Cooperation culture and monetary incentives to cooperate: An experiment in a company

Pre-analysis plan

Marvin Deversi, LMU Munich

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1. Introduction

Cooperation among employees is one of the most important pillars for company success (e.g., Dirks, 1999; Dirks and Ferrin, 2001; Kosfeld and Von Siemens, 2009, 2011; Gratton, 2011, 2013; Fehr, 2018). In the last decades, almost all large companies have started to spend significant resources into fostering a cooperative culture. A common practice is to provide employees with additional incentives to cooperate. For example, through managers or institutional arrangements that allocate monetary rewards to more cooperative employees.

However, economic theory as well as empirical evidence suggest that incentive choices can induce unintended side effects (for reviews see Frey and Jegen, 2001; Gneezy et al., 2011; Bowles and Polania-Reyes, 2012). A side effect that has been emphasized in the economic literature on cooperation is that incentive choices signal bad (or good) news about the prevalence of uncooperative individuals in a population (compare to, e.g., Sliwka, 2006; Van der Weele, 2009; Friebel and Schnedler, 2011; and Benabou and Tirole, 2012). As a consequence, incentives can have limited or even counterproductive effects on cooperative behavior.

The three prerequisites for these signaling effects to arise are: (1) the principal's objective is to foster cooperation, (2) there is asymmetric information about status-quo cooperation, i.e., the principal is informed about the share of uncooperative agents in the population whereas the agent is not, and (3) the agents make their cooperation decision upon observing the principal's incentive choice. Under these conditions, a manager that incurs a cost to implement an additional incentive to enhance cooperation signals to employees that current cooperation levels are low. A manager who refrains from setting such an incentive reversely signals high levels of cooperation. These signals are predicted

to affect the cooperation culture of a company through altering individual and shared beliefs about status-quo cooperation.

Do incentive choices work as information devices in a natural environment, namely, in a company that wants to foster cooperation? And what are their implications for the company's efforts? The present pre-analysis plan outlines hypotheses and planned analyses of a fully-incentivized online experiment with about 50 managers and 350 employees from a large software company. It focuses on the effects induced by managers' incentive choices on the cooperation culture among employees in that company.

In 2017, the company has participated in a first study (as outlined by Deversi et al., 2019) to measure and subsequently foster their culture of cooperation. Importantly, the managers and all subordinate employees have not been informed about the study results yet. In the planned online experiment, I randomly inform managers about the results and randomly state to employees that the manager has been informed. This gives me the unique opportunity to observe information effects of incentive choices in the field.

In detail, I elicit a variety of cooperation measures from employees conditional on a manager's decision whether to implement or not to implement an additional incentive to cooperate in an online public goods game (PGG) experiment. The optional additional incentive provides the most cooperative employee with a monetary bonus.[1] Further, I am able to enrich the experimental dataset with individual-level matched data from the company records. I analyze the conjoint dataset to answer the following main research questions:

How do informed versus uninformed managers' incentive choices affect the cooperation culture among subordinate employees in a company? In particular, do these incentive choices signal information about the status quo of cooperation?

The remainder of this pre-analysis plan is structured as follows: I will first describe the data to be collected from the experiment and the company records, and explain how the

[1] I focus on this particular incentive because it is a policy that two top-managers in the project team of the 2017 study have outlined as their planned instrument to increase cooperation if measured levels are too low. The two managers in the project team know more about the study design and potential outcomes than all other managers in the company. It is very unlikely that they spread information about the study as we agreed on non-disclosure of these information until the research phase has been ended. Additionally, both managers have agreed that they would not participate in the study even if they would be randomly selected and invited (they represent 0,07% of all invited managers).

data relates to the questions above. Then, I formulate my main hypotheses. I also lay out my planned statistical methods to test these hypotheses. In addition, power calculations are presented. Finally, I anticipate strategies for some more extrapolative data analyses.

2. Research strategy

2.1 Sampling

The sampling procedures are similar to what has been described and pre-registered by Deversi et al. (2019, AEARCTR-0002596).[2] My sample will consist of teams within the company that have at least 8 and at most 20 members of which more than 70% are based in the German-speaking area. I exclude working students and other non-headcount relevant employees (e.g., temporary consultants). For a two-week long roll-out phase, from the 6th until the 21st of February, 2019, a total of around 1,500 potential respondents (i.e., about 110 teams) will be randomly chosen (given the invitation criteria mentioned above) and invited. I aim for a participation rate of about 25%. So, my objective is to reach a final sample size of 350-400 participants. After a team has been randomly selected, the potential individual team members will receive an e-mail with an official invitation for which both the HR Department and the Works Council have agreed to accompany a strong support statement.

2.2 Data to be collected

The main idea of the paper is to use a *modified PGG experiment* to characterize the cooperation culture of the company. Contributions to the public good are used as a proxy for cooperation.[3] In an incentive compatible way, I elicit cooperative attitudes, beliefs about others' cooperation, descriptive and injunctive norms of cooperation[4], and actual cooperation behavior. I collect this data from an artefactual field experiment (in the terminology of Harrison and List (2004)) in which both actual managers and subordinate

[2] All participants in my experiment have not participated in the experiments in Deversi et al. (2019).
[3] Deversi et al. (2019) show that PGG measures significantly correlate with variables of cooperation behavior in the company. In particular, this is true for cooperative attitudes and beliefs.
[4] I define a norm as a shared perception or belief (for an overview see Bicchieri et al. (2011)). The descriptive norm describes what the majority of employees beliefs about the most common behavior. The injunctive norm describes what the majority of employees beliefs about the appropriate behavior. These measures mostly reflect the cultural aspects of cooperation.

employees take part. While the employees participate in the PGG, the managers decide about the incentives of the PGG in a principal-agent game structure. In a subsequent *survey module*, I elicit a variety of control variables like socio-economic characteristics or economic preferences, and address the participants' perception about the managers' reward decisions in the company. After the experiments have been conducted, the gathered data is merged with *outcome and context variables* from the company records. A list of all collected variables and a brief description for the reason of collection is presented in the appendix.

2.2.1 Modified PGG experiment

The first part is a modified version of an experiment according to the abc-framework of cooperation. It uses the design of Fischbacher et al. (2001), including the elicitation of individual beliefs (see Gächter and Renner (2010)) and shared beliefs (as described in Krupka and Weber (2013)). The main modification is that a randomly matched, anonymous manager from the company decides whether to counter the social dilemma incentives of the game by implementing an additional monetary incentive to cooperate. The incentive to cooperate awards the employee that puts the highest contribution into the public good an additional payment of three tokens.[5] The payout function of the manager can be described as follows.

$$\pi_m = 15 + \gamma \sum_{j=1}^{n} c_j - \begin{cases} 5 \text{ if incentive to cooperate is chosen} \\ 0 \text{ if incentive to cooperate is not chosen} \end{cases}$$

The manager earns a fixed amount of 15 tokens (worth €15) and benefits from the public good contributions of the group of three employees with $\gamma = 0.5$. The manager cannot contribute to the public good. Setting an additional incentive to cooperate costs 5 tokens and refraining from doing so is costless.

Non-managing participants are randomly grouped in groups of three employees. It is common knowledge, that all other group members are randomly selected employees (without leadership responsibility) of the company. Each group member receives an

[5] The tie-breaking rule is specified such that the three tokens are evenly distributed among the participants that contributed the highest amount.

initial endowment of 10 Tokens (which equals €10) to be allocated to a private account or to be contributed to a public account. The invested amount, an integer that satisfies $0 \leq c_i \leq 10$, is referred to as the unconditional contribution. The sum of all contributions to the public good is multiplied by γ, which also is 0.5, and divided equally among all $n = 3$ group members. This leads to the following payoff function for subject i:

$$\pi_i = 10 - c_i + \gamma \sum_{j=1}^{n} c_j + \begin{cases} \text{3 if incentive to cooperate is chosen by manager} \\ \text{and } c_i > \boldsymbol{c}_{-i} \\ \text{0 if incentive to cooperate is not chosen by manager} \\ \text{or } c_i < \boldsymbol{c}_{-i} \end{cases}$$

where c_i denotes the contribution of group member i. The marginal per capita return (MPCR) from investing in the public good is γ, with $\frac{1}{n} < \gamma < 1$. The additional incentive to cooperate only realizes if the randomly matched manager decides to implement the additional incentive and if group member i put a higher contribution into the common account than the other group members did, $\boldsymbol{c}_{-i}$ is the contribution vector of the others.

From an individual perspective, free-riding (i.e., $c_i = 0$) is a dominant strategy without the additional incentives (standard social dilemma). The bonus increases the incentive to contribute without affecting the action space of players.[6] Since the sum of marginal returns is larger than 1, contributing the entire endowment is the optimal choice from a collective perspective (i.e., maximizing efficiency) in both scenarios. The decision is made only once and anonymously and, thus, there are no incentives to build a reputation.

For both possible choices of the manager (i.e., using the strategy method), I elicit unconditional contributions, the full contribution schedules, subjects' beliefs about others' average unconditional contributions, and descriptive and injunctive norms in the voluntary contribution mechanism setting above. After indicating an unconditional contribution and without any feedback, participants are asked to fill in contribution tables, indicating their contribution for each possible average contribution of the other group members, rounded up to integers. To make the unconditional and the conditional contribution incentive-compatible, I use the mechanisms described in Fischbacher et al. (2001). That is, for one randomly selected subject the conditional contributions are

[6] For the unconditional contribution decision there exists an equilibrium in mixed strategies (that also includes contributions that are higher than 0) such that in expectation participants have an higher incentive to cooperate.

payoff-relevant, whereas for the two remaining subjects the unconditional contribution is.

I also elicit expected contributions of others in an incentivized way. Following Gächter and Renner (2010), participants are asked to guess the average unconditional contribution of the other group members and receive 5 Euro if they hit the correct average, and 0 Euro otherwise. I also elicit descriptive and injunctive norms of public good contribution using coordination games as described by Krupka and Weber (2012). Here, participants receive €3 for each correctly answered question: "What do most group members think is the most common contribution to the joint account?" (descriptive norms) and "What do most group members think is the appropriate contribution to the joint account?" (injunctive norm). Finally, I ask three questions about the behavior ("What percentage of the managers on average choose the additional payment scheme?"), the expectation ("What is the average expectation of the managers about the contribution of the group members to the joint account?"), and the prescriptive view of the manager ("How high is the contribution to the joint account that managers on average rate as appropriate?"). Participants receive €1 for each correctly answered question. All of these questions are administered in the strategy method with respect to the manager decision, except from the expectation about manager incentive choice behavior where these contingencies do not apply.

On the manager side, I elicit beliefs about how employees will answer these questions.

2.2.2 Information structure and treatment variation

The critical feature of my experiment is the information structure. Generally, there exists uncertainty about the prevailing level of cooperation in the PGG among employees. Before manager choose the incentives of the PGG, I manipulate the information set of managers by showing them the measured contribution levels from different, but randomly selected employees from the same company measured by Deversi et al. (2019).

There are two treatments. In the "Informed" treatment, managers know that 369 employees from the company have given an average of 7.9 Tokens into the common account and 2.1 Tokens in the private account without the additional incentive. Here, the employees are informed that the manager has received information about contributions

in the previous study when she/he decides, but they *do not* know the exact numbers. In the "Uninformed" treatment, both the employees and the managers do not receive either information. I elicit the variables mentioned above using the strategy method. Employees decide about their PGG behavior twice: once in the situation in which the manager selected no additional incentive, and once in the situation in which the manager selected the additional incentive to cooperate. The following figure summarizes the design.

Strategy method

		No bonus	**Bonus**
Between subjects	**Uninformed manager**	175 employees & 25 managers	
	Informed manager	175 employees & 25 managers	

2.2.4 Survey data

After the experimental part took place, I ask survey questions. I start with eliciting the perception of participants about returns to cooperative behavior in the company. Inspired by Dominitz and Manski (1996), the questionnaire describes a hypothetical scenario in which the participant's manager has a budget of €10,000 to be split between two of his team members. This is usual practice in the company and the size of the monetary award is realistic. Importantly, the two employees are described to be identical with respect to all relevant observables (like age, gender, career level, work tasks, expert knowledge, etc.). The participants are told that the employees differ in only one aspect at a time and they are asked to rate how their manager would split the €10,000 between the two employees if the only difference would be that

- … employee A is more productive in individual work than employee B?
- ... employee A works more cooperatively in teamwork than employee B?

- ... the manager feels more sympathetic to employee A as compared to employee B?
- ... employee A was praised by the manager of your manager and employee B was not mentioned?
- … employee A indicates that he / she is expecting a high award payment from the manager this year and employee B does not do so?
- ... employee A intentionally chose to join your team, while employee B joined your team through a reorganization?

Afterwards, the same questions are asked with respect to the probability that the manager would select one of the employee as a "key contributor" (which is a non-monetary recognition status conferred by the manager; only 15% of the employees can be recognized with this status). The managers are asked how they would split the money or whom they would recognize, respectively, in the scenarios described above.

Additionally, the participants are asked how they rate the likelihood that the management decides to change a currently existing non-monetary cooperation recognition tool into a monetary one in the near future. This is the actual plan of the managers of the company.

Thereafter, I use survey questions from the economic preferences survey module from Falk et al. (2016) and Falk et al. (2018) to measure participants altruism, reciprocity, trust, self-perception of math ability, and competitiveness. To measure time preferences, I use the full survey module, for the other questions I use the simple (validated) one-liner questions.

Finally, I elicit some structural and work outcome variables that will not be available from the company records. This includes a measure for the production function[7] of their task (with respect to the complementary to employees' efforts), team cohesion, perceived work-related stress, team stability, their team selection decision, and work satisfaction.

[7] Here, I generally ask about the necessity to cooperate in order to successfully perform the employee's assigned tasks. In addition, I ask whether the employees work in the cloud area of the company or in the customer-specific area. The former includes much more exposure to cooperation with other employees from different teams than the latter.

2.2.4 Company data

The data from the company records is merged to the experimental and survey data. In particular, this concerns structural or socio-economic information (e.g., bonus scheme, task production function, board area, job area, seniority, gender,…). Other outcome variables, like received monetary and non-monetary awards, wage levels, and wage increases, will also be used.

2.2.5 Procedures

I conduct the described experimental and survey modules online. Potential participants receive a personalized participation link. Every respondent knows that he/she must complete the experiment within the two-weeks long roll-out. I match participants randomly ex post, and participants will know that. Since nobody receives feedback during the experiment, such a procedure is game theoretically equivalent to simultaneously entering decisions. Participants can use their personal ID code to login after the roll-out phase has ended to get feedback on the results. I will ask participants to perform the online experiment individually. The random allocation to groups makes sure that coalition formation among group members when filling in the online experiment will be impossible.

I also take upmost care to ensure data protection. Individual data from the company to be linked to the elicited data will be de-identified. The data collection and storage is facilitated through Qualtrics. There exists a data protection agreement between the company and Qualtrics; and a research agreement (including data protection) between the company and the research team. Data protection units at the company, at LMU and University of Heidelberg supervise the study. The company will not receive individual-level data, and all participants will be informed about the full pseudonymization of their responses. Data protection procedures will also be monitored by the responsible unit for data protection at the company. However, the latter will only be involved in determining the exact procedures, not in handling the linked data. I make sure that the pseudonymized final dataset will only be stored on the computers of the researchers involved in this project within university fire walls. Ethics approval of the University of Munich has been received in January 2019.

3. Hypotheses

I formulate my main null hypothesis:

$H_{0,E}$: *Stating what kind of information the managers hold does not significantly affect employees' individual and shared beliefs about others' contributions, injunctive norms, cooperative attitudes, and cooperative behavior, holding incentives constant.*

The main alternative hypothesis is that employees hold different individual and shared beliefs in identical PGGs when it has been stated that managers were informed about the behavior of other employees before setting incentives. The mechanism underlying the hypothesized differences is the transmission of information about prevalent cooperation behavior through the manager's incentive choice.

First, consider employees' responses in "No bonus" & "Informed" versus "No bonus" & "Uninformed". Here, the manager decided not to intervene and the PGG is played without the additional incentive to cooperate. In the "Informed" treatment such choice should additionally reflect the information that contribution levels observed by the manager have been high, as otherwise it would have been worth to incur the cost and implement the additional incentive. On average, this leads to higher beliefs and a higher perceived descriptive norm in "No bonus" & "Informed" compared to "No bonus" & "Uninformed".

This hypothesis is supported by economic theory and empirical studies from the experimental laboratory that have used a comparable treatment manipulation (e.g., Galbiati et al., 2013; or Danilov and Sliwka, 2016). From the experiments in Deversi et al. (2019), it has been documented that employees significantly underestimate the contribution level in the PGG (7.9 versus 6.6, $p<0.001$). This should set the ground for the manager effectively signaling that contribution levels are high when refraining from the additional incentive.

I formulate a less strong hypothesis for the additional incentive case (aka "Bonus" treatment). Consider employees' responses in "Bonus" & "Informed" versus "Bonus" & "Uninformed". Here, the manager decided to intervene and the PGG is played with the additional incentive to cooperate. Reversely, this should reflect the information that contribution levels observed by the manager have been low, such that it was worth it to incur the cost and implement the additional incentive. On average, this should lead to

lower beliefs and a lower perceived descriptive norm of participants in “Bonus” & ”Informed” compared to “Bonus” & ”Uninformed”. Given the underestimation result from Deversi et al. (2019), one could expect smaller information effects under the additional incentive. Danilov and Sliwka (2016), or relatedly Fehr and Rockenbach (2003), also find similar asymmetries. While this could be an empirical phenomenon, Danilov and Sliwka (2016) illustrate the theoretical argument that contracts that rely on more contingent pay elements are less elastic to information about others’ behavior.

Furthermore, changing the perception of other employees’ behavior in the PGG could also change the moral view of employees on how they ought to behave. While the information effect could be reflected here as well, the manager decision might also represent a coordination device (see Cooter, 1998). In line with this, employees could coordinate on not providing the bonus means that they should not contribute. Hence, the disincentive effects would be boosted. This effect could be perceived even stronger when the manager is informed, but works in the opposite direction as compared to the information effect. So, how the injunctive norm is eventually affected is an empirical question.[8]

A very interesting question is how actual cooperation behavior (unconditional contributions) is affected by incentive choice. Next to beliefs, the unconditional contribution is also determined through norms and attitudes, hence it is hard to state a precise prediction on that. The treatment variation might induce additional effects on the unconditional contribution and the conditional contribution schedule due to social image concerns, pure altruism, guilt aversion, coordination, or conformism. Importantly, also these effects work in the opposite direction of the information effect. So, even if employees anticipate this reaction to the treatment in other employees behavior, this would only decrease the treatment effect measured in beliefs and descriptive norms.

An important remark that I want to make is that the information effects on cooperation behavior are likely to depend on the employees’ prior beliefs and their conditional cooperation types (esp. with respect to their degree of conditional cooperation, i.e., how strong they rely on their belief).

[8] I deem it more likely that the descriptive norm reflects the information effect because my treatment manipulation reflects more what the descriptive norm coordination game is about, namely, the most commonly observed behavior.

Another effect that could be induced is that employees perceive refraining from (selecting) the additional incentive as an act of flexibilization (restriction) and, hence, a signal of trust (distrust). This would lead to higher (lower) contributions and higher (lower) beliefs (see Falk and Kosfeld, 2006). While I deem this effect unlikely to increase with the treatment, I make sure to use between-treatment difference-in-difference effects to produce a cleaner measure of the information effects. This measure should reflect a limited effect of incentives.

I formulate the following null hypothesis with respect to treatment responses of the managers.

$H_{0,M}$: *Informing managers about the unconditional contributions in the 2017 study experiment does not affect their behavior and beliefs.*

If managers are selfish utility maximizers, this should not be true as the costs to implementing the additional incentive are higher than the possible benefits from the incentive. From this perspective one expects that managers do not implement the additional incentive in the "Informed" condition. If the managers have pro-social preferences, this might not hold.

In the model of Van der Weele (2009), managers anticipate limited incentive effects and, in equilibrium, set weaker (dis-)incentives. Empirically, this prediction might not hold: In their review, Bowles and Polania-Reyes (2012) report on evidence of principals that were rather surprised about the side effects of incentives. As documented in Deversi et al. (2019), managers' beliefs also underestimate the actual contribution levels (7.9 versus 6.8, t-test: $p<0.001$). Their beliefs about employees' contributions are likely to reflect the tradeoff between spending the cost for an additional incentive to cooperate and PGG contributions of the subordinate employees.

Finally, apart from my hypothesized between-subject treatment effects, I have a strong prior that the additional incentive to cooperate increases unconditional and conditional contributions, and individual and shared beliefs about unconditional contributions of others.

4. Statistical analysis

For all hypothesis tests, I use non-parametric tests that compare means (and distributions where applicable). I will use Mann-Whitney U tests for between-subject comparisons and I use McNemar tests for within-subject comparisons. If standard deviations vary significantly between treatments, I also consider using Epps-Singleton tests (see Georg and Kaiser, 2009). I will also report (one-sided) t-test results if the variables are normally distributed as my main hypotheses on beliefs are directional. Additionally, I plan to provide OLS regressions that show the robustness of my results including controls for main structural variables from the company (like age, gender, tenure, bonus scheme, board area, career, …). I will report p-values that are corrected for multiple hypotheses testing. In order to get impression of potential communication among participating employees, I compare participation times of employees that are in the same work team and, hence, more likely to sit in a shared office. My main analysis relies on the collected data, but I also make sure to check the robustness of results when excluding participating employees that have not fully completed the experiment.

4.1 Primary and secondary outcome variables

The main variables of interest are the belief about others' contributions without the additional incentive, and the respective descriptive norm. Secondary outcome variables are these respective variables for the additional incentive case. The between-subject difference-in-differences eliminate potentially confounding factors that are treatment-specific but affect individual and shared beliefs similarly within incentive schemes. Other variables of interest are the unconditional contributions, injunctive norms, their within-subject differences, and attitudes. I use the employees' beliefs about the managers' choice behavior, expectations, and prescriptive views as robustness variables. This is also the case with respect to the variables elicited from the managers as I expect a rather low sample size here.

4.2 Heterogeneity analysis

The hypothesized information effects are likely to depend on the prior belief of subjects and whether a subject is a conditional cooperator.[9] With respect to the latter, the conditional contributions from the contribution table without the additional incentive allow me to classify types: perfect conditional contributors, imperfect conditional contributors with other- and self-serving bias, unconditional types, and others (Fischbacher et al., 2001; Kocher et al., 2008, 2015). I check the heterogeneity of the information effects with respect to the degree of conditional cooperation. I can also use each subject's slope coefficient of a OLS regression of the contribution schedule and the conditional contributions as a continuous variable for conditional cooperation. With respect to heterogeneity to the priors and potential consistency effects in the contribution schedule, I use pre-defined sub-groups of employees that differ in their belief of others' unconditional contributions degrees of conditional cooperation. I found significant differences for the following groups in the data of Deversi et al. (2019):

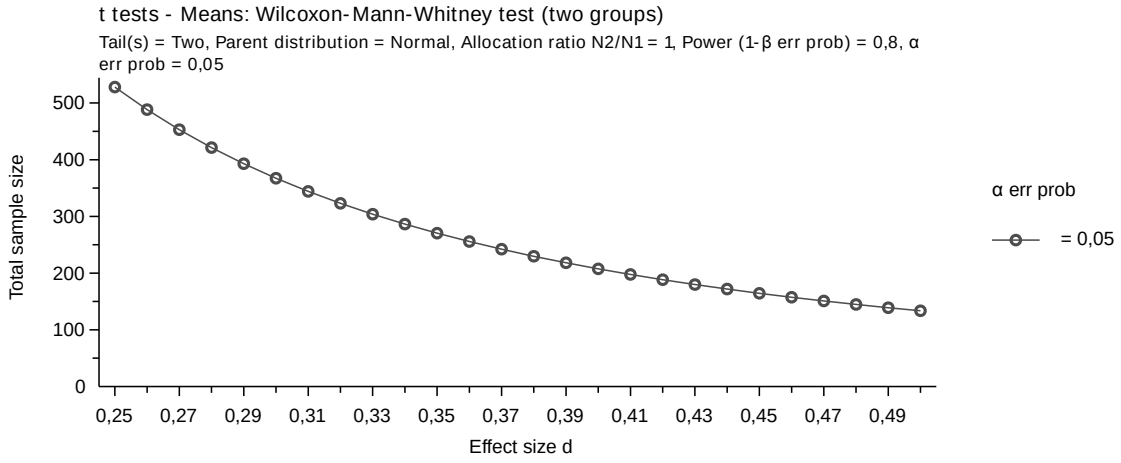
- Employees with individual performance pay are much less likely to be conditional cooperators than employees under the flat performance pay scheme ($p<0.01$).
- Female employees underestimate the contribution of others in the public good more strongly than male employees ($p<0.05$).
- Employees that work in the cloud business model of the firm (i.e., have more exposure to cooperative workshops with other team members) have higher beliefs about the contributions of others ($p<0.1$) and are also more likely to be conditional cooperators ($p<0.1$).

I also plan to check heterogeneity with respect to tenure of the employee as new employees of the company (like those being included after a recent acquisition) are less likely to correctly estimate the cooperation culture of the company than older ones (also Danilov and Sliwka (2016) state this hypothesis). I will use median and/or quartile splits to analyze this, if I do not have enough employees that very recently joined the company (tenure less than 1 year).

[9] Conditional cooperators should condition their behavior more strongly on the beliefs than unconditional cooperators or selfish individuals.

4.3 Power analysis

I use the data from Deversi et al. (2019) to calibrate my power analysis in G*Power (Faul et al., 2007). The average belief about others' unconditional contributions was $\bar{b} = 6.64$ with a standard deviation of $s = 2.80$. The figure below shows the required total sample size (to be split equally in the two treatments "Informed" and "Uninformed") that is necessary to detect different effect sizes. I assume the usual type I error rate of $\alpha = 0.05$ and a power of $1 - \beta = 0.8$. To detect an economically reasonable effect size of 0.3, I need a total sample size of 368 (184 in both treatments). Given the expectation that about 350-400 employees participate[10], I should have enough power to detect economically sizable and relevant effects that are larger than 0.31 using a Mann-Whitney U test.



I rely on this calculation to determine my sample size, because I expect my main effect to show up in the beliefs of subjects. In addition, I do not have a reasonable benchmark to incorporate the behavioral response to the additional incentive into my calculation as this has not been part of the 2017 study. Also, in the available data from the company we observe very different levels of behavior in the PGG as compared to data from the experimental laboratory which accordingly also do not provide informative priors.

[10] In the first study, the response rate after two reminders was about 25%. This gives about 375 employees (1500*25%).

4.4 Exploratory analysis

I plan to conduct explanatory analyses with the dataset at hand:

- I use the survey data on beliefs about rewards to cooperation to determine correlation to actual behavior in the company and outcome variables (like the receipt of monetary and non-monetary appreciate awards). I also compare the employees' perceptions to the managers' fictitious decisions, and to the belief about the real management decision on introducing monetary incentive to cooperate in the company.
- I use the attitude data from the PGG experiment to define cooperation types (as mentioned above) and correlate this to company data. Does a correlation between contribution attitudes and actual cooperation behavior in the company exist? What about the correlation to outcome variables like monetary, or non-monetary awards, salary increases, and stress perception? This allows me to check whether the variables I elicited are meaningful in the sense that they correlate with relevant behavior and outcomes in the field.

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Appendix

Variable list – experimental measures

Player	Variable	Description
Employees	Cooperative behavior (no bonus)	Unconditional contribution in PGG without additional incentive
	Cooperative behavior (bonus)	Unconditional contribution in PGG with additional incentive
	Cooperative attitude (no bonus) (from 0 to 10)	Conditional contribution vector in PGG without additional incentive
	Cooperative attitude (bonus) (from 0 to 10)	Conditional contribution vector in PGG with additional incentive
	Belief about others' cooperation (no bonus)	Belief about other employees' unconditional contribution in PGG without additional incentive
	Belief about others' cooperation (bonus)	Belief about other employees' unconditional contribution in PGG with additional incentive
	Descriptive norm (no bonus)	Shared belief about most common unconditional contribution in PGG without the additional incentive measured using a coordination game
	Descriptive norm (bonus)	Shared belief about most common unconditional contribution in PGG with the additional incentive measured using a coordination game
	Injunctive norm (no bonus)	Shared belief about appropriate unconditional contribution in PGG without the additional incentive measured using a coordination game
	Injunctive norm (bonus)	Shared belief about appropriate unconditional contribution in PGG with the additional incentive measured using a coordination game
	Belief about managers' behavior	Expected fraction of managers that choose the additional incentive
	Belief about managers' expectation (no bonus)	Belief about the unconditional contribution in the PGG without the additional incentive that the manager expects from employees
	Belief about managers' expectation (bonus)	Belief about the unconditional contribution in the PGG with the additional incentive that the manager expects from employees
	Belief about managers' prescriptive view (no bonus)	Belief about the unconditional contribution in the PGG without the additional incentive that the manager wants from employees
	Belief about managers' prescriptive view (bonus)	Belief about the unconditional contribution in the PGG with the additional incentive that the manager wants from employees
Managers	Incentive choice	Decision of manager to implement or not to implement the additional incentive
	Belief about employees' cooperation behavior (no bonus)	Belief about employees' unconditional contribution in PGG without the additional incentive
	Belief about employees' cooperation behavior (bonus)	Belief about employees' unconditional contribution in PGG with the additional incentive
	Belief about employees' belief about their colleagues cooperation behavior (no bonus)	Belief about the employees' average belief about the unconditional contribution in the PGG without the additional incentive
	Belief about employees' belief about their colleagues cooperation behavior (no bonus)	Belief about the employees' average belief about the unconditional contribution in the PGG with the additional incentive
	Prescriptive view (no bonus)	Unconditional contribution in the PGG without the additional incentive that managers deem appropriate
	Prescriptive view (bonus)	Unconditional contribution in the PGG with the additional incentive that managers deem appropriate

Variable list – survey measures

Player	Variable	Description
Employees	Belief about award split (productivity)	Belief about how their manager would allocate monetary awards between two team members that are identical except from their productivity

	Belief about award split (cooperation)	Belief about how their manager would allocate monetary awards between two team members that are identical except from their cooperativeness
	Belief about award split (sympathy)	Belief about how their manager would allocate monetary awards between two team members that are identical except from their sympathy
	Belief about award split (recommendation)	Belief about how their manager would allocate monetary awards between two team members that are identical except from the fact that one employee has been recommended by the manager's boss
	Belief about award split (demand)	Belief about how their manager would allocate monetary awards between two team members that are identical except from the fact that one employee has asked for a high award payment
	Belief about award split (selection)	Belief about how their manager would allocate monetary awards between two team members that are identical except from the fact that one employee has joined the team intentionally and the other has done so through a re-organization
	Belief about likelihood of becoming a key contributor (productivity)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their productivity
	Belief likelihood of becoming a key contributor (cooperation)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their cooperativeness
	Belief about likelihood of becoming a key contributor (sympathy)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their sympathy
	Belief about likelihood of becoming a key contributor (recommendation)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their productivity the fact that one employee has been recommended by the manager's boss
	Belief about award split (demand)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their productivity the fact that one employee has asked for a high award payment
	Belief about likelihood of becoming a key contributor (selection)	Belief about which team member their manager would select as a key contributor if the only difference between team members is their productivity the fact that one employee has joined the team intentionally and the other has done so through a re-organization
Managers	Award split (productivity)	Manager allocates monetary awards between two team members that are identical except from their productivity
	Belief about award split (cooperation)	Manager allocates monetary awards between two team members that are identical except from their cooperativeness
	Belief about award split (sympathy)	Manager allocates monetary awards between two team members that are identical except from their sympathy
	Belief about award split (recommendation)	Manager allocates monetary awards between two team members that are identical except from the fact that one employee has been recommended by the manager's boss
	Belief about award split (demand)	Manager allocates monetary awards between two team members that are identical except from the fact that one employee has asked for a high award payment
	Belief about award split (selection)	Manager allocates monetary awards between two team members that are identical except from the fact that one employee has joined the team intentionally and the other has done so through a re-organization
	Belief about likelihood of becoming a key contributor (productivity)	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their productivity
	Belief likelihood of becoming a key contributor (cooperation)	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their cooperativeness
	Belief about likelihood of becoming a key contributor (sympathy)	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their sympathy
	Belief about likelihood of becoming a key	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their

	contributor (recommendation)	productivity the fact that one employee has been recommended by the manager's boss
	Belief about award split (demand)	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their productivity the fact that one employee has asked for a high award payment
	Belief about likelihood of becoming a key contributor (selection)	Manager selects the likelihood of team members becoming a key contributor if the only difference between team members is their productivity the fact that one employee has joined the team intentionally and the other has done so through a re-organization
Managers	Punishment for oneself	See Falk et al. (2016)
	Punishment for others	See Falk et al. (2016)
Both	Altruism	See Falk et al. (2016)
	Reciprocity	See Falk et al. (2016)
	Trust	See Falk et al. (2016)
Employees	Competitiveness	Agreement with "In everything I try to be the best person in the room."
Both	Perception of math ability	See Falk et al. (2016)
	Time preference	Full survey stair-case module from Falk et al. (2016)
	Production function	Agreement with "The tasks of my team require a high degree of cooperation among the team members."
	Team competition	Agreement with "The cooperation between me and my team members is mainly characterized by a distinct competitive attitude, which leads to tensions in the team."
	Team cohesion	Agreement with "The team cohesion in our team is great."
	Stress perception	TICS short version (calculated index from a set of questions)
	Stability	For how long have you been a member (manger) of your current team?
	Reorganization	When was the last time your team underwent restructuring?
	Manager stability	How long has your immediate manager been in this role?
	General stability	How stable do you feel your team to be?
	Selection	To what extent has the team and its composition played an important role in selecting your current job?
	Individual cloud task	Do you personally work more on/with Cloud Solutions or Customer-Based Solutions?
	Team cloud task	Does your team work more on/with Cloud Solutions or Customer-Based Solutions?
	Work satisfaction	How satisfied are you overall with your current work situation?
	Nationality	Nationality
	Children	# of children
	Education	Higher education entrance qualification/bachelor/master/dimplom/doctor/phD/other
	Friends	# of friends