Incentive and signaling effects of bonus payments: Analyses of the Pre-Analysis Plan

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1 Main analysis

This document presents the analysis following the pre-analysis plan (PAP) uploaded on February 20, 2019 at `https://www.socialscienceregistry.org/trials/3931`. First of all, we would like to note that the pre-analysis plan is not ideal due to a lack of specificity in some parts. Here, we try to follow the pre-registered tests and present their results.

As described in Section 4 'Statistical analysis' of the PAP, we first assess normality of the outcomes and whether their standard deviations (SDs) differ across treatments. For this, we use the Shapiro-Wilk test for normality and bootstrap the difference in SDs. We find no evidence for normality and neither for differences in SDs. We hence proceed with Mann-Whitney U (MWU) and McNemar tests for between- and within-comparisons, respectively.

1.1 Primary outcomes

Beliefs about others' contributions *absent* the incentive do not differ between informed and uninformed employees (MWU, p=0.91), and neither does the descriptive norm for this scenario (MWU, p=0.82).

1.2 Secondary outcomes

Beliefs about others' contributions *with* the incentive do not differ between informed and uninformed employees (MWU, p=0.24), and neither does the descriptive norm for this scenario (MWU, p=0.31). The between-subject differences-in-differences for these two variables are not statistically significant, either (MWU, p=0.31 for beliefs and p=0.24 for the descriptive norm).

1.3 Other variables of interest

Unconditional contributions of informed and uninformed employees do not differ, either (MWU, p=0.73 absent the incentive and p=0.63 with the incentive). The between-subject differences-in-differences are not statistically significant, either (MWU, p=0.27). Injunctive norms do not differ between informed and uninformed employees (MWU, p=0.75 absent the incentive, p=0.27 with the incentive and p=0.68 for the differences-in-differences).

1.4 Robustness variables

Beliefs about the manager's choice do not differ between informed and uninformed employees (MWU, p=0.98) and neither do beliefs about the manager's expected contributions with the incentive (MWU, p=0.70) and without the incentive (MWU, p=0.25). Beliefs about the manager's prescriptive views are also similar (MWU, p=0.58 absent incentives and p=0.91 with incentives).

1.5 Multiple testing corrections

Since all the above are null results, we refrain from correcting the p-values, but we calculate sharpened q-values (Benjamini, Krieger, and Yekutieli 2006) taking into account i) all p-values of the analysis presented below in Section 2 and ii) all p-values presented in Sections 4.2, 5.1, and 5.2 of the paper.

2 Heterogeneity

The PAP mentions the following dimensions: conditional cooperators (vs. other types), individual vs flat performance pay, female vs male, cloud vs other business models and tenure. The latter could be assessed via median split or for tenure of less than a year (this only applies to 11% of the sample, we hence opt for the median split as shown in the paper). The PAP also mentions checking the participation times of employees in the same work team (who are more likely to sit in a shared office). We include this as a potential source of heterogeneity in the following analysis, where we use median splits of the completion date within work teams.

Table 1 presents results for beliefs about others' contributions and for dimensions not shown in the paper. Wald tests reject the equality of coefficients on the interaction term for conditional cooperators vs other types (p=0.023, q=0.059), but not for the type of performance incentives (p=0.19, q=0.322), gender (p=0.38, q=0.51), the type of business model (p=0.35, q=0.47) and completion time within the team (p=0.93, q=0.91).

Table 1: Heterogeneity in beliefs about others' contributions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I(INCENTIVE)	3.074***	1.944***	2.231***	2.018***	2.387***	1.653***	2.064***	2.283***	2.066***	2.275***
	(0.626)†††	(0.193)†††	(0.228)†††	(0.265)†††	(0.201)†††	(0.373)†††	(0.242)†††	(0.271)†††	(0.230)†††	(0.278)†††
I(INFO)	1.172	-0.243	-0.0311	-0.227	0.466	-1.316**	-0.442	0.384	-0.490	0.461
	(0.891)	(0.354)	(0.414)	(0.604)	(0.408)	(0.642)†	(0.455)	(0.512)	(0.461)	(0.477)
I(INCENTIVE × INFO)	-1.322	0.697**	0.525	-0.185	0.145	0.695	0.546	0.0249	0.266	0.316
	(0.852)	(0.314)†	(0.363)	(0.414)	(0.320)	(0.570)	(0.371)	(0.441)	(0.380)	(0.426)
Constant	4.044***	5.089***	4.975***	4.555***	4.501***	5.966***	5.606***	4.338***	4.763***	5.083***
	(1.185)	(0.511)	(0.528)	(1.091)	(0.603)	(0.839)	(0.796)	(0.613)	(0.628)	(0.767)
Sample	Other types	Cond. Coop.	Flat Pay	Ind. Perf. Pay	Men	Women	Other biz	Cloud biz	Early compl.	Late compl.
Observations	186	598	552	232	528	256	404	380	382	402
R^2	0.197	0.180	0.172	0.153	0.192	0.166	0.197	0.158	0.214	0.195

Notes: The dependent variable is beliefs about average unconditional contributions of the group members. For each employee and dependent variable two entries are observed: one entry under the incentive and one without the incentive. The omitted category is No Info and No Incentive. The control variables include gender, seniority, incentive scheme, career level, and job function. 18 employees are not included in the regressions using the additional controls as some of these have not been available for those participants. Standard errors are clustered on the subject level and are shown in parentheses; * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Sharpened q-values are indicated as follows † <0.10, †† <0.05, ††† <0.01.

We repeat the analysis for the second pre-specified outcome variable, descriptive norms. Table 2 presents the results. Wald tests marginally reject the equality of coefficients on the interaction term for conditional cooperators vs other types when not adjusting for multiple testing (p=0.097, q=0.19) and individual vs flat incentives (p=0.086, q=0.176), but not for gender (p=0.77, q=0.82), the type of business model (p=0.69, q=0.75) and completion time within the team (p=0.25, q=0.39).

The following analysis was not pre-specified (and is not considered in the sharpened q-values), but we consider it useful nonetheless. It tests whether the findings of Deversi et al. (2019), which were the basis of pre-registering several dimensions of heterogeneity, hold in our sample. Contrary to their findings, we do not find differences in proportions of conditional cooperators by incentive scheme (χ^2, p=0.35). Neither do women hold different beliefs from men about the contributions of others (MWU, p=0.51). While individuals who work in the cloud business model have a higher fraction of conditional cooperators (χ^2, p<0.001), their beliefs about contributions of others do not differ from individuals who work in other business models (MWU, p=0.24).

Table 2: Heterogeneity in descriptive norms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I(INCENTIVE)	3.205***	2.807***	2.722***	3.348***	3.080***	2.451***	3.178***	2.611***	2.985***	2.808***
	(0.614)†††	(0.241)†††	(0.251)†††	(0.458)†††	(0.262)†††	(0.427)†††	(0.297)†††	(0.337)†††	(0.321)†††	(0.316)†††
I(INFO)	0.901	-0.306	-0.0290	-0.401	0.336	-1.248*	-0.0657	-0.189	-0.129	-0.102
	(0.906)	(0.374)	(0.423)	(0.644)	(0.423)	(0.640)	(0.485)	(0.525)	(0.507)	(0.487)
I(INCENTIVE × INFO)	-0.914	0.597	0.674	-0.592	0.255	0.478	0.162	0.435	-0.0902	0.700
	(0.881)	(0.377)	(0.420)	(0.630)	(0.409)	(0.657)	(0.457)	(0.540)	(0.488)	(0.506)
Constant	3.949***	4.943***	4.846***	4.346***	4.486***	5.688***	4.962***	4.555***	4.485***	4.940***
	(1.208)	(0.540)	(0.539)	(0.967)	(0.621)	(0.816)	(0.779)	(0.667)	(0.643)	(0.783)
Sample	Other types	Cond. Coop.	Flat Pay	Ind. Perf. Pay	Men	Women	Other biz	Cloud biz	Early compl.	Late compl.
Observations	184	589	542	231	521	252	400	373	377	396
R^2	0.215	0.262	0.230	0.255	0.272	0.254	0.272	0.210	0.241	0.273

Notes: The dependent variable is the descriptive norm. For each employee and dependent variable two entries are observed: one entry under the incentive and one without the incentive. The omitted category is No Info and No Incentive. The control variables include gender, seniority, incentive scheme, career level, and job function. 18 employees are not included in the regressions using the additional controls as some of these have not been available for those participants. Standard errors are clustered on the subject level and are shown in parentheses; * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Sharpened q-values are indicated as follows † <0.10, †† <0.05, ††† <0.01.

3 Exploratory analysis

3.1 Beliefs about cooperation and company perceptions

Beliefs about others' cooperation are positively but not statistically significantly correlated with agreement (on a scale from 0 to 100) to "People in my team cooperate to get the job done" (Spearman's $\rho = 0.037$, $p = 0.41$)[1] and to "In my team, recognition and rewards other than money encourage good performance" (Spearman's $\rho = 0.066$, $p = 0.14$).

3.2 Employees' perception and managers' decisions

See Sections 5.1 and 5.2 in the paper.

3.3 Cooperative types and company perceptions

Types classified based on PGG behavior are correlated (Spearman's ρ) as follows with agreement (on a scale from 0 to 100) to "People in my team cooperate to get the job done". Positively for unconditional cooperators (ρ=0.15, p<0.001), uncorrelated for free-riders (ρ=0.018, p=0.69), triangle types (ρ=0.027, p=0.77), and other types (ρ=-0.015, p=0.74) and negatively for conditional cooperators (ρ=-0.10, p=0.027). Unfortunately, we did not receive administrative data on monetary and non-monetary awards or salary increases. Regarding stress perceptions, we find the following correlations. Weakly positive for other types (ρ=0.06, p=0.07), no correlation for free-riders (ρ=0.047, p=0.18), triangle types (ρ=0.05, p=0.47) and conditional cooperators (ρ=-0.02, p=0.54), and negative for unconditional cooperators (ρ=-0.07, p=0.040).

[1] Note that the median agreement to this statement is 91.