that firms could benefit by granting full autonomy to divisions in their decentralized transfer price negotiation. Such a course of action would motivate divisions to acquire and use their private information more efficiently, resulting in greater firm profit.

The remainder of the paper is organized as follows. Section 2 describes the setting, reviews relevant literature and presents our hypotheses. Section 3 describes the experimental design. Section 4 presents the results of the experiment. Section 5 concludes.

2 Hypotheses

Setting

We explore how headquarters involvement affects the frequency of buyer and seller agreement and coordination efficiency of internal transfers defined as the difference between actual and optimal firm profit. Division managers work in an environment where their compensation is based on division profits and where the right to negotiate transfer prices is delegated to them. Rather than negotiating both price and quantity, we simplify the setting by holding quantity constant, so that divisions only negotiate over price. To further simplify the negotiation environment, there is no competitive external market for the intermediate good.

We analyze a coordination problem under information asymmetry as it likely exists in practice (Milgrom and Roberts 1992, Dikolli and Vaysman 2006).[3] The actual production cost of the good is private information of the production division and the final selling price of the good is private information of the sales division. Transfer price negotiations should help managers coordinate on a mutually beneficial price when exchange is profitable and encourage them not to trade the good when the exchange is unprofitable.[4] Headquarters has inferior information about production costs and final selling price than the decentralized divisions (Dejong et al. 1989; Ghosh 2000). We operationalize this asymmetric information as headquarters knowing the *distributions* of production costs and final selling prices but not knowing the *actual* cost or

[3] As we explained above, there are likely to be multiple sources of information asymmetry between divisions and headquarters and between different divisions in practice and buyer and seller are unlikely to be able to communicate their information credibly to headquarters. To increase experimental control, we abstract from such multiple sources and limit information asymmetry to the key variables determining the profitability of the transfer.

[4] In some prior studies on transfer price negotiations, information asymmetry is eliminated for experimental control purposes (e.g., Arnold et al. 2016; Kachelmeier and Towry 2002; Luft and Libby 1997). However, in our study, like in other transfer price experiments, information asymmetry represents a prerequisite for the coordination problem (Ghosh 2000; Chalos and Haka 1990; Dejong et al. 1989).

price before buyer and seller start to negotiate. Prior to becoming involved and making transfer price decisions, headquarters, however, receives information about negotiation offers that likely conveys additional information about the profitability of the transfer. Thus, this information reduces headquarters' information asymmetry about transfer profitability, albeit not fully.[5]

We study three treatments in a nested experimental design in which headquarters involvement in the transfer pricing process is either present or absent. Nested within headquarters involvement present, involvement can be either weak (*WI*) or strong (*SI*). In the case of no headquarters involvement (*NI*), headquarters is a passive observer of the outcome of the negotiation. In the WI condition, when negotiations fail, headquarters may suggest a transfer price. If both managers accept the suggested transfer price, then the good is transferred at that price. If either manager rejects the suggested price, the transfer does not take place. In the SI condition, when negotiations fail, headquarters assumes the decision authority and decides whether to impose a binding transfer price for the sale of the good between divisions.

Headquarters involvement has some similarities to having an arbitrator or mediator whose role is to either suggest or impose an outcome when negotiation fails. Consequently, some behavioral regularities from this research apply in our setting. Headquarters involvement in transfer price negotiations however differs from mediation and arbitration in some important ways. First, arbitration and mediation are typically initiated by the negotiators who also determine the mediator/arbitrator's role and, prior to negotiations, whether her decision will be binding or not (Farber and Bazerman 1987). In contrast, in an organizational setting, headquarters has the authority to decide whether it becomes involved and whether its decisions are binding, and establishes other negotiation parameters. Second, mediators and arbitrators usually have no monetary

[5] As evidenced in the results section, the information from negotiation offers is indeed informative about profitability. We abstract from any direct communication from seller and buyer to headquarters after the negotiation for two main reasons: First, such communication is unlikely to be credible as, otherwise, decentralized transfer price negotiations would not be necessary. Thus, even with such direct communication, headquarters is still unlikely to be informed about the exact costs and price. Second, such additional communication usually leads to rather complex anticipation effects. Thus, excluding such direct communication increases experimental control.

stake in the negotiation outcome while headquarters is the residual claimant of the transfer decision. Finally, while in mediation and arbitration research, negotiation agreement usually either *has* to be found or can only be positive for both parties (e.g., Notz and Starke 1978; Bazerman and Neale 1982; Magenau 1983; Bazerman et al. 1992), the overarching goal of transfer pricing is to achieve coordination, i.e., to make the transfer when it is profitable and to not make the transfer when it is unprofitable (e.g., Hirshleifer 1956).

Hypotheses

Agreement Frequency

There are several reasons why headquarters involvement in the setting of transfer prices may reduce the likelihood that the divisions reach an initial agreement during negotiations. First, if either buyer or seller or both feel that headquarters involvement will result in an outcome that is more favorable than a negotiated outcome, they may make more extreme demands and be more reluctant to make concessions during negotiations (Starke and Notz 1981, Magenau 1983, Farber and Bazerman 1987). Second, when there is a possibility that headquarters will determine the transfer price, managers may feel less responsibility for the final outcome (Bigoness 1976, Notz and Starke 1978, Starke and Notz 1981, Neale and Bazerman 1983). Reduced feelings of responsibility for the outcome of transfer price negotiations are likely to decrease managers' efforts to reach agreement during negotiations. These arguments are consistent with the evidence from studies on arbitration and mediation demonstrating that anticipation of third-party intervention has a "chilling" or "narcotic" effect on the bargaining process (Wirtz 1963, Starke and Notz 1981, Magenau 1983, Neale and Bazerman 1983).

Finally, there is an informational/strategic reason why the anticipation of headquarters involvement may reduce the frequency of initial agreement during negotiations. In the event that headquarters chooses to intervene when negotiations fail, they acquire information regarding the state of the negotiation impasse prior to making a transfer price decision. Hence, making concessions during negotiations is risky in the sense that it provides headquarters information regarding production costs and final selling prices. This may encourage managers to make more extreme initial offers and make fewer concessions during negotiations in an attempt to influence the final transfer price in their favor. These arguments lead to our first hypothesis.

H1a: Headquarters involvement in negotiated transfer pricing reduces the frequency of Initial agreement between divisions during negotiations.

Under both weak and strong headquarters involvement, when making concessions during negotiations, division managers must weigh the costs and benefits of reaching an agreement and failing to reach an agreement. Since headquarters acquires information regarding the state of the negotiation before its decision, offers and counteroffers can be used both as an attempt to reach agreement and as a way to influence a suggested or imposed transfer price if an agreement is not reached. Under WI, a manager can always reject a transfer price that results in a loss. Under SI, it is possible that an imposed transfer price creates a loss for one or both divisions. Compared to WI, this makes failure to reach an agreement riskier under SI. *Ceteris paribus*, this may lead to more agreement during negotiations under SI.

However, it is possible that managers may be more motivated to influence headquarters' choice of transfer prices under SI since headquarters can impose a price that buyers and sellers are unable to reject. This could lead managers to make less concessions during negotiations under SI. For instance, arbitration research shows that when participants agree ex ante to allow an arbitrator to choose an outcome in the event of failed negotiations, negotiators tend to be biased in their views that the arbitrator chooses an outcome in their favor. Extant research demonstrates that such bias leads to less agreement during negotiations (Carnevale and Pruitt 1992).

In summary, some arguments suggest stronger motivations for division managers to reach agreement under SI compared to WI whereas other arguments suggest less willingness to make concessions or accept offers under SI than under WI. Therefore, we leave this issue as an empirical question and state Hypothesis H1b in its null form:

H1b: There is no difference in the frequency of initial agreement under weak headquarters involvement and strong headquarters involvement.

Coordination Efficiency of Transfer Pricing

Next, we argue that headquarters involvement in transfer price negotiations reduces the efficiency of internal transfers. As discussed above, we expect headquarters involvement to reduce the frequency that divisions reach agreement during negotiations. A reduction in the frequency of negotiation agreement and the reliance on headquarters, however, can have negative effects on efficiency because, even after acquiring information from the negotiation, headquarters generally does not possess exact information about the current costs and prices (Milgrom and Roberts 1992, Dikolli and Vaysman 2006; Dorestani 2007; Zimmerman 2014). Thus, headquarters' suggested or imposed transfer prices are unlikely to consistently maximize firm profit. Under SI, headquarters could require the transfer of unprofitable goods or prevent the transfer of profitable goods. Under WI, unprofitable transfers may be avoided, but if the suggested transfer price results in either division incurring a loss, it will be rejected regardless of whether it is profitable for the firm. This reduces efficiency when the transfer would result in a profit for the firm.

Headquarters' biased assessment of the negotiation outcome is likely to exacerbate this negative effect of information asymmetry in two ways: First, when negotiation fails, headquarters does not know if the failure is due to the cost exceeding the price or if it is attributable to the managers' bargaining behavior. Prior research indicates that in such a case, individuals are prone to a "fundamental attribution error" (Ross 1977) as they tend to over-attribute others' actions to their dispositions rather than situational constraints (e.g., Dunning, Griffin, Milojkovic and Ross 1990). Similarly, in negotiations, individuals tend to overestimate others' tendency to use devious tactics and strategies (Ross and Ward 1995). As a consequence, headquarters likely underestimates managers' willingness to reach an agreement and likely over-attributes negotiation failure to the managers' bargaining tactics. Therefore, it becomes involved too often.

Second, individuals generally exhibit overconfidence and tend to overestimate their abilities (e.g., Moore and Healy 2008).[6] Headquarters' overconfidence in their ability to make profitable transfer price decisions may further foster their involvement in the negotiations (e.g., Billett and Qian 2008; Malmendier and Tate 2005). Moreover, it will likely lead headquarters to discount information from the negotiation and overweigh their own initial judgments when making transfer price decisions (e.g., See, Morrison, Rothman and Soll 2011; Block and Harper 1991). These arguments suggest that information asymmetries paired with headquarters' cognitive biases are likely to lead to inefficient transfer prices and transfer decisions and, consequently, decrease the coordination efficiency of transfer price negotiations. We state this prediction formally as H2a:

H2a: Headquarters involvement in negotiated transfer pricing reduces the coordination efficiency of internal transfers.

It is, however, unclear whether this effect is stronger under weak or under strong involvement. If headquarters decides to make an unprofitable transfer under strong involvement, division managers cannot reject this transfer, therefore increasing inefficiency relative to weak involvement. Alternatively, in contrast to weak involvement, profitable transfers cannot fail under strong involvement because the suggested transfer price results in a loss for one of the divisions or because one of the division managers perceives the transfer price as unfair. If this effect prevails, coordination efficiency would be greater under strong involvement. Consequently, we state H2b as a null hypothesis:

H2b: There is no difference in the coordination efficiency of internal transfers under weak headquarters involvement and strong headquarters involvement.

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[6] Studies in economics and psychology show that people tend to be overconfident in their beliefs and judgements in a variety of contexts (Russo and Schoemaker 1992, Camerer and Lovallo 1999) leading DeBondt and Thaler (1995) to state that, "Perhaps the most robust finding in the psychology of judgment is that people are overconfident."

3 Method

Overview and Design

The experimental task involves a production manager (seller), a sales manager (buyer) and headquarters.[7] Buyer-seller dyads negotiate over the price of an intermediate good prior to production.[8] If agreement is reached, the seller transfers the good to the buyer who sells it externally to the final customer. If buyers and sellers do not reach agreement, headquarters may become involved in the transfer of the good. The experimental setting reflects a coordination problem: Because production costs can vary between 1 and 500 and the final selling price can vary between 100 and 600, the transfer of the good can either be profitable (if final selling price ≥ production costs) or non-profitable (if final selling price < production costs).

We use a nested experimental design in which we vary headquarters involvement in the transfer pricing process—present versus absent. Nested within headquarters involvement present, we manipulate the degree of headquarters involvement—weak involvement (*WI*) versus strong involvement (*SI*). This design results in three experimental conditions depicted in Figure 1. A third (within participants) factor is period, as the experiment lasts six periods.

Figure 1: Experimental Design and Number of Participants

Headquarters involvement absent (*NI*)	**Headquarters involvement present**	
	Weak involvement (*WI*)	Strong involvement (*SI*)
n = 54	n = 54	n = 54

Note: n = number of participants.

Each period, buyer and seller are re-matched such that they are not matched with the same counterpart more than once. Headquarters is also randomly re-matched to buyer and seller dy-

[7] We obtained all permission to conduct this behavior research from the University's Institutional Review Board.
[8] In the experiment, the terms *sales manager* and *production manager* were used. For consistent exposition, we will continue to use the labels buyers and sellers.

ads. Participants are informed of this procedure. Our primary dependent variables are the frequency of negotiation agreement (H1a and H1b) and the coordination efficiency of internal transfers (H2a and H2b).

In the headquarters involvement absent (*NI*) condition, while there is an experimental participant in the role of headquarters, headquarters is not permitted to take any action. Thus, in this condition, headquarters does not influence the negotiation or the transfer of the good between the two managers. In contrast, in the two headquarters involvement present conditions, headquarters can decide to take actions when negotiations have failed. On the continuum of headquarters involvement that likely exists in practice, the two conditions represent two different degrees of the bindingness of the involvement. In the WI condition, when headquarters is informed of failed negotiations, it may suggest a transfer price to the two managers. The suggested price can be any whole number between the minimum production cost ($1) and the maximum final selling price ($600). If both managers accept the suggested transfer price, the good is transferred at that price. If either manager rejects the suggested price, the transfer does not take place. Note that headquarters is *not required* to suggest a transfer price. In the SI condition, after negotiation failure, headquarters assumes decision authority and determines whether the transfer is made or not and, if so, the price at which divisions must trade. As in the WI condition, headquarters is free to decide about becoming involved and is not required to do so.

We did not require headquarters to suggest or set a transfer price in the SI and WI conditions in order to enable the same solution in the SI and WI conditions as in the NI condition. In the NI condition, buyer and seller always have an incentive to agree on a mutually beneficial transfer price when trade is efficient because it increases buyer and seller profit and not to trade the good when trade is inefficient because it would decrease buyer and seller profit. If managers expect headquarters to not become involved in the SI and WI conditions, the situation for buyer and seller would be identical to the NI condition and, consequently, they would have incentives to always reach agreement when the transfer of the good is profitable. However, as outlined above, headquarters is unlikely to abstain from becoming involved once the negotiation fails.

We employ a setting that likely reflects information structures underlying coordination problems in corporate practice. The coordination problem arises due to information asymmetries that are generic to intra-firm relations. We operationalize information asymmetry as follows: Prior to negotiations, the seller learns the actual cost and the buyer learns the actual selling price. To minimize carry-over effects between periods, we also keep up the information asymmetry with respect to the actual cost and price after the negotiation. Headquarters learns about the actual firm profit in the case of agreement, but never learns the actual cost or actual selling price. This operationalization reflects that in practice, asymmetric information exists both between different decentralized units and between decentralized units and headquarters and that factors like, e.g., noise and earnings management usually prevent other parties from inferring the exact information ex post (Milgrom and Roberts 1992, Dikolli and Vaysman 2006; Dorestani 2007).

The information headquarters receives regarding the negotiations between buyer and seller is the same in all three conditions and was common knowledge among buyers, sellers and headquarters prior to any negotiations. When the negotiation succeeds, headquarters is informed of the agreed upon transfer price and that the good is transferred. When the negotiation fails, headquarters acquires additional information about buyer and seller offers from the negotiation, as it is likely the case in practice as well. We operationalize the information acquisition by informing headquarters of the last offer each manager made in the course of the negotiation. Providing information only about the *last* offers to headquarters instead of the history of negotiations reduces complexity for headquarters and, thus, increases experimental control.[9] However, as described below, we simultaneously ensure that sellers and buyers cannot change their offers strategically at the end of the negotiation. Headquarters would have also been informed if either the buyer or seller had not made any offer, but there is no such case in the experiment. This

[9] The availability of only partial information about the negotiation is also likely to have external validity, as it is unlikely that headquarters follows all decentralized transfer price negotiations very closely in practice.

information about final buyer and seller offers carries additional information about the profitability of the transfer, as we will demonstrate in the results section. Thus, it reduces headquartes' information asymmetry about the profitability of the transfer before its decision, albeit not fully.

We did not implement any direct communication from buyer or seller to headquarters after failed negotiations for two main reasons: First, such communication is unlikely to be credible. Frictions that make credible communication infeasible include, for example, headquarters' difficulty in observing or verifying predictions of final selling prices or production costs. Even at the end of a period, due to noise and incentives for buyer and seller to strategically allocate costs in their divisions, headquarters is unlikely to be able to observe or infer the true relevant costs and selling price predictions. Second, such additional communication usually leads to rather complex anticipation effects and potential costs. Thus, excluding direct communication increases experimental control. Together, like the information structure we implemented, any direct communication would only partially reduce headquarters' information asymmetry before making the decision but simultaneously would make the setting much more complex.

Experimental task

Each period, buyers and sellers have three minutes (180 seconds) to negotiate the transfer price for a good. Either manager can break off the negotiation at any time. We do not include any monetary negotiation costs for the participants. This design feature represents a conservative design choice with respect to negotiation break offs and negotiation failures.

Each period, negotiation starts with the buyer making the first offer. The buyer's first offer can be any amount from the minimum production cost of 1 to the maximum final selling price of 600. The seller can either accept the initial offer or make any counteroffer between 1 and 600. Until an offer is accepted or a manager ends the negotiation process, negotiations proceed with the two managers making alternating offers. Importantly, when making a new offer, the buyer is not allowed to make an offer that is less than his previous offer. Likewise, when the seller makes a new offer, it cannot be greater than her previous offer. We implement this design choice because, as explained above, buyers and sellers know that headquarters receives information about buyers' and sellers' last offers in the negotiation and they should not be able to strategically change their offers towards the end of the negotiation. However, either manager can always make the *same* offer as the previous offer. Similarly, either manager can end the negotiation at any time. Managers are not required to make an initial offer if they choose not to negotiate. Participants' computer screens include a timer so that they can track the time remaining for negotiations.

The cost of the intermediate good is uniformly distributed on $\{1, 2, \ldots, 500\}$ and the selling price of the final good is uniformly distributed on $\{100, 101, \ldots, 600\}$. Cost and price *distributions* are common information to buyers, sellers and headquarters. From these distributions, the theoretical frequency of a profitable transfer is 68 percent.[10] Participants are informed that the firm wants managers to make decisions resulting in maximum profit for the firm and that, as an incentive to do so, division managers are paid based on their division profits and headquarters is paid based on firm profit.

At the end of the period, the computer displays whether the transfer is made or not. If the transfer is made, the computer also displays to all participants the transfer price. Regardless of the outcome, the division managers are informed about their respective division profits and the headquarters' manager is informed about the firm profit. Then the next period begins.

Compensation

In every period, buyers, sellers and headquarters receive a fixed wage of 30 points. Additionally, buyers and sellers receive 20 percent of their respective division profits and headquarters receives 10 percent of the firm's profit. Buyers' and sellers' share in their respective

[10] Prior to the experimental sessions, we randomly generated six sequences of six costs (one for each period) for the sellers and six sequences of six prices (one for each period) for the buyers. To facilitate comparisons across conditions, the same six cost and six price sequences are used in each session. The mean cost across all six periods was 245.11 and the mean price was 354.61. The actual frequency of profitable transfers in the experiment is 69.4 percent.

division profits are twice as high as headquarters' share in the firm profit because on average, division profit equals half of the firm profit. Division profits and firm profit are determined by whether the transfer is made, and if so, the negotiated transfer price. So, when the intermediate good is transferred, payoffs are summarized as follows:

Buyer's compensation = 30 + 20% × (Final Selling Price – Transfer Price)
Seller's compensation = 30 + 20% × (Transfer Price – Production Cost)
Headquarters' compensation = 30 + 10% × (Final Selling Price – Production Cost)

If the transfer does not take place, both division profits and firm profit equal zero and each manager receives only the fixed wage of 30 points. The compensation of all parties was common knowledge to participants. To guarantee independence of the periods and to avoid wealth effects, one period in the experiment was randomly selected as the payment period. In case the division or firm profit is negative, the negative variable part of the compensation is deducted from the fixed wage of 30 but the maximum loss is restricted to 30. Participants' cash earnings are determined by converting their experimental points from the randomly selected period into cash at the rate of $0.50 per point. Participants are also paid a $5 participation fee. On average, they earned $25 from the experiment.[11]

Participants and Procedures

A total of 162 undergraduate students from a large public US university participated in the experiment. We conducted three sessions for each condition with 18 participants in each session. Each student participated in only one session. The mean age of the participants is 20.4 years and 46 percent of participants are female.

At the start of each session, participants were provided with written instructions and were informed of their randomly assigned role as buyer, seller or headquarters. Instructions were

[11] The fixed wage and the participation fee were intended, in part, to mitigate the chance of negative earnings. Given the experimental parameters, it was still possible for participants to have negative earnings. We observe only 7 out of 972 cases in which participants had negative earnings periods.

read aloud by one of the experimenters. To ensure that all participants understood the experiment, they were required to complete a pre-experiment quiz, and the experiment did not begin until all of them had answered all questions correctly. Then, the six periods of the experiment started. As explained above, buyers, sellers and headquarters were randomly re-matched each period. Participants were separated by partitions and interacted anonymously through a computer network. The experiment was programmed with z-tree software (Fischbacher 2007). At the conclusion of the six periods, participants completed a post-experiment questionnaire. They received their cash payments and were dismissed. Experimental sessions lasted approximately 80 minutes.

Measures

Our primary dependent variable to test H1a and H1b is the frequency of agreement, FREQAGREE, between buyer and seller. FREQAGREE is an indicator variable that is equal to 1 when the two parties reach agreement during the negotiation and 0 when negotiations fail.

Our dependent variable for H2a and H2b is the efficiency of internal transfers made in the firm. We use two measures to capture our theoretical construct. First, we use the frequency of efficient internal transfers, FREQEFF. FREQEFF is an indicator variable equal to 1 when the transfer decision is efficient and equal to 0 when the transfer decision is inefficient. The decision is efficient when it results in a profitable trade (final selling price ≥ production cost) and when it results in avoiding an unprofitable trade (final selling price < production cost). The transfer decision is inefficient when an unprofitable transfer is made and a profitable trade is not made.

Additionally, we analyze the efficiency loss to the firm, EFFLOSS. EFFLOSS measures the difference between actual and optimal firm profit. That means, EFFLOSS is equal to zero when the transfer decision is efficient. In contrast, when the transfer would be profitable but no transfer is made, EFFLOSS equals the value of the internal trade (final selling price – production costs) as this profit was not realized. Similarly, if the transfer is unprofitable but was made, EFFLOSS equals the loss for the firm implied by this transfer (production costs – final selling price). Thus, EFFLOSS also captures the magnitude of inefficient transfer decisions.

To understand why headquarters involvement may decrease the efficiency of internal transfers, it is also important to understand how headquarters react in the case of negotiation failure and how successful they are in their decisions. Thus, for the two involvement conditions, we calculate the frequency with which headquarters becomes involved after negotiation failure, FREQINVOLVE. Additionally, to measure the efficiency of involvement, we also calculate the frequencies of transfers after negotiation failure both in the case of *profitable* transfers (FREQTRANS_VAL) and in the case on *non-profitable* transfers (FREQTRANS_NONVAL).

4 Results

Descriptive Statistics

Panel A of Table 1 reports descriptive statistics for our primary dependent variables. First, it shows that the buyers and sellers reach agreement less often when headquarters is potentially involved in the negotiation. The frequency of agreement, FREQAGREE, decreases from 67.59 percent in the no headquarters involvement condition to 47.22 percent in the headquarters involvement present conditions, consistent with less agreement under headquarters involvement predicted in H1a. Additionally, Table 1 shows that within headquarters involvement present conditions, the differences in FREQAGREE between the WI and the SI conditions are small (WI: 50.00 percent vs. SI: 44.44 percent). Obviously, the degree of headquarters involvement does not seem to strongly affect agreement in transfer price negotiations. Consequently, the null hypothesis H1b is unlikely to be rejected.

Table 1: Mean, *Standard Deviation* and (Number of Observations) for Key Measures of the Experiment

	Headquarters involvement absent (*NI*)	**Headquarters involvement present**		
		Total involvement	Weak involvement (*WI*)	Strong involvement (*SI*)
Panel A: Agreement and Efficiency Measures				
FREQAGREE	**.6759**	**.4722**	.5000	.4444
	.4702	***.5004***	*.5023*	*.4992*
	(108)	**(216)**	(108)	(108)
FREQEFF	**.8519**	**.7407**	.7963	.6852
	.3569	***.4392***	*.4046*	*.4666*
	(108)	**(216)**	(108)	(108)
EFFLOSS	**18.01**	**34.48**	25.07	43.89
	53.65	***69.85***	*60.64*	*77.12*
	(108)	**(216)**	(108)	(108)
Panel B: Headquarters involvement after negotiation failure				
FREQINVOLVE	**N/A**	**.7895**	.9814	.6167
	N/A	***.4095***	*.1361*	*.4903*
	N/A	**(114)**	(54)	(60)
FREQTRANS_VAL	**N/A**	**.5517**	.5000	.6000
	N/A	***.5017***	*.5092*	*.4983*
	N/A	**(58)**	(28)	(30)
FREQTRANS_NONVAL	**N/A**	**.3571**	.0385	.6333
	N/A	***.4835***	*.1961*	*.4901*
	N/A	**(56)**	(26)	(30)

Notes: Every cell displays the mean, *standard deviation* and (number of observations) for the corresponding measure.

FREQAGREE is the frequency of negotiation agreement.

FREQEFF is the frequency of efficient internal transfers. A transfer decision is efficient when the transfer was made in the case of a profitable transfer (final selling price ≥ production cost) or when the transfer was *not* made in the case of a *non*-profitable transfer (final selling price < production cost).

EFFLOSS measures by how much the current firm profit deviates from the optimal firm profit.

FREQINVOLVE is the frequency of headquarters involvement after negotiation failure.

FREQTRANS_VAL is the frequency of transfers after negotiation failure in the case of profitable transfers.

FREQTRANS_NONVAL is the frequency of transfers after negotiation failure in the case of non-profitable transfers.

Turning to the coordination efficiency of internal transfers, Table 1 shows that, consistent with H2a, efficiency decreases in the headquarters involvement present conditions. The frequency of efficient coordination, FREQEFF, decreases from 85.19 percent when involvement is absent to 74.07 percent when headquarters involvement is present. Further, mean efficiency loss, EFFLOSS, increases from 18.01 with no headquarters involvement is to 34.48 when involvement is present. These findings provide evidence in favor of H2a.

When comparing coordination efficiency in the two headquarters involvement present conditions, Table 1 shows that efficiency is lower when headquarters involvement is strong than when it is weak. First, FREQEFF decreases from 79.63 percent when involvement is weak (WI) to 68.52 percent when involvement is strong (SI). Second, EFFLOSS increases from 25.07 in the WI condition to 43.89 in the SI condition. Both findings contradict the null hypothesis H2b.

Panel B of Table 1 also provides initial evidence about the sources of inefficiencies in the headquarters involvement present conditions. First, it shows that headquarters becomes involved and makes transfer price suggestions in the majority of the cases after negotiation failure. In the WI condition, headquarters makes a transfer price suggestion in all but one case (FREQINVOLVE = 98.14 percent). In the SI condition, it determines a transfer price (combined with a transfer of the good) in 61.67 percent of the cases. This finding is consistent with our underlying reasoning for H1a that headquarters is unlikely to abstain from becoming involved in the case of negotiation failure. Panel B also provides evidence of the reasons why efficiency is lower in the SI than in the WI condition. While in the case of *profitable* transfers, the frequency of transfers in both conditions is similar (FREQTRANS_VAL, WI = 50.00 percent vs. SI = 60.00 percent) the frequency of transfers is much lower in the WI than in the SI condition when transfers are *unprofitable* (FREQTRANS_NONVAL, WI = 3.85 percent vs. SI = 63.33 percent). Thus, in the SI condition, headquarters seems to overestimate their decision quality in the cases of negotiation failure but—as illustrated by similar values for FREQTRANS_VAL (60.00 percent) and FREQTRANS_NONVAL (63.33 percent)—are in fact unable to distinguish between profitable and unprofitable transfers. In contrast, in the WI condition, headquarters involvement is less risky as buyer and seller can still reject the suggested transfer price. But, simultaneously, when negotiation fails, transfers that would be profitable for the firm occur with a frequency of only 50 percent (FREQEFF_VAL = 50 percent), indicating problems of making mutually beneficial transfer price suggestions.

Hypotheses Tests

For our hypotheses tests, we use mean observations per participant over all periods. That is, instead of treating multiple observations per participant as independent observations, we calculate means for the relevant variables for each participant and use this observation. This procedure yields 18 observations per condition.

H1a predicts that agreement frequency is lower when headquarters can become involved. H1b is stated in its null form and predicts no effect of the degree of headquarters involvement on agreement frequency. As we implemented a nested design, we test H1a and H1b jointly in a nested ANOVA. The dependent variable is FREQAGREE. The independent variables are involvement and strong involvement nested in involvement. The results are reported in Panel A of Table 2.

As displayed in Panel A of Table 2, the effect of headquarters involvement on the frequency of negotiation agreement, FREQAGREE, is significantly negative ($F = 17.27$, $p < 0.001$, two-tailed). This result supports H1a. In contrast, the table also shows that the degree of involvement (weak or strong) does not have a significant effect on FREQAGREE ($F = 0.96$, $p = 0.331$, two-tailed). Thus, we are unable to reject H1b. These results suggest that the main driver of negotiation failure in transfer price negotiations is headquarters involvement per se, but the degree of headquarters involvement only seems to have minor effects.

Table 2: Effects of Headquarters Involvement on the Frequency of Agreement, the Frequency of Efficient Trade and the Efficiency Loss

Panel A: FREQAGREE[a]	*df*	*MS*	*F*	*p*
Involvement	1	0.4979	17.27	<0.001***
Strong involvement │ Involvement	1	0.0278	0.96	0.331
Error	51	0.0288		

Panel B: FREQEFF[b]	*df*	*MS*	*F*	*p*
Involvement	1	0.1481	7.42	0.009***
Strong involvement │ Involvement	1	0.1111	5.56	0.022**
Error	51	0.0200		

Panel C: EFFLOSS[c]	*df*	*MS*	*F*	*p*
Involvement	1	3256.01	4.78	0.033**
Strong involvement │ Involvement	1	3185.98	4.68	0.035**
Error	51	680.66		

Notes: The table displays results of a nested ANOVA using mean observations over all periods as the unit of observation. All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

[a]FREQAGREE is the frequency of negotiation agreement.

[b]FREQEFF is the frequency of efficient internal transfers. A transfer decision is efficient when the transfer was made in the case of a profitable transfer (final selling price ≥ production cost) or when the transfer was *not* made in the case of a *non*-profitable transfer (final selling price < production cost).

[c]EFFLOSS measures by how much the current firm profit deviates from the optimal firm profit.

H2a predicts that the coordination efficiency of internal transfers decreases with headquarters involvement. H2b is stated in its null form and predicts no difference in efficiency between strong and weak involvement. We test our hypotheses in two nested ANOVAs using the frequency of efficient trades, FREQEFF, and the efficiency loss, EFFLOSS, as the two alternative dependent variables to measure the (in-)efficiency of negotiation outcomes. Again, the factors are involvement and strong involvement nested in involvement. The results are reported in Panels B (FREQEFF) and C (EFFLOSS) of Table 2.

As reported in Panel B of Table 2, the effect of headquarters involvement on the frequency of efficient trades, FREQEFF, is significant ($F = 7.42$, $p = 0.009$, two-tailed). Additionally, the effect under SI is significantly stronger than under WI ($F = 5.56$, $p = 0.022$, two-tailed).

Similarly, Panel C reports that the effect of headquarters involvement on the efficiency loss, EFFLOSS, is significant ($F = 4.78$, $p = 0.033$, two-tailed) and that the effect on EFFLOSS is again stronger under SI than under WI ($F = 4.68$, $p = 0.035$, two-tailed). These results support H2a. Moreover, we reject the null hypothesis H2b in favor of a significantly negative effect of strong versus weak headquarters involvement on the coordination efficiency of internal transfers.[12]

Supplemental Analyses

Responsibility for Negotiation Result

In the development of H1a and H1b, we argued that headquarters involvement is likely to decrease managers' perceived responsibility for the negotiation outcome. The post-experiment questionnaire asked participants how responsible they felt with respect to (i) negotiation agreement and (ii) the transfer of the good (on a 7-point Likert scale from 1 (not at all) to 7 (very much)). Results show that perceived responsibility is significantly lower when headquarters involvement is present than when it is absent (negotiation agreement: 4.74 vs. 5.44, Wilcoxon, $p = 0.009$; transfer of the good: 4.56 vs. 5.11, Wilcoxon, $p = 0.026$, both one-tailed). In contrast, perceived responsibility is not significantly different between the WI and SI conditions (negotiation agreement: 4.86 vs. 4.61, Wilcoxon, $p = 0.552$; transfer of the good: 4.64 vs. 4.47, Wilcoxon, $p = 0.678$). These results provide evidence for the theory underlying H1a and H1b and are consistent with our findings on FREQAGREE in the tests of H1a and H1b.

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[12] To test the robustness of our results, we also conducted regression analyses (EFFLOSS: Tobit regression, FREQAGREE and FREQEFF: Logit regressions) using disaggregated data rather than mean observations per participant. To control for multiple observations within participant we cluster the standard errors on the participant level. We also include a period variable to control for time effects. All statistical inferences with respect to our hypotheses tests remain the same. Additionally, we find a significantly positive time effect on negotiation efficiency. As the effect seems to be driven by low efficiency in period 1, we remove this period and rerun the regressions. This removes any significant time effect but, again, all statistical inferences regarding our hypotheses remain the same.

Headquarters' Weak Involvement and its Success

In the theory development, we argued that, due to overconfidence and misattribution, headquarters is likely to make systematically incorrect decisions about involvement and suggested transfer prices. We will first examine this conjecture for weak involvement. As reported above, we find that in the WI condition, the frequency of headquarters involvement after negotiation failure (FREQINVOLVE) is 98 percent which is significantly higher than the frequency of profitable projects in the case of negotiation failure (52 percent, $\chi^2 = 46.07$, $p < 0.001$). However, as buyer and seller can still reject the transfer price suggestion, involvement is not very risky in this condition. In fact, when the transfer is *unprofitable*, the transfer is made in only one out of 26 cases (FREQTRANS_NONVAL = 0.0385) in this condition.

Analyzing the frequency of efficient transfers after negotiation failure when the transfer would be *profitable* for the firm (FREQTRANS_VAL), however, reveals that headquarters involvement in the WI condition is also not without costs. FREQTRANS_VAL only amounts to 50 percent, half of the optimum frequency of 100 percent. This low frequency is due to headquarters' inability to suggest transfer prices that are mutually beneficial. Specifically, when the project is profitable for the firm, headquarters' suggested transfer price is *not* beneficial for buyer or seller in 46.43 percent of the cases, and consequently, the good is not transferred.

To provide direct evidence for our conjecture that headquarters' overconfidence inhibits successful involvement, we construct a measure of overconfidence based on prior literature (e.g., Gloede and Menkhoff 2014; Oberlechner and Osner 2012). On the post-experiment questionnaire, we ask subjects to estimate their rank (from 1 to 18) if we ranked all participants in the session with respect to average points in all periods. Our overconfidence measure for each participant is the difference between his/her actual rank and the rank that he/she estimated. If participants are perfectly calibrated, i.e., neither over- nor under confident, this measure equals zero. If they indicate a better than their actual rank, this measure is positive, reflecting overconfidence, and the more positive this measure, the higher is participants' overconfidence about their ability to make good judgments and decisions in the experiment (Dunning, Meyerowitz and Holzberg 1989). Consistent with prior evidence (e.g., Glaser and Weber 2007), participants exhibit a moderate, but significant level of overconfidence on average (1.33 > 0, t = 2.78, p = 0.006, two-tailed). Headquarters' overconfidence is, on average, not significantly different from managers' overconfidence (1.36 vs. 1.30, t = 0.06, p = 0.953), suggesting that headquarters' role alone did not lead them to overestimate their ranks more than the decentralized managers.[13]

As prior research provides evidence that overconfidence can negatively influence decision quality due to biased information processing (e.g., Zacharakis and Shepherd 2001), we now explore whether more overconfident headquarters made worse transfer price suggestions. In a probit regression, we regress an indicator variable that is equal to one when the transfer price suggestion is beneficial to *both* buyer *and* seller and zero otherwise on our overconfidence measure. Additionally, we include the potential profit of the project (final selling price minus production costs) as a control variable to exclude the possibility that our findings are driven by a higher proportion of less profitable projects for more overconfident headquarters. (Untabulated) results show that the likelihood of mutually beneficial transfer price suggestions in the *WI* condition decreases in headquarters' overconfidence (β = -0.182, p = 0.003, one-tailed).

This difficulty for headquarters in suggesting a mutually beneficial transfer price also becomes apparent when comparing the coordination efficiency of profitable transfers between the NI condition and the WI condition. Even though involvement is intended to realize profitable transfers when negotiating parties cannot agree, testing the differences in efficiency measures in a regression analysis shows that efficiency is *lower* for both measures in the WI condition than in the NI condition and significantly so for FREQEFF (FREQEFF: β = -0.30, p

[13] Note that differences between the groups cannot be due to estimated differences in general payoff between the groups because headquarters earned 10 percent of the firm profit (the sum of both division profit) whereas decentralized managers earned 20 percent of their respective division profit.

= 0.092, one-tailed; EFFLOSS: $\beta = 63.33$, $p = 0.134$, one-tailed). When splitting the transfers along the median into high and low profit transfers and re-running the regression analysis separately, we find (results untabulated) that efficiency is significantly lower in the WI condition than in the NI condition for low profit transfers (FREQEFF: $\beta = -0.40$, $p = 0.071$, one-tailed; EFFLOSS: $\beta = 54.51$, $p = 0.068$, one-tailed), but not significantly different for high profit transfers (FREQEFF: $\beta = -0.29$, $p = 0.262$, one-tailed; EFFLOSS: $\beta = 93.09$, $p = 0.318$, one-tailed). Clearly, the smaller the potential profit (the closer cost is to price), the more difficult it is for headquarters to suggest transfer prices that are mutually beneficial.

Headquarters' Strong Involvement and its Success

In this section, we explore the reasons for larger inefficiencies under SI than under WI. In the theory development, we argued that in the case of a profitable project, strong involvement could improve efficiency because it avoids the risk that headquarters makes transfer price suggestions that are not mutually beneficial. In the case of unprofitable projects, however, strong involvement would lead to less efficiency as the decentralized manager could no longer reject it.

Our data are consistent with these conjectures but illustrate that the latter effect is much larger than the former, making strong involvement less efficient. When the transfer is *unprofitable*, the transfer is made in only one out of 26 cases in the WI condition but in 19 out of 30 cases in the SI condition (FREQTRANS_NONVAL: 0.04 vs. 0.63, $\chi^2 = 21.47$, $p < 0.001$). Moreover, EFFLOSS is much larger in this case in the SI than in the WI condition (80.73 vs. 4.50, $t = 4.79$, $p < 0.001$). In contrast, when the transfer is *profitable*, differences between the two conditions are small. The transfer is made in 14 of 28 cases in the WI condition but in 18 out of 30 cases in the SI condition (FREQTRANS_VAL: 0.50 vs. 0.60). This difference is directionally consistent with higher efficiency in the SI condition when projects are profitable but not significant ($\chi^2 = 0.59$, $p = 0.444$). Likewise, EFFLOSS, is not significantly different between the two conditions in this case (66.00 vs. 65.11, t = 0.035, p = 0.972). Thus, under strong involvement, headquarters suffer more from bad decisions when projects are unprofitable but do not benefit from increased decision authority when projects are profitable.

In our theory development, we also argued that headquarters likely attributes negotiation failure to incorrect causes and, due to overconfidence, discounts or ignores information from the negotiation, leading to inefficient transfer decisions. In fact, in the SI condition, headquarters becomes more frequently involved after negotiation failure than the transfer would be profitable (0.62 vs. 0.50, χ^2 = 1.66, p = 0.099). This result suggests systematic misattribution of negotiation failure to buyers' and sellers' disposition rather than the situation (unprofitability of the project). The result that involvement is slightly *less* when transfers are profitable (FREQTRANS_VAL = 0.60) than when they are unprofitable (FREQTRANS_NONVAL = 0.63) further illustrates headquarters' difficulties in making transfer decisions. To further support our theory, we now investigate whether the additional information headquarters receives from buyer's and seller's negotiation offers is informative about the profitability of the transfer, whether headquarters reacted to this information and how headquarters' overconfidence is related to this reaction.

First, we analyze whether the likelihood of a profitable transfer increases as the difference between the final seller and buyer offers narrows. We regress an indicator variable VALUE (equal to 1 when the transfer is profitable and 0 when the transfer is unprofitable) on the difference between the last seller and buyer offers. We use a probit model and include period fixed effects to control for time effects. We cluster standard errors to account for multiple observations within participant. The results are included in Table 3 (Model 1). As reported in the table, we find a significantly negative effect of the difference between the last seller and buyer offers on VALUE (β = -0.0058, p = 0.001, two-tailed). Thus, the smaller the distance between the last offers, the greater was the likelihood of a profitable transfer, illustrating the informativeness of headquarters' information about the negotiation offers.

Table 3: Information Content of Final Seller and Buyer Offers and Headquarters' Use of it under Strong Involvement (SI)

Coefficient (Robust standard error)	**Model 1 VALUE (0/1)**	**Model 2 INVOLVE (0/1)**	**Model 3 INVOLVE (0/1)**
Constant	1.0080 (0.3402)***	0.5948 (0.3728)	0.6224 (0.3572)*
Difference between last buyer and seller offers	-0.0057 (0.0012)***	-0.0008 (0.0015)	-0.0006 (0.0013)
Overconfidence			-0.0695 (0.0665)
Difference between last buyer and seller offers *Overconfidence			0.0006 (0.0003)**
Period fixed effects	*Included*	*Included*	*Included*
Pseudo R^2	0.1974	0.0329	0.0974
N	60	60	60

Notes: N indicates the number of observations. The probit regressions use only observations from the strong involvement (SI) condition in which negotiations failed. The regressions use standard errors clustered at the participant level to control for multiple observations within participant and include period fixed effects to control for time effects (not reported). p-values are one-tailed for directional predictions and two-tailed otherwise.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

VALUE is an indicator variable equal to 1 when the transfer is profitable and 0 when the transfer is non-profitable.

INVOLVE is an indicator variable equal to 1 when headquarters decided to become involved after negotiation failure and 0 when it decided not to become involved.

Difference between last buyer and seller offers is the difference between the final offers made by buyer and seller during the negotiation in case the negotiation failed.

Overconfidence equals a headquarters' actual rank in the session with respect to the average number of points in all periods less his/her estimated rank in the session.

Second, we investigate whether headquarters included this information into their decision to become involved and to make the transfer in the SI condition. Under strong involvement, the decision to become involved is equivalent to transferring the good and, thus, should only occur when the project is profitable. We test whether headquarters' likelihood to become involved also decreases when the distance in final offers increases—as the first regression about the relation between VALUE and this distance would suggest. Therefore, we regress an indicator variable INVOLVE (equal to 1 when headquarters became involved after negotiation failure and 0 when it did not become involved) on the difference between the last offers. Results are included in Table 3 (Model 2). As shown in the table, we do not find any significant relationship between the two variables (β = -0.0008, p = 0.568, two-tailed). Thus, headquarters did *not* effectively include the information from the negotiation offers into their decisions about the transfer.

Finally, we explore how headquarters' overconfidence determines the use of information and its decision to become involved. We regress INVOLVE on the distance between the final offers, headquarters' overconfidence and the interaction of both variables. We expect more overconfident headquarters to make less use of information from the negotiation and, thus, to react less negatively to the increasing distance in final offers. Model (3) of Table 3 shows that, as expected, the interaction between both variables is significantly positive (β = 0.0006, p = 0.018, one-tailed), reflecting less negative (or more positive) reactions to the distance in final offers when headquarters are more overconfident. For example, when the overconfidence measure becomes negative (e.g., -6), the reaction becomes significantly negative (-0.006 - 6 × 0.006 = -0.0042, χ^2 = 2.70, p = 0.050, one-tailed). Vice versa, when the overconfidence measure becomes positive (e.g., +6), headquarters' reaction to the distance in final offers becomes even significantly *positive* (-0.006 + 6 × 0.006 = 0.0030, χ^2 = 3.05, p = 0.040, one-tailed). Thus, highly overconfident headquarters not only use the signal less but even use it in the wrong direction.

We now also test whether, as a consequence, coordination efficiency decreases in overconfidence. Therefore, in the cases of negotiation failure, we regress FREQEFF and EFFLOSS on our overconfidence measure and the potential project profit to control for differences in transfer values. For both measures, we find a significantly negative effect of overconfidence on efficiency (FREQEFF: β = -0.0945, p = 0.016, one-tailed; EFFLOSS: β = 8.54, p = 0.073, one-tailed). Together, these results provide evidence for our underlying theory.

5 Conclusion

Our study investigates how headquarters involvement affects the efficient coordination of internal transfers in decentralized transfer price negotiations. Prior literature has mainly assumed that decentralized managers negotiate transfer prices autonomously and focuses on effects of fairness preferences on transfer price negotiations (e.g., Luft and Libby 1997; Kachelmeier and Towry 2002). We, however, focus on headquarters' potential involvement when negotiations fail and their perceptions of negotiation failure.

We investigate our research questions in an experiment. In our setting, buyers and sellers, representing decentralized division managers, negotiate over the price of an intermediate good without a competitive external market. The setting reflects a coordination problem that is due to information asymmetries inside the firm. Transfers are profitable on average, but there are instances in which the actual costs exceed the actual price of the good. It is desirable for the firm to transfer (not transfer) the good whenever it is profitable (unprofitable). If buyer and seller reach agreement on a transfer price, the transfer takes place at that price. If they fail to reach agreement, headquarters may become involved.

We study three conditions in a nested design that are supposed to reflect points on the continuum of headquarters involvement in practice. As a baseline setting, we use a condition in which headquarters involvement is absent, i.e., headquarters is a passive observer of the negotiation outcome. We compare this condition to two conditions with headquarters involvement present but different degrees of involvement labeled "weak involvement (WI)" and "strong involvement (SI)". Under WI, headquarters may suggest a transfer price to division managers, but both managers must accept the suggested transfer price for the transfer to take place. Under SI, headquarters assumes full authority in the event of failed negotiations and determines whether the transfer is made or not and, if so, the price at which divisions must trade.

Consistent with our theory, we find that headquarters involvement reduces the frequency of agreement in negotiations, but negotiation agreement does not differ between weak and strong involvement. Involvement also reduces the coordination efficiency of internal transfers, and the reduction is greater under strong than under weak involvement. Additional analyses reveal that headquarters attributes negotiation failure too often to managers' bargaining capabilities rather than to the possibility that trade would be unprofitable, leading headquarters to become involved too often. Due to overconfidence, headquarters then does not effectively use the available information from the negotiation. Finally, under WI, headquarters often suggests transfer prices that are not mutually beneficial and, thus, lead to the rejection of profitable transfers.

Our findings have important implications for both theory and practice. From a theoretical perspective, our study contributes to the stream of research investigating frictions in transfer price negotiations and their causes (e.g., Luft and Libby 1997; Kachelmeier and Towry 2002; Arnold et al. 2016) by informing it about the role and perceptions of headquarters as an important player in transfer pricing. Moreover, we add to the research on delegated versus centralized decision making in firms (e.g., Coats and Rankin 2016; Gallo 2012) by providing evidence about the influence of overconfidence on suboptimal central decision-making.

For practice, our study shows that, when divisions anticipate no interference in negotiated transfer pricing, they are motivated to use their private information more efficiently, resulting in greater firm profit. This result demonstrates that when firms are decentralized and delegate tasks to better informed managers, risks of headquarters' interference include underestimating the value of committing to treating divisions autonomously and overestimating its own decision making abilities. These coordination inefficiencies would need to be taken into account in practice when firms weigh the costs and benefits of becoming involved in transfer price negotiations.

In our experiment, headquarters received information about negotiation offers as an additional information source before making transfer price decisions or suggestions. In practice, headquarters may have other options available to them in the event of failed negotiations. These options may include the acquisition of information via an internal audit or by eliciting additional reports from division. As we pointed out above, however, such actions would also impose a cost on the firm since an audit would require resources and divisions would have incentives to misrepresent their reports, making it unlikely that headquarters' information asymmetry is fully offset. Additionally, anticipation of these actions, which represent a lack of commitment to autonomy, may further impede the ability of divisions to reach an agreement during negotiations. Future research could address such alternative courses of action and their effect on firm profit.

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Appendix

Experimental Instruments

Instructions

Thank you for participating in our study. All interactions will take place anonymously over a computer network. Therefore, we will never be able to link your name with any of your decisions or responses during this study. We promise to carry out this study in the manner described in the instructions, with no deception of any form.

As will be described in more detail below, your task in this study will be to negotiate with another participant. All negotiations will take place over a computer network so that you will not know the identity of the other participant. Because the outcomes of the negotiations will affect your earnings, it is important that you read the instructions carefully. After reading the instructions, you will take a short quiz to test your comprehension of the instructions. No one will be able to continue until everyone has passed the quiz.

If you have any questions while we are going over the instructions, or during the study, please raise your hand and we will answer your question in private. Please do not talk with anyone other than the administrator after this point. Also, please help us maintain control over this study by not discussing it with anyone who may be participating in future sessions.

Today's session will take approximately 90 minutes.

Specific Instructions

This study involves decision making in an organizational setting. You work for a firm that has two types of divisions: one that produces a product ("Production Division") and one that sells the product on the marketplace ("Sales Division"). Additionally, the firm has a central headquarters. You will either play the role of a manager of one of the two divisions or the role of the headquarters manager.

The computer system has randomly assigned to you the role of a **production division manager /sales division manager / headquarters manager**. You will keep the same role through the whole study.

The firm wants the managers to make decisions that will result in maximum profit for the firm. As an incentive to do so, the sales and production division manager will be evaluated and compensated according to their own division profits. The headquarters manager will be evaluated and compensated based on overall firm profit.

Decision Situation

Consider the following situation: The production division produces a product that it "sells" to the sales division at a price called the *transfer price*. Importantly, the transfer price affects the profits of both the production division and the sales division. The sales division then sells the good at the market and receives the market price for it.

[No involvement condition: The firm expects division managers to earn high division profits because high division profits contribute to high firm profits. As a result, the division managers take responsibility for their division profits. As a transfer of the product from the production division to the sales division affects division profits, headquarters has fully delegated the decision about the transfer to the division managers. This means that division managers *negotiate* the conditions of the transfer. In their negotiations, the division managers negotiate a *transfer price* which the sales manager has to pay to the production manager in order to “buy” the product from the production division.]

[Weak involvement condition: The firm expects division managers to earn high division profits because high division profits contribute to high firm profits. As a result, the division managers take responsibility for their division profits. As a transfer of the product from the production division to the sales division affects division profits, headquarters has delegated the decision about the transfer to the division managers as long as both divisions find an agreement. This means that division managers *negotiate* the conditions of the transfer. In their negotiations, the division managers negotiate a *transfer price* which the sales manager has to pay to the production manager in order to “buy” the product from the production division. In case the two divisions cannot agree on a transfer price during the negotiation, the headquarters manager can make a suggestion about the transfer price the two divisions should use but cannot force the two divisions to accept the transfer price.]

[Strong involvement condition: The firm expects division managers to earn high division profits because high division profits contribute to high firm profits. As a result, the division managers take responsibility for their division profits. As a transfer of the product from the production division to the sales division affects division profits, headquarters has delegated the decision about the transfer to the division managers as long as both divisions find an agreement. This means that division managers *negotiate* the conditions of the transfer. In their negotiations, the division managers negotiate a *transfer price* which the sales manager has to pay to the production manager in order to “buy” the product from the production division. However, in case the two divisions cannot agree on a transfer price during the negotiation, headquarters takes over the decision authority and the headquarters manager decides whether the production division has to transfer the good to the sales division and determines the transfer price that the sales division has to pay for the good.]

This study has six periods. That is, you will negotiate *six* times in total. You will keep the same role (either production manager or sales manager or headquarters manager) over all periods. After each period, you will be randomly assigned to a new division manager in a way that you will not negotiate twice with any division manager. In each round, you will also be randomly matched with a one of the six headquarters managers.

Below, we describe how the transfer price affects division profits, the negotiation procedures, and how you will be paid in this study.

Profits from the transfer of the product

Just as in the real world, production costs and market prices sometimes vary. In the production division, costs vary between 1 and 500. This means that in every period, the costs of the good can take on every value between 1 and 500 with equal probability.

Likewise, in the sales division, the market price varies between 100 and 600. This means that in every period, the market price when the sales division finally sells the good at the market can take on every value between 100 and 600 with equal probability.

As a consequence, there are situations where transferring the good from the production division to the sales division and then selling the product at the market is beneficial for the firm because the market price is *higher* than the production costs. For example, if the market price is 500 and the production costs are 100, the firm profit from transferring the good and selling it at the market would be 500 – 100 = 400.

However, there can also be cases where the transfer of the good and selling of the good at the market is bad for the firm because the market price is *lower* than the production cost. For example, if the market price is 200 and the production costs are 400, the firm profit from transferring the good and selling it at the market would be 200 – 400 = -200.

Before the negotiation starts in each period, the production manager will be informed about his/her production costs of the current period but will **not** know the current market price of the sales division. Instead, the production manager will only know that the market price can take on every value between 100 and 600 with equal probability.

Likewise, the sales manager will be informed about his/her market price in each period before the negotiation starts but will **not** know the current costs of the production division. The sales manager will only know that the production costs can take on every value between 1 and 500.

Headquarters will **never** be informed about the exact production costs and the exact market price of the current period but will only know the potential values of the costs and the market price.

Both the costs of the production division and the market price of the sales division are randomly determined by the computer. Random draws are independent of prior and future periods.

Transfer Price, Division Profits and Firm Profit

- *<u>If the good is transferred between the production division and sales division:</u>* The production division transfers the good to the sales division and receives the negotiated transfer price. The production division bears the production costs of this period. The sales division sells the good at the market and receives the market price of this period. The sales division pays the transfer price to the production division. Consequently, if the good is transferred from the production division to the sales division, the division profits amount to:

Production Division Profit= Transfer Price - Production Costs
Sales Division Profit= Market Price - Transfer Price

As you can see, the transfer price determines how the realized profit from the production and the sale of the good is allocated to the two divisions.

As you can also see, the production manager's profit is higher, the *higher* the transfer price is. In contrast, the sales manager's profit is higher, the *lower* the transfer price is. Neither of the managers know how large the division profit of the other manager is because the sales manager does not know the exact production cost of the production manager and the production manager does not know the exact market price of the sales manager.

The *firm profit* always corresponds to the sum of the two division profits. Consequently, when the good is transferred the firm profit amounts to:

Firm Profit = Sales Division Profit+ Production Division Profit
= Market Price - Transfer Price + Transfer Price - Production Costs
= Market Price – Production Costs

- *<u>If the good is not transferred between the production division and sales division:</u>* The good is not transferred from the production division to the sales division and is not sold at the market. In this case, there is no division profit for either division. Likewise, as the *firm profit* always corresponds to the sum of the two division profits the firm profit is also zero when the good is not transferred:

  Production Division Profit= 0
  Sales Division Profit= 0
  Firm Profit = 0

Negotiation Procedures

The computer program will randomly pair a production manager and a sales manager at the beginning of each period. Negotiations are conducted over a computer network.

In each period, the negotiation starts with the sales manager making the first offer and after this, the production manager and sales manager alternate in making offers or being able to accept the other party's last offer. The sales manager's first offer can be any whole number between the minimum production costs (1) and the maximum market price (600). The production manager can then accept the offer or make a counteroffer. Likewise, the production manager's counteroffer can be any whole number between the minimum production costs (1) and the maximum market price (600). The sales manager can then accept or reject the production manager's counteroffer and make a new offer him-/herself and so forth.

Importantly, when making a new offer the sales manager is not allowed to make offers that are smaller than his/her previous offer. Thus, the sales manager's new offer must be **greater than or equal to** his/her previous offer. Likewise, when making a new offer the production manager's offer must not be larger than his/her previous offers. That means, the production manager's new offer must be **less than or equal to** his/her last offer.

[No involvement condition: During the negotiations, every manager can always accept the current offer of the counterpart. Additionally, every manager can break off the negotiation at any point. That means, the two division managers do not even have to make an initial offer if they do not want to negotiate. If one of the two division managers breaks off the negotiation, the negotiations for this period fail and negotiations cannot be resumed once they have been broken off. Also, if no offer has been accepted by the end of time that is available for the negotiation, negotiations fail. If negotiations fail for either of the above reasons, the good will **not** be transferred to the sales division and not be sold at the market.]

[Weak involvement condition: During the negotiations, every manager can always accept the current offer of the counterpart. Additionally, every manager can break off the negotiation at any point. That means, the two division managers do not even have to make an initial offer if they do not want to negotiate. If one of the two division managers breaks off the negotiation, the negotiations for this period fail and negotiations cannot be resumed once they have been broken off. Also, if no offer has been accepted by the end of time that is available for the negotiation, negotiations fail. If negotiations fail for either of the above reasons, headquarters can make a suggestion about the transfer price the two divisions should use.]

[Strong involvement condition : During the negotiations, every manager can always accept the current offer of the counterpart. Additionally, every manager can break off the negotiation at any point. That means, the two division managers do not even have to make an initial offer if they do not want to negotiate. If one of the two division managers breaks off the negotiation, the negotiations for this period fail and negotiations cannot be resumed once they have been broken off. Also, if no offer has been accepted by the end of time that is available for the negotiation, negotiations fail. If negotiations fail for either of the above reasons, headquarters takes over the decision authority and decides about the transfer of the good between the two divisions and about the transfer price.]

In each period, the negotiation time is restricted to three minutes (180 seconds). During this time, sales managers and production managers can send as many offers back and forth as they want. The clock at the top right of the screen shows the remaining negotiation time in each period. Please refer to the figure appended to your instructions, showing the negotiation screen.

Headquarters' information and decision about the transfer of the good

[No involvement condition: After the negotiation is concluded, the headquarters manager will be informed about the result of the negotiation (agreement and transfer price or negotiation failure). Additionally, if the negotiation failed the headquarters manager will be informed about the **last offer** each party made in the course of the negotiation. In case the sales manager or the production manager did not make any offer in the negotiation, the headquarters manager will also be informed about this. However, headquarters has no possibility to influence the negotiation or the transfer of the good between the two divisions.]

[Weak involvement condition: After the negotiation is concluded, the headquarters manager will be informed about the result of the negotiation (agreement and transfer price or negotiation failure). Additionally, if the negotiation failed, the headquarters manager will be informed about the **last offer** each party made in the course of the negotiation. In case the sales manager or the production manager did not make any offer in the negotiation, the headquarters manager will also be informed about this. After receiving the information about both parties' last offer the headquarters manager is free to make a suggestion about the transfer price the two divisions should use. This final suggestion can be any whole number between the minimum production costs (1) and the maximum market price (600).

In case the headquarters manager makes a transfer price suggestion, both the sales manager and the production manager are, however, entirely free to accept this proposal. That means, the headquarters manager cannot force the two managers to accept the proposed transfer price. If any of the two managers reject the transfer price proposed by the headquarters manager the good will **not** be transferred to the sales division and not be sold at the market.]

[Strong involvement condition : After the negotiation is concluded, the headquarters manager will be informed about the result of the negotiation (agreement and transfer price or negotiation failure). Additionally, if the negotiation failed, the headquarters manager will be informed about the **last offer** each party made in the course of the negotiation. In case the sales manager or the production manager did not make any offer in the negotiation, the headquarters manager will also be informed about this. After receiving the information about both parties' last offer, headquarters takes over the decision authority and the headquarters manager decides whether the good should be transferred from the production division to the sales division. Moreover, when the headquarters manager decides that the good is transferred the headquarters manager also determines the transfer price that the sales division has to pay. This transfer price can be any whole number between the minimum production costs (1) and the maximum market price (600).

Both the sales manager and the production manager have to accept the headquarters manager's decision about the transfer price and the transfer of the good. Only when the headquarters manager decides not to transfer the good, the good will **not** be transferred between the two divisions and not be sold at the market.]

End of Period Information

At the end of each period, the production manager and the sales manager will be informed about the negotiation outcome (negotiation agreement or failure, transfer price, and negotiation time). Moreover, every manager will also be informed about his/her respective division profit. However, neither manager will be informed about the other division's profit in this period.

Headquarters will also be informed about the negotiation outcome (negotiation agreement or failure, transfer price, and negotiation time) and the firm profit. However, headquarters will not be informed about the exact division profits of the production division and the sales division. That means, headquarters will not know the exact production costs and the exact market price at the end of a period.

Computing Your Pay

In every period, both division managers and headquarters receive a fixed wage of 30 points. Additionally, both division managers participate in their respective division profits and headquarters participates in the firm profit.

The points earned by the production manager each period depend on the negotiation outcome in the following way:

[No involvement condition:

- If there is *agreement* in the negotiation, the production manager receives the fixed wage of 30 points plus 20 percent of his/her division profit, which is equal to the *transfer price* minus the *actual production costs*. When the production division profit is negative the points will be deducted from the production manager's fixed wage.

- If there is *no agreement* in the negotiation, the profit of the production division is 0 and, therefore, the production manager only receives his/her fixed wage of 30 points.]

[Weak involvement condition:

- If there is *agreement* in the negotiation or if there is no agreement in the negotiation but headquarters' suggested transfer price is accepted by both managers, the production manager receives the fixed wage of 30 points plus 20 percent of his/her division profit. This profit is equal to the *transfer price* minus the actual production costs. When the production division profit is negative the points will be deducted from the production manager's fixed wage.

- If there is *no agreement* in the negotiation and at least one of the two managers rejects the final transfer price suggestion from headquarters, the profit of the production division is 0 and, therefore, the production manager only receives his/her fixed wage of 30 points.]

[Strong involvement condition :

- If there is *agreement* in the negotiation or there is *no agreement* in the negotiation but headquarters decides that the transfer of the good from the production division to the sales division has to be *made*, the production manager receives the fixed wage of 30 points plus 20 percent of his/her division profit. This profit is equal to the *transfer price* minus the *actual production costs*. When the production division profit is negative the points will be deducted from the production manager's fixed wage.

- If there is *no agreement* in the negotiation and headquarters decides that the transfer of the good is *not made*, the profit of the production division is 0 and, therefore, the production manager only receives his/her fixed wage of 30 points.]

The points earned by the sales manager in each period also depend on the negotiation outcome in the following way:

[No involvement condition:

- If there is *agreement* in the negotiation, the sales manager receives the fixed wage of 30 points plus 20 percent of his/her division profit, which is equal to the *actual market price* minus the *transfer price*. When the sales division profit is negative the points will be deducted from the sales manager's fixed wage.

- If there is *no agreement* in the negotiation, the profit of the sales division is 0 and, therefore, the sales manager only receives his/her fixed wage of 30 points.]

[Weak involvement condition:

- If there is *agreement* in the negotiation or if there is no agreement in the negotiation but headquarters' suggested transfer price is accepted by both managers, the sales manager receives the fixed wage of 30 points plus 20 percent of his/her division profit. This profit is equal to the *actual market price* minus the *transfer price*. When the sales division profit is negative the points will be deducted from the sales manager's fixed wage.

- If there is *no agreement* in the negotiation and at least one of the two managers rejects the transfer price suggestion from headquarters, the profit of the sales division is 0 and, therefore, the sales manager only receives his/her fixed wage of 30 points.]

[Strong involvement condition :

- If there is *agreement* in the negotiation or if there is *no agreement* in the negotiation but headquarters decides that the transfer of the good from the production division to the sales division has to be *made*, the sales manager receives the fixed wage of 30 points plus 20 percent of his/her division profit. This profit is equal to the *actual market price* minus *negotiated transfer price*. When the sales division profit is negative the points will be deducted from the sales manager's fixed wage.

- If there is *no agreement* in the negotiation and headquarters decide that the transfer of the good is *not made*, the profit of the sales division is 0 and, therefore, the sales manager only receives his/her fixed wage of 30 points.]

Finally, the points earned by the headquarters manager in each period also depend on the negotiation outcome and the transfer of the good in the following way:

- If the good is transferred from the production division to the sales division, the headquarters manager receives the fixed wage of 30 points plus 10 percent of the firm profit, which is equal to the *actual market price* minus the *actual production costs*. When the firm profit is negative the points will be deducted from the headquarters manager's fixed wage.

- If the good is not transferred from the production division to the sales division, the firm profit is 0 and, therefore, the headquarters manager only receives his/her fixed wage of 8 points.

At the end of the study, one of the six periods will be randomly drawn as the payment period, and the points you earned in this period will be converted to cash (at a rate of $1 for every 2 points earned). As a result, the higher the profit of the production division in the randomly-determined payment period, the higher will be the production manager's pay from this study. The higher the profit of the sales division in the randomly-determined payment period, the higher will be the sales manager's pay from this study. Finally, the higher the firm profit in the randomly-determined payment period, the higher will be the headquarters manager's pay from this study.

The converted points from the randomly selected payment period will be added to your $5.00 participation fee. The resulting amount will be paid to you privately in cash at the end of today's session.

Additional Questions

After completing the study, you will complete a questionnaire about how you made your decisions. Last, you will be asked to provide demographic information. Your responses to these questions will be anonymous.

Pre-experimental quiz

Note: This will be administered via the computer. Participants have to answer each question correctly before they can continue to the next question.
All answers will be accompanied by an explanation *why* the answer was right or wrong (to emphasize the corresponding instructions again). In case an answer was wrong, participants will have to answer the question again.

1. I will interact with the same two participants throughout the entire experiment session
   - True
   - False

2. My identity will be revealed to the other participants at the end of the experiment
   - True
   - False

3. My role will remain constant throughout the experiment session. That is, if I am a sales manager in Period 1, I will be a sales manager in all subsequent periods. Likewise, if I am a production manager in Period 1, I will be a production manager in all subsequent periods. And if I am a headquarters manager in Period 1, I will be a headquarters manager in all subsequent periods.
   - True
   - False

4. If the production manager and the sales manager did not reach an agreement in the negotiation, the good cannot be transferred from the production division to the sales division and both division profits and the firm profit will be zero.
   - True
   - False

5. By transferring the good to the sales division, the production manager and the sales manager can only be better off and can never be worse off compared to not transferring the good.
   - True
   - False

[Only weak and strong involvement condition:]
6. If the production manager and the sales manager do not reach agreement during the negotiation, the headquarters manager will always have to make a transfer price suggestion.
   - True
   - False

7. If someone breaks off the negotiations before negotiation time runs out, both team managers will receive 0 points.
   - True
   - False

8. Please choose the correct answer.
Assume that the market price is 450, the production costs are 150 and the transfer price is 250. How large are the production division profit, the sales division profit and the firm profit?

a) Production division profit = 300, sales division profit = 300, firm profit = 300 points
b) Production division profit = 100, sales division profit = 300, firm profit = 200 points
c) Production division profit = 100, sales division profit = 200, firm profit = 300 points
d) Production division profit = 150, sales division profit = 150, firm profit = 200 points

9. Please choose the correct answer.
Assume the market price is 450 and the transfer price is 150. How large is the **sales division manager's** bonus?

a) 450
b) 300
c) 60
d) 30

10. Please choose the correct answer.
Assume the transfer price is 400 and the production costs are 150. How large is the **production division manager's** bonus?

a) 400
b) 350
c) 100
d) 50

11. Please choose the correct answer.
Assume the market price is 450 and the production costs are 150. How large is the **headquarters manager's** bonus?

a) 450
b) 300
c) 60
d) 30

12. If production manager and sales manager cannot reach agreement during the negotiation headquarters will be informed about the last offer of each party in the negotiation.

- True
- False

13. Every new transfer price offer of the sales division manager must not be lower than his/her prior offer and every new transfer price offer of the production division manager must not be higher than his/her prior offer.

- True
- False

14. The production manager will be know the market price of the sales division in the current period when negotiating and the sales manager will know the production division's production costs.

- True
- False

15. Headquarters will be informed about the market price and the production costs in the current period.

- True
- False

ESSAY 2

Discretionary Bonus Pools and Employees' Influence Activities: An Experimental Investigation

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Abstract
This study experimentally investigates how the extent of superior discretion over the allocation of a bonus pool affects the output of a team when employees can engage in unproductive influence activities. Granting superiors high discretion allows them to use non-verifiable information and observations in order to mitigate free-rider incentives in teams. Prior research, however, also suggests that discretion may give rise to unproductive influence activities of employees. The question, therefore, is whether organizations should limit superiors' discretion extent in order to mitigate influence activities in teams. Conventional economic theory assumes that superiors optimally account for influence activities in bonus decisions if they have incentives to do so. Limiting the discretion extent therefore harms superiors' flexibility and may impair the efficiency of discretionary bonus pools. Relying on behavioral theory, however, I argue that superiors likely overweight their personal information in bonus decisions. This increases incentives for employees to engage in influence activities under high discretion and detracts them from contributing to team output. I thus predict that limiting superiors' discretion extent can actually increase team output, contrary to standard economic predictions. Furthermore, I predict and show that the degree of mutual monitoring between peers amplifies the positive effect of limiting superiors' discretion extent. The reason is that influence activities of peers are more salient under a high degree of monitoring and thereby affect behavior and fairness perceptions of employees more strongly. Limiting the discretion extent therefore becomes particularly important with higher degrees of mutual monitoring. This study contributes to the literature on discretionary bonus pools by providing evidence on the failure of superiors to sufficiently account for influence activities in bonus decisions and, thus, on the benefits of limiting superiors' discretion extent.

Keywords: Influence activities, bonus pool, discretion extent, mutual monitoring

1 Introduction

Many organizations delegate bonus decisions to lower levels of management by granting superiors of a team some discretion to allocate a bonus pool among their subordinates (Baiman and Rajan 1995, Bailey, Hecht and Towry 2011). In team-based environments where objective performance measures are often available only on an aggregate level (e.g., team or branch), discretionary bonus pools allow superiors to use non-verifiable observations in order to mitigate free-riding incentives in teams (Baker, Gibbons and Murphy 1994; Murphy and Oyer 2003; Fisher, Maines, Peffer and Sprinkle 2005). However, prior research also stresses that increasing discretion in bonus or promotion decisions gives rise to *costly* influence activities (e.g., Milgrom and Roberts 1988; Prendergast and Topel 1993; Du, Tang and Young 2012). That is, instead of contributing to team output, employees may waste valuable working time trying to bias the superior's bonus decision in their favor (e.g., Prendergast 1999; Inderst, Müller and Wärneryd 2007; Bol 2008). Specifically, employees may excessively focus on activities that increase their visibility to superiors but do not contribute much to team output, for example, by participating in every meeting their superior is present even if it is irrelevant (e.g., Smith 2013; Knight 2016). Likewise, employees may waste time self-promoting their efforts and achievements (e.g., Garfinkle 2011; Besanko, Dranove, Shanley and Schaefer 2009). While these activities are aimed at influencing superiors' information about individual performance, they likely also distract employees from exerting productive effort. Therefore, they are costly for an organization (Milgrom and Roberts 1992).

Organizations could limit superiors' discretion extent in order to mitigate incentives for unproductive influence activities in the first place. Yet, standard economic theory assumes that superiors will optimally account for influence activities in bonus decisions if they have economic incentives to do so (e.g., Holmstrom 1989; Fairburn and Malcomson 2001). Consequently, limiting the extent of discretion in advance may unnecessarily harm superiors' flexibility to adopt an optimal bonus allocation strategy, and hence, may undermine the efficiency of discretionary bonus pools.

However, in practice organizations vary greatly in the extent to which superiors are endowed discretion to allocate bonus pools (Bailey et al. 2011). Some organizations allow their superiors full discretion. Others allow discretion over only a small portion with the remainder allocated equally among employees or based on predefined bureaucratic rules (e.g., Lawler and Cohen 1992; Bailey et al. 2011). For example, the 2011 proxy statement of Yahoo discloses that 30 percent of their bonus pool is allocated to employees at discretion and 70 percent based on corporate performance goals. The 2014 proxy statement of Jacobs Engineering Group reveals that about 50 percent of the bonus pool is allocated based on weighted salaries versus total weighted salaries of all participants and the remaining 50 percent at the discretion of the CEO.

Given that the extent of discretion varies considerably in practice it is important to increase our understanding of what factors influence the efficacy of superior discretion in organizations. In this study, I investigate how the extent of superior discretion over bonus allocations affects team output when employees besides exerting productive effort can engage in unproductive influence activities. Moreover, I investigate whether this effect depends on an important organizational feature—the degree of mutual monitoring in teams. Relying on behavioral theory, I first predict that in a setting with influence activities—contrary to standard economic predictions—limiting superiors' extent of discretion in the allocation of a bonus pool can increase team output. The intuition underlying this prediction is that individuals often have difficulties to consciously control the impact of information on their subsequent decisions even if this information is irrelevant or distorted (Wilson and Brekke 1994; Chiander and Schweitzer 2003). The mere exposure to information about individual performances may lead superiors to create beliefs that have consequential effects on their bonus allocations. As a result, superiors likely overweight their personal information in bonus decisions, which increases incentives for employees to engage in influence activities (e.g., Ferris, Judge and Bowland 1994). Granting superiors high discretion thus likely shifts employees' focus away from productive effort to unproductive influence activities. In addition, higher levels of influence activities reduce the accuracy of superiors' information about individual contributions, which likely leads to more distortions in performance assessments and bonus allocations of superiors (e.g., Ferris and Judge 1991; Ferris et al. 1994). This, in turn, may negatively affect employees' perceptions of distributive fairness (Voussem, Kramer and Schäffer 2016) and may lead employees to withhold effort (e.g., Cohen-Carash and Spector 2001; Colquitt, Conlon, Wesson, Porter and Ng 2001). Limiting the discretion extent thus helps to prevent and mitigate the detrimental effects of influence activities in the first place.

Further, I predict that a high degree of mutual monitoring in teams amplifies the effect of superiors' discretion extent on team output. The degree of mutual monitoring refers to the ability of employees to observe their peers' behavior and activities (Towry 2003; Hannan, Towry and Zhang 2013). With higher degrees of mutual monitoring, employees may directly observe their peers' engagement in influence activities. As a result, influence activities of peers are likely to provoke stronger reactions under higher degrees of mutual monitoring. First, when employees observe their peers engaging in influence activities they may adopt such behavior more often in subsequent periods (e.g., Ferris et al. 1994). Second, higher degrees of mutual monitoring make distortions in the bonus allocation of superiors more salient for employees and may thereby undermine perceptions of distributive fairness more strongly (e.g., Pfeffer and Langton 1993; Bol, Kramer and Maas 2016). Limiting the discretion extent may thus become particularly important with high degrees of mutual monitoring between peers.

I test my predictions in an experiment in which two employees and a superior interact as a team over eight periods. In each period, employees can contribute to team output by exerting productive effort and they can engage in influence activities. Influence activities do not contribute to team output. However, they increase the employees' individual performance signal as observed by the superior. Employees are rewarded from a bonus pool that increases in team output. The superior's task is it to allocate some portion of the bonus pool among employees. Before allocating the bonus pool, superiors receive a non-verifiable signal about the individual performance of each employee. The performance signal, however, does not only reflect employees' effort but also their influence activities. Employees incur lower private costs for engaging in influence activities than for exerting effort. Superiors thus have to take into account that increasing the weight on the performance signal in bonus allocations may not only motivate employees to increase their effort but also their engagement in influence activities. Superiors are compensated based on team output and, thus, have incentives to allocate the bonus pool so as to elicit high levels of effort over all periods.

In this setting, I manipulate two factors (between subjects). First, I vary the extent to which superiors are endowed with discretion (low vs. high). Under a low (high) discretion extent superiors allocate 25 (75) percent of the bonus pool at their discretion while the remaining 75 (25) percent is allocated evenly among employees. Second, I vary the degree of mutual monitoring in teams (low vs. high). Under a high degree of mutual monitoring employees can directly observe their peer's level of effort and influence activities, while, under a low degree of mutual monitoring, they observe the same signal about their peer's performance as the superior.

The results of the experiment suggest that limiting the extent of superior discretion in bonus allocations increases team output due to decreased levels of influence activities. Moreover, the positive effect of limiting the discretion extent is amplified by the degree of monitoring in teams and is significant under a high degree of mutual monitoring only. Consistent with the underlying theory, additional analyses provide evidence that superiors do not adequately reduce the weight on the performance signals when the extent of discretion increases. As a result, individual performance signals have a stronger impact on individual bonus shares under high discretion, which motivates employees to increase their engagement in influence activities. Further analyses also reveal that, under a high degree of mutual monitoring, employees react more strongly to their peers' previous influence activities by increasing their own engagement in such activities and by lowering their productive effort in subsequent periods.

This study provides insights into the role of superiors' discretion extent in motivating team output and in diminishing the cost of influence activities in organizations. Prior research investigates the effect of superior discretion in settings without costly influence activities (e.g., Fisher et al. 2005; Arnold, Hannan and Tafkov 2018; Arnold and Tafkov 2015). Specifically, Fisher et al. (2005) provide evidence suggesting that superior discretion motivates productive effort when superiors have information reflecting individual efforts in an unbiased manner. However, the results of my study suggest that these prior findings do not necessarily hold in a setting where influence activities are possible. My study thereby contributes to prior literature by highlighting the detrimental effects of influence activities under a high extent of superior discretion.

More importantly, the results of the study show that limiting the extent of discretion can lead to higher team output, particularly in an environment in which employees can more easily monitor the activities of each other. The study, thus, identifies the degree of mutual monitoring in teams as an important factor influencing the efficacy of superior discretion in bonus decisions. In addition, whereas prior research often emphasizes the role of mutual monitoring in inducing cooperation and effort in teams (e.g., Arya, Felling and Glover 1997; Towry 2003), my findings suggest that the efficacy of mutual monitoring in fostering cooperation can be undermined when granting superiors high discretion over bonus allocations.

Finally, from a practical perspective, the study informs organizations about the benefits of limiting the discretion extent. When delegating bonus decisions to lower levels of management organizations should not solely rely on their superiors to adopt optimal bonus allocation strategies. Instead, limiting the extent to which superiors are endowed with discretion provides a useful tool for organizations to mitigate costs of influence activities and, ultimately, to increase the efficiency of discretionary bonus pools.

The remainder of the paper is organized as follows. Section 2 describes the setting, reviews relevant literature, and presents the hypotheses. Section 3 describes the experimental design. Section 4 presents the results of the experiment. Section 5 concludes.

2 Hypotheses

Setting

I explore how the extent of superior discretion over bonus allocations affects the output of teams in a setting, in which employees can engage in costly influence activities. In this section, I introduce a model of effort and influence activities. Further, I describe the optimal bonus allocation strategy and the optimal extent of discretion from a standard economic perspective (For a more technical description of the model see the Appendix). In the basic setting, two employees repeatedly work together in a team that is managed by a superior. In each working period, employees choose about their engagement in two activities—productive effort and unproductive influence activities. By exerting effort employees contribute to team output. In contrast, influence activities are unproductive in the sense that they do not contribute to team output. However, they increase an employee's performance signal that is observed by the superior. Employees engaging in influence activities thus attempt to give their superior the impression of exerting high effort. For example, employees may excessively focus on visible tasks while neglecting other important tasks (Bol 2008). A computer support specialist at Ford, for example, reported that he was able to increase his performance ranking by regularly e-mailing useless computing-related news articles to all members of his department, which increased his visibility to superiors (Besanko et al. 2009, p. 423). Likewise, employees may waste valuable work time and energy trying to promote their performances or ingratiate themselves with their superiors at the expense of more productive activities (e.g., Milgrom and Roberts 1992; Prendergast and Topel 1993; Besanko et al. 2009).

Employees incur private costs for both, effort and influence activities. However, employees bear higher private costs from exerting effort than engaging in influence activities. The lower private costs of influence activities reflect that in practice employees may favor such activities over productive effort because they are less exhausting and time-consuming. Consequently, it is less costly for an employee to increase his performance signal by engaging in influence activities rather than exerting effort in productive activities.

Team output is determined by the sum of employees' productive effort and a random component that is beyond employees' control. The firm has a formal information system that objectively measures team output, but not individual effort of employees. Employees are compensated from a bonus pool that is linearly increasing in team output.

Superiors are granted some discretion to allocate the bonus pool after team output is realized. Before allocating the bonus pool, superiors receive a non-verifiable signal about the individual performance of each employee. The superior's signal, however, does not solely reflect an employee's productive effort. That is, superiors cannot distinguish between productive effort and influence attempts of their employees. Therefore, both activities increase the individual performance signal as observed by the superior.

Due to the presence of influence activities, superiors face a trade-off when deciding about how strongly to incorporate their private information in the allocation of the bonus pool. On the one extreme, they may completely ignore the private signal about individual performances and allocate the entire bonus pool equally among employees. Such an allocation strategy would eliminate all incentives for employees to engage in influence activities. Yet, by reducing the weight on individual performance signals, superiors also weaken the link between individual effort and reward and, thereby, provide opportunities for employees to free ride on the efforts of their peers. On the other extreme, superiors may fully incorporate their private information by allocating the entire bonus pool based on the performance signals. However, when placing more weight on performance signals superiors also increase incentives for employees to engage in influence activities because it is less costly for them to improve their performance signal by engaging in influence activities rather than exerting effort. Superiors therefore face the challenge to optimally trade off the cost of free-riding against the cost of influence activities by placing a weight on their information in between these two extremes.

An important feature of the setting is that superiors are aware that their private information may be distorted by employees' influence activities. Furthermore, they are rewarded based on team output. Superiors therefore have an incentive to allocate the bonus pool such as to motivate employees to exert high effort and to not engage in influence activities.

For simplicity, I describe the optimal solution using the parameters from the actual experiment. Relying on standard economic rationality assumptions, the setting has a unique bonus allocation strategy that maximizes team output. Optimally superiors allocate half of the bonus pool based on the observed performance signal while they allocate the remaining part of the bonus pool equally among employees (The derivation of the unique Nash equilibrium is presented in the Appendix). Such an allocation strategy ensures an equilibrium, in which employees do not engage in influence activities while at the same time an employee's opportunity to free-ride on the peer's effort is reduced.

From a standard economic perspective organizations should not limit superiors' extent of discretion as any reduction in the discretion extent in advance may harm superiors' flexibility to adopt the optimal bonus allocation strategy.[14] For example, allowing superiors to allocate only 25 percent of the bonus pool would preclude a weight of 50 percent on the performance signal. However, if superiors fail to account for influence activities in their bonus allocations and place too much weight on their personal observations and information, organizations may

[14] In other analytical settings, limiting the discretion extent may be necessary from a standard economic perspective because superiors do not have sufficient incentives to mitigate influence activities of their subordinates (Fairburn and Malcomson 2001) or because superiors cannot credibly commit to ignore such attempts in their decisions (Milgrom and Roberts 1988). However, I investigate the effects of the discretion extent in a setting in which information is only used for bonus decisions and superiors' interests are perfectly aligned with those of the organization. In such a setting, it is sequentially rational for superiors to use the information in a way to discourage influence activities and to elicit high levels of effort in the long-run.

have to limit the discretion extent in order to mitigate incentives for influence activities in the first place.

In this setting, I study the efficacy of superior discretion in bonus allocations by varying superiors' extent of discretion. Under a low discretion extent, superiors allocate only 25 percent of the bonus pool at their discretion while the remainder is allocated equally among employees. Under a high discretion extent, superiors allocate 75 percent of the bonus pool with the remainder allocated equally. Given the standard economic solution, a low extent of discretion would thus preclude the optimal strategy of allocating one-half of the bonus pool based on the performance signals and the other half equally. Accordingly, standard economic theory would predict higher team output under high than under low discretion as under low discretion, due to increased free-riding opportunities, employees have lower incentives to exert effort.

In addition to the discretion extent, I vary the degree of mutual monitoring between peers to test the effect of superiors' discretion extent in two different work environments. The degree of mutual monitoring refers to the ability of employees to observe each other's actions (Towry 2003; Hannan et al. 2013), which varies across organizations due to, for example, differential levels of interactions between employees (Hannan et al. 2013). In work environments with high degrees of mutual monitoring employees can draw clear inferences about their peers' workplace behavior while, with low degrees of mutual monitoring, employees may not have much information about their peers' activities and behavior. In this study, I vary the degree of mutual monitoring at two levels. Under a high degree of mutual monitoring employees are able to monitor their peers' effort and influence activities perfectly. Under a low degree of mutual monitoring, however, observe the same signal about their peers' performance as the superior, which equals the sum of their peers' effort and influence activities.

Hypotheses Development

The Extent of Superior Discretion and Team Output

By delegating bonus decision to lower organizational levels, organizations increase their reliance on superiors to adopt strategies that motivate employees to exert high effort. As described above, when employees can engage in influence activities superiors have to find an optimal balance between incorporating and ignoring their personal information and observations in bonus decision in order to mitigate incentives for influence activities while at the same time strengthening the link between effort and reward. Superiors should thus be able to control the impact of information on their subsequent bonus decisions.

Prior research, has shown that influence activities of employees strongly affect individual performance assessments of superiors (e.g., Ferris and Judge 1991; Ferris et al. 1994; Du et al. 2012) and their allocation of discretionary rewards and bonuses (e.g., Higgins et al. 2003). Moreover, existing research indicates that decision makers tend to rely on their information even when it is in their interest *not* to do so (e.g., Camerer, Loewenstein and Weber 1989, Galinsky and Mussweiler 2001) and even when they know that their information may be distorted (e.g., Chinander and Schweitzer 2003). It is therefore unlikely that superiors that are granted high discretion are able to optimally weigh their performance information in order to prevent employees from engaging in influence activities and to motivate them to exert high effort. Rather than having control over the impact of information on their subsequent decisions, superiors may unconsciously overweigh their personal observations and (potentially distorted) information when allocating bonus pools. Such unintended responses on information may occur because of unconscious mental processing of information (Wilson and Brekke 1994). The mere exposure to information about individual performances may lead superiors to create beliefs that have consequential effects on their bonus decisions regardless of whether the information is distorted or not (e.g., Wilson and Brekke 1994; Chinander and Schweitzer 2003). Thus, while a high extent of discretion would allow superiors the flexibility to optimally use their performance information in order to reduce incentives for free-riding and influence activities, from a behavioral perspective, it is likely that they will fail to do so. Instead, superiors likely overweigh their personal information and observations in bonus allocations. As a consequence, incentives for employees to engage influence activities increase in superiors' discretion extent.

Employees experiencing increased incentives for influence activities under a high extent of superior discretion likely increase their engagement in such activities with detrimental effects on team output. First, influence activities may detract employees from exerting productive effort and thereby from contributing to team output (e.g., Prendergast 1999; Corgnet and Rodriguez-Lara 2013). In other words, employees may devote time and energy trying to influence the superior's bonus decision while neglecting more important and productive activities or tasks. Second, increases in influence activities reduce the accuracy of superiors' performance information in reflecting employees' effort and contributions to team output. This, in turn, increases the likelihood of distorted bonus allocations. As a result, employees' increases in effort may ultimately not be reflected in superiors' allocation of the bonus pool. Influence activities may therefore reduce an employee's perceived returns from productive effort as superiors are not able to adequately reward employees for increases in their effort. Consequently, team output may decrease due to the reduced effectiveness of incentives (Baker, Jensen and Murphy 1988).

Finally, more distorted bonus allocations under a high extent of superior discretion may also affect employees' perceptions of distributive fairness (e.g., Voußen et al. 2015). Specifically, misallocations of the bonus pool may undermine the fairness perceptions of employees that exert high effort when the allocation of the bonus pool fails to reflect their relative contributions. The consequences are that employees may withhold effort in subsequent periods in order to restore perceived distributive justice (Cohen-Carash and Spector 2001; Colquitt et al. 2004). On the other hand, employees whose influence activities are rewarded by higher bonuses may be further motivated to engage in such behavior in future periods.

Following the argumentation above, if superiors fail to account for influence activities in their bonus allocations, limiting the discretion extent likely lowers employees' engagement in influence activities, which, in turn, positively affects team output. This prediction is formally stated as H1.

H1: Limiting superiors' extent of discretion in the allocation of bonus pools can increase team output when employees can engage in influence activities.

Degree of Mutual Monitoring between Peers and the Extent of Superior Discretion

Next, I argue that a high degree of mutual monitoring exacerbates the effect of superiors' discretion extent on team output. As discussed above, I expect that increasing the extent of superior discretion boosts influence activities in teams and, ultimately, undermines team output. Such an increase in employees' influence activities may now be particularly problematic in work environments with a high degree of mutual monitoring between employees.

Under a high degree of mutual monitoring employees can draw clearer inferences about their peers' workplace behavior and they may directly observe whether their peers exert effort or whether they spend more time engaging in influence activities as an attempt to increase their individual bonus shares. Employees' responses to their peers' workplace behavior may therefore be more pronounced under a high degree of mutual monitoring, for two main reasons. First, a high degree of mutual monitoring enables employees to directly compare their own contributions to team output to those of their peers, which may increase the effect of bonus distortions on employees' fairness perceptions (e.g., Pfeffer and Langton 1993; Bol et al. 2016). That is, bonus distortions due to influence activities of peers become more salient under a high degree of mutual monitoring and may thus undermine perceptions of distributive fairness more strongly. This, in turn, may lead to larger reductions in employees' effort if the degree of mutual monitoring is high.

Second, the behavior of peers may be more contagious when employees directly observe each other's behavior under a high degree of mutual monitoring (e.g., Robinson and O'Leary-

Kelly 1998; Schroeder, Jensen, Reed, Sullivan and Schwab 1983). There is considerable evidence that team members' behavior within social dilemmas is influenced by observations of other members' behavior (Kerr et al. 2009) and that, particularly, observing less cooperative or unethical behavior of peers may lead other team members to adjust their own behavior accordingly (e.g., Croson and Shang 2008; Gino, Aval and Ariely 2009). Similarly, employees observing their peers engaging in influence activities may be encouraged more often to adopt such behavior in subsequent periods (e.g., Ferris et al. 1994). As a result, since high discretion likely leads employees to increase their engagement in influence activities, a high degree of mutual monitoring likely exacerbates such behavior over time. In contrast, when employees lower their engagement in influence activities under a low discretion extent, a high degree of mutual monitoring may help to reinforce low levels of influence activities over time.

These arguments suggest that the effects of a high extent of discretion are likely to be more pronounced in settings with a high degree of mutual monitoring between peers. Consequently, limiting superiors' discretion extent likely leads to larger increases in team output under a high compared to a low degree of mutual monitoring. This prediction is formally stated as H2.

H2: The positive effect of limiting the superiors' discretion extent on team output will be stronger when the degree of mutual monitoring between peers is high rather than low.

3 Method

Experimental Design

This experiment uses a 2 x 2 between-subjects experimental design in which two factors are varied—the extent of superiors' discretion in bonus allocations (high vs. low) and the degree of mutual monitoring in teams (high vs. low). Superiors' discretion extent is varied so that superiors with *high discretion* allocate 75 percent of the bonus pool at their discretion, while superiors with *low discretion* allocate only 25 percent of the bonus pool, with the remainder allocated evenly among employees. The manipulation of the discretion extent is chosen in such a way that the two extents of discretion (low and high) are symmetrically located around the standard economic optimal solution of 50 percent (see Appendix). Yet, while—from a standard economic perspective—a high discretion extent would allow superiors to incorporate the performance signal to the optimal extent of 50 percent, a low discretion extent precludes such an allocation strategy. This design choice thus constitutes a challenging environment to find the predicted results.

The degree of mutual monitoring is varied so that employees under a *low degree of mutual monitoring* do not monitor effort and influence activities of their coworkers directly, while employees under a *high degree of mutual monitoring* could directly monitor their peer's effort and engagement in influence activities.

Experimental Task

Two employees (Employee A and Employee B) and a superior (denoted as team manager in the experiment) repeatedly interact in a team over eight periods in total. At the beginning of each period, the two employees decide about their levels of effort and influence activities.[15] In both activities, employees choose a level of engagement between 0 and 20 in each of the two activities under the restriction that the *sum* of effort and influence activities does not exceed 20 in total.[16] Team output is determined by the two employees' effort and a positive random term (uniformly distributed integer between 0 and 12) while influence activities do *not* contribute to team output:

$$Team\ Output = Effort_i + Effort_j + \varepsilon \qquad (1)$$

where $i,j \in \{A, B\}$

The random component (ε) is added, so that employees under a low degree of mutual monitoring cannot directly infer their peers' level of effort and influence activities.

[15] To use neutral labels the two activities were referred to as activity one (effort) and activity two (influence activities) in the instructions and during the experiment.

[16] As the superior's private signal equals the sum of an employee's effort and influence activities, this restriction is to ensure that the performance signal cannot be larger than 20. A performance signal larger than 20 would directly reveal to superiors that the employee engaged in influence activities.

Employees incur *private costs* for both, effort and influence activities that are increasing in the level of engagement. Yet, an employee's private cost of effort is higher compared to the private cost of influence activities. Specifically, an employee's private cost function is given as follows:

$$Private\ Cost_i = 0.25 \times (Effort_i + 0.37 \times Influence\ Activities_i)^2 \qquad (2)$$

where $i \in \{A, B\}$

The private cost function is common knowledge to both, employees and superiors. Employees compensation is linked to aggregate team output via a bonus pool. For each unit of team output the bonus pool for the two employees increases by 10 points. That is, the total bonus pool for the two employees is computed as follows:

$$Bonus\ Pool = 10 \times Team\ Output \qquad (3)$$

In each period, the points from the bonus pool are completely allocated between the two employees. The bonus pool is allocated in two steps. First, under a high (low) discretion extent a portion of 25 (75) percent is deducted from the total bonus pool and allocated evenly between the two employees (nondiscretionary bonus). Second, the remaining portion of 75 (25) percent of the bonus pool is allocated at the discretion of the superior (discretionary bonus). An employee's bonus is thus computed as follows:

$$Employee's\ Bonus = Nondiscretionary\ Bonus + Discretionary\ bonus \qquad (4)$$

Before allocating the bonus pool, superiors receive the private performance signal about each employee's contribution to the aggregate team output. Superiors' private performance signal equals the sum of an employee's level of effort and influence activities. Therefore, superiors cannot distinguish between employees' effort and influence activities. In line with prior literature, influence activities are unproductive from the organization's perspective as they only affect the superior's performance signal but do not contribute to aggregate team output.

Earnings

In each period, employees receive a fixed salary of 15 points in addition to their bonus. To determine the employees' final earnings in a period, the private costs resulting from effort and influence activities (as defined in Equation (2)) are deducted from the employee's bonus and fixed salary. In summary, an employee's earnings for the period are computed as follows:

Employee Earnings = 15 + Employee's Bonus – Private Costs (5)

Each period superiors receive a bonus that increases in team output. For each unit team output produced superiors receive a bonus of 4 points. Superiors do not receive a fixed salary and they do not bear any private costs. Their earnings for the period are thus computed as follows:

Superior Earnings = 4 × Team Output (6)

Participants' earnings in a period were summed up over all eight periods and converted to cash at a rate of CHF 1 per 36 points. Additionally, each participant was paid out a show-up fee of CHF 5. On average, participants earned CHF 30 from the experiment.

Participants and Procedures

In total, 144 undergraduate students from a public European university participated in the experiment. Participants were randomly allocated among the four experimental conditions. Each participant was assigned to his/her role at the beginning of the experiment (Employee A, Employee B, or Team Manager). Participants repeatedly interacted in the same teams for eight experimental periods.

The number of participants in each condition is included in Figure 1. Each student participated in only one session. The mean age of the participants is 23.2 years and 48.6 percent of participants are female.

Figure 1: Experimental Design and Number of Participants

	Low Degree of Mutual Monitoring	High Degree of Mutual Monitoring	*Total*
Low Extent of Superior Discretion	N = 36 (*12*)	N = 36 (*12*)	N = 72 (*24*)
High Extent of Superior Discretion	N = 36 (*12*)	N = 36 (*12*)	N = 72 (*24*)
Total	N = 72 (*24*)	N = 72 (*24*)	N = 144 (*48*)

Note: N = number of participants (*number of teams*).

At the start of each session, participants were provided with written instructions and were informed of their randomly assigned role of either an employee or superior. Instructions were read aloud by the experimenter. After the instructions, participants stood up behind their cubicles and introduced themselves to the members of their team by telling their name, age, and hobby. Participants revealed their identities in order to reduce the social distance and to ensure that the members of a team have some minimal social familiarity with each other (Gächter and Fehr 1999). This likely increases social pressure among participants and is common in experiments involving mutual monitoring (e.g., Towry 2003; Brüggen and Moers 2007; Maas and van Rinsum 2013).

After the round of introductions, all participants were required to complete a pre-experiment quiz to ensure that they understand the experimental procedures. Once all participants had answered all questions of the quiz correctly, the eight periods of the experiment started. Participants interacted through a computer network and could not communicate with each other. The experiment was programmed with z-tree experimental economics software (Fischbacher 2007).

At the beginning of each period, employees chose their level of effort and influence activities. They could enter any combination of effort and influence activities on the interval between [0, 1,…, 20] that did not exceed 20 in sum. Once employees entered a level of effort and influence activities, the program calculated and displayed the private costs such a combination would incur (as defined in Equation (2)).[17] Employees could then adjust their levels of effort and influence activities as often as they wished. After both employees confirmed their entries, the computer calculated team output by summing up the two employees' productive effort and by adding a random integer uniformly distributed between 0 and 12.[18] Next, superiors received the signal about the two employees' individual performance (i.e. the sum of effort and influence activities). At the same time, employees received either the same signal as the superior about their peer's performance (low degree of mutual monitoring) or they were informed about their peer's effort and influence activities separately (high degree of mutual monitoring). On the same screen, which displayed the private performance signal, superiors were also informed about team output, the size of the total bonus pool and the size of the discretionary part of the bonus pool (i.e., either 25 or 75 percent of the total bonus pool). Superiors then had to determine individual bonuses by assigning points from the discretionary bonus pool to the two employees. Superiors were free in allocating discretionary bonuses as long as *all* points from the discretionary bonus pool were distributed and as long as each employee's discretionary bonus was not negative. The points from the non-discretionary part of the bonus pool were allocated equally between the two employees. At the end of each period, employees and superiors learned their period earnings as defined in Equation (5) and Equation (6). Then the next period started.

At the conclusion of the eight periods, participants completed a post-experiment questionnaire. They received their cash payments and were dismissed. Experimental sessions lasted approximately 75 minutes.

[17] In addition, all participants (employees and superiors) had a printed table available during the entire experiment, which showed the private costs for any possible combination of effort and influence activities.
[18] Prior to the experimental sessions, I randomly generated sequences of eight random terms (one for each period). To facilitate comparisons across conditions, the same sequences of random terms are used in each session.

4 Results

Descriptive Statistics

The primary dependent variable, used to test H1 and H2, is TEAM OUTPUT. TEAM OUTPUT is calculated as the sum of the two employees' effort in a period. This measure thus represents the part of team output that employees can influence. Table 1 reports descriptive statistics for the primary dependent variables.

Table 1 shows (as graphed in Figure 2) that TEAM OUTPUT increases when the extent of discretion decreases from high to low. Moreover, TEAM OUTPUT increases substantially from 22.66 to 29.34 under a high degree of mutual monitoring while it increases only marginally under a low degree of mutual monitoring (20.77 vs. 20.90). This finding represents initial evidence in favor of H2 predicting that the positive effect of limiting the discretion extent is stronger when the degree of mutual monitoring is high rather than low.

Figure 2: Effects of the Discretion Extent and the Degree of Mutual Monitoring on Team Output

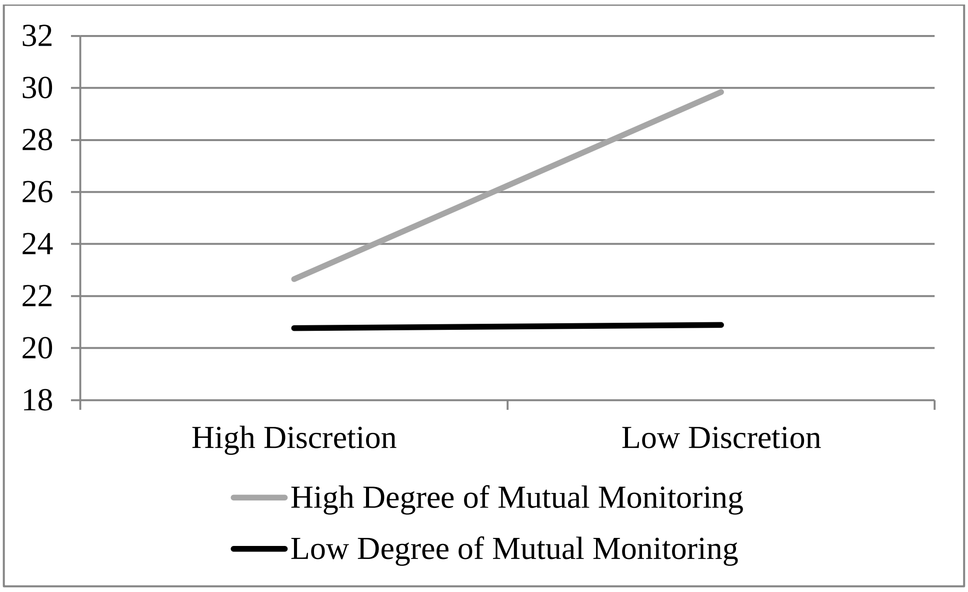

Figure 3: Effects of the Discretion Extent and the Degree of Mutual Monitoring on Team Influence

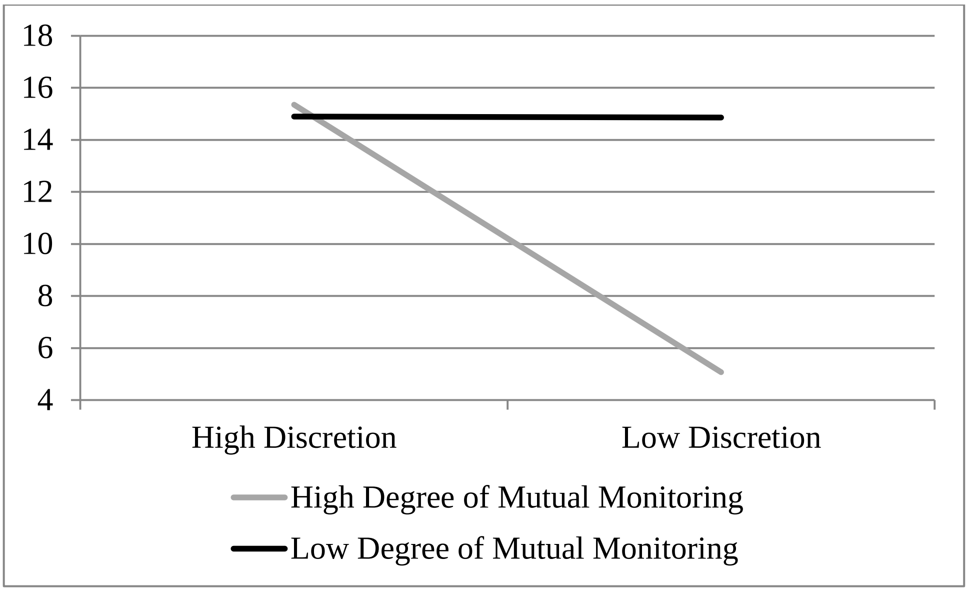

Table 1: Mean, *Standard Deviation* (Number of Observations) for Key Measures and Number of Observations by Treatment

	Low Degree of Mutual Monitoring (*LMM*)		**High Degree of Mutual Monitoring (*HMM*)**	
	High Extent of Discretion (*HD*)	Low Extent of Discretion (*LD*)	High Extent of Discretion (*HD*)	Low Extent of Discretion (LD)
EFFORT	10.3854	10.4479	11.3281	14.9219
	4.4660	*5.3483*	*5.1635*	*4.5899*
	(192)	(192)	(192)	(192)
INFLUENCE ACTIVITY	7.4479	7.4323	7.6771	2.5365
	4.4625	*5.3833*	*5.3211*	*3.3235*
	(192)	(192)	(192)	(192)
TEAM OUTPUT	20.7708	20.8958	22.6563	29.8438
	6.3204	*7.2453*	*8.7909*	*8.2886*
	(12)	(12)	(12)	(12)
TEAM INFLUENCE	14.8958	14.8646	15.3542	5.0729
	6.2061	*6.8235*	*8.9842*	*5.5899*
	(12)	(12)	(12)	(12)

Note: Every cell displays the mean, *standard deviation* and (number of observations) for the corresponding measure.

EFFORT is the employees' effort choice in a period (number between 0 and 20).

INFLUENCE ACTIVITY equals an employee's in influence activities in a period (number between 0 and 20).

TEAM OUTPUT corresponds to the average sum of the two employees' effort over all 8 periods.

TEAM INFLUENCE corresponds to the average sum of the two employees' influence activities all 8 periods.

I also calculate the level of influence activities in a team by summing up the two employees' level of influence activities in a period (TEAM INFLUENCE). Turning to the level of influence activities, Table 1 shows that when the degree of mutual monitoring is high a decrease in the superiors' discretion extent leads to reduced levels of influence activities in teams (15.35 vs. 5.07). Again, however, the decrease in employees' influence activities is negligible when the degree of mutual monitoring is low (14.90 vs. 14.86).

Hypotheses Tests

I test both hypotheses jointly in an ANOVA using TEAM OUTPUT as dependent variable. The extent of superior discretion (low vs. high) and the degree of mutual monitoring (low vs. high) are the between-subjects factors. To control for multiple observations per team, I use mean observations per team over all eight periods. This procedure yields 12 independent observations per condition.

The ANOVA in Panel A of Table 2 presents the results for team output. H1 predicts that team output will be greater under a low discretion extent independent from the degree of mutual monitoring between peers and H2 predicts that a high degree of mutual monitoring amplifies the effect of reducing superiors' discretion extent. The results from the ANOVA reported in Panel A of Table 2 are consistent with these predictions. The ANOVA indicates a statistically significant main effect for the discretion extent on TEAM OUTPUT ($F = 4.04$, $p = 0.050$, two-tailed). Furthermore, the ANOVA finds a statistically significant two-way interaction between the degree of mutual monitoring and the extent of discretion ($F = 3.77$, $p = 0.059$, two-tailed). Panel A of Table 2 also reports results from the simple effects analyses conducted subsequent to the ANOVA. Results reveal that under a *high* degree of mutual monitoring TEAM OUTPUT is significantly greater under a low compared to a high discretion extent (29.34 vs. 22.66, $F = 7.80$, $p = 0.005$, two-tailed). However, under a low degree of mutual monitoring reducing the extent of discretion does not have a significant effect on TEAM OUTPUT (20.90 vs. 20.77, F

< 0.01, p = 0.961, two-tailed). In summary, these results provide support for H2 while H1 is only partially supported.

Table 2: Effects of the Extent of Superior Discretion and the Degree of Mutual Monitoring on Team Output and Team Influence

Panel A: **TEAM OUTPUT**[a]	df	MS	F	p
Discretion (High/Low)	1	160.42	4.04	.050**
Monitoring (High/Low)	1	352.08	8.87	.005***
Discretion*Monitoring	1	149.64	3.77	.059*
Error	44	39.71		
Simple effects for each degree of mutual monitoring				
Effect of high discretion: Low degree of monitoring			<0.01	0.961
Effect of high discretion: High degree of monitoring			7.804	0.005***

Panel B: **TEAM INFLUENCE**[b]	df	MS	F	p
Discretion (High/Low)	1	319.04	11.63	.001***
Monitoring (High/Low)	1	261.33	9.53	.004***
Discretion*Monitoring	1	315.19	11.49	.002***
Error	44	27.42		
Simple effects for each degree of mutual monitoring				
Effect of high discretion: Low degree of monitoring			<0.01	0.988
Effect of high discretion: High degree of monitoring			23.127	<0.001***

The dependent variables of the ANOVAS are TEAM OUTPUT (Panel A), and TEAM INFLUENCE (Panel B). The independent variables are whether the extent of supervisor discretion was high or low and whether the degree of monitoring between peers was high or low.

High discretion: Supervisors allocated 75 percent of the bonus pool. Low discretion: Supervisors allocated 25 percent of the bonus pool. High degree of monitoring: Employees directly monitor effort and influence activities of their peers. Low degree of monitoring: Employees did not monitor effort and influence activities of their peers directly.

The observations include 48 teams equally allocated across the 4 conditions. For every team, there is one observation. Thus, every ANOVA contains 48 observations. All p-values are two-tailed.

***, ** and * denote significance at the 1 percent, 5 percent and 10 percent levels, respectively.

[a]TEAM OUTPUT corresponds to the average sum of the two employees' effort over all 8 periods.
[b]TEAM INFLUENCE corresponds to the average sum of the two employees' influence activities all 8 periods.

Supplemental Analyses

Employees' Influence Activities

In the theory development underlying H1 and H2, I argued that reductions in employees' influence activities under a low discretion extent might in part explain observed differences in team output. Thus, to test how employees' engagement in influence activities is affected by the discretion extent and the degree of mutual monitoring I test an ANOVA with TEAM INFLUENCE as dependent variable. Again, to control for multiple observations per team, I use mean observations per team over all eight periods.

The ANOVA reported in Panel B of Table 2 shows a significant main effect of the discretion extent on TEAM INFLUENCE (F = 11.63, p = 0.001, two-tailed) and a statistically significant two-way interaction between the degree of mutual monitoring and the extent of discretion (F = 11.49, p = 0.002, two-tailed). Furthermore, the simple effects test reveals that limiting the discretion extent leads to significant decreases in TEAM INFLUENCE when the degree of mutual monitoring between peers is high (15.35 vs. 5.07, F = 23.13, p < 0.001, two-tailed). The effect of the discretion extent is, however, insignificant when the degree of mutual monitoring is low (14.90 vs. 14.86, F < 0.01, p = 0.988, two-tailed). The pattern of TEAM INFLUENCE across conditions thus reflects the reverse pattern of TEAM OUTPUT. The results, therefore, support the notion that among the main drivers of observed differences in team output is employees' engagement in influence activities.

Superiors' Incorporation of the Performance Information in Bonus Allocations

In the theory development, I argued that superiors likely overweigh their personal observations and information in allocating bonus pools. As a consequence, superiors likely fail to sufficiently reduce the weight on the performance signals in order to mitigate incentives for influence activities when the extent of discretion increases. Therefore, in this section, I explore whether the weight superiors place on the individual performance signals in allocating the bonus pool changes with a varying extent of discretion.

To do so, I ran a regression with employees' share in the *discretionary* portion of the bonus pool as dependent variable. The independent variables are an employee's relative performance signal in a period (Relative Performance Signal)[19] and the interaction between the Relative Performance Signal and a dummy variable equaling 1 if the extent of discretion is high and zero otherwise (High Discretion).[20] If superiors do not account for influence activities with an increasing extent of discretion then I expect no difference between the conditions with high and low superior discretion in the weight superiors place on the performance signal when allocating the *discretionary* portion of the bonus pool. That is, when considering employees' share in the discretionary portion of the bonus pool only then I expect the coefficient of the interaction between the Relative Performance Signal and High Discretion to be insignificant.

The first regression reported in Table 3, shows that employees' discretionary bonus share significantly increases in their relative performance signal ($\beta = 0.5765$, $p < 0.001$, two-tailed). Moreover, as expected, the interaction between the relative performance signal and the discretion extent is insignificant ($\beta = 0.0046$, $p = 0.986$, two-tailed), indicating that superiors do not reduce the weight placed on the relative performance signal when the extent of discretion increases.

[19] The relative performance signal equals the ratio between an employee's individual performance signal and the sum of the two employees' performance signals in a period.

[20] In the regressions, I exclude observations where the performance signal does not differ between the two employees as in such a case any differences in bonus shares cannot be explained by differences in the performance signal. Including these observations would thus simply increase the noise and make it more difficult to find systematic differences between conditions with a high and low discretion extent. Furthermore, to control for unobserved differences between subjects the regressions include subject fixed effects.

Table 3: Effects of Employees' Relative Performance Signal on Employees' Share in the Bonus Pool

Coefficient (p-value)	**Discretionary Bonus Share**	**Total Bonus Share**
Constant	0.2062 (0.004)***	0.3550 (0.000)***
Relative Performance Signal	0.5765 (0.000)***	0.1441 (0.000)***
Relative Performance Signal * High Discretion	0.0046 (0.986)	0.2917 (0.098)*
Subject fixed effects	*Included*	*Included*
R^2: within	0.1145	0.0743
R^2: between	0.2163	0.0066
N	208	208

Note: N indicates the number of observations. In both models, observations with zero difference in employees' relative performance signal are excluded. The regressions use standard errors clustered at the team manager's level to control for multiple observations within participant. The model also includes subject fixed effects (not reported). All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

Discretionary Bonus Share equals an employee's discretionary bonus (total bonus net of nondiscretionary bonus) divided by the period's discretionary part of the bonus pool (part allocated by the superior).

Total Bonus Share equals an employee's total bonus divided by the period's total bonus pool.

High Discretion is a dummy variable equal to 1 when the extent of discretion is high and equal to 0 when the extent of discretion is low.

Relative Performance Signal equals an employee's performance signal divided by the sum of the two employees' performance signal in a period.

To further compare incentives for employees to engage in influence activities under high and low discretion, I ran a second regression with employees' share in the total bonus pool as dependent variable. If superiors place the same weight on the performance signal independent from the discretion extent then the relative performance signal is expected to have a stronger impact on total bonus shares under a high compared to a low discretion extent because superiors allocate a larger portion of the bonus pool under high discretion. In fact, results reported in Table 3 show that the interaction between the relative performance signal and discretion extent is now positive and significant (β = 0.2917, p < 0.098, two-tailed). In sum, the findings provide evidence that, consistent with the underlying theory, superiors fail to sufficiently account for influence activities in their bonus decisions. The consequences are that employees have increased incentives to engage in unproductive influence activities under high superior discretion.

Detrimental Effects of Influence Activities and the Degree of Mutual Monitoring

In the theory development, I argued that the negative effect of influence activities on team output is likely to be stronger under a high compared to a low degree of mutual monitoring which is supported by the results. This is likely to be the case because employees' reactions to influence activities of their peers may be more pronounced the better they can monitor their peers' actions. That is, employees observing their peers engaging in influence activities under a high degree of monitoring may adopt such behavior more often in subsequent periods at the expense of productive effort.

In order to analyze how employees' reactions to their peers' influence activities are affected by the degree of mutual monitoring, I test two different models: First, I analyze the effect of peers' influence activities in the *current* period on employees' provision of effort in the *subsequent* period. Therefore, I regress employees' effort in the subsequent period ($EFFORT_{t+1}$) on the influence activities of the other employee in the current period (Peer Influence Activity) and the interaction between Peer Influence Activity and a dummy variable equal to 1 if the degree of mutual monitoring is high and zero otherwise (High Degree of Monitoring).[21] If peers' influence activities are more detrimental to effort under a high degree of mutual monitoring, I expect the interaction to be negative. In fact, results reported in Table 4 show that the interaction between Peer Influence Activity and High Degree of Monitoring is significantly negative (β = -0.4346, p < 0.001, two-tailed). While the effect of Peer Influence Activity on $EFFORT_{t+1}$ is insignificant under a low degree of mutual monitoring (β = 0.0815, p = 0.226,

[21] To control for differences between subjects and periods the regression includes subject and period fixed effects.

two-tailed) it becomes significantly negative under a high degree of mutual monitoring (-0.4346 + 0.0815 = -0.3531, $F = 16.67$, $p < 0.001$, two-tailed).

Table 4: Effects of Peers' Current Influence Activities on Employees' Effort and Influence Activities in the Next Period

Coefficient (p-value)	**EFFORT$_{t+1}$**	**INFLUENCE ACTIVITY$_{t+1}$**
Constant	12.5461 (0.000)***	5.2270 (0.000)***
Peer Influence Activity	0.0815 (0.226)	-0.0586 (0.317)
Peer Influence Activity * High Degree of Monitoring	-0.4346 (0.000)***	0.3880 (0.000)***
Period fixed effects	*Included*	*Included*
Subject fixed effects	*Included*	*Included*
R^2: within	0.0640	0.0613
R^2: between	0.0043	0.0248
N	672	672

Note: N indicates the number of observations. The regressions use standard errors clustered at the team level to control for multiple observations within teams. The model also includes period and subject fixed effects (not reported). All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

INFLUENCE ACTIVITY$_{t+1}$ is the employees' engagement in influence activities in the next period (t+1).

EFFORT$_{t+1}$ is the employees' effort choice in the next period (t+1)

High Degree of Monitoring is a dummy variable equal to 1 when the degree of mutual monitoring between peers is high and equal to 0 otherwise.

Peer Influence Activity corresponds to the other employee's engagement in influence activities in the current period (number between 0 and 20).

Second, I test the effect of peers' influence activities in the current period on employees' engagement in influence activities in the subsequent period. For that, I employ the same regression model as described above, yet, using an employee's influence activities in the subsequent period (INFLUENCE ACTIVITY$_{t+1}$) as dependent variable. If influence activities are more contagious under a high degree of monitoring, I expect the interaction between Peer Influence

Activity and High Degree of Monitoring to be positive. Results reported in Table 4 show that the interaction is positive and highly significant (β = 0.3880, p < 0.001, two-tailed). Again, while the effect of Peer Influence Activities is insignificant under a low degree of monitoring (β = -0.0586, p = 0.317, two-tailed), the effect becomes positive and significant under a high degree of mutual monitoring (0.3880 - 0.0586 = 0.3294, F = 16.71, p < 0.001, two-tailed). Overall, these results support the notion that employees react more strongly to their peers' influence activities under a high compared to a low degree of mutual monitoring.

Effect of the Discretion Extent under a Low Degree of Mutual Monitoring

In the development of H1, I argued that implementing limitations on the discretion extent leads to lower levels of influence activities independent from the degree of mutual monitoring in teams. While this holds true under a high degree of mutual monitoring, the effect of the discretion extent, however, becomes insignificant under a low degree of monitoring.

One explanation for this non-finding might be that under a low degree of monitoring employees may not only engage in influence activities to influence their superiors' bonus decision but also to hide low levels of effort from their peers as employees, just like superiors, cannot distinguish between effort and influence activities of their peers. That is, under a low degree of monitoring employees may try to give their peers the impression of exerting high effort in order to prevent them from revising their productive effort downwards when observing low performance signals. This motivation to engage in influence activities may thus persist under a low degree of monitoring independent from superiors' extent of discretion. Moreover, employees may have more motivation to hide low levels of effort from their peer if they perceive their peer to exert high effort as in this case it may pay more to keep up the impression of exerting high effort.

Therefore, I explore in more details how the perceived effort of peers affects employees' engagement in influence activities and their reaction to the discretion extent under a low degree of mutual monitoring. To do so, I test a model, in which I regress average influence activities of an employee in the last four periods on the perceived effort of the other employee in the first four periods, the discretion extent, and the interaction thereof. To measure the perceived effort of peers (Perceived Peer Effort) I deduct an employee's own effort from team output (including the random noise term) as employees cannot monitor effort of their peers directly under a low degree of mutual monitoring. Next, I take the average over the first four periods. If employees under a low degree of mutual monitoring attempt to hide relatively low levels of effort from their peers by engaging in influence activities I expect the level of influence activities in the last periods to be positively associated with the perceived effort of peers in the first periods. This effect should, however, be reduced under a high extent of discretion as in this case influence activities may be primarily directed towards superiors rather than peers.

Results from the regression reported in Table 5 reveal that employees' levels of influence activities in the last periods are significantly higher when they perceive their peers to exert high effort in the first periods (β = 0.3752, p = 0.043, two-tailed). Furthermore, the positive and significant effect of the discretion extent (β = 7.5966, p = 0.084, two-tailed) indicates that employees increase their engagement in influence activities under high discretion independent from the perceived effort of their peers. Finally, the interaction between Perceived Peer Effort and High Discretion is negative and significant (β = -0.4340, p = 0.073, two-tailed). In fact, the effect of the perceived peer effort on influence activities becomes insignificant under a high extent of discretion (0.3752 – 0.4340 = -0.0588, F = 0.15, p = 0.700, two-tailed).

Table 5: Effects of Perceived Effort of Peers and the Extent of Discretion Under a Low Degree of Monitoring between Peers

Coefficient (p-value)	**Average Influence (*Last 4*)**
Constant	1.7434 (0.531)
High Discretion (1/0)	7.5966 (0.084)*
Perceived Peer Effort (*First 4*)	0.3752 (0.043)**
Perceived Peer Effort (*First 4*) * High Discretion	-0.4340 (0.073)*
R^2	0.0996
N	48

Note: N indicates the number of observations. The regressions use standard errors clustered at the team level to control for multiple observations within teams. All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

Average Influence (*Last 4*) is an employee's average level of influence activities over the last 4 periods.

Perceived Peer Effort (*First 4*) is equal the average peer's potential effort as observed by the employee (team output net of an employees' own effort) over the first 4 periods.

High Discretion is a dummy variable equal to 1 when the superior's extent of discretion in allocating the bonus pool is high and equal to 0 otherwise.

These results suggest that employees under a low degree of mutual monitoring may also be motivated to engage in influence activities that are directed towards peers rather than superiors. This motivation may persist even when superiors' extent of discretion is low and may explain why limiting the discretion extent is less effective in mitigating influence activities when the degree of mutual monitoring between peers is low rather than high.

5 Conclusion

This study experimentally investigates how the extent of superior discretion in the allocation of a bonus pool affects the output of a team. Prior experimental research has examined the efficiency of discretionary bonus pools in settings where employees only decide about their provision of productive effort (e.g., Fisher et al. 2005; Van der Heijden, Potters and Sefton 2009). However, one pertinent problem of superior discretion – the danger of influence activities – has long been discussed in the economic literature (Milgrom and Roberts 1988; Prendergast 1999). In this study, the efficiency of superior discretion is thus tested under conditions in which employees can become engaged in activities that are directed to influence bonus decision rather than to contribute to team output.

In the experimental setting, two employees work together in a team to produce a joint output. As compensation, employees receive a share of a bonus pool that is formally linked to team output. The team is managed by a superior whose compensation increases with the team output and who has some discretion to allocate the bonus pool between the two employees. Before allocating the bonus pool, the superior receives a non-verifiable signal about the individual performances of each of the two employees. The performance signal, however, does not only reflect employees' productive effort. Employees can also engage in unproductive influence activities to increase their performance signal as observed by the superior. Employees incur lower private costs for engaging in influence activities than for exerting productive effort. The superior thus has to take into account that increasing the weight on the performance signal when allocating the bonus pool might not only motivate employees to increase their effort but also to increase their engagement in influence activities.

Using a between-subjects experimental design I vary two factors. First, I vary the discretion extent of superiors in bonus allocations. Under a *high* discretion extent, superiors allocate 75 percent of the bonus pool at their discretion while the remainder is allocated equally between the two employees. Under a *low* discretion extent, superiors only allocate 25 percent of the bonus pool with the remainder allocated equally. Second, I vary the degree of mutual monitoring between employees. Under a *high* degree of mutual monitoring, employees can directly observe their peers' engagement in influence activities and their provision of effort. Under a *low* degree of mutual monitoring, however, employees observe the same noisy signal as the superior about their peers' performance.

Consistent with my theory I find that limiting superiors' extent of discretion in bonus decisions helps to mitigate employees' engagement in influence activities and, thereby, increases team output under a high degree of mutual monitoring in teams. However, influence activities are more prevalent under a low degree of mutual monitoring as initially predicted. A possible explanation is that under a low degree of monitoring influence activities may not only be directed to influence the impression and decisions of superiors but also the one of peers.

Additional analyses reveal that superiors fail to sufficiently account for influence activities when allocating the bonus pool. Limiting the discretion extent thus lowers the impact the superiors' personal information and observations may have on bonus allocations and, therefore, reduces incentives for employees to engage in influence activities in the first place. Further analyses reveal that influence activities of peers are more contagious under a high degree of mutual monitoring. Limiting the extent of discretion therefore becomes more important with higher degrees of mutual monitoring between peers in order to limit the detrimental effects of influence activities on team output.

My findings have important implications for both theory and practice. From a theoretical perspective, my study contributes to the recent stream of research investigating the efficiency of discretion in bonus allocations (e.g., Fisher et al. 2005; Bailey et al. 2011; Arnold and Tafkov 2015) by informing about the costs and prevalence of employees' influence activities under high superior discretion. Moreover, the study adds to research by providing evidence that influence activities are potentially more detrimental to team output when the degree of mutual monitoring in teams increases.

From a practical perspective, the study provides evidence that organizations should not rely too strongly on their superiors to adopt an allocation strategy that motivates employees to enhance productive effort and not to engage in influence activities. Rather than granting superiors full discretion in bonus decisions, organizations may therefore limit the discretion extent. Such a course of action mitigates incentives for influence activities in the first place and, as a result, improves the efficiency of discretionary bonus pools.

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Appendix

Model of Influence Activities and Effort

In this appendix, I introduce a model of employees' effort and influence activities and derive the optimal bonus allocation strategy under standard economic assumptions. Consider two risk-neutral and homogenous agents that produce a joint team output. Each agent $i \in \{1, 2\}$ selects a level of effort (e_i) and a level of influence activities (b_i). Employees bear private costs from both, effort and influence activities, where $c_i(e_i, b_i)$ is a function converting any combination of effort and influence activities to costs. The private cost of effort is higher compared to the cost of influence activities in the sense that the marginal cost of influence activities is only a fraction k of the marginal costs of effort. Moreover, there are spillover costs between the two activities such that the marginal cost of effort is increasing in the level of influence activities (and vice versa).[22] Specifically, the private cost function looks as follows:

$$c_i(e_i, b_i) = \frac{1}{4}(e_i + k \cdot b_i)^2$$

where:

$$k \in]0, 1[$$
$$i \in \{1, 2\}$$

Team output q is a function of the two employees' effort and a uniformly distributed random term $\varepsilon \in [0, 12]$ representing the uncertainty in the production process. Specifically,

$$q(e_1, e_2, \varepsilon) = e_1 + e_2 + \varepsilon$$

Employees are compensated by the means of a bonus pool that is completely allocated between the two employees at the end of a period. The size of bonus pool P is linearly increasing in team output by factor t:

[22] Spillover costs are often implemented when modelling multi-task environments (e.g., Holmstrom and Milgrom 1991). They likely exist in practice because time constraints may limit employees' ability to engage in both activities or because excessive engagement in one activity may exhaust employees and, thereby affect the costs to engage in other activities.

$$P(q) = t \cdot q(e_1, e_2, \varepsilon) = t \cdot (e_1 + e_2 + \varepsilon)$$

Before allocating the bonus pool the superior gets a non-verifiable signal about the individual performance of each of the two employees. The performance signal (S_i) is a function of an employees' effort and influence activities:

$$S_i(e_i, b_i) = e_i + b_i$$

The superiors then have to place an optimal weight on the performance signal when allocating the bonus pool so as to motivate high efforts. Specifically, superiors can do so by allocating a portion α of the bonus pool based on the performance signal while allocating the remaining portion of the bonus pool $(1 - \alpha)$ equally between the two employees. Thus, an employee's share in the bonus pool (B_i) is represented by the following function:

$$B_i = \alpha \cdot P(q) \cdot \frac{S_i}{S_1 + S_2} + (1 - \alpha) \cdot P(q) \cdot \frac{1}{2} = \left(\alpha \cdot \frac{S_i}{S_1 + S_2} + \frac{(1 - \alpha)}{2}\right) \cdot P(q)$$

where:

$$\alpha \in [0, 1]$$

Self-interested employees maximize their expected utility EU_i, which is increasing in their share in the bonus pool B_i and decreasing in their private cost of effort and influence activities $c_i(e_i, b_i)$. The utility function is additively separable in its two operands. Furthermore, as common in experimental studies, I assume that utility can be measured in monetary terms (e.g, Towry 2003). Hence, the utility function may be represented as,

$$EU_i = \left(\alpha \cdot \frac{S_i}{S_1 + S_2} + \frac{(1 - \alpha)}{2}\right) \cdot \mathrm{E}\big(P(q)\big) - c_i(e_i, b_i)$$

where:

$$\mathrm{E}\big(P(q)\big) = t \cdot \big(e_1 + e_2 + \mathrm{E}(\varepsilon)\big)$$

Self-Interested Equilibrium in Absence of Influence Activities

As a benchmark, I first derive employees' effort as a function of the weight α when employees do not engage in influence activities. In this case, the superiors' non-verifiable performance signal S_i perfectly reflects individual effort (i.e., $S_i = e_i$). In absence of influence activities, self-interested employees thus maximizes the following objective function:

$$\max_{e_i} EU_i = \left(\alpha \cdot \frac{e_i}{e_1 + e_2} + \frac{(1-\alpha)}{2}\right) \cdot \mathrm{E}\big(P(q)\big) - \frac{1}{4}(e_i)^2 \qquad \text{(A.1)}$$

s. t. $\quad e_i \geq 0$

The effort function can be derived by rearranging the first order condition under the assumption of homogenous employees (i.e., $e_1 = e_2$):

$$e_i = \frac{1}{2}\left(t \cdot (1+\alpha) + \sqrt{t^2 \cdot (1+\alpha)^2 + 2t \cdot \mathrm{E}(\varepsilon) \cdot \alpha}\right) \qquad \text{(A.2)}$$

Equation A.2 reveals that in absence of influence activities individual effort is strictly increasing in the weight α. That is, increasing the weight α reduces opportunities for employees to free-ride on the effort of the other employee by strengthening the link between individual effort and reward.

Self-Interested Equilibrium in Presence of Influence Activities

Next, I derive employees' effort as a function of the weight α when employees do engage in influence activities. In this case, the superiors non-verifiable performance signal S_i reflects an employee's effort and his engagement in influence activities (i.e., $S_i = e_i + b_i$). In presence of influence activities, self-interested employees thus maximize the following objective function:

$$\max_{e_i, b_i} EU_i = \left(\alpha \cdot \frac{S_i}{S_1 + S_2} + \frac{(1-\alpha)}{2}\right) \cdot \mathrm{E}\big(P(q)\big) - \frac{1}{4}(e_i + k \cdot b_i)^2 \qquad \text{(B.1)}$$

s. t. $\quad e_i \geq 0$

$\quad b_i \geq 0$

Again, the effort function can be derived by rearranging the *two* first order conditions under the assumption of homogenous employees (i.e., $e_1 = e_2$ and $b_1 = b_2$):

$$e_{\mathrm{i}} = \frac{t}{1-k} - k \cdot b_i \tag{B.2}$$

where:

$$b_i = \frac{1}{k} \cdot \left(\frac{t}{(1-k)} - \frac{t}{(1-k)^2 \cdot (1+\alpha)} + \frac{\mathrm{E}(\varepsilon) \cdot \alpha}{2 \cdot (1+\alpha)} \right) \tag{B.3}$$

Equation (B.2) reveals that an employee's effort is strictly decreasing in his level of influence activities (for all $b_i \geq 0$). Furthermore, equation (B.3) implies that employees' engagement in influence activities is positive and strictly increasing in the weight α whenever α *exceeds* the following threshold:

$$\bar{\alpha} = \frac{2tk}{(1-k) \cdot (2t + \mathrm{E}(\varepsilon) \cdot (1-k))}$$

If, however, the weight α is set below this threshold equation B.3 would imply a negative level of influence activities, which is not feasible. Consequently, below the threshold $\bar{\alpha}$ employees do not become engaged in influence activities (i.e., $b_i = 0$).

Importantly, this threshold also constitutes the weight α on the private performance signal, which maximizes individual effort. That is, as long as the weight α is set below the threshold $\bar{\alpha}$, employees do not engage in influence activities, and hence, an increase in the weight α would imply higher effort as indicated by equation A.2. In contrast, when the weight α is set above the threshold $\bar{\alpha}$, employees engage in influence activities (i.e., $b_i > 0$) and any increase in the weight α leads them to increase the level of influence activities and to reduce effort as indicated by equations B.2 and B.3. Employees' effort is thus highest if setting the weight on the private performance signal exactly equal to $\bar{\alpha}$.

Benchmark Solutions

In this study, the following specific parameters are used:

$$t = 10$$
$$k = 0.37$$
$$\mathrm{E}(\varepsilon) = 6$$

The optimal weight α, given the above parameters, is therefore calculated as follows:

$$\alpha^* = \frac{2 \cdot 10 \cdot 0.37}{(1 - 0.37) \cdot (2 \cdot 10 + 6 \cdot (1 - 0.37))} \approx 0.5$$

In the resulting Nash Equilibrium employees would not engage in influence activities (see discussion above) and they would choose their level of effort as implied by equation B.2 (or by equation A.1, which yields the same result):

$$e_i^* = \frac{10}{1 - 0.37} \approx 15.87$$

Under a *low* discretion extent (LD) superiors can allocate only 25 percent of the bonus pool at their discretion. Assuming that superiors allocate the discretionary part of the bonus pool based on their performance signals, this would imply a weight α equal to 0.25. In the resulting Nash Equilibrium employees would then again not engage in influence activities and they would choose a level of effort as implied by equation A.2:

$$b_i^{LD} = 0$$

$$e_i^{LD} = \frac{1}{2}\left(10 \cdot (1 + 0.25) + \sqrt{100 \cdot (1 + 0.25)^2 + 120 \cdot 0.25}\right) \approx 13.07$$

Under a *high* discretion extent (HD) superiors can allocate 75 percent of the bonus pool at their discretion. A high discretion extent would thus enable superiors to adopt an optimal bonus allocation strategy and to elicit the effort level of e_i^*. If superiors, however, fail to account for influence activities and assuming that they fully allocate the discretionary part of the bonus pool based on the performance signal, this would imply a weight α equal to 0.75. In the resulting equilibrium employees would then choose their level of effort and influence activities as implied by equations B.2 and B.3:

$$b_i^{HD} = \frac{1}{0.37} \cdot \left(\frac{10}{(1 - 0.37)} - \frac{10}{(1 - 0.37)^2 \cdot (1 + 0.75)} + \frac{(6 \cdot 0.75)}{2 \cdot (1 + 0.75)}\right) \approx 7.46$$

$$e_i^{HD} = \frac{10}{1 - 0.37} - 0.37 \cdot b_i^{HD} \approx 13.11$$

Experimental Instruments[23]

Preliminary Remarks

Thank you for participating in this experiment.

This experiment investigates decision making in an organizational setting. Please read the instructions carefully. Your earnings will depend on the decision that you and other participants make during this experiment.

After reading the instructions, you will take a short quiz to test your comprehension of the instructions. No one will be able to continue until everyone has passed the quiz.

We promise to carry out this study in the manner described in the instructions, with no deception of any form.

If you have any questions while we are going over the instructions, or during the study, please raise your hand and we will answer your question in private.

This experiment will approximately take 90 minutes.

General Instructions

This experiment consists of several „rounds". In each round, you are part of a three-person team. Assume that you and the two other participants in your team work for the same organization. In each team, one participant will act as the team manager and the two other participants will act as an employee (employee A or employee B).

You are assigned to the role of **a (team manager/ Employee A/B)**. All participants will keep their role throughout the entire experiment.

This experiment consists of eight rounds in total. Throughout the eight rounds of the experiment, your team will remain the same.

You can earn points in each round of the experiment. How many points you will earn in a round depends on the decisions that you and the two other participants in your team make. Your experimental payout will be calculated based on the total amount of points that you have earned during the experiment. Earned points will be converted into actual cash at the rate of **36 points = CHF 1** and will be added to your **CHF 5** participation fee.

In the event that you have a negative amount of points at the end of the experiment, the points (converted into cash) will be deducted from your participation fee. A potential deduction, however, cannot be higher than the participation fee.

Each participant has already been assigned to a cubicle that is marked with a number from 1 to 15. The numbers enable all participants to identify the members of their team: With the help of the numbers, you can identify the two other members of your team during the experiment and you can also identify for each team member whether he/she acts as the team manager or as an employee.

[23] The experimental instruments are directly translated from German to be as close as possible to the original instruments. The materials presented here account for other treatments by indicating modifications in square parentheses.

At the beginning of the experiment each participant will stand up behind his/her cubicle – team-by-team – and each participant will briefly introduce himself/herself personally to the members of his/her team (name, age, hobby).

The experiment will start after the round of introductions. From this point, all interactions will take place over the computer network until the end of the experiment.

Employees' task
The task of the employees – A and B – is it to decide in each round about their levels of effort in two activities. The choice of the effort levels influences the output that the team produces, and determines the cost of effort that an employee has to bear. The task is identical for all employees.

Choice of effort levels
Employees choose their levels of effort in two different activities – *Activity 1* and *Activity 2*. Each employees chooses his/her effort levels by determining a number between 0 and 20 for each of the two activities.

Effort costs and team output
Just as there are different activities in reality that are more or less exhausting and that contribute more or less to team output, the two activities in this experiment also differ in the **effort costs** incurred and in their contribution to **team output**.

> **Effort costs:**
> Each employee bears individual costs for his/her levels of effort in activity 1 and 2. ***Table 1*** (see at the end of these instructions) shows the effort costs contingent on the level of effort in activities 1 and 2.
>
> *Activity 1* incurs higher effort cost than *Activitiy 2*: An increase in the effort level in *Activity 1* leads to additional effort costs more than twice as high as an equal increase in the effort level in *Activity 2*.
>
> **Team output:**
> Each employee can contribute to team output by increasing his/her effort level in *Activity 1*. An increase in the effort level in *Activity 1* by one unit increases team output by one unit.
> In contrast, an increase in the effort level in *Activity 2* does not increase team output.

Hence, an increase in the effort level in *Activity 1* leads to high effort costs for an employee. However it also contributes much to team output. In contrast, an increase in the effort level in *Activity 2* incurs much lower additional effort cost. However, it does not contribute to team output.

Total effort
The effort levels of an employee in *Activity 1* and *Activity 2* together add up to **total effort** of an employee. Assume that – just like in the real world – your total effort requires work time and, hence, total effort is limited: The total effort of an employee in each round cannot be higher **20**.

Team output and bonus pool

Team output in each round is determined by two components:

Effort Levels: Employees can increase team output by increasing their level of effort in *Activity 1*. The effort levels of the two employees in *Activity 1* are summed up and are added to team output at the end of each round.

Random component: In reality, it can happen that employees work hard but - because of bad luck – only realize a low team output. Or, it can happen that employees don't really work hard but they may be lucky and still realize a high team output. This can also happen in this experiment. That is, in each period the computer randomly determines a *positive* integer between 0 and 12 {0, +1, +2, …, +12}, which is added to team output at the end of a round. (Each integer has in each round the same probability to be drawn independent of previous or future draws.)

To summarize, team output of the organization in each round is equal the sum of the two employees' effort level in *Activity 1* + the random component (which is a randomly determined integer between 0 and 12).

The organization makes a profit of 20 points for each unit of team output that the two employees produce. In each round, 50 percent of the organization's profit are going into a bonus pool for the two employees. At the end of each round, this *bonus pool* will be completely allocated between the two employees:

Bonus pool for the employees:
Each unit of team output increases the organization's profit by 20 points. 50 percent of the organization's profit are going into a bonus pool at the end of a round. **Therefore, each unit of team output increases the bonus pool by 10 points.**

The information of the team manager and allocation of the bonus pool

In each round, the team manager will be informed about the *team output* and about the total effort of each of the two employees. The team manager, however, is not informed about the efforts of the two employees in activity 1 and 2 separately. That is, the team manager will know the total level of effort of each employee, however, he/she won't know how much of the total effort was contributed to either *Activity 1* or *Activity 2*.

The allocation of the *bonus pool* between the two employees is conducted in two steps:

Team bonus

In a first step, the team bonus is allocated. The team bonus corresponds to the portion of the bonus pool that is in any case allocated equally between the two employees. That is, each of the two employees receives one-half of the team bonus. The portion of the bonus pool that is allocated as team bonus – equally between employees – is equal to **25% [75%]** of the bonus pool. This portion is fixed and cannot be changed by the team manager.

Individual bonus

In a second step, the team manager allocates the remaining portion of **75% [25%]** of the bonus pool that is not allocated as team bonus. The team manager allocates this portion of

75% [25%] of the bonus pool between the two employees after being informed about the total effort of each of his/her two employees. The team manager is free in his/her decision about how to allocate the bonus pool between the two employees as long as the sum of the individual bonus payments amounts to 75% [25%] of the bonus pool and as long as none of the two employees receives less than 0 as an individual bonus.

Information of the employees
At the end of each round, employees receive information about efforts and bonus payments of the other employee in their team.

[Conditions with a high degree of mutual monitoring: Before the team manager allocates the bonus pool employees are informed about the total effort of the other employee in their team. In contrast to the team manager, employees are additionally informed about the levels of effort of the other employee in activities 1 and 2. That means each employee knows exactly how much effort the other employee in his/her team has contributed to *Activity 1* and *Activity 2*.]

[Conditions with a low degree of mutual monitoring: Before the team manager allocates the bonus pool, employees are informed about the total effort of the other employee in their team. Just like the team manager, however, employees are not informed about the levels of effort of the other employee in activities 1 and 2 separately. That means each employee knows total effort of the other employee in his/her team, however, he/she does not know how much effort the other employee in his/her team has contributed to *Activity 1* and *Activity 2*.]

At the end of each round, after the team manager allocated the bonus pool, each employee is informed about his/her total bonus and the total bonus of the other employee in his/her team.

Net income of an employee
Besides the bonus payment, each employee receives a fixed income of **15 points** in each round. The fixed income is added to an employee's total points from the bonus pool. The net income of an employee in a round is therefore equal to the fixed income plus his/her total bonus minus his/her costs of effort.

> **Net income of an employee:**
> Fixed income + total bonus – costs of effort = Net income in points

Net income of the team manager
In each round, the team manager receives a bonus as his/her net income. The bonus of the team manager is directly linked to the profit of the organization. The team manager receives 20% of the organization's profit payed out as bonus at the end of each round.

> **Bonus of the team managers:**
> Each unit of team output increases the profit of the organization by 20 points. The team manager receives 20% of the organization's profit payed out as bonus. **Hence, each additional unit of team output increases the manager's bonus by 4 points.**

Information at end of each round
At the end of each round, each employee and the team manager is informed about their individual net incomes in the corresponding round.

EXAMPLE ROUND:

Assume that you and the other employee in your team have chosen the following effort levels independent from each other:

	Employee A	Employee B
Effort in *Activity 1*	16	8
Effort in *Activity 2*	0	8
Total effort	**16**	**16**

The choice of the above levels of effort are leading – according to ***Table 1*** (see at the end of these instructions) – to the following costs of effort for the two employees:

	Employee A	Employee B
Effort Costs	64.0	30.0

The efforts of the two employees in *Activity 1* together with the random component determine team output. Assume that the random component is equal to 8. Each unit of effort in *Activity 1* increases team output by one unit:

Effort in Activity 1	
Employee A:	16 units
Employee B:	8 units
Random component	8 units
Team output	***32 units***

Due to the chosen levels of effort in *Activity 1* the team has produced in this example round 32 units of team output in total. Each unit of team output increases the bonus pool by 10 points. Hence, at the end of the round the bonus pool is calculated as follows:

Bonus pool: 10 points x 32 units = 320 points

At the end of the round and before the allocation of the bonus pool, employees and the team manager are informed about the efforts of each employee. The team manager [as well as the two employees], however, only observes [observe] total effort of the two employees. The team manager [They], however, does not [do not] observe how much effort employees have contributed to *Activity 1* and *Activity 2* separately.

Information of the team manager about the efforts of the two employees

	Employee A	Employee B
Total effort	16	16

[Conditions with a high degree of mutual monitoring: The two employees, however, can observe total effort as well as how much effort the other employee has contributed to each of the two activities.]

At the end of the round, the team manager allocates the portion of bonus pool between the two employees, which is not allocated as team bonus. That means, 25% [75%] of the bonus pool are allocated as team bonus equally between employees. The remaining 75% [25%] of the bonus pool are allocated by the team manager at his/her discretion.

Hence, in this example round, the team bonus is equal to 25% [75%] * 320 = 80 [240] points. Each employees receives one-half of the team bonus, which is equal to 80 / 2 = 40 [240/2 = 120] points. The team manager is free to allocate the remaining 240 [80] points from the bonus pool at his/her discretion as long as he/she allocates the total amount of 240 [80] points between the two employees and as long as none of the two employees receives less than 0.

Superior's allocation of the bonus pool

	Employee A	Employee B	Total
Team bonus	40 [120]	40 [120]	***80 [240]***
Individual bonus	*a*	*b*	***240 [80]***
Total bonus of an Employee	***40 [120] + a***	***40 [120] + b***	***320 points (=Bonus pool)***

After the team manager has allocated the bonus pool, each employee is informed about his/her total bonus and about the total bonus of the other employee. The total bonus of an employee is calculated by the sum of the team bonus and the employee's individual bonus as determined by the team manager.

The net income of an employee at the end of each round is calculated as follows:

Fix income + total bonus – effort costs = *Net income in points*
(rounded up to the next whole number)

Net income of an employee

	Employee A	Employee B
Fix income	15	15
Total bonus	*40 [120]+ a*	*40 [120]+ b*
Effort costs	64.0	30.0
Net income in points	**15 + *(40 [120] + a)* – 64.0**	**15 + *(40 [120] + b)* – 30.0**

The net income of the team manager at the end of each round is calculated as follows:

Units of team output x 4 bonus points per unit = *Net income in points*

Net income of the team manager
Team manager: 32 x 4 = 128 points

Experimental payout and completion of the experiment

The points that you have earned in each round will be summed up over all eight rounds of the experiment. At the end of the experiment, these points will determine your experimental pay-out.

Your points will be converted into to cash at a rate of **36 points = CHF 1.** This amount will be added to your **participation fee of CHF 5** and it will paid out at the end of the experiment.

In the event that you have a negative amount of points at the end of the experiments, the points converted into cash will be deducted from your participation fee. However, a cash de-duction in CHF will never be higher than the participation fee.

As soon as you received your payout, you have successfully completed the experiment. Please help us to remain control over the results of this experiment by not talking to anybody about this experiment who could still participate. Thank you.

***Table 1*: Effort costs** (in points)

Effort in Activity 1	*Effort in Activity 2*																				
	0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***
0	0.0	0.0	0.1	0.3	0.5	0.9	1.2	1.7	2.2	2.8	3.4	4.1	4.9	5.8	6.7	7.7	8.8	9.9	11.1	12.4	13.7
1	0.3	0.5	0.8	1.1	1.5	2.0	2.6	3.2	3.9	4.7	5.5	6.4	7.4	8.4	9.5	10.7	12.0	13.3	14.7	16.1	-
2	1.0	1.4	1.9	2.4	3.0	3.7	4.5	5.3	6.2	7.1	8.1	9.2	10.4	11.6	12.9	14.3	15.7	17.2	18.7	-	-
3	2.3	2.8	3.5	4.2	5.0	5.9	6.8	7.8	8.9	10.0	11.2	12.5	13.8	15.2	16.7	18.3	19.9	21.6	-	-	-
4	4.0	4.8	5.6	6.5	7.5	8.6	9.7	10.9	12.1	13.4	14.8	16.3	17.8	19.4	21.1	22.8	24.6	-	-	-	-
5	6.3	7.2	8.2	9.3	10.5	11.7	13.0	14.4	15.8	17.3	18.9	20.6	22.3	24.1	25.9	27.8	-	-	-	-	-
6	9.0	10.1	11.4	12.6	14.0	15.4	16.9	18.4	20.1	21.8	23.5	25.4	27.2	29.2	31.2	-	-	-	-	-	-
7	12.3	13.6	15.0	16.4	18.0	19.6	21.3	23.0	24.8	26.7	28.6	30.6	32.7	34.9	-	-	-	-	-	-	-
8	16.0	17.5	19.1	20.7	22.5	24.3	26.1	28.0	30.0	32.1	34.2	36.4	38.7	-	-	-	-	-	-	-	-
9	20.3	21.9	23.7	25.6	27.5	29.4	31.5	33.6	35.8	38.0	40.3	42.7	-	-	-	-	-	-	-	-	-
10	25.0	26.9	28.8	30.9	32.9	35.1	37.3	39.6	42.0	44.4	46.9	-	-	-	-	-	-	-	-	-	-
11	30.3	32.3	34.5	36.7	38.9	41.3	43.7	46.2	48.7	51.3	-	-	-	-	-	-	-	-	-	-	-
12	36.0	38.3	40.6	43.0	45.4	48.0	50.6	53.2	56.0	-	-	-	-	-	-	-	-	-	-	-	-
13	42.3	44.7	47.2	49.8	52.4	55.1	57.9	60.8	-	-	-	-	-	-	-	-	-	-	-	-	-
14	49.0	51.6	54.3	57.1	59.9	62.8	65.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	56.3	59.1	61.9	64.9	67.9	71.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	64.0	67.0	70.1	73.2	76.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	72.3	75.4	78.7	82.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	81.0	84.4	87.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	90.3	93.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Pre-experimental quiz

Note: This will be administered via the computer. Participants have to answer each question correctly before they can continue to the next question.
All answers will be accompanied by an explanation *why* the answer was right or wrong (to emphasize the corresponding instructions again). In case an answer was wrong, participants will have to answer the question again.

1. I will interact with the same team members throughout the eight rounds of the experiment
   - True
   - False

2. My role will remain constant throughout the experiment session. That is, if I am a team manager in the first round, I will be a team manager in all subsequent rounds. Likewise, if I am an employee in the first round, I will be an employee in all subsequent rounds.
   - True
   - False

3.1 If an employee chooses a level of effort in *Activity 1* of 15 and a level of effort in *Activity 2* of 5, then team output will increase by:
   a) 20 units
   b) 15 units
   c) 10 units
   d) 5 units

3.2 If an employee chooses a level of effort in *Activity 1* of 5 and a level of effort in *Activity 2* of 15, then team output will increase by:
   a) 20 units
   b) 15 units
   c) 10 units
   d) 5 units

4.1 If an employee chooses a level of effort in *Activity 1* of 15 and a level of effort in *Activity 2* of 5, then his/her effort costs are equal to:
   a) 15 points
   b) 27.8 points
   c) 71 points
   d) 100 points

4.1 If an employee chooses a level of effort in *Activity 1* of 5 and a level of effort in *Activity 2* of 15 then his/her effort costs are equal to:
   a) 15 points
   b) 27.8 points
   c) 71 points
   d) 100 points

5. If both employees choose a level of effort in *Activity 1* of 10 and a level of effort in *Activity 2* of 10 and the random component equals to 5, then team output is equal to:
- a) 15 units
- b) 25 units
- c) 45 units
- d) 60 units

6. If team output is equal to 30 units, then the bonus pool for the employees is equal to:
- a) 60 points
- b) 150 points
- c) 300 points
- d) 600 points

7. If team output is equal to 30 units, then the bonus for the team manager is equal to:
- a) 30 points
- b) 90 points
- c) 120 points
- d) 300 points

8. The team manager allocates the portion of the bonus pool, that is not allocated as team bonus (equally among employees), at his/her discretion
- True
- False

9. Employees will not only be informed about *total effort* of the other employee, but also about the other employee's level of effort in *Activity 1* and *Activity 2* separately
- True
- False

10. The team manager will not only be informed about *total effort* of the two employees, but also about the two employees' levels of effort in *Activity 1* and *Activity 2* separately
- True
- False

11. 25% [75%] of the bonus pool will be allocated equally among the two employees
- True
- False

<u>ESSAY 3</u>

Discretionary Bonus Pools and Employees' Influence Activities: The Efficacy of Superiors' Announcements.

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Abstract
The purpose of this study is to examine experimentally how the ability of superiors to determine and announce the extent of discretion over bonus allocations affects team output in a setting where employees can become engaged in unproductive influence activities. Prior research demonstrates that limiting superiors' extent of discretion can increase team output by mitigating influence activities in teams. In prior settings, the extent of discretion is determined by the organization while superiors are not involved in the decision. In this study, superiors determine the discretion extent themselves. Between subjects, I manipulate whether superiors have to announce the discretion extent to their employees or not and whether the degree of mutual monitoring in teams is high or low. I argue that in a setting with influence activities, a policy that requires superiors to announce the discretion extent in advance is important because it helps them to manage and control employees' behavior more effectively. Furthermore, I suggest that the effect of such a policy is more pronounced when the degree of mutual monitoring in teams is high. This is because social influences under a high degree of mutual monitoring likely reinforce the effect of superiors' announcements. The study finds that a policy, which requires superiors to announce the discretion extent, improves the link between individual effort and rewards and leads to increased team output when the degree of mutual monitoring in teams is high. Announcement, however, does not significantly affect team output when the degree of mutual monitoring is low. Further analyses indicate that the usefulness of announcement depends on how evident the relation between the announced discretion extent and team output is to superiors. This study contributes to theory and practice by showing how the efficacy of superior discretion can be improved when employees can engage in unproductive activities to distort superiors' personal observations and information in their favor.

Keywords: Influence activities, bonus pool, discretion, announcement, mutual monitoring

1 Introduction

Organizations frequently delegate bonus decisions to their team managers. Specifically, superiors of a team are often granted some discretion to allocate a bonus pool among their subordinates according to their subjective assessments (Baiman and Rajan 1995; Murphy and Oyer 2003; Bailey, Hecht and Towry 2011; Kampkötter and Sliwka 2018). When objective performance measures are available only on an aggregate level (e.g., branch or division profits), discretion over bonus decisions enables superiors to use their non-verifiable observations and information in order to better reward individual performances and mitigate free-riding incentives in teams (Fisher, Maines, Peffer and Sprinkle 2005; Van der Heijden, Potters and Sefton 2009). Hence, by delegating bonus decisions to lower levels of management organizations rely on superiors of a team to allocate bonus pools in a way that elicits high performances and ultimately enhances firm value. Prior research, however, has shown that superiors are often prone to judgmental biases that may reduce the efficacy of discretionary bonus pools in motivating employee effort (e.g., Prendergast and Topel 1993; Bol 2008; Bol 2011).

Moreover, the introduction of superior discretion in organizations may give rise to *unproductive* influence activities of employees. That is, discretion may induce employees to focus their attention on activities that are not necessarily contributing to the output of the organization but that are aimed to influence the bonus decision of superiors (Bol 2008; Prendergast 1999; Inderst, Müller and Wärneryd 2007). For example, employees may distort their efforts towards activities that are more visible for superiors while neglecting other, potentially more productive, activities (e.g., Bol 2008). Consequently, influence activities may reduce the efficacy of superior discretion due to distorted bonus allocations and because they detract employees from exerting effort that is more productive. Prior analytical and experimental research therefore stresses that implementing limitations on the extent of superior discretion may be necessary to mitigate costs of influence activities in organizations (e.g., Milgrom and Roberts 1988; Milgrom and Roberts 1992 Corgnet and Rodriguez Lara 2013; Elsinger 2017).

Organizations may embed limitations on superiors' discretion extent in the design of bonus plans. That is, by design, bonus plans often allow discretion only over some portion of the bonus pool with the remainder allocated based on predefined rules (e.g., Murphy and Oyer 2003; Bailey et al. 2011). Organizations, however, often also let their team managers implement and communicate important specifics of a bonus plan (e.g., Jensen, McMullen and Stark 2007). For example, superiors have to specify and announce relevant assessment criteria and the weights placed on subjective and objective performance measures in the end-of-year assessments of their subordinates' performances (e.g., Bol 2011; Moers 2005). Similarly, organizations can establish guidelines that require superiors to determine and announce to what extent they allocate bonus pools based on predefined rules without ex post discretion (e.g., equally among employees) and to what extent they retain ex post discretion over bonus allocation decisions. Such a policy ensures that employees learn from the very beginning to what extent their end-year bonus may depend on the discretionary assessment of their superior.

In a setting where employees can engage in influence activities, this study investigates whether a policy that requires superiors to specify and announce the extent of discretion over bonus allocations increases team output compared to when superiors do not announce the discretion extent in advance. Furthermore, the study also investigates whether the effect of superiors' announcement is more pronounced when the degree of mutual monitoring in teams is high rather than low (i.e., when employees can more directly monitor the workplace behavior and activities of their peers). From a standard economic perspective, whether superiors announce the discretion extent or not is irrelevant and should not affect team output. That is, under both policies, superiors can allocate bonus pools in whatever way would best induce employees to exert productive effort ex ante (Baiman and Rajan 1995). Furthermore, given standard economic rationality assumptions, employees would anticipate such a bonus allocation strategy and choose their effort accordingly, independent of whether superiors announce the discretion extent or not.

However, I develop theory to predict that announcement increases team output by mitigating influence activities in teams. Announcement provides superiors with a tool to manage their employees' expectations more effectively. That is, superiors can announce to limit their discretion by allocating some portion of the bonus pool equally among employees independent form their personal information and observations. This likely reduces employees' expected returns from engaging in unproductive influence activities in the first place and may encourage them to focus on productive effort instead. Consequently, if superiors recognize announcement as a tool to effectively influence employees' expectations and behavior then they likely use it to motivate high effort and team output over time. Moreover, I predict that the effect of superiors' announcements is stronger when the degree of mutual monitoring in teams is high rather than when it is low. The reason is that under a high degree of mutual monitoring in teams the behavior of employees may be more strongly influenced by their expectations and observations of other team members' behavior (e.g., Robinson and O'Leary-Kelly 1998, Croson 2001). Consequently, if announcement induces employees to reduce their engagement in influence activities and to focus on productive effort, a high degree of mutual monitoring may additionally help to reinforce this effect over time.

I test the effects of announcement via an experiment. In the experimental setting three employees repeatedly work together in a team to produce a joint output. Employees are rewarded from a bonus pool that linearly increases in team output. Teams are managed by a superior who has discretion to allocate the bonus pool among the employees at the end of a period. Before allocating the bonus pool, the superior receives a personal signal about the individual performances of each of the three employees. The personal performance signal, however, does not only reflect employees' productive effort. Employees can also engage in influence activities that do not contribute to team output but that increase an employee's performance signal as observed by the superior. Employees incur lower private costs for engaging in influence activities than for exerting effort. The superior thus has to take into account that placing more weight on the personal performance signal in bonus allocations might not only motivate employees to increase their effort but also their engagement in influence activities. Superiors are compensated based on team output, and are thus incented to allocate bonus pools so as to elicit high levels of effort over all periods.

The experiment uses a 2 x 2, between subjects, design in which teams interact over eight periods in total. I manipulate announcement at two levels (present vs. absent). In the announcement present conditions, superiors announce at the beginning of each period the portion of the bonus pool that will be allocated equally among employees (i.e., without ex post discretion) and the portion that they allocate at discretion ex post. In the conditions without announcement, superiors do not announce the discretion extent to their employees. Further, I vary the degree of mutual monitoring in teams (low vs. high). Under a high degree of mutual monitoring employees can directly observe their peers' level of effort and influence activities, while, under a low degree of mutual monitoring, just like the superior, employees cannot distinguish between productive effort and influence activities of their peers.

The results of the experiment show that announcement enhances the link between individual effort and reward. Yet, the efficacy of superiors' announcements in promoting team output depends on the degree of mutual monitoring in teams. Specifically, announcement significantly increases team output when the degree of mutual monitoring is high. The effect of superiors' announcements, however, becomes insignificant under a low degree of mutual monitoring. Additional analyses indicate that the efficacy of announcement in general crucially depends on the discretion extent announced by superiors. That is, in the announcement conditions, employees respond to their superiors' announcements by increasing their effort and decreasing influence activities more strongly, the *lower* the extent of discretion announced. The results thus suggest that announcement becomes more effective in inducing effort and team output when superiors announce to *limit* their discretion to a high extent. Again, the relation between the announced discretion extent and employees' effort is more pronounced under a high degree of mutual monitoring. Moreover, because the connection between the announced discretion extent and team output is less evident under a low degree of mutual monitoring it likely also becomes more challenging for superiors to determine and announce an optimal extent of discretion. This may additionally help to explain why announcement becomes ineffective in improving team output when the degree of mutual monitoring in teams decreases.

The findings of the study have important implications for theory and practice. From a theoretical perspective, the study contributes to prior research testing efficacy of superior discretion under varying conditions (e.g. Arnold and Tafkov 2015; Elsinger 2017). The findings are in line with the results from a previous study showing that high superior discretion can be detrimental to team output in presence of influence activities, particularly in work environments with a high degree of mutual monitoring between peers (Elsinger 2017). The study contributes to the existing knowledge base by providing evidence that superiors recognize the importance of limiting their ex post discretion when they have to announce it to their subordinates. They can thus use announcements to better motivate productive effort in teams.

Whereas prior studies emphasize the importance of limiting superior discretion by design in order to reduce the cost of influence activities (e.g., Milgrom 1988; Milgrom and Roberts 1988; Corgnet and Rodriguez Lara 2013; Elsinger 2017) this study test the efficacy of an alternative policy. Specifically, the study informs organizations that the efficacy of superior discretion in teamwork environments can be improved by letting superiors specify and announce the extent of discretion at the beginning of a year. First, such a policy enables superiors to manage and control employees’ expectations and behavior more effectively. And second, it helps to enhance the link between individual effort and reward by mitigating influence activities in teams. Therefore, announcement provides a simple and practical tool for organizations to improve the efficiency of discretionary bonus pools. Announcement may be particularly useful, when organizations lack sufficient information to optimally define the extent of superior discretion over bonus allocations or when they want to abstain from implementing general limitations on the discretion extent.

The remainder of the paper is organized as follows. Section 2 describes the setting and presents the hypotheses. Section 3 describes the experimental design. Section 4 presents the results of the experiment. Section 5 concludes.

2 Hypotheses

Setting

Prior analytical and experimental research emphasizes the benefits of using discretionary bonus pools in *teamwork* environments, where it is often difficult to measure individual performances objectively (e.g., Baiman and Rajan 1995; Fisher et al. 2005; Maas, Van Rinsum and Towry 2012). The idea is that organizations commit to pay out a bonus pool, which is tied to objective and verifiable measures of aggregate performance. The bonus pool is then allocated among eligible employees at the discretion of a superior. Baiman and Rajan (1995) show analytically that discretionary bonus pool arrangements optimally enable organizations to exploit non-contractible sources of information without facing a commitment problem. Furthermore, Fisher et al. (2005) confirm these findings empirically by showing in an experiment that high discretion over bonus allocations increases team output in a setting where superiors have non-verifiable information about individual performances.

These prior findings, however, may depend on crucial assumptions. For example, prior research makes specific assumptions about the characteristic of the team production function (e.g., Fisher et al. 2005; Van der Heijden et al. 2009; Maas et al. 2012). Arnold and Tafkov (2015), however, show that the efficacy of superior discretion depends on the nature of a task. More specifically, they show that discretion may be detrimental to team output when tasks of employees are interdependent. Moreover, prior research assumes that superiors can observe individual performances in an unbiased manner (Baiman and Rajan 1995; Rajan and Reichelstein 2009; Fisher et al. 2005). That is, even though superiors may not observe employees' efforts perfectly, a crucial assumption is that employees cannot distort the information and observations of superiors in their favor (i.e., the superior's personal information on average reflects an employee's actual effort choice). This assumption may be too strong because it implies that there is no other and potentially easier way for employees to influence the superiors' decision than exerting productive effort. However, employees need to be viewed as actively involved in adopting the most effective tactics to manage the information they convey (Ferris, Judge, Rowland and Fitzgibbons 1990). For example, discretion may encourage employees to focus on activities that are more visible for superiors and not necessarily the most productive ones (Prendergast 1999, Bol 2011, Corgnet and Rodriguez-Lara 2013). Hence, superiors may get a biased impression about individual contributions and performances if some employees excessively focus on activities that increase their visibility. Similar as in Elsinger (2017), in this study I relax the assumption that superiors get unbiased information about individual performances.

Specifically, I explore how the ability of superiors to announce the extent of discretion over bonus allocations affects the output of teams in a setting, in which employees can engage in costly influence activities. In the basic setting, three employees repeatedly work together in a team that is managed by a superior. In each working period, employees choose about their engagement in two activities—productive effort and unproductive influence activities. By exerting effort, employees contribute to team output and increase their individual performance as observed by the superior. Yet, employees also bear high personal costs from exerting effort, as effort is exhausting and time-consuming. In contrast, influence activities incur lower personal costs but are also less productive in the sense that they do *not* contribute much to team output. Nevertheless, they increase an employee's performance as observed by the superior. Employees engaging in influence activities thus attempt to give their superior the impression of exerting high effort without actually having to bear high personal costs of effort.

Employees are compensated from a bonus pool that is formally linked to objectively measurable team output. Superiors are then granted discretion to allocate the bonus pool after team output is realized and after observing a non-verifiable signal about the individual performance of each employee. Superiors, however, cannot distinguish between productive effort and mere influence attempts of their employees. Therefore, both activities increase the individual performance signal as observed by the superior. An important feature of the setting is that superiors are aware that their private information may be distorted by employees' influence activities.

Due to the presence of influence activities, superiors face a trade-off when deciding about how strongly to incorporate their private information in bonus allocations. On the one hand, when superiors reduce the weight on their personal information and allocate bonus pools more equally among employees, this increases opportunities for employees to free-ride on the efforts of their peers and thereby harm team output. On the other hand, when superiors increase the weight on their personal information in bonus allocation decision, this may induce employees to focus on activities that are easy and effective in distorting the superiors' information in their favor while neglecting more productive activities, which again may harm team output.

Because superiors' compensation is tied to team output, they have an incentive to allocate the bonus pool in whatever way best motivates employees to exert effort. Relying on standard economic rationality assumptions and given the parameters from the actual experiment, the setting has a unique bonus allocation strategy that maximizes team output. Optimally superiors allocate half of the bonus pool based on the observed performance signal while they allocate the remaining part of the bonus pool equally among employees (The derivation of the unique

Nash equilibrium is presented in the Appendix). Such an allocation strategy ensures an equilibrium, in which employees do not engage in influence activities while at the same time an employee's opportunity to free-ride on their peers' effort is reduced.

From a standard economic perspective, employees' provision of effort and engagement in influence activities should not depend on whether superiors make an announcement about the discretion extent or not. That is, given standard economic assumptions, employees should anticipate that superiors allocate the bonus pool so as to motivate high effort and to reduce incentives for influence activities even if superiors make no announcement. However, from a behavioral perspective, announcement likely matters. Superiors can mitigate incentives for influence activities more effectively by announcing to limit their discretion in the first place. That is, announcement likely affects the beliefs employees hold about how strongly superiors rely on their personal observations and information in bonus allocations. Therefore, announcement likely also influences employees' choice of effort and influence activities.

To test the effects of announcement, I manipulate in this study whether or not superiors announce the extent of discretion over bonus allocations at the beginning of a period. In all conditions, superiors determine at the beginning of a period a binding portion of the bonus pool between 0 and 100 percent that is in any case allocated equally among employees (i.e., without ex post discretion) with the remainder allocated at discretion ex post. In the conditions with announcement, the portions of the bonus pool allocated with and without ex post discretion are announced before employees choose their level of effort and influence activities. In the conditions without announcement, employees are not informed about the discretionary and nondiscretionary portions of the bonus pool.

Furthermore, I vary degree of mutual monitoring between peers to test the effect of announcement in two different work environments. Under a high degree of mutual monitoring employees are able to monitor their peers' effort and influence activities perfectly. Under a low degree of mutual monitoring, employees, just like the superior, cannot distinguish their peers' influence activities from productive effort. They thus observe the same signal about their peers' performances as the superior, which equals the sum of their peers' effort and influence activities.

Hypotheses

The Effects of Superior's Announcement on Team Output

Discretion over bonus allocations allows superiors to incorporate their personal observations about individual performances in order to mitigate opportunism and free-riding in teams (e.g., Fisher et al. 2005, Baiman and Rajan 1995). Superior discretion therefore intends to better motivate individual performances and promote team output when formal information systems provide objective performance measures only on an aggregate level.

Yet, when superiors have ex post discretion over bonus allocations, employees may start to engage in activities that are directed to influence the superior's bonus decision but that do not necessarily contribute to team output (e.g., Prendergast 1999; Bol 2008). Such influence attempts are costly for organizations because they likely divert employees' attention and effort away from more productive activities (Milgrom 1988; Prendergast 1999, Woods 2012). Moreover, influence activities distort the superiors' information about individual contributions to team output, which likely also leads to more distortions in bonus allocations of superiors. Influence activities of peers thereby reduce an employee's benefit from exerting effort. Additionally, due to distorted bonus allocations, influence activities may also negatively affect employees' perceptions of distributive fairness. This is problematic because prior research demonstrates that perceived distributive fairness is an important driver of employees' satisfaction and their willingness to contribute to team output (e.g., Cohen-Carash and Spector 2001).

In order to prevent influence activities in the first place it may thus be important to limit and communicate the extent of discretion over bonus allocations at the beginning of a year (Elsinger 2017). Specifically, when delegating bonus allocation decisions to superiors, organizations can establish guidelines that require superiors to specify and announce the discretion extent in advance.[24] Compared to a setting where superiors do not announce the discretion extent, employees under announcement learn at the beginning of a year to what extent superiors retain ex post discretion over bonus allocations and to what extent they limit their discretion by allocating bonus pools based on aggregate team performance (e.g., equally among employees).

Announcements of superiors can have a strong impact on employees' decisions and behavior as prior experimental research on leadership demonstrates (e.g. Gürerk, Irlendbusch and Rockenbach 2009). For example, announcements of superiors about the use of incentives (reward or punishment) shape the team's culture and affect individual contributions to team output (Gürerk et al. 2009). Or announcements of superiors about suggested contributions are closely followed by subordinates (Houser, Levy, Padgitt, Peart and Xiao 2007). Announcements thus support superiors in inducing desired behaviors (e.g., Gürerk et al. 2009). Consequently, when superiors announce the discretion extent to their employees they likely take into account how employees respond to the announcement. Superiors can use announcements as a tool to control and manage employees' expectations and workplace behavior more effectively. Specifically, superiors can announce to limit their ex post discretion in order to mitigate employees' incentives to engage influence activities and to induce them to focus on more productive effort from the very beginning. Announcement therefore likely helps to promote team output by alleviating employees' expected returns from engaging in unproductive influence activities in the first place.

Moreover, when superiors limit their ex post discretion under announcement they commit themselves to allocate smaller portions of the bonus pool based on their personal observations and information. Superiors that do not announce to limit their discretion in advance could still

[24] Announcing the discretion extent is similar to settings in which superiors have to specify and announce their employees in advance the weights placed on subjective and objective measures in performance assessments as, for example, described in Moers 2005. That is, by placing more weight on objective performance measures superiors limit the impact of their subjective (discretionary) assessments on bonus allocations.

mimic such a bonus allocation strategy ex post by reducing the weight on their personal information when allocating bonus pools. However, they likely fail to do so. Prior research demonstrates that individuals often unconsciously overweigh personal information in their decisions. For example, individuals tend to overweigh redundant information when making decisions (e.g., Joe 2003), and they tend to rely on information even if aware that the information may be distorted or irrelevant (e.g., Chinander and Schweitzer 2003). Announcement may therefore prevent superiors from relying too strongly on their personal observations once they have to allocate the bonus pool at the end of a year. As a result, announcement ultimately reduces returns on influence activities which leads to fewer influence activities and, consequently, also to less distortions in bonus allocations of superiors. These arguments lead to my first hypothesis:

H1: Team output is higher when superiors announce the discretion extent to their subordinates than when the discretion extent is not announced.

Announcement and the Degree of Mutual Monitoring between Peers

Next, I argue that a high degree of mutual of mutual monitoring amplifies the effect of announcement. The degree of mutual monitoring in teams refers to the ability of employees to observe their peers' activities and workplace behavior (e.g., Towry 2003; Hannan, Towry and Zhang 2013). That is, a high degree of mutual monitoring enables employees to draw clearer inferences about their peers' effort as well as their engagement in influence activities. A high degree of mutual monitoring thus increases the salience of peers' behavior in the work place and facilitates comparison among employees (Hannan et al. 2013).

I therefore expect that employees' response to superiors' announcements of the discretion extent may be more pronounced when the degree of mutual monitoring in teams increases. The reason is that superiors' announcements under a high degree of mutual monitoring may not only affect employees' behavior through altering their expectations of how strongly superiors will rely on their personal information in bonus allocations but, additionally, through increased social influences. Prior research shows that the behavior of the members of a team is influenced by both expectations and observations of others' behavior (Kerr, Park, Ouwerkerk, Parks, Gallucci and van Lange 2009; Robinson and O'Leary-Kelly 1998), and more so, the better individuals can monitor the behavior of each other (e.g., Schroeder, Jensen, Reed, Sullivan and Schwab 1982; Croson 2001; Carpenter 2004). Such social influences occur because of team members' preferences to conform to the behavior of those around them (e.g., Carpenter 2004; Tayler and Bloomfield 2011; Aronson, Wilson and Akert 2008; Cardinaels and Yin 2015) or because they reciprocate cooperative and uncooperative actions of their peers (e.g., Fehr and Falk 2002; Bradsley and Sausgruber 2005; Croson 2007). The effect of announcement may thus be reinforced under a high degree of mutual monitoring when employees expect a certain behavior to be more prevalent given the superior's announcement (e.g., Cardinaels and Yin 2015; Sliwka 2007) or when employees' observations of their peers' behavior lead them to react and behave more similarly over time.

Specifically, when superiors announce to limit their ex post discretion over bonus allocations, employees may not only expect influence activities to be less effective in influencing bonus allocation decisions of superiors but, additionally, employees may also expect such activities to be less prevalent. Consequently, the announcement of the discretion extent may reduce the attractiveness of influence activities even more under high degrees of mutual monitoring when employees are also concerned to conform to the behavior of their peers. This, in turn, may induce employees to focus on productive effort and may help to reinforce higher contributions to team output over time. This prediction is formally stated as H2.

H2: The effect of the superiors' announcements on team output is more pronounced when the degree of mutual monitoring in teams is high than when it is low.

3 Method

Experimental Design

This experiment uses a 2 x 2 between-subjects design in which two factors are varied. The first factor is whether superiors announce the discretion extent at the beginning of a period or whether no such announcement is made (announcement present vs. announcement absent). Second, the degree of mutual monitoring is varied at two levels. Employees under a *low degree of mutual monitoring* do not monitor effort and influence activities of their coworkers directly. Employees under a *high degree of mutual monitoring* directly observe their peer's effort and engagement in influence activities at the end of each period.

Task Overview and Experimental Design

Three employees (Employee A, Employee B and Employee C) and a superior (Team Manager) repeatedly interact in a team. In each period, the employees' task is it to choose their level of effort and influence activities. At the beginning of each period, the three employees choose their levels by assigning a number between 0 and 20 to each of the two activities under the restriction that the *sum* of effort and influence activities does not exceed 20 in total.[25] The output of the team is the summation of each of the three employee's effort level:

$$\textit{Team Output} = \Sigma_i \textit{Effort}_i \qquad (1)$$
where $i \in \{A, B, C\}$

Employees incur *private costs* for both—effort and influence activities. The private costs are increasing in the level of engagement. Yet, an employee's private cost of effort is higher compared to the private cost of influence activities. Specifically, an employee's private cost function is given as follows:

$$\textit{Private Cost}_i = 0.25 \times (\textit{Effort}_i + 0.5 \times \textit{Influence Activities}_i)^2 \qquad (2)$$
where $i \in \{A, B, C\}$

The private cost function is common knowledge to all—employees and superiors. Employees are compensated from a bonus pool that is linked to aggregate team output. For each unit of team output the bonus pool for the three employees increases by 10 points:

$$\textit{Bonus Pool} = 10 \times \textit{Team Output} \qquad (3)$$

[25] As the superior's private signal equals the sum of an employee's effort and influence activities, this restriction is to ensure that the performance signal cannot be larger than 20. A performance signal larger than 20 would directly reveal to superiors that the employee engaged in influence activities.

In each period, the points from the bonus pool are completely allocated between the three employees. At the beginning of each period, superiors define a portion between 0 and 100 percent of the bonus pool (in increments of 10 percentage points) that it is in any case allocated equally among employees (*nondiscretionary* portion of the bonus pool). At the end of each period, the bonus pools is therefore allocated in two steps. First, the nondiscretionary portion is deducted from the total bonus pool and each of the three employees receives one third of the nondiscretionary portion of the bonus pool (nondiscretionary bonus). Second, the remaining portion of the bonus pool is allocated at superiors' discretion ex post (discretionary bonus). An employee's bonus is thus computed as follows:

Employee's Bonus = Nondiscretionary Bonus + Discretionary bonus (4)

To isolate the effect of announcement I decided to keep the bonus allocation procedure constant across all conditions. That is, superiors in all conditions define the discretion extent at the beginning of each period in order to avoid potential framing or demand effects that may drive differences between conditions. However, while in the announcement conditions superiors announce the discretionary and nondiscretionary portion of the bonus pool at the beginning of each period, in the conditions without announcement employees never learn the portion of the bonus pool allocated at discretion and the portion allocated without ex post discretion. This design choice also allows me to draw conclusions about the superiors' motivation to limit the discretion extent. While under both conditions—with and without announcements—superiors may limit the discretion extent due to their allocation preferences, systematic differences in the discretion extent between the conditions are likely driven by strategic considerations of superiors regarding the impact on employees' behavior.

Before allocating the bonus pool, superiors observe a performance signal of each employee's contribution to the aggregate team output. The performance signal is the summation of an employee's level of effort and influence activities. Therefore, superiors cannot distinguish between effort and influence activities. Furthermore, influence activities are unproductive from the organization's perspective as they only affect the superior's performance signal but do not contribute to team output.

Earnings

In each period, employees receive a fixed salary of 40 points in addition to their bonus. To determine the employees' final earnings in a period, the private costs resulting from effort and influence activities (as defined in Equation (2)) are deducted from the employee's bonus and fixed salary. In summary, an employee's earnings for the period are computed as follows:

Employee Earnings = 40 + Employee's Bonus – Private Costs (5)

Each period superiors receive a bonus that increases in team output. For each unit team output produced, superiors receive a bonus of 4 points. Superiors do not receive a fixed salary and they do not bear any private costs. Their earnings for the period are thus computed as follows:

Superior Earnings = 4 × Team Output (6)

Participants' earnings in a period were summed up over all eight periods and converted to cash at a rate of CHF 1 per 34 points. Additionally, each participant was paid out a show-up fee of CHF 5. On average, participants earned CHF 26 from the experiment.

Participants and Procedures

A total of 128 undergraduate students from a public European university participated in the experiment. Participants were randomly allocated among the four experimental conditions. Each participant was assigned to a four-person team and his/her role (Employee A, Employee B, Employee C or Team Manager) at the beginning of the experiment.

The number of participants in each condition is included in Figure 1. Each student participated in only one session. The mean age of the participants is 23.7 years and 46.9 percent of participants are female.

Figure 1: Experimental Design and Number of Participants

	Low Degree of Mutual Monitoring	High Degree of Mutual Monitoring	*Total*
Announcement Present	N = 32 (*8*)	N = 32 (*8*)	N = 64 (*16*)
Announcement Absent	N = 32 (*8*)	N = 32 (*8*)	N = 64 (*16*)
Total	N = 64 (*16*)	N = 64 (*16*)	N = 128 (*32*)

Note: N = number of participants (*number of teams*).

At the start of each session, participants were provided with written instructions and were informed of their randomly assigned role of an employee or superior (team manager). Instructions were read aloud by the experimenter. After the instructions, participants stood up behind their cubicles and introduced themselves to the members of their team by telling their name, age, and hobby. Participants revealed their identities in order to reduce the social distance and to ensure that the members of a team have some minimal social familiarity with each other (Gächter and Fehr 1999) which is common in experiments involving mutual monitoring (e.g., Towry 2003; Brüggen and Moers 2007; Maas and van Rinsum 2013).

After the round of introductions, all participants were required to complete a pre-experiment quiz to ensure that they understand the experiment. After all the participants had answered all questions of the quiz correctly, the eight periods of the experiment started. Participants interacted through a computer network and could not communicate with each other. The experiment was programmed with z-tree experimental economics software (Fischbacher 2007).

At the beginning of each period, in all conditions, superiors first determined a portion of the bonus pool between 0 and 100 percent in increments of 10 percentage points that was in any case allocated as team bonus equally among employees after team output had been realized (nondiscretionary portion of the bonus pool). The remainder of the bonus pool superiors allocated at their discretion at the end of a period (discretionary portion). In the announcement conditions, the nondiscretionary and discretionary portion of the bonus pool were announced before employees chose about their level of effort. Subsequent to the determination of the non-discretionary and discretionary portion of the bonus pool, employees chose their level of effort and influence activities. They could enter any combination of effort and influence activities on the interval between [0, 1,…, 20] that did not exceed 20 in sum. Once employees entered a level of effort and influence activities, the program calculated and displayed the private costs such a combination would incur (as defined in Equation (2)).[26] Employees could then adjust their levels of effort and influence activities as often as they wished. After each of the three employees confirmed his/her entry, the computer calculated team output by summing up the three employees' productive effort. Next, superiors received the signal about each of the three employees' individual performance (i.e. the sum of effort and influence activities). At the same time, employees received either the same signal as the superior about their peers' performances (low degree of mutual monitoring) or they were informed about each of their peers' effort and influence activities separately (high degree of mutual monitoring). On the same screen, which showed the private performance signal, superiors in all conditions were also informed about team output, the size of the total bonus pool and the size of the discretionary part of the bonus pool (i.e., the portion *not* allocated equally among employees). Superiors then had to determine individual bonuses by assigning points from the discretionary bonus pool to the three employees. Superiors were free in allocating bonuses as long as *all* points from the discretionary bonus pool were distributed and as long as each employee's share in the discretionary bonus pool was larger or equal to zero. The remaining points from the nondiscretionary portion of the bonus pool were then allocated equally between the three employees. At the end of each period employees and superiors were displayed their period earnings as defined in Equation (5) and Equation (6). Then the next period started.

[26] In addition, all participants (employees and superiors) had a printed table available during the entire experiment, which showed the private costs for any possible combination of effort and influence activities.

At the conclusion of the eight periods, participants completed a post-experiment questionnaire. They received their cash payments and were dismissed. Experimental sessions lasted approximately 80 minutes.

4 Results

Descriptive Statistics

The primary dependent variable, used to test H1 and H2, is TEAM OUTPUT. TEAM OUTPUT is computed as the sum of the three employees' effort in a period. Table 1 reports descriptive statistics for the primary dependent variables. As reported in Table 1 and graphed in Figure 2, under a high degree of mutual monitoring, TEAM OUTPUT increases from 24.13 in absence of announcement to 34.80 when announcement is present. In contrast, under a low degree of mutual monitoring TEAM OUTPUT slightly decreases from 29.28 in absence of announcement to 27.09 when announcement is present. This finding represents first evidence for H2, which predicts that the effect of superiors' announcement on team output is more pronounced when degree of mutual monitoring is high than when it is low. However, directionally inconsistent with H1, team output does not increase but slightly decreases when announcement is present under a low degree of mutual monitoring.

Further, I also calculate TEAM INFLUENCE as the sum of the three employees' influence activities in a period. As reported in Table 1 and graphed in Figure 3, under a high degree of mutual monitoring, TEAM INFLUENCE considerably decreases from 19.72 without announcement to 13.91 when announcement present. Under a low degree of mutual monitoring TEAM INFLUENCE only slightly decreases from 21.02 without announcement to 19.72 in the condition with announcement. The data thus provide evidence that superiors' announcement of the discretion extent helps to mitigate influence activities in teams, which likely also drives the observed results on team output. However, again, the efficacy of announcement in mitigating influence activities seems to depend on the degree of mutual monitoring in teams.

Table 1: Mean, *Standard Deviation* (Number of Observations) for Key Measures and Number of Observations by Treatment

	Low Degree of Mutual Monitoring		High Degree of Mutual Monitoring	
	Announcement Absent	Announcement Present	Announcement Absent	Announcement Present
TEAM OUTPUT	29.2813	27.0938	24.1250	34.7969
	12.9168	*11.8532*	*10.8255*	*17.5944*
	(64)	(64)	(64)	(64)
TEAM INFLUENCE	21.0156	19.7188	24.7500	13.9063
	13.1601	*10.9658*	*11.6114*	*14.3833*
	(64)	(64)	(64)	(64)
DISCRETION EXTENT	55.6250[a]	35.6250	65.3125[a]	28.9062
	30.9570	*27.6529*	*28.3945*	*28.1784*
	(64)	(64)	(64)	(64)
RETURN ON EFFORT	3.4114	4.6273	2.8447	6.7215
	5.0604	*1.8208*	*2.4453*	*4.6372*
	(24)	(24)	(24)	(24)

Note: Every cell displays the mean, *standard deviation* and (number of observations) for the corresponding measure.

TEAM OUTPUT corresponds to the sum of the three employees' effort in a period.

TEAM INFLUENCE corresponds to the sum of the three employees' influence activities in a period.

DISCRETION EXTENT corresponds to the portion of the bonus pool that is allocated at ex post discretion in a period as defined by the team manager at the beginning of a period.

RETURN ON EFFORT corresponds to the estimated increase of an employee's total bonus for an increase in effort by one unit (estimated for each employee individually over all eight periods).

[a] In the conditions without announcement, the discretion extent is not announced and employees never learn what portion of the bonus pool will be allocated at discretion ex post.

Figure 2: Effects of Announcement on TEAM OUTPUT under a Low and High Degree of Mutual Monitoring

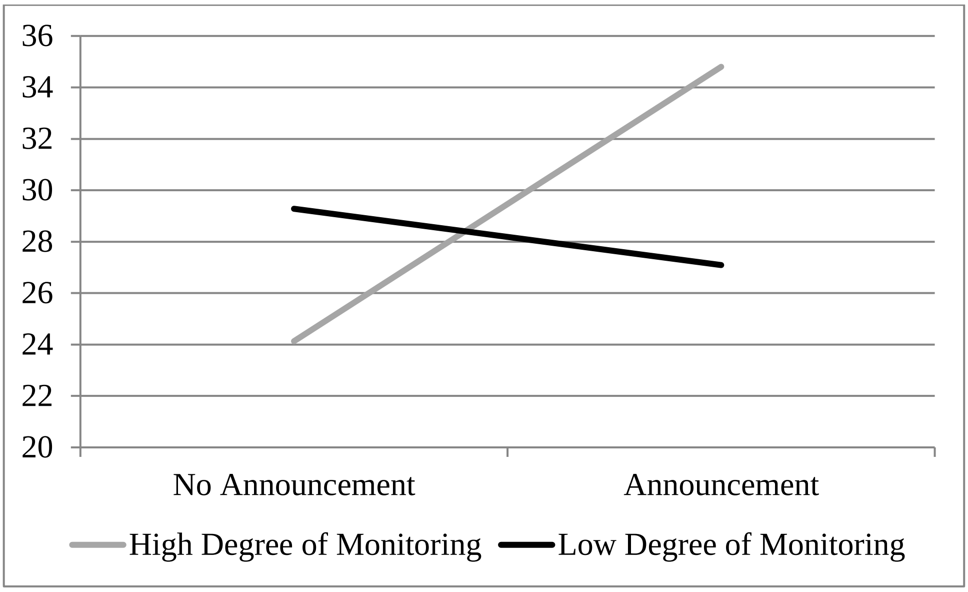

Figure 3: Effects of Announcement on TEAM INFLUENCE under a Low and High Degree of Mutual Monitoring

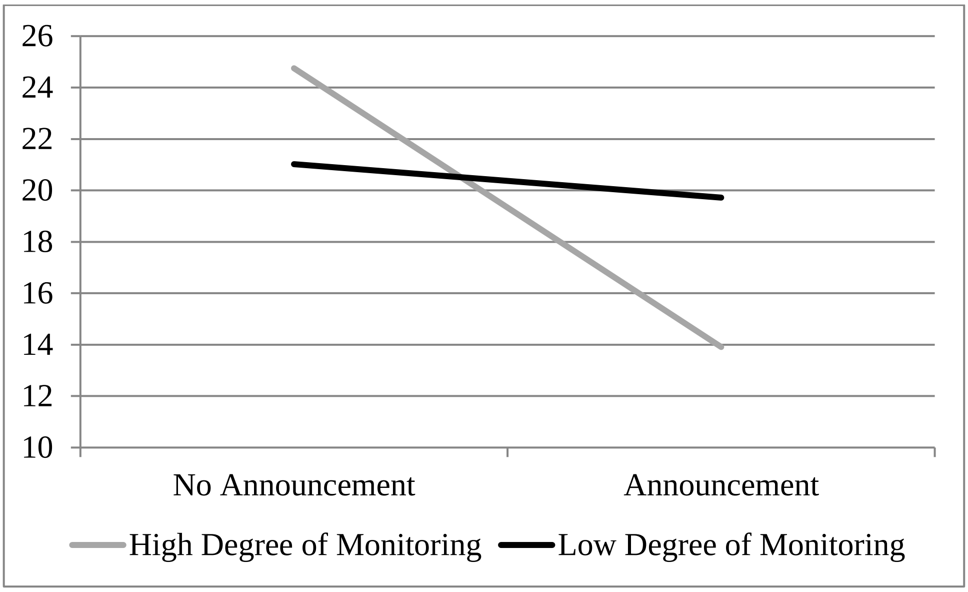

Table 1 also reports, for each condition, the average extent of ex post discretion as determined by the team managers in the beginning of a period (DISCRETION EXTENT). The discretion extent ranges between 0 and 100 percent (in increments of 10 percentage points) whereby a discretion extent of 0 percent means that the entire bonus pool is allocated equally among employees (without ex post discretion) and 100 percent means that team managers retain discretion to allocate the entire bonus pool ex post. As reported, team managers determine on average considerably lower discretion extents and, hence, give up more discretion when the discretion extent is announced (*high degree of mutual monitoring:* 28.91; *low degree of mutual monitoring:* 35.63) as compared to when the discretion extent is not announced (*high degree of mutual monitoring:* 65.63; *low degree of mutual monitoring:* 55.25). The difference in the average discretion extent between the conditions with and without announcement is significant (32.27 vs. 60.47, $t = 7.777$, $p < 0.001$, two-tailed). This result supports the notion that, in the announcement conditions, superiors recognize and use announcements as a tool to influence employees' behavior. That is, under announcement, superiors likely limit their discretion to a higher extent in order to reduce employees' expected benefits from engaging in influence activities in the first place.

Finally, Table 1 also reports employees' average returns on effort for each condition (RETURN ON EFFORT). It is measured at the employee level, by regressing, for each employee separately, the total bonus (that is paid out to the employee at the end of a period) on the employee's level of effort in a given period. The estimated coefficient of effort thus reflects the average increase of an employee's total bonus for an increase in effort by one unit. For a one unit increase in effort the bonus pool for the entire team increases by 10 points. Employees in the announcement conditions can on average capture higher shares from their contribution to the bonus pool. That is, under a low degree of mutual monitoring, RETURN ON EFFORT increases from 3.41 points without announcement to 4.63 points when announcement is present. Under a high degree of mutual monitoring, RETURN ON EFFORT increases even more from 2.84 points in absence of announcement to 6.72 points when announcement is present. The data thus provides evidence that announcement increases employees' benefits from exerting productive effort.

Hypotheses Tests

Hypothesis 1 predicts that team output increases when superiors announce the discretion extent. Moreover, hypothesis 2 predicts that the positive effect of announcement is more pronounced when the degree of mutual monitoring is high than when it is low. To test the two hypotheses I use OLS regressions with TEAM OUTPUT as dependent variable. As independent variables, I use a dummy variable equal to 1 when announcement is present (Announcement), a dummy variable equal to 1 when the degree of mutual monitoring in teams is high (High Degree of Mutual Monitoring) and the interaction of the two variables. The model also includes period fixed effects. To control for multiple observations per team, I use standard errors clustered at the team level. In order to find support for H1 and H2, the coefficient of Announcement and the coefficient of the interaction term should be both significantly positive.

Results of the regression reported in Table 2 reveal a negative but insignificant coefficient of Announcement (β = -2.19, p = 0.673, two-tailed)[27] indicating that team output does not differ between the conditions with and without announcement when the degree of mutual monitoring in teams is low. However, the coefficient of the interaction term is positive and significant (β = 12.86, p = 0.054, one-tailed) as predicted in H2. Furthermore, under a high degree of mutual monitoring, the effect of announcement becomes positive and significant (-2.19 + 12.86 = 10.67, F = 3.19, p = 0.084, two-tailed). Together, these results thus support the prediction that the effect of announcement is more pronounced under a high degree of mutual monitoring. Under a low degree of mutual monitoring, however, announcement does not significantly affect team output. Hypothesis 1, therefore, is not supported by the results.

[27] Even though I make a directional prediction about the effect of announcement under a low degree of mutual monitoring, I report p-values from a two-tailed test, as the coefficient is directionally inconsistent with the prediction.

Table 2: Effects of Announcement and the Degree of Mutual Monitoring on Team Output

Coefficient (p-value)	**TEAM OUTPUT$_t$**
Constant	28.895 (0.000)***
Announcement[a]	-2.188 (0.661)
High Degree of Mutual Monitoring	-5.156 (0.342)
Announcement * High Degree of Mutual Monitoring	12.859 (0.054)*
Period fixed effects	*Included*
R^2	0.0862
N	256

Note: N indicates the number of observations. The regressions use standard errors clustered at the team level to control for multiple observations within teams. The models also include period fixed effects (not reported). P-values are one-tailed for directional predictions and two-tailed otherwise.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

TEAM OUTPUT$_t$ is equal the sum of the three employees' effort in period t.

Announcement is a dummy variable equal to 1 when superiors announce the discretion extent at the beginning of a period and zero otherwise.

High Degree of Mutual Monitoring is a dummy variable equal to 1 when the degree of mutual monitoring between peers is high and equal to 0 otherwise.

[a] Even though a directional prediction is made for Announcement, the reported p-value for the coefficient of Announcement is two-tailed, since the coefficient is directionally inconsistent with the prediction.

Supplemental Analyses

Effects of Superiors' Announcement on the Level of Influence Activities in Teams

In the theory development, I argue that announcement likely reduces employees' expected returns from engaging in influence activities, which leads to lower levels of influence activities in teams and, in turn, helps to improve team output. To test how announcement affects the level of influence activities in teams I conduct the same OLS regression that I use to test H1 and H2 but with TEAM INFLUENCE as dependent variable. The results reported in Table 3 reveal that the coefficient of Announcement is negative but insignificant (β = -1.30, p = 0.391, one-tailed). Hence, under a low degree of mutual monitoring, the level of influence activities in teams does not significantly differ across conditions with and without announcement. However, the coefficient of the interaction term is negative and significant (β = -9.55, p = 0.079, one-tailed). In fact, under a high degree of mutual monitoring, announcement significantly reduces the level of influence activities in teams (-1.30 - 9.55 = -10.85, F = 5.26, p = 0.029, two-tailed). These results provide evidence that announcement is more effective in mitigating influence activities when the degree of mutual monitoring in teams is high.

Table 3: Effects of Announcement and the Degree of Mutual Monitoring on the Level of Influence Activities in Teams

Coefficient (p-value)	**TEAM INFLUENCE$_t$**
Constant	20.980 (0.000)***
Announcement	-1.297 (0.391)
High Degree of Mutual Monitoring	3.734 (0.342)
Announcement * High Degree of Mutual Monitoring	-9.549 (0.079)*
Period fixed effects	*Included*
R^2	0.1003
N	256

Note: N indicates the number of observations. The regressions use standard errors clustered at the team level to control for multiple observations within teams. The models also include period fixed effects (not reported). P-values are one-tailed for directional predictions and two-tailed otherwise.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

TEAM INFLUENCE$_t$ is equal the sum of the three employees' level of influence activities in period t.

Announcement is a dummy variable equal to 1 when superiors announce the discretion extent at the beginning of a period and zero otherwise.

High Degree of Mutual Monitoring is a dummy variable equal to 1 when the degree of mutual monitoring between peers is high and equal to 0 otherwise.

Employees' Response to the Announced Discretion Extent

In the theory section, I argue that superiors can use announcements to influence and control employees' behavior more effectively. Hence, in the following, I investigate in more details how employees in the announcement conditions react to different extents of discretion announced by their team managers.

To do so, I ran two separate regressions including observations from the announcement conditions only. First, I regress employees' effort in a period ($EFFORT_t$) on the discretion extent announced by the superior (Announced Discretion Extent), a dummy variable indicating whether the degree of mutual monitoring is high (High Degree of Mutual Monitoring) and the interaction between the two variables. Second, I run the same regression with employees' level of influence activities as dependent variable ($INFLUENCE\ ACTIVITY_t$). The two models include period fixed-effects.

As reported in the first column of Table 4, the coefficient of the announced discretion extent is negative and significant (β = -0.06, p = 0.037, two-tailed), indicating that employees' effort is lower when team managers announce to retain high discretion over bonus allocation decisions. Furthermore, results indicate that the effect of the announced discretion extent is more pronounced when the degree of mutual monitoring increases because the interaction term is significantly negative (β = -0.06, p = 0.100, two-tailed). Reversed effects of the announced discretion extent are observed when running the same regression with employees' influence activities as dependent variable. Table 4 (column 2) reports a significantly positive effect of the Announced Discretion Extent on the level of influence activities (β = 0.06, p = 0.001, two-tailed). Furthermore, the positive and significant interaction term (β = 0.08, p = 0.010, two-tailed) indicates that this effect is again more pronounced when the degree of mutual monitoring in teams is high. Overall, these results provide evidence that superiors can use announcements to influence employees' behavior and even more so under a high degree of mutual monitoring.

Table 4: Effects of the Announced Discretion Extent on Employee's Level of Effort and Influence Activities in the Announcement Conditions

Coefficient (p-value)	**$EFFORT_t$ (1)**	**$INFLUENCE\ ACTIVITY_t$ (2)**
Constant	11.932 (0.000)***	3.790 (0.000)***
Announced Discretion Extent	-0.059 (0.037)**	0.064 (0.001)***
High Degree of Mutual Monitoring	4.006 (0.143)	-3.663 (0.010)***
Announced Discretion Extent * High Degree of Mutual Monitoring	-0.063 (0.100)*	0.075 (0.010)***
Period fixed effects	*Included*	*Included*
R^2	0.2148	0.3103
N	384	384

Note: N indicates the number of observations. The regressions include observations from the announcement conditions only. The regressions use standard errors clustered at the team level to control for multiple observations within teams and subjects. The models also include period fixed effects (not reported). All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

$EFFORT_t$ corresponds to an employee's effort in period t.

$INFLUENCE\ ACTIVITY_t$ corresponds to an employee's level of influence activities in period t.

Announced Discretion Extent is a variable reflecting the discretion extent announced by superiors and ranges between 0 (no ex post discretion) and 100 percent (full ex post discretion).

High Degree of Mutual Monitoring is a dummy variable equal to 1 when the degree of mutual monitoring between peers is high and equal to 0 otherwise.

Moreover, in a setting with influence activities, discretion over bonus allocation seems to be even less efficient than standard economic theory predicts. That is, the results ultimately suggest that superiors are most successful in inducing high effort (and team output) by completely giving up their discretion over bonus allocations. The problem is that the announcement of retaining high discretion encourages employees to increase their engagement in influence activities, which ultimately likely leads to more distorted bonus allocations. This, in turn, may negatively affect employees' perceptions of distributive fairness and additionally demotivate them to contribute to team output. To measure perceptions of distributive fairness, participants in the role of an employee were asked in the post-experiment questionnaire to indicate how fair the superior's allocation of the bonus pool was on a 7-point Likert-scale from 1 (very unfair) to 7 (very fair). Results (untabulated) from an ordered probit regression, in which I regress perceptions of distributive fairness on the mean discretion extent announced by the team manager (over all eight periods), reveal that in the announcement conditions perceptions of distributive fairness decrease in the mean discretion extent (β = -0.03, p = 0.034, two-tailed). This finding thus suggests that—in a setting with influence activities—employees perceive bonus allocations as fairer when superiors on average announce to retain low discretion and, ultimately, allocate larger portions of the bonus pool equally among employees.

Superiors' Ability to Use Announcements

Results from the previous section suggest that superiors that announce to limit their discretion to a high extent are more successful in inducing employees to exert effort. It is therefore crucial that superiors in the announcement conditions quickly learn how employees respond to the announced discretion extent. However, since the link between effort and the announced discretion extent is weaker when the degree of mutual monitoring in teams is low, it may also become more challenging for superiors to quickly learn and use announcements so as to optimally motivate individual effort. In fact, when calculating the correlation between the announced discretion extent and team output for each team in the announcement conditions separately, the correlation coefficient is significantly negative (at the 5% significance level) in five out of eight teams under a high degree of mutual monitoring and in two out of eight teams only under a low degree of mutual monitoring. This indicates that superiors may have more difficulties to recognize the relation between the announced discretion extent and team output when the degree of mutual monitoring in teams is low, which may also help to explain why in such an environment, team output may not increase when announcement is present.

To gain insights into whether superiors are better able to use announcements when the correlation between the announced discretion extent and team output is more evident, I re-run the OLS regression used to test H1 and H2 excluding observations from the announcement conditions, in which the correlation is insignificant. Results (untabulated) reveal that the effect of Announcement on team output is now positive although still not significant at conventional levels ($\beta = 6.84$, $p = 0.123$, one-tailed). The coefficient of the interaction between Announcement and a High Degree of Mutual Monitoring is still significantly positive ($\beta = 13.41$, $p = 0.041$, one-tailed). Overall, these findings provide some evidence that announcement becomes more effective in promoting team output when superiors are better able to recognize the relation between the announced discretion extent and team output.

Superiors' Incorporation of Personal Information in Bonus Allocation Decisions

In the theory development, I argue that the announcement of the discretion extent likely prevents superiors from relying too strongly on their personal information in bonus allocations. Under announcement, superiors announce their subordinates a portion of the bonus pool that is in any case allocated equally among employees (i.e., without ex post discretion), while the remainder is allocated at discretion. Superiors in the announcement conditions on average announce to allocate 67.73% of the bonus pool *without* ex post discretion and to retain discretion over 32.27% of the bonus pool. In the conditions without announcement superiors allocate on average substantially larger portions of the bonus pool at their discretion (60.47%). However, even though superiors retain higher discretion over bonus allocation when announcement is absent, they could ex post still place a low weight on their personal information and allocate large portions of the bonus pool equally among employees.

Hence, to test whether announcement in fact reduces the impact of superiors' personal information on bonus allocations, I run a regression with an employee's total bonus share in a given period (Total Bonus Share)[28] as dependent variable. The independent variables are an

[28] Total Bonus Share equals an employee's total bonus (sum of discretionary and nondiscretionary bonus) in a period divided by the overall bonus pool in a period.

employee’s relative performance signal in a period (Relative Performance Signal)[29], a dummy variable equal to 1 if announcement is present (and zero otherwise) and the interaction between the two variables. A significantly negative interaction term would indicate that bonus allocations in the announcement conditions are less affected by the personal information of superiors.

Table 5: Effects of Employees’ Relative Performance Signal on Employees’ Share in the Bonus Pool

Coefficient (p-value)	**Total Bonus Share**
Constant	0.1074 (0.185)
Relative Performance Signal	0.6779 (0.008)***
Announcement	0.1563 (0.064)*
Relative Performance Signal * Announcement	-0.4690 (0.064)*
Period Fixed Effects	*Included*
R^2	0.1841
N	765[a]

Note: N indicates the number of observations. The regressions use standard errors clustered at the team level to control for multiple observations within groups. The model also includes period fixed effects (not reported). All p-values are two-tailed.

*, **, and *** represent significance levels of 10 percent, 5 percent, and 1 percent, respectively.

Total Bonus Share equals an employee’s total bonus divided by the period’s total bonus pool.

Announcement is a dummy variable equal to 1 when the extent of discretion is announced and equal to 0 when the extent of discretion is not announced.

Relative Performance Signal equals an employee’s performance signal divided by the sum of the three employees’ performance signal in a period.

[a] Overall there are 768 employee observations (32 teams, 3 employees per team, 8 periods). Three employee observations (same team and period) are excluded from the analysis because team output and, hence, the bonus pool was equal to zero.

[29] Relative Performance Signal equals the ratio between an employee’s individual performance signal and the sum of all three employees’ performance signals in a period.

As reported in Table 5, the coefficient of the Relative Performance Signal is positive and highly significant (β = 0.68, p = 0.008, two-tailed), indicating that in the conditions without announcement superiors strongly rely on the signal about employees' performances when allocating the bonus pool. Furthermore, the positive and significant coefficient of Announcement (β = 0.16, p = 0.064, two-tailed) reflects that under announcement larger portions of the bonus pool are allocated equally among employees (i.e., without ex post discretion). Finally, the interaction term is significantly negative (β = -0.47, p = 0.064, two-tailed). This implies that the link between the relative performance signal and an employee's bonus share is weaker when announcement is present, which is consistent with the notion that announcement prevents superiors from relying too strongly on their personal information in bonus allocations.

These results suggest that when superiors are required to announce the discretion extent to their subordinates, superiors not only use announcements to directly influence the behavior of their subordinates but, in addition, influence activities also become less effective in distorting bonus allocation decisions of superiors as superiors incorporate their personal information to a lower degree. Consequently, announcement ultimately decreases employees' potential benefits from engaging in unproductive influence activities.

Informativeness of Superiors' Personal Information and Employees' Returns on Effort

The analyses in the prior section show that superiors in the announcement conditions less strongly rely on their personal information in bonus allocations, which leads employees to reduce their engagement in influence activities. This, in turn, likely also increases the informativeness of superiors' personal information about individual performances and enables them to reward employees more accurately for increases in their effort. In the following I thus analyze in more details, how announcement affects the informativeness of the performance signal and the superior's ability to reward effort.

First, to measure how informative the superior's performance signal is about individual effort, I calculate the correlation between an employee's relative performance signal and an employee's relative effort for the conditions with and without announcement separately.[30] The more accurately the relative performance signal reflects employees' relative effort—and thereby their contribution to team output—the more positively the correlation between the two variables should be. The correlation between the relative performance signal and relative effort is equal to 0.17 (p = 0.001, two-tailed) when announcement is absent and equal to 0.44 ($p <$ 0.001, two-tailed) when announcement is present. Hence, the correlation between the relative performance signal and relative effort is higher when announcement is present and this difference is significant (z = 4.181, $p < 0.001$, two-tailed). This indicates that the performance signal becomes more informative about individual effort and relative contributions to team output in the announcement conditions.

Second, I investigate in more details whether the enhanced informativeness of the performance signal also increases superiors' ability to reward individual effort. To do so, I estimate for each employee individually the relation between individual effort and the total bonus that is paid out to the employee at the end of a period (RETURN ON EFFORT). Employees' average return on effort is higher in both announcement conditions than in the conditions without announcement (as reported in Table 1). For a one unit increase in effort the total bonus pool for the entire team increases by 10 points. While, without announcement employees on average only get 3.13 points from increasing their effort by one unit, with announcement employees get on average 5.67 points. This difference in the returns on effort between the conditions with and without announcement is significant (t = 3.287, p = 0.001, two-tailed), indicating that under announcement superiors are better able to use their information to reward individual effort.

5 Conclusion

Prior research emphasizes the importance of implementing limitations on superiors' discretion extent in order to mitigate the cost of influence activities in organizations (e.g., Milgrom

[30] Relative effort equals the ratio between an employee's individual effort and the sum of all three employees' effort in a period.

and Roberts 1988; Elsinger 2017). This study contributes to prior literature by testing the efficacy of letting superiors announce the discretion extent and by examining their ability to use announcements as a tool to promote high team output over time.

The effects of superiors' announcements are tested in an experimental setting. In the setting, three employees work together in a team to produce a joint output. Employees are compensated by the means of a bonus pool that is formally linked to team output. The team is managed by a superior that has some discretion to allocate the bonus pool among the three employees. Before allocating the bonus pool, the superior receives a personal signal about the individual performances of each of the three employees. The personal performance signal, however, does not only reflect employees' productive effort. Employees can also engage in unproductive influence activities to increase their performance signal as observed by the superior. Employees incur lower private costs for engaging in influence activities than for exerting effort. The superior thus has to take into account that placing more weight on the personal performance signal in bonus allocations might not only motivate employees to increase their effort but also to increase their engagement in influence activities.

Using a between-subjects experimental design I manipulate whether superiors announce the extent of discretion to their subordinates at the beginning of each period or not. Furthermore, I test the effects of announcement in two different work environments by varying the degree of mutual monitoring in teams at two levels. Under a high degree of mutual monitoring, employees can directly observe their peers' engagement in influence activities and their provision of effort. Under a low degree of mutual monitoring, however, employees observe the same signal as the superior about their peers' performance.

The results of the study provide evidence that a policy that requires superiors to announce the extent of discretion over bonus allocations in advance can help to improve team output in a setting with influence activities. Consistent with my prediction, I find that the effect of announcement is more pronounced in work environments with a high degree of mutual monitoring between peers. Specifically, under a high degree of mutual monitoring, announcement increases team output and reduces influence activities in teams. Under a low degree of mutual monitoring, however, announcement does not lead to increased team output. The problem is that superiors under a low degree of mutual monitoring may have more difficulties to determine and announce an optimal extent of discretion as the connection between team output and the announced discretion extent is less apparent.

Nevertheless, the findings suggest that announcement enables superiors to better reward individual effort of employees, which is an important driver of employees' motivation to contribute to team output and their perceptions of distributive fairness. A policy that requires superiors to announce the extent of discretion over bonus allocations therefore provides a useful tool for organizations to mitigate the costs of influence activities and, ultimately, to improve the efficacy of discretionary bonus pools.

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Appendix

Model of Influence Activities and Effort

In this appendix, I introduce a model of employees' effort and influence activities and derive the optimal bonus allocation strategy under standard economic assumptions. Consider three risk-neutral and homogenous agents that produce a joint team output. Each agent $i \in \{1, 2, 3\}$ selects a level of effort (e_i) and a level of influence activities (b_i). Employees bear private costs from both, effort and influence activities, where $c_i(e_i, b_i)$ is a function converting any combination of effort and influence activities to costs. The private cost of effort is higher compared to the cost of influence activities in the sense that the marginal cost of influence activities is only a fraction k of the marginal costs of effort. Moreover, there are spillover costs between the two activities such that the marginal cost of effort is increasing in the level of influence activities (and vice versa).[31] Specifically, the private cost function looks as follows:

$$c_i(e_i, b_i) = \frac{1}{4}(e_i + k \cdot b_i)^2$$

where:

$$k \in \,]0, 1[$$
$$i \in \{1, 2, 3\}$$

Team output q is a function of the three employees' effort. Specifically,

$$q(e_1, e_2, e_3) = e_1 + e_2 + e_3$$

Employees are compensated by the means of a bonus pool that is completely allocated between the two employees at the end of a period. The size of bonus pool P is linearly increasing in team output by factor t:

$$P(q) = t \cdot q(e_1, e_2, e_3) = t \cdot (e_1 + e_2 + e_3)$$

[31] Spillover costs are often implemented when modelling multi-task environments (e.g., Holmstrom and Milgrom 1991). They likely exist in practice because time constraints may limit employees' ability to engage in both activities or because excessive engagement in one activity may exhaust employees and, thereby affect the costs to engage in other activities.

Before allocating the bonus pool, the superior gets a private signal about the individual performance of each of the three employees. The private performance signal (S_i) is a function of an employees' effort and influence activities:

$$S_i(e_i, b_i) = e_i + b_i$$

The superiors then have to place an optimal weight on the private performance signal when allocating the bonus pool so as to motivate high efforts. Specifically, superiors can do so by allocating a portion α of the bonus pool based on the private performance signal while allocating the remaining portion of the bonus pool $(1 - \alpha)$ equally among the three employees. Thus, an employee's share in the bonus pool (B_i) is represented by the following function:

$$B_i = \alpha \cdot P(q) \cdot \frac{S_i}{S_1 + S_2 + S_3} + (1 - \alpha) \cdot P(q) \cdot \frac{1}{3}$$

where:

$$\alpha \in [0, 1]$$

Self-interested employees maximize their expected utility EU_i, which is increasing in their share in the bonus pool B_i and decreasing in their private cost of effort and influence activities $c_i(e_i, b_i)$. The utility function is additively separable in its two operands. Furthermore, as common in experimental studies, I assume that utility can be measured in monetary terms (e.g, Towry 2003). Hence, the utility function may be represented as,

$$EU_i = \left(\alpha \cdot \frac{S_i}{S_1 + S_2 + S_3} + \frac{(1 - \alpha)}{3}\right) \cdot P(q) - c_i(e_i, b_i)$$

Self-Interested Equilibrium in Absence of Influence Activities

As a benchmark, I first derive employees' effort as a function of the weight α when employees do not engage in influence activities. In this case, the superiors' private performance signal S_i perfectly reflects individual effort (i.e., $S_i = e_i$). In absence of influence activities, self-interested employees thus maximizes the following objective function:

$$\max_{e_i} EU_i = \left(\alpha \cdot \frac{e_i}{e_1 + e_2 + e_3} + \frac{(1 - \alpha)}{3}\right) \cdot P(q) - \frac{1}{4}(e_i)^2 \qquad \text{(A.1)}$$

s. t. $e_i \geq 0$

The effort function can be derived by rearranging the first order condition under the assumption of homogenous employees (i.e., $e_1 = e_2 = e_3$):

$$e_i = 2 \cdot t \cdot \left(\frac{2}{3} \cdot \alpha + \frac{1}{3}\right) \tag{A.2}$$

Equation A.2 reveals that in absence of influence activities individual effort is strictly increasing in the weight α. That is, increasing the weight α reduces opportunities for employees to free-ride on the effort of the other employee by strengthening the link between individual effort and reward.

Self-Interested Equilibrium in Presence of Influence Activities

Next, I derive employees' effort as a function of the weight α when employees do engage in influence activities. In this case, the superiors private performance signal S_i reflects an employee's effort and his engagement in influence activities (i.e., $S_i = e_i + b_i$). In presence of influence activities, self-interested employees thus maximize the following objective function:

$$\max_{e_i, b_i} EU_i = \left(\alpha \cdot \frac{S_i}{S_1 + S_2 + S_2} + \frac{(1-\alpha)}{2}\right) \cdot P(q) - \frac{1}{4}(e_i + k \cdot b_i)^2 \tag{B.1}$$

s. t. $e_i \geq 0$

$b_i \geq 0$

Again, the effort function can be derived by rearranging the *two* first order conditions under the assumption of homogenous employees (i.e., $e_1 = e_2 = e_3$ and $b_1 = b_2 = b_3$):

$$e_i = \frac{2 \cdot t}{3 \cdot (1-k)} - k \cdot b_i \tag{B.2}$$

where:

$$b_i = \frac{2 \cdot t}{3 \cdot k} \cdot \frac{1}{(1 + 2 \cdot \alpha) \cdot (1-k)} \cdot \left(2 \cdot \alpha - \frac{k}{(1-k)}\right) \tag{B.3}$$

Equation (B.2) reveals that an employee's effort is strictly decreasing in his level of influence activities (for all $b_i \geq 0$). Furthermore, equation (B.3) implies that employees' engagement in influence activities is positive and strictly increasing in the weight α whenever α *exceeds* the following threshold:

$$\bar{\alpha} = \frac{k}{2 \cdot (1 - k)}$$

If, however, the weight α is set below this threshold equation B.3 would imply a negative level of influence activities, which is not feasible. Consequently, below the threshold $\bar{\alpha}$ employees do not become engaged in influence activities (i.e., $b_i = 0$).

Importantly, this threshold also constitutes the weight α on the private performance signal, which maximizes individual effort. That is, as long as the weight α is set below the threshold $\bar{\alpha}$, employees do not engage in influence activities, and so an increase in the weight α would imply higher effort as indicated by equation A.2. In contrast, when the weight α is set above the threshold $\bar{\alpha}$, employees engage in influence activities (i.e., $b_i > 0$) and any increase in the weight α leads them to increase the level of influence activities and to reduce effort as indicated by equations B.2 and B.3. Employees' effort is thus highest if setting the weight on the private performance signal exactly equal to $\bar{\alpha}$.

Benchmark Solution

In this study, the following specific parameters are used:

$$t = 10$$

$$k = 0.5$$

The optimal weight α, given the above parameters, is therefore calculated as follows:

$$\alpha^* = \frac{0.5}{2 \cdot (1 - 0.5)} = 0.5$$

In the resulting Nash Equilibrium employees would not engage in influence activities (see discussion above) and they would choose their level of effort as implied by equation B.2 (or by equation A.1, which yields the same result):

$$e_i^* = 20 \cdot \frac{2 \cdot 0.5 + 1}{3} \approx 13.33$$

Experimental Instruments[32]

Preliminary Remarks
Thank you for participating in this experiment.

This experiment investigates decision making in an organizational setting. Please read the instructions carefully. Your earnings will depend on the decision that you and other participants make during this experiment.

After reading the instructions, you will take a short quiz to test your comprehension of the instructions. No one will be able to continue until everyone has passed the quiz.

We promise to carry out this study in the manner described in the instructions, with no deception of any form.

If you have any questions while we are going over the instructions, or during the study, please raise your hand and we will answer your question in private.

This experiment will approximately take 90 minutes.

General Instructions
This experiment consists of several „rounds". In each round, you are part of a four-person team. Assume that you and the three other participants in your team work for the same organization. In each team, one participant will act as the team manager and the three other participants will act as an employee (employee A, employee B or employee C).

You are assigned to the role of **a (team manager/ Employee A/B/C)**. All participants will keep their role throughout the entire experiment.

This experiment consists of eight rounds in total. Throughout the eight rounds of the experiment, your team will remain the same.

You can earn points in each round of the experiment. How many points you will earn in a round depends on the decisions that you and the three other participants in your team make. Your experimental payout will be calculated based on the total amount of points that you have earned during the experiment. Earned points will be converted into actual cash at the rate of **34 points = CHF 1** and will be added to your **CHF 5** participation fee.

In the event that you have a negative amount of points at the end of the experiment, the points (converted into cash) will be deducted from your participation fee. A potential deduction, however, cannot be higher than the participation fee.

Each participant has already been assigned to a cubicle that is marked with a number from 1 to 16. The numbers enable all participants to identify the members of their team: With the help of the numbers, you can identify the members of your team during the experiment and you can also identify for each team member whether he/she acts as the team manager or as an employee.

[32] The experimental instruments are directly translated from German to be as close as possible to the original instruments. The materials presented here account for other treatments by indicating modifications in square parentheses.

At the beginning of the experiment each participant will stand up behind his/her cubicle – team-by-team – and each participant will briefly introduce himself/herself personally to the members of his/her team (name, age, hobby).

The experiment will start after the round of introductions. From this point, all interactions will take place over the computer network until the end of the experiment.

Employees' task

The task of the employees – A, B and C – is it to decide in each round about their levels of effort in two activities. The choice of the effort levels influences the output that the team produces, and determines the cost of effort that an employee has to bear. The task is identical for all employees.

Choice of effort levels

Employees choose their levels of effort in two different activities – *Activity 1* and *Activity 2*. Each employees chooses his/her effort levels by determining a number between 0 and 20 for each of the two activities.

Effort costs and team output

Just as there are different activities in reality that are more or less exhausting and that contribute more or less to team output, the two activities in this experiment also differ in the **effort costs** incurred and in their contribution to **team output**.

> **Effort costs:**
> Each employee bears individual costs for his/her levels of effort in activity 1 and 2. ***Table 1*** (see at the end of these instructions) shows the effort costs contingent on the level of effort in activities 1 and 2.
>
> *Activity 1* incurs higher effort cost than *Activity 2*: An increase in the effort level in *Activity 1* leads to additional effort costs more than twice as high as an equal increase in the effort level in *Activity 2*.
>
> **Team output:**
> Each employee can contribute to team output by increasing his/her effort level in *Activity 1*. An increase in the effort level in *Activity 1* by one unit increases team output by one unit.
> In contrast, an increase in the effort level in *Activity 2* does not increase team output.

Hence, an increase in the effort level in *Activity 1* leads to high effort costs for an employee. However, it also contributes much to team output. In contrast, an increase in the effort level in *Activity 2* incurs much lower additional effort cost. However, it does not contribute to team output.

Total effort

The effort levels of an employee in *Activity 1* and *Activity 2* together add up to **total effort** of an employee. Assume that – just like in the real world – your total effort requires work time and, hence, total effort is limited: The total effort of an employee in each round cannot be higher **20**.

Team output and bonus pool
In each round, effort levels in *Activity 1* of the three employees are summed up. The sum of the three employees' levels of effort in *Activity 1* is equal to team output in a round.

The organization makes a profit of 20 points for each unit of team output that the three employees produce. In each round, 50 percent of the organization's profit are going into a bonus pool for the three employees. At the end of each round, this *bonus pool* will be completely allocated between the three employees:

> **Bonus pool for the employees:**
> Each unit of team output increases the organization's profit by 20 points. 50 percent of the organization's profit are going into a bonus pool at the end of a round. **Therefore, each unit of team output increases the bonus pool by 10 points.**

The allocation of the bonus pool and information of the team manager
The allocation of the bonus pool among the three employees is determined by the team manager at his/her sole discretion. The team manager is free in his/her decision how to allocate the bonus pool as long as the sum of the individual bonus payments amounts to the total bonus pool and as long as none of the three employees receives less than 0.

In each round, the team manager will be informed about the *team output* and about the total effort of each of the three employees. The team manager, however, is not informed about the efforts of the three employees in activity 1 and 2 separately. That is, the team manager will know the total level of effort of each employee. However, he/she will not know how much of the total effort was contributed to either *Activity 1* or *Activity 2*.

The allocation of the *bonus pool* between the two employees is conducted in two steps:

At the beginning of each round – before employees choose their levels of effort in the two activities – the team manager determines a portion of the bonus pool that is allocated at the end of the round as team bonus. The portion of the bonus pool that is allocated as team bonus can be determined in steps of 10 percentage points and can range from 0% to 100%.

The team bonus is allocated in any case equally among the three employees at the end of a round. That means each employee receives one third of the team bonus.

[Conditions with announcement: At the beginning of each round, before employees choose their levels of effort in the two activities, employees are informed about the portion of the bonus pool that is allocated as team bonus. The announcement of the team manager about the team bonus is binding. That is, each of the three employees will in any case receive one third of the team bonus. The team manager cannot change the portion of the bonus pool that is allocated as team bonus at the end of a round].

[Conditions without announcement: Employees are not informed about the portion of the bonus pool that is allocated as team bonus.]

At the end of each round – after being informed about the total effort of each of his/her employee – the team manager allocates the remaining portion of the bonus pool that is not allocated as team bonus at his/her sole discretion. The team manager, however, cannot assign a negative individual bonus to any of the employees.

<u>Information of the employees</u>
At the end of each round, employees receive information about efforts and bonus payments of the other employee in their team.

[Conditions with a high degree of mutual monitoring: Before the team manager allocates the bonus pool, employees are informed about the total effort of the other employees in their team. In contrast to the team manager, employees are additionally informed about the levels of effort of the other employees in activities 1 and 2. That means, each employee knows exactly how much effort the other employees in his/her team has contributed to *<u>Activity 1</u>* and *<u>Activity 2</u>*.]

[Conditions with a low degree of mutual monitoring: Before the team manager allocates the bonus pool, employees are informed about the total effort of the other employees in their team. Just like the team manager, however, employees <u>are not</u> informed about the levels of effort of the other employees in activities 1 and 2 separately. That means, each employee knows total effort of the other employee in his/her team, however, he/she does not know how much effort the other employee in his/her team has contributed to *<u>Activity 1</u>* and *<u>Activity 2</u>*.]

At the end of each round, after the team manager allocated the bonus pool, each employee is informed about his/her total bonus and the total bonus of the other employee in his/her team.

<u>Net income of an employee</u>
Besides the bonus payment, each employee receives a <u>fixed income</u> of **40 points** in each round. The fixed income is added to an employee's total points from the bonus pool. The net income of an employee in a round is therefore equal to the fixed income plus his/her total bonus minus his/her costs of effort.

> **Net income of an employee:**
> Fixed income + total bonus – costs of effort = Net income in points

<u>Net income of the team manager</u>
In each round, the team manager receives a bonus as his/her net income. The bonus of the team manager is directly linked to the profit of the organization. The team manager receives 15% of the organization's profit payed out as bonus at the end of each round.

> **Bonus of the team managers:**
> Each unit of team output increases the profit of the organization by 20 points. The team manager receives 15% of the organization's profit payed out as bonus. **Hence, each additional unit of team output increases the manager's bonus by 3 points.**

<u>Information at end of each round</u>
At the end of each round, each employee and the team manager is informed about their individual net incomes in the corresponding round.

EXAMPLE ROUND:

Assume that you and the other two employees in your team have chosen the following effort levels independent from each other:

	Employee A	Employee B	Employee C
Effort in *Activity 1*	14	6	6
Effort in *Activity 2*	0	8	13
Total effort	**14**	**14**	**19**

The choice of the above levels of effort are leading – according to ***Table 1*** (see at the end of these instructions) – to the following costs of effort for the three employees:

	Employee A	Employee B	Employee C
Effort Costs	49.0	25.0	39.1

The efforts of the three employees in *Activity 1* determine team output. Each unit of effort in *Activity 1* increases team output by one unit:

Contribution to Team Output

Employee A:	14 units
Employee B:	6 units
Employee C:	6 units
Team output	***26 units***

Due to the chosen levels of effort in *Activity 1* the team has produced in this example round 26 units of team output in total. Each unit of team output increases the bonus pool by 10 points. Hence, at the end of the round the bonus pool is calculated as follows:

Bonus pool: 10 points x 26 units = 260 points

At the end of the round and before the allocation of the bonus pool, employees and the team manager are informed about the efforts of each employee. The team manager [as well as the three employees], however, only observes [observe] total effort of the three employees. The team manager [They], however, does not [do not] observe how much effort employees have contributed to *Activity 1* and *Activity 2* separately.

Information of the team manager about the efforts of the two employees

	Employee A	Employee B	Employee C
Total effort	14	14	19

[The three employees, however, can observe total effort as well as how much effort each of the other employees has contributed to each of the two activities.]

At the end of the round, the team manager allocates the bonus pool among the three employees. Assume that the team manager determines at the beginning of the round a team bonus of 30% of the bonus pool. The team bonus in this round is therefore equal to 30% * 260 = 78. Each of the three employees receives one third of the team bonus, which is equal to 78 / 3 = 26. The remaining 182 points from bonus pool are allocated by the team manager at his/her discretion at the end of the round as long as he/she allocates the total amount of 182 points among the three employees and as long as none of the three employees receives less than 0.

[Conditions with announcement:

Superior's allocation of the bonus pool

	Employee A	Employee B	Employee C	Total
Team bonus	26	26	26	***78***
Individual bonus	*a*	*b*	*c*	***182***
Total bonus of an Employee	***26 + a***	***26 + b***	***26 + c***	***260 points (=Bonus pool)***

After the team manager has allocated the bonus pool, each employee is informed about his/her total bonus and about the total bonus of the other employee. The total bonus of an employee is calculated by the sum of the team bonus and the employee's individual bonus as determined by the team manager.]

[Conditions without announcement:

Superior's allocation of the bonus pool

	Employee A	Employee B	Employee C	Total
Total bonus of an Employee	***A*** points	***B*** points	***C*** points	***260 points (=Bonus pool)***

After the team manager has allocated the bonus pool, each employee is informed about his/her total bonus and about the total bonus of the other employee.]

The net income of an employee at the end of each round is calculated as follows:

Fix income + total bonus – effort costs = *Net income in points*
(rounded up to the next whole number)

[Conditions with announcement:

Net income of an employee

	Employee A	Employee B	Employee C
Fix income	40	40	40
Total bonus	*26 + a*	*26 + b*	*26 + c*
Effort costs	49.0	25.0	39.1
Net income in points	**40 + *(26 + a)* – 49.0**	**40 + *(26 + b)* – 25.0**	**40 + *(26 + c)* – 39.1**

]

[Conditions without announcement:

Net income of an employee

	Employee A	Employee B	Employee C
Fix income	40	40	40
Total bonus	*A*	*B*	*C*
Effort costs	49.0	25.0	39.1
Net income in points	**40 + *A* – 49.0**	**40 + *B* – 25.0**	**40 + *C* – 39.1**

]

The net income of the team manager at the end of each round is calculated as follows:

Units of team output x 3 bonus points per unit = *Net income in points*

Net income of the team manager
Team manager: 26 x 3 = 78 points

Experimental payout and completion of the experiment

The points that you have earned in each round will be summed up over all eight rounds of the experiment. At the end of the experiment, these points will determine your experimental payout.

Your points will be converted into to cash at a rate of **34 points = CHF 1.** This amount will be added to your **participation fee of CHF 5** and it will paid out at the end of the experiment.

In the event that you have a negative amount of points at the end of the experiments, the points converted into cash will be deducted from your participation fee. However, a cash deduction in CHF will never be higher than the participation fee.

As soon as you received your payout, you have successfully completed the experiment. Please help us to remain control over the results of this experiment by not talking to anybody about this experiment who could still participate. Thank you.

***<u>Table 1</u>*: **Effort costs** (in points)

Effort in Activity 1	*Effort in Activity 2*																				
	0	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***
0	0.0	0.1	0.3	0.6	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0
1	0.3	0.6	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	-
2	1.0	1.6	2.3	3.1	4.0	5.1	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	-	-
3	2.3	3.1	4.0	5.1	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	-	-	-
4	4.0	5.1	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	36.0	-	-	-	-
5	6.3	7.6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	36.0	39.1	-	-	-	-	-
6	9.0	10.6	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	36.0	39.1	42.3	-	-	-	-	-	-
7	12.3	14.1	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	36.0	39.1	42.3	45.6	-	-	-	-	-	-	-
8	16.0	18.1	20.3	22.6	25.0	27.6	30.3	33.1	36.0	39.1	42.3	45.6	49.0	-	-	-	-	-	-	-	-
9	20.3	22.6	25.0	27.6	30.3	33.1	36.0	39.1	42.3	45.6	49.0	52.6	-	-	-	-	-	-	-	-	-
10	25.0	27.6	30.3	33.1	36.0	39.1	42.3	45.6	49.0	52.6	56.3	-	-	-	-	-	-	-	-	-	-
11	30.3	33.1	36.0	39.1	42.3	45.6	49.0	52.6	56.3	60.1	-	-	-	-	-	-	-	-	-	-	-
12	36.0	39.1	42.3	45.6	49.0	52.6	56.3	60.1	64.0	-	-	-	-	-	-	-	-	-	-	-	-
13	42.3	45.6	49.0	52.6	56.3	60.1	64.0	68.1	-	-	-	-	-	-	-	-	-	-	-	-	-
14	49.0	52.6	56.3	60.1	64.0	68.1	72.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	56.3	60.1	64.0	68.1	72.3	76.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	64.0	68.1	72.3	76.6	81.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	72.3	76.6	81.0	85.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	81.0	85.6	90.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	90.3	95.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Pre-experimental quiz

Note: This will be administered via the computer. Participants have to answer each question correctly before they can continue to the next question.
All answers will be accompanied by an explanation *why* the answer was right or wrong (to emphasize the corresponding instructions again). In case an answer was wrong, participants will have to answer the question again.

1. I will interact with the same team members throughout the eight rounds of the experiment
   - True
   - False

2. My role will remain constant throughout the experiment session. That is, if I am a team manager in the first round, I will be a team manager in all subsequent rounds. Likewise, if I am an employee in the first round, I will be an employee in all subsequent rounds.
   - True
   - False

3.1 If an employee chooses a level of effort in *Activity 1* of 15 and a level of effort in *Activity 2* of 5, then team output will increase by:
a) 20 units
b) 15 units
c) 10 units
d) 5 units

3.2 If an employee chooses a level of effort in *Activity 1* of 5 and a level of effort in *Activity 2* of 15, then team output will increase by:
a) 20 units
b) 15 units
c) 10 units
d) 5 units

4.1 If an employee chooses a level of effort in *Activity 1* of 15 and a level of effort in *Activity 2* of 5, then his/her effort costs are equal to:
a) 25 points
b) 39.1 points
c) 76.6 points
d) 100 points

4.1 If an employee chooses a level of effort in *Activity 1* of 5 and a level of effort in *Activity 2* of 15 then his/her effort costs are equal to:
a) 15 points
b) 39.1 points
c) 76.6 points
d) 100 points

5. If all three employees choose a level of effort in *Activity 1* of 10 and a level of effort in *Activity 2* of 10, then team output is equal to:

a) 15 units
b) 30 units
c) 45 units
d) 60 units

6. If team output is equal to 30 units, then the bonus pool for the employees is equal to:

a) 60 points
b) 150 points
c) 300 points
d) 600 points

7. If team output is equal to 30 units, then the bonus for the team manager is equal to:

a) 30 points
b) 90 points
c) 120 points
d) 300 points

8. Who decides about the allocation of the bonus pool?

a) The bonus pool will always be allocated equally among employees.
b) The employees decide together about the allocation of the bonus pool.
c) The team manager allocates the bonus pool at his/her discretion.

9. Employees will not only be informed about *total effort* of the other employees, but also about the other employees' levels of effort in *Activity 1* and *Activity 2* separately

- True
- False

10. The team manager will not only be informed about *total effort* of the two employees, but also about the two employees' levels of effort in *Activity 1* and *Activity 2* separately

- True
- False

[Only announcement conditions:]
11. If the team manager announces at the beginning of the round a portion of the bonus pool that is allocated as team bonus equally among employees, then this portion of the bonus pool

a) … will be allocated in any case equally among employees at the end of the round.
b) … will still be allocated at the discretion of the team manager.

[Only announcement conditions:]
12. Assume that the team manager announced a portion of 50% of the bonus pool that is allocated as team bonus equally among employees. The bonus pool for the employees at the end of the round is equal to 300. How many points of the bonus pool will be allocated equally among employees in this round?

a) 0 points
b) 150 points
c) 300 points

SELBSTÄNDIGKEITSERKLÄRUNG

Ich erkläre hiermit, dass ich diese Arbeit selbständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Koautorenschaften sowie alle Stellen, die wörtlich oder sinngemäss aus Quellen entnommen wurden, habe ich als solche gekennzeichnet. Mir ist bekannt, dass andernfalls der Senat gemäss Artikel 36 Absatz 1 Buchstabe o des Gesetzes vom 5. September 1996 über die Universität zum Entzug des aufgrund dieser Arbeit verliehenen Titels berechtigt ist.

Bern, 31. Mai 2018

Florian Elsinger