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Can Contracts Signal Social Norms? – Experimental Evidence

Anastasia Danilov[a]* and Dirk Sliwka[b]

We investigate whether incentive schemes signal social norms and thus affect behavior beyond their direct economic consequences. A one-shot principal-agent experiment is studied, in which prior to contract choice principals are informed about the past actions of other agents and thus have more information about norms of behavior. Compared to a setting in which principals are uninformed, agents exert substantially higher effort under a fixed wage contract when they are aware that an informed principal chose this contract. The informed principal's choice apparently signals a norm not to exploit trust, which leads to more trustworthy behavior. This mechanism's robustness is explored in further experiments.

Key words: social norms, shirking, contracts, incentives, signaling, experiment
JEL Codes: D03, C91, D86

[a] Faculty of Management, Economics, and Social Sciences, University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, Email: danilov@wiso.uni-koeln.de, Telephone: +49 (0) 221 470 6313.

[b] Faculty of Management, Economics, and Social Sciences, University of Cologne, Albertus-Magnus-Platz, D-50923 Cologne, Germany, Email: dirk.sliwka@uni-koeln.de, Telephone: +49 (0) 221 470 5887.

* Corresponding author: Email: danilov@wiso.uni-koeln.de, Telephone: +49 (0) 221 470 6313.

1. INTRODUCTION

In recent years, the notion that social norms matter for behavior has gained considerable attention in economics.[1] Indeed, there is now substantial evidence that individuals are influenced in their choices by the observed behavior of others in an identical situation.[2] Many individuals tend to avoid deviations from prevailing norms of behavior, for instance, as these deviations may cause negative emotions such as remorse or shame.

However, individuals often confront a situation in which there is uncertainty about prevailing norms. Consider, for example, an employee who has just joined an organization and may be uncertain about expected effort, working time, private Internet use in the office, or the extent to which she is expected to support colleagues. A very natural reaction for this employee would be to gather information about the behavior of colleagues, which enables her to detect a potential norm of conduct. This may be easy for observable actions (such as working time) but difficult for unobservable actions (such as productively spent working time) that are crucial for the performance of the organization. Even after several years in the same organization, this employee might be unable to assess the behavior of her colleagues with complete certainty in some situations, and she may have to rely on additional information or clues.

On the other hand, owners or managers often have means, such as active monitoring and accounting systems, key performance figures, or employee surveys, to gain a deeper understanding about existing work norms and attitudes in their organizations. Even when direct information about individual behavior is not available, they may be able to infer "average behavior" from these other sources. When designing management tools, such as incentive schemes or monitoring technologies, managers may naturally use this information about observed behavioral patterns. For instance, if a principal observes an under-provision of effort, she may choose to use higher-powered incentives or impose tighter monitoring. But this could lead to an important effect that may sometimes be overlooked, namely, that such interventions convey information about prevailing behavioral norms in an organization – and this, in turn, can have an indirect effect on employees' actions as their perceptions about the behavior of others is altered. Indeed, Sliwka (2007), Friebel, and Schnedler (2011), van der Weele (2012) and Bénabou and Tirole (2012) have recently shown in formal economic models that contract choices may signal information about the actions of other agents and thus create indirect effects on behavior. In a field experiment, Gneezy and Rustichini (2000a)

[1] See for instance Akerlof (1980), Elster (1989), Bernheim (1994), Lindbeck, Nyberg, and Weibull (1999), Kübler (2001), Fehr, Fischbacher, and Gächter (2002), Fehr and Fischbacher (2004a, b), Fischer and Huddart (2008), Bicchieri (2006), Krupka and Weber (2009), Krupka, Leider, and Jiang (2011), Huck, Kübler, and Weibull (2012). See also Young (2008) for an overview.

[2] Examples are Ichino and Maggi (2000), Clark (2003), Stutzer and Lalive (2004), Bradler, Dur, Neckermann, and Non (2013).

found that introducing a fine in child-care facilities for picking up children late increased the number of parents who came late, arguing that this makes late pick-ups more acceptable.[3]

We explore the idea that contracts can signal social norms in a set of laboratory experiments. Our key mechanism is most closely related to the theoretical approach by Sliwka (2007). Suppose that agents have a preference for conformity, as their behavior is influenced by their beliefs about the behavior of others. Conformists act prosocially if they believe many other agents also do so. If a principal who has more information about the distribution of types in an organization now proposes a specific compensation contract, her choice may reveal information about the behavior of others and thus the prevailing norms in the organization. In particular, when a principal proposes a pure fixed wage, she is apparently confident that most agents will not shirk – and in turn that conformists' inclination to shirk should be reduced. On the other hand, the choice of performance-contingent pay or a tight monitoring scheme may reveal the principal's pessimism about the behavior of the agents – and in turn increase conformists' willingness to act more selfishly.[4] Due to the presence of selfish individuals, signaling a strong work norm by choosing a fixed wage or not using a monitoring technology is costly to the principal, and this can indeed make the signal credible.

To study this idea and its implications in detail we conducted several lab experiments. In our first experiment, we implemented a very simple one-shot principal-agent game. Our main treatment variation was as follows: In the *Baseline* treatment, principals could choose between a fixed wage and performance-contingent compensation. Each principal was matched to an agent, who then chose his level of effort. We elicited the agents' efforts for both forms of compensation using the strategy method.[5] In the *Norms* treatment, we replicated this Baseline treatment with one addition: We showed the principals a table containing the efforts chosen by agents in a preceding Baseline session and informed the agents that their principals had seen such a table (without showing the agents its content). Hence, the treatment intervention was rather weak on the agents' side: They did not have more specific information about the behavior of others but knew that the principals had this information prior to the contract choice. We studied the effect of this intervention in two settings, varying whether the choice of the performance-contingent contract was costly for the principal or not. In the costly contract choice setting, principals had to bear a direct fixed cost for choosing the performance-contingent contract, which may affect the signaling value of the contract choice, as the analysis of a formal signaling model shows.

[3] For further experimental evidence on related crowding out effects see Gneezy and Rustichini (2000b), Fehr and Falk (2002), Fehr and Rockenbach (2003), Fehr and List (2004), Falk and Kosfeld (2006), and Mellström and Johannesson (2008). For a broader overview on the issue see Bowles (2008).

[4] Several other theoretical models explore the detrimental effects of sanctions or performance-contingent pay schemes and give potential (behavioral) economic explanations. See, for instance, Bénabou and Tirole (2003, 2006) and Ellingsen and Johannesson (2008).

[5] See Selten (1967).

It turns out that Norms treatment variation has a substantial effect on chosen efforts under the fixed wage. In the Norms treatments, average effort increases by 25% (if the performance-contingent contract comes with no costs) and by 42% (if it is costly) as compared to the Baseline treatments in each setting. In other words, agents become much more trustworthy when they know that the principal who decided not to use the performance-contingent contract made this decision being well informed about the behavior of other agents in the same situation. But we do not find evidence that the exogenous variation in the relative costs of the contracts affects the signaling value of the contract choice.

The mechanism described in the above rests on three arguments. First, the principals' contract choice must be affected by the observed information about past behavior of other agents. Second, the contract choice in turn must affect the agents' beliefs about the behavior of others. Third, changes in beliefs about the behavior of others must affect the agents' own behavior. We conducted further experiments and extended our experimental design to test these elements of the proposed theoretical mechanism in more detail, showing that (i) agents' beliefs about the behavior of others are indeed substantially affected by an informed principal's contract choice, (ii) principals vary their contract choices depending on information they receive about agents' behavior in a previous experiment, and (iii) agents choose different actions when informed about the selected choices of other agents in the same situation.[6]

Our study is related to other recent contributions on the interaction of social norms and contracts. According to the model by Bénabou and Tirole (2012), norms do not arise because of preferences for conformity but because the behavior of others influences how publicly observed actions affect social esteem. In their model, agents differ with respect to their intrinsic motivation to choose a certain prosocial action and have a preference to be esteemed, i.e., that others perceive them to be intrinsically motivated. An observer's perception of a certain act depends now on the equilibrium strategies all agents in the population choose – hence, social norms arise because observed actions have different signaling values that are conditional on the strategies of other agents. Similar to Sliwka (2007), changes in extrinsic incentives may reveal a designer's private information on the distribution of types of agents and therefore affect the way in which outside observers interpret the chosen actions. In the models by Friebel and Schnedler (2011) and van der Weele (2012) there is a complementarity between efforts of different agents, and, therefore, information about the behavior of others is directly valuable to improving coordination. Galbiati, Schlag, and van der Weele (2013) studied behavior in a twice-repeated "weakest link"-coordination game experiment with technological complementarities comparing sanctions that were

[6] The latter is well in line with previous studies on "social history effects." For instance, Berg, Dickhaut, and McCabe (1995) show that information about the behavior of others has a positive effect on reciprocity in an investment game. Bardsley and Sausgruber (2005), Bicchieri and Xiao (2009), Servátka (2009), Gächter, Nosenzo, and Sefton (2012), and Gürerk (2013) find a positive correlation between contributions in public good, dictator, and gift-exchange games and information on decisions of unrelated individuals in the same situation.

exogenously imposed after the first round, unconditional on previous behavior, to sanctions that were endogenously imposed by a subject who had observed previous behavior and benefitted from high levels of coordination. They found that players who made high contributions in the first round contributed less under endogenous sanctions in the second round.[7]

In our setup, the behavior of agents is not publicly observable; there is no interdependence in production between the agents, and the agents themselves do not observe the behavior of others. We show that contract choices reveal information on norms, and this matters for behavior even when individual choices remain unobservable and in the absence of any technological interdependence. Hence, the observed effects can neither be driven by image concerns nor by technological complementarities but are well in line with the idea that people can intrinsically prefer norm compliance.

The remainder of the paper is organized as follows: In the next section we present the design and procedures of our core experimental setting. In Section 3 we derive our hypothesis. In Section 4 we report results of our main treatments. In Section 5 we explore the underlying mechanism in more detail. In Section 6 we study the restriction game. Section 7 concludes.

2. EXPERIMENTAL DESIGN AND PROCEDURES

Our baseline design is a simple, *one-shot* principal-agent game. At the beginning of the experiment, all participants receive an endowment of €6. Participants are randomly matched in pairs, where one subject is assigned the role of a principal (labeled *employer*) and the other to the role of an agent (*employee*). The principal chooses between a fixed wage (labeled *trust compensation*) and performance-contingent pay (*contingent compensation*) for her agent. The agent chooses an effort level $e \in [0, 100]$ at private costs of $c(e) = e^2/1200$. The agent's effort level determines the probability that the principal will receive a high payoff, i.e., with probability e she will earn €12 and nothing otherwise. The agents know that the principals cannot observe their efforts but rather only the project's success. Under the trust compensation, the principal pays an unconditional wage of €5. Under the contingent compensation the agent receives €5 only if the principal earns the high payoff of €12 and nothing otherwise.[8]

Efforts for both contract types are elicited using the strategy method, such that each agent has to state an effort level for each of the two compensation schemes before learning about the principal's choice. After

[7] See also Hart and Moore (2008, Section V), Kessler and Leider (2012), or Bartling and Schmidt (2015) for recent studies on the interaction of social norms and contracts that do not focus on the signaling effect of contracts.

[8] The second-best effort (maximizing the individual payoff) is 0 for the trust and 30 for the performance-contingent pay and the first-best effort (maximizing the joint payoff) is 72 in both cases. Under the trust compensation principals and agents earn equal (expected) payoffs at an effort of 59 and the principals (on average) do not make any loss starting from effort level 42. Agents had access to an on-screen computation tool, where they could insert effort values for a particular incentive scheme, and learn the costs of effort and (expected) payoffs for both parties. They could use this tool for as many trials as they wanted before determining their final decision.

all choices are made, the payoffs are computed based on the respective choices made by the principal and agent.

Our main treatment variation is the following: We compare *Baseline* treatments, in which the game is played as described above, with *Norms* treatments. There is only one difference between these two treatment types: On the decision screen of principals in the Norms treatments we introduce an additional table showing the real decisions of 10 agents from a previous session of the Baseline treatment. The agents know the principals have this information but do not know its content.[9] The payoff functions for both principal and agent remain unchanged. Hence, from the agents' perspective, the treatment intervention varies only the fact that the principals are ex-ante better informed about the behavior of other agents in the same population. Thus, any changes in agents' behavior must be driven by their awareness that the principals had more information prior to the contract choice.

We extend our experimental setup to a 2x2 between-subjects design and study the question of whether having an informed principal also affects agents' behavior in a setting where the performance-contingent contract implies additional costs to a principal. The difference between the *Costless* and *Costly* treatments is only that, in the latter setting, principals have to bear additional costs of €2 when choosing the performance-contingent compensation, and the agents are aware of this. All other parameters remain unchanged. The reasons for studying the Costly treatments are twofold: First, it provides an additional robustness test. In the Costless treatment, the choice of a fixed wage is rather risky and potentially inferior from a principal's perspective, while the contingent contract only requires a payment to the agent in case of success. The Costly treatment increases the relative advantage of the fixed wage contract. Second, it may allow testing a further implication of the signaling model: As the costs of choosing the contingent contract change the relative attractiveness of the two contracts, it can affect their signaling value and thus the efforts chosen by the agents. We explain this in more detail in section 4.

As we study a one-shot decision situation, it was important for us to make sure that the participants understood the instructions and the decision situation as well as possible. Before proceeding to the decision stage, subjects had to complete a short quiz on the structure of the experiment and the computation of payoffs. Only after answering correctly they could proceed to the decision stage. In the decision stage, we provided agents with an on-screen calculator (see Figure D1 in the Online-Appendix D). The agents could use it to compute the expected payoffs from any effort level for themselves and the principal under each compensation form. The calculator was used by 89.6% of agents, who pushed the button on average 7 times.

[9] In particular, principals see a table with 10 columns and 2 rows similar to Figure A1 in Appendix A. To ascertain that agents understand the principal's information structure, agents see the same table but with "xx" instead of the actual efforts (Figure A2 in Appendix A). See Online-Appendix D for the instructions.

The experiment consisted of 25 sessions with 20 to 32 subjects each.[10] We observe 80 to 93 principal-agent dyads per treatment (see Table A1 in Appendix A for more details). All sessions were conducted in the Laboratory for Experimental Research of the University of Cologne, using the experimental software zTree (Fischbacher, 2007). A total of 691 participants (56% females and mostly students) were recruited via ORSEE (Greiner, 2004). All subjects participated only once. All decisions were anonymous and no communication was permitted during the experiment. Average earnings (incl. €2.50 show-up fee) were €12.55. The sessions lasted about one hour.

3. KEY HYPOTHESIS

Our key hypothesis is that agents react differently to an identical contract when they know it has been chosen by a principal who is informed about the behavior of other agents in the same situation. In particular, we expect agents to choose a higher effort level under the fixed wage contract if an informed principal proposes it. In Appendix B, we analyze a formal signaling model supporting this claim. This mechanism is based on two assumptions, namely that (i) agents differ in their prosocial preferences and (ii) a subset of the agents is influenced by social norms in the sense that their prosociality depends on their beliefs about the average prosociality of the others. If the principal is then informed about behavior of other agents in the same situation, her contract choice can indeed reveal information about the social norm of behavior and in turn affect agents' choices.

The key idea of this mechanism is the following: When the principal has observed that many agents in the relevant population are selfish and shirk under the fixed wage contract, offering this contract is very costly given the high likelihood that the agent she is matched with is also selfish and will shirk. If, however, the principal has observed that there are many prosocial agents in the population, i.e., agents who exert high efforts under the fixed wage, shirking will be less likely. Thus, the choice of a fixed wage contract is relatively less costly when the principal has observed more prosocial behavior, and offering a fixed wage is therefore more attractive. The contract choice thus becomes a credible signal about the social norm. If conformity matters, agents adapt their behavior: The choice of a fixed wage by an informed principal should lead to higher efforts by conformists. The choice of the contingent compensation, on the other hand, may reveal that the principal apparently observed more selfish behavior, and, in turn, the agents can become more selfish.

[10] Our initial set-up encompassed 9 sessions. At the request of the referees, we collected more observations and ran another 16 sessions. In each session two treatments were conducted at the same time with subjects being randomly assigned to one of two treatments. In these sessions we also elicited agents' beliefs about the behavior of others and (in the costly contract choice treatments) principals' choices by the strategy method.

Since the contingent contract provides extrinsic incentives, even purely selfish agents have a reason to work under this contract type. Thus, the agents' efforts should be less elastic to information about the social norm, and the negative effect of the Norms intervention on efforts should be weaker under this contract.

4. RESULTS

We start by investigating average effort levels in all four treatments for both contract types. As Figure 1 shows, the agents' effort reaction to the fixed wage contract is indeed strongly affected by the Norms intervention: If agents know that the principal is informed about the behavior of other agents prior to her contract choice, they exert substantially higher efforts under the fixed wage contract – and this is the case both in the Costless and the Costly contract choice treatments. The average effort increases by 25% in the Costless (p = 0.0575, two-sided Mann-Whitney U test) and by 42% in the Costly contract choice treatments (p = 0.0034). Hence, in line with our key hypothesis, the mere fact that the agents know that the principal had been informed about the behavior of others before the contract choice substantially alters their reaction to a fixed wage.

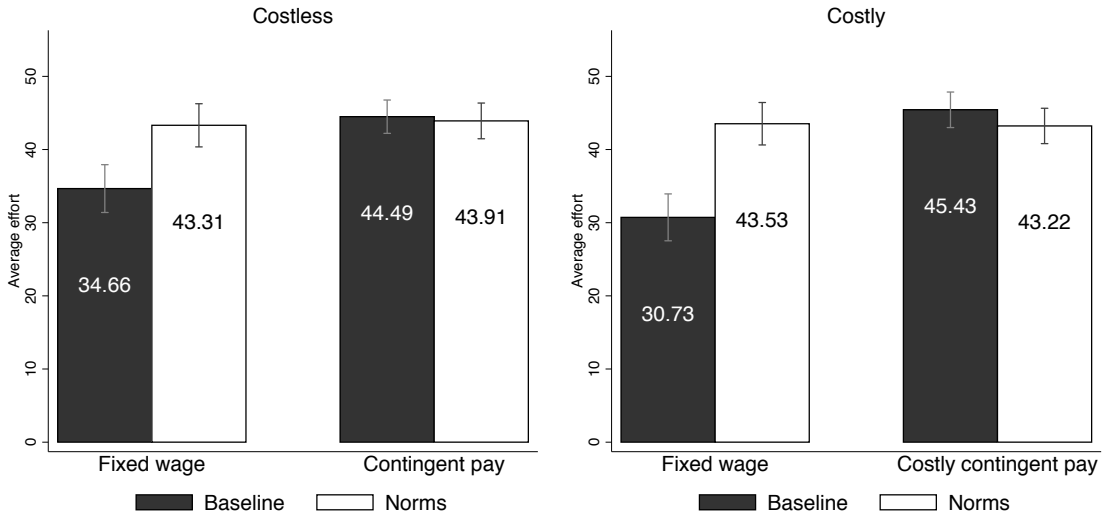

FIGURE 1
Average efforts and standard errors of means

Under the contingent contract, efforts are hardly affected by the Norms intervention. Recall that the theory predicted a negative effect as an informed principal's choice of a contingent contract entails a negative signal about the prosociality of the agent's population. The theory also suggested that the negative effect of the Norms intervention under the contingent contract is weaker than the positive effect under the trust contract, because the incentives provided by the contingent contract do not rely on the

norm-driven prosociality of the agents. Efforts are indeed slightly smaller in the Norms treatments: by 1.3% in the Costless and by 4.8% in the Costly setting. However, these differences are insignificant ($p = 0.8087$ in Costless and $p = 0.5031$ in Costly treatments, two-sided MWU tests). Efforts are thus inelastic to norms signaling under the contingent contract but strongly elastic under the fixed wage contract. The between treatment difference-in-difference in efforts under the two contract types ($p = 0.0552$ in Costless and $p = 0.0004$ in Costly treatments, two-sided MWU test) is thus nearly entirely driven by an increase in efforts under the fixed wage.[11]

The econometric analysis reported in Table 1 confirms these patterns. Models (1) and (2) regress the effort separately for the Costless and Costly treatments on a dummy indicating the Norms intervention and demographic controls. Model (3) is based on the pooled data across the Costly and Costless treatments. In all specifications the difference-in-difference, as measured by the interaction term Trust contract × Norms treatment, is positive and significant. The trust contract leads to substantially higher efforts relative to the contingent contract in the settings where the agents know that the principal is informed about behavior of others.

[11] It is important to note that an increase in average efforts is consistent with the theory. The model predicts that efforts increase under the fixed wage and decrease under the contingent wage. However, efforts under the contingent wage are less sensitive to information about the norm as here agents have a selfish incentive to work in both settings (in the model the first derivative of conformists' effort choices with respect to their beliefs about the norm is always smaller under the contingent contact than under the fixed wage). Hence, overall efforts may well increase in equilibrium with norms signaling.

TABLE 1

Regression results: Effect of the Norms intervention on effort

Dependent variable: effort	(1) Costless	(2) Costly	(3) Pooled
Fixed wage	-9.83***	-14.70***	-9.83***
	(2.98)	(3.13)	(2.98)
Norms treatment	-0.88	-2.06	-0.57
	(3.39)	(3.42)	(3.38)
Fixed wage × Norms treatment	9.22**	15.00***	9.22**
	(4.32)	(4.22)	(4.30)
Costly			0.80
			(3.40)
Costly × Fixed wage			-4.88
			(4.31)
Costly × Norms treatment			-1.58
			(4.85)
Costly × Fixed wage × Norms treatment			5.78
			(6.02)
Female	1.58	4.06	2.27
	(3.28)	(3.41)	(2.33)
Age	-0.15	0.63	0.10
	(0.42)	(0.69)	(0.42)
Constant	47.51***	28.42*	41.04***
	(10.37)	(16.45)	(10.43)
Observations	370	322	692
R-squared	0.02	0.06	0.04

Note: OLS regressions. The data consist of two effort decisions per subject: under the fixed wage and under the performance-contingent pay. Robust standard errors clustered on the subject level are reported in parentheses. The significance levels are indicated with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Comparing the Costly and Costless contract choice setting we do not find significant differences in the average effort reaction. All p-values for non-parametric effort comparisons between the Costly and Costless settings are above 0.50 (two-sided MWU tests; see also column (3) in Table 1 for the regression analysis). Average effort under the fixed wage is lower in the Costly Baseline than in the Costless Baseline setting but this difference is also not significant ($p = 0.5087$, two-sided MWU test).

One potential explanation for the absence of a treatment difference between the Costly and Costless setting is that there are countervailing effects in our formal model reported in Appendix B: We show that when the contingent contract is costly, separating equilibria (in which the choice of the fixed wage is informative about the norm) exist under weaker conditions about the distribution of types. Intuitively, because the trust contract becomes relatively more attractive when the contingent contract is costly, the likelihood that it is actually chosen on the equilibrium path (which is a precondition for credible signaling) should increase.[12] But, on the other hand, the size of the effort effect due to norms signaling should be

[12] To be precise, in the model the condition $B\frac{b}{c} > w - k$, which is satisfied in the Costly contract choice setting but not in the Costless setting, guarantees the existence of a separating equilibrium if only the fraction of conformists is not too large; and the same condition then also rules out

weaker as the choice of a fixed wage is a weaker signal about the average prosociality in the popoulation.[13] There is some indication for these patterns in the data as in Costly contract choice treatment the effort effect of the Norms intervention is driven by an increase in the *proportion* of agents who exert strictly more effort under the fixed wage contract, while in the Costless contract choice treatment it is rather driven by an increase in the *level* of efforts chosen by the agents who exert strictly more effort under the fixed wage contract.[14] However, we also acknowledge that the inference process about what exactly the contract choice reveals about the social norm when the principal may act strategically, requires a higher level of common knowledge of rationality. In other words: the idea underlying the main result, that "if the principal offers a fixed wage he cannot have seen many shirking agents," does not require a very sophisticated reasoning. Preferences for conformity then directly imply a positive effort reaction. But the question "what exactly does the contract choice tell me about the extent of shirking given that the principal chose the contract strategically?" seems to be more difficult.

Figure 2 shows histograms of the effort choices for the fixed wage (upper panels) and the contingent wage (lower panels) in bins of 5 effort units. The most striking difference is the substantial reduction in the very low efforts (0-4) under the fixed wage in the Norms treatments (black bars) as compared to the baseline setting (white bars). For example, in the Costly contract choice setting, the fraction of agents choosing these very low efforts drops from about 40.7% to 17.5% in the Norms treatment ($p = 0.0012$, two-sided proportion test). In the Costless treatment, the proportion of efforts in the lowest category also drops significantly from 33.7% in the Baseline to 20.4% in the Norms treatment ($p = 0.0422$). Hence, many of the otherwise very selfish agents apparently choose to exert substantially higher efforts when they know that an informed principal had chosen the fixed wage. In turn, the effort variance under the fixed wage is lower in the Norms treatments as compared to the Baseline, both in the Costless and Costly setting (the respective p-values are 0.0583 and 0.0413, Levene's robust test of variances, see Table A2 in

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the existence of a pooling equilibrium where only the contingent wage is offered. If this condition is not met, a separating equilibrium exists only under stronger restrictions on prior beliefs. See Appendix B for details.

[13] To see that note the following: If there is a separating equilibrium in the model, informed principals choose the trust contract if and only if there is sufficiently strong average prosociality in the population. The higher the costs of the performance-contingent contract, the lower is the required level of prosociality that makes offering a trust contract more attractive. In the model a costly contingent compensation option therefore leads to a weaker increase in efforts compared to the setting where the contingent contract can be chosen at no costs (provided that a separating equilibrium is played in both of them).

[14] In the Costly contract choice treatment the effort effect of the Norms intervention the *proportion* of agents who exert strictly more effort under the trust than the contingent contract from 27% to 46% ($p = 0.0120$, two-sided proportion test). But the Norms intervention leaves the *spread in efforts* for these agents virtually unchanged (those who exert more effort under the trust contract exert 20.2 more in the Baseline and 20.6 in Norms). In the Costless contract choice the opposite pattern occurs as the proportion of agents exerting more effort under the trust than the contingent contract increases to a weaker extent from 38% to 44% ($p = 0.4036$, two-sided proportion test) but the spread in efforts increases in these cases from 18.8 to 25.9 effort units (i.e. by about 38%, $p = 0.0726$, two-sided MWU test). Hence, more agents positively react to the choice of a trust contract in the Costly setting (in line with the idea that the likelihood that the signal is seen as informative is larger), but the size of the positive reaction is stronger in the Costless setting.

Appendix A for more details). One interpretation of this result is that norms signaling leads to more consistent behavior of the agents.[15]

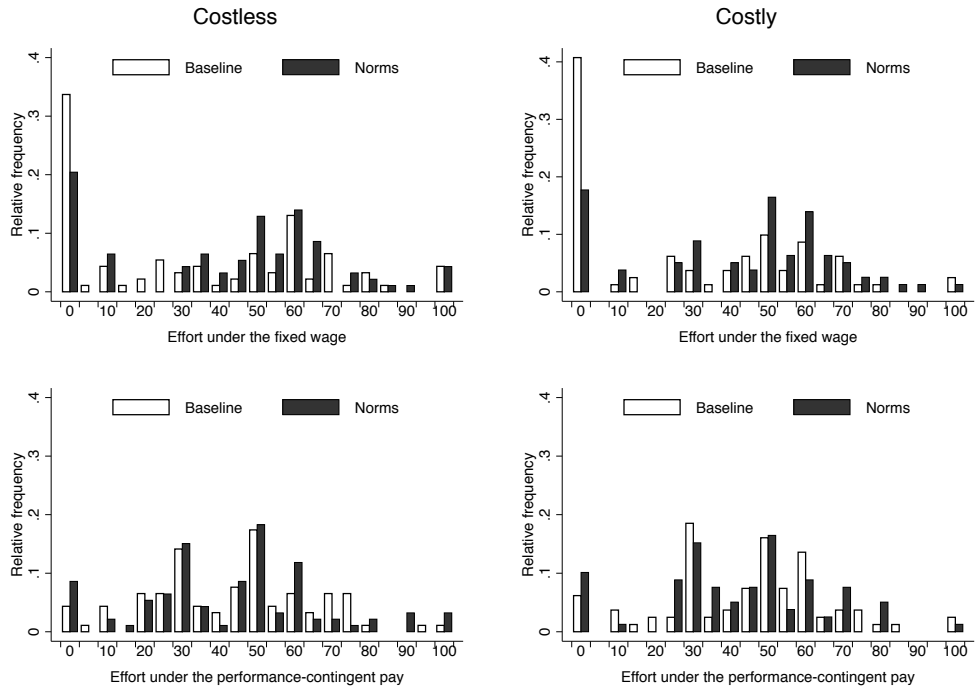

FIGURE 2
Effort distributions

Finally, we turn our attention to the profits of principals and overall welfare. In line with the effort effect, the Norms intervention leads to significantly higher profits under the fixed wage, with an increase from €5.15 to €6.20 in the Costless and from €4.69 to €6.22 in the Costly contract choice treatment, (p = 0.0575 and p = 0.0034 respectively, two-sided MWU test, see Table A3 in Appendix A for more details). However, this is still less than the profits resulting from the contingent contract (€9.11 and €7.18, p = 0.0000 and p = 0.0724 respectively, two-sided WSR test). The generated overall welfare is significantly smaller under a fixed wage than under a contingent contract in the Costless Baseline treatment (€14.35 as compared to €15.29, p = 0.0003), but the fixed wage achieves a nearly identical total welfare level to the contingent compensation in the Norms treatment (€14.97 as compared to €15.21, p = 0.7672, two-sided WSR test). In the Costly contract choice treatments, however, the fixed wage leads

[15] We thank an anonymous referee for this suggestion.

to a significantly higher welfare than the contingent contract (€13.34 and €14.22 with $p = 0.0001$ in Baseline and €13.25, and €15.09 in Norms with $p = 0.0000$).

The principal's contract choice should depend on the information about the behavior of agents. In order to be able to analyze the choices of principals it is important to have variation in the information principals receive about norms of behavior. We address this issue in Section 5.2 in detail introducing a new design element in a subset of the experimental sessions.

5. DISENTANGLING THE SIGNALING MECHANISM

The main results from the experiment seem to be well in line with the hypothesis that contracts can signal social norms and, in turn, affect behavior beyond the direct incentive effects. In particular, the mere fact that agents know that the contract is chosen by a principal informed about the behavior of others substantially increases efforts under a fixed wage. But, of course, there may be additional mechanisms that drive the observed behavioral patterns. One potential alternative mechanism could be guilt aversion (see, for instance, Battigalli and Dufwenberg (2007) or Ellingsen et al. (2010)). Suppose that, in line with the idea of guilt aversion, agents choose higher efforts when they believe the principal expects them to do so. If a principal now proposes a fixed wage only when she has high expectations about the efforts exerted under that form of compensation, the choice of the fixed wage can reveal these expectations and indeed trigger higher efforts. However, this reasoning alone cannot explain why efforts under the fixed wage are higher in the Norms treatment, as the principal's expectations are similarly revealed in the Baseline treatment. Hence, it is apparently important that the principal has information about the behavior of other agents, which trigger the additional behavioral response. Further, even though principals do not observe agents' efforts directly, agents may perceive that principals compare them to other agents in the Norms treatments and therefore exert higher efforts. A mere comparison effect should lead to higher efforts also under the contingent contract. However, we do not observe that efforts increase under the contingent compensation when an informed principal proposes it.

As laid out before, the mechanism suggested by the underlying theory rests on three premises: First, agents must infer information about social norms from principals' choices. Second, a principal's contract choice must be affected by the information observed about past behavior of other agents. And third, information about the behavior of others must affect the agents' own behavior. To see whether these are indeed core driving forces behind our results, we now investigate these three hypotheses individually.

5.1 Agents' Beliefs

An important element in the hypothesized mechanism is that agents adapt their beliefs about the norm of behavior based on the principal's contract choice. We investigate this question in two ways. In the last 16 out of the 25 sessions, we elicited agents' beliefs about the behavior of other agents under both contract types after the decision making stage. We used an incentivized procedure, such that agents received an additional payoff equal to €2 minus €0.01 per unit of the squared deviation between their estimate and the true session mean of efforts.[16] While we caution that these beliefs are endogenous and potentially driven by false consensus effects or used self-servingly as a justification for prior actions,[17] it is still interesting to study how the contract choice affects beliefs differently in the Norms as compared to the Baseline treatments. As Figure 3 shows, the Norms intervention increases beliefs about efforts under the fixed wage, in the Costless and the Costly contract choice setting (p = 0.0424 in Costless and p = 0.0870 in Costly, two-sided MWU test), but does not significantly affect beliefs about efforts under the contingent wage (p > 0.711).[18] However, the difference-in-difference is not significant in both settings (p = 0.156 for the Costless and p = 0.3523 in the Costly).

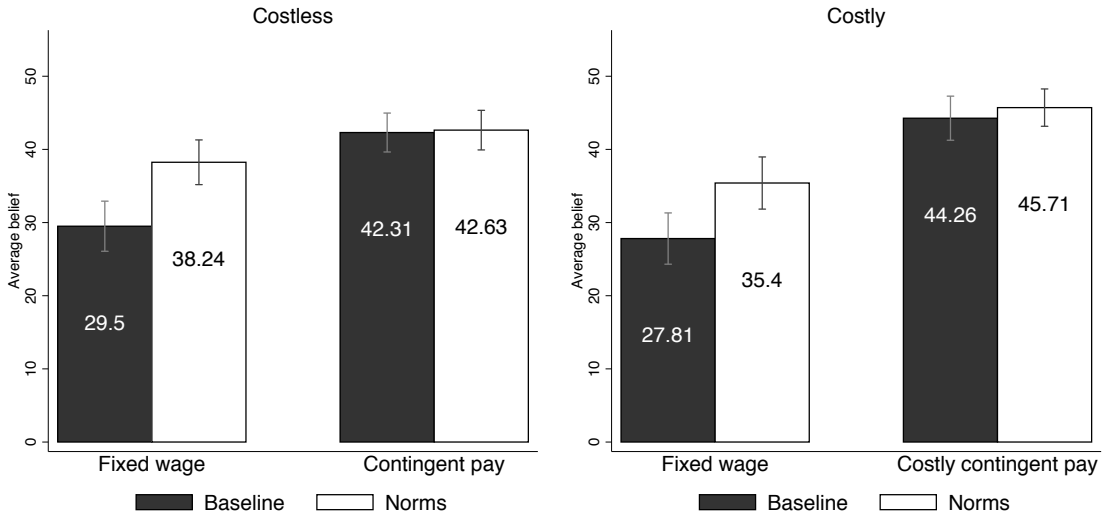

FIGURE 3
Agents' beliefs and standard errors of means

[16] When the deviation between the guess and the actual mean was above 14, agents recieved no payment for these questions (i.e., no fines were imposed for wrong guesses).

[17] See Zizzo (2010) for discussion about demand effects in belief elicitation and Costa-Gomes, Huck, and Weizsäcker (2014) for a discussion on the endogeneity of elicited beliefs.

[18] See Table A4 in Appendix A for more details.

To avoid false consensus effects and self-serving beliefs, we also conducted a separate (online) experiment that was designed purely to elicit incentivized beliefs about inferences from the principal's choices in our previous experiment. In the *Contingent Contract Beliefs* (N = 57) and *Trust Contract Beliefs* (N = 61) treatments, we investigate to what extent the principal's contract choice affects observers' beliefs about this principal's information on the social norm. In these treatments, subjects were outside observers who received instructions from the Costless Norms treatment and had to estimate the information a principal had observed when selecting one of the two contracts. Subjects were paid for the correctness of their beliefs according to the quadratic scoring rule: They earned €3 minus €0.01 for each unit of quadratic deviation from the respective true value.[19] The experiment was conducted online and participants were paid via bank transfer or with amazon.de vouchers. Each subject participated only once and had not taken part in any of our prior treatments.

In the treatment Contingent Contract Beliefs, subjects estimated the average efforts actually observed by a principal who was randomly chosen from those who had selected the contingent contract. In the treatment Trust Contract Beliefs, they estimated the average efforts observed by a principal who had chosen the trust contract. In each of these two treatments, subjects stated two numbers – one for their estimate of the average efforts *observed by this principal* under the fixed wage, and one for average efforts observed under the performance-contingent compensation.[20] A comparison between these two treatments allows another test of the idea that the actual contract choice of a principal affects beliefs about this principal's knowledge about the behavior of others, this time by "impartial" outside observers.[21]

The results show that third party beliefs are affected by contract choices. In the treatment in which participants estimate what the principal had seen before proposing a contingent compensation contract, observers indeed believe that this principal observed significantly higher efforts under the contingent contract (*59.28* instead of *49.12*, $p = 0.0178$, two-sided WSR test). This picture is reversed when participants estimate what the principal had seen before proposing the fixed wage. Here subjects expect higher effort under the fixed wage than under the performance-contingent compensation (*62.36* instead of *49.13,* $p = 0.0018$, two-sided WSR test).

We caution that these third party beliefs may not be very accurate, given that it is likely difficult for outside observers in an online experiment to not only put themselves in the situation of a subject in the

[19] The subjects received nothing for answers with a deviation of more than 17 points from the true value.

[20] After showing the instructions of the Norms treatment and asking test question to ensure that agents understood the setting, the subjects received the following statement: *"We have randomly drawn one of the prior participants in the role of an employer. This employer has observed contributions of 10 employees from the prior experiment for both the trust and the contingent contract. This employer has chosen the [Treatment Contingent Pay Beliefs] contingent contract / [Treatment Fixed Wage Beliefs] trust wage after having seen the table of the form shown in the above. What is your best estimate about the average effort under the trust contract in the table above? What is your best estimate about the average effort under the contingent contract in the table above?"*

[21] See also Table A5 in Appendix A for descriptive statistics and *p*-values.

experiment but also to make indirect inferences about behavior observed by principals who made a certain contract choice.[22] But the qualitative picture is of interest: Contract choices affect inferences made about what principals have seen irrespective of whether they are elicited from directly affected agents or outside observers.

5.2 Principals' Contract Choice Behavior

So far, we have mainly been interested in differences in agents' reaction to the principal's contract choice. But it is also important to see whether principals choose different contracts when the social information varies. An affirmative answer to this question is an important precondition for the suggested mechanism: if principals do not react to information about the norm of behavior, their contract choice cannot reveal such information. In order to answer this question we elicited principals' contract choices using the strategy method in six sessions of the Costly contract choice experiment.[23] In total, 92 principals (46 in the Baseline and 46 in the Norms setting) went through a different decision procedure than in our initial design leaving the agents' decision completely unaffected. In both the Baseline and the Norms treatments, principals saw five different tables, each showing *possible* behavior of 10 agents from a previous session (again containing each agent's efforts under fixed wage and contingent contract). Each of the tables had exactly the same format as the table used in our initial design. The principals were informed that one of these tables corresponded to actual effort choices from a previous experimental session, but they did not know which one was the "true table" (see Table D7 in Online-Appendix D for details).

The tables were designed such that effort levels and thus the relative profitability of the contracts varied between the different scenarios. In two out of the five tables the principals' profits were higher under the contingent contract, and in the other three tables the fixed wage contract led to higher profits.[24] Principals only saw the vectors of chosen efforts and not the implied profits. In order to study whether principals used their contract choice strategically, principals were explicitly informed in the Baseline treatment that

[22] We also conducted a "Baseline Beliefs experiment" in which instructions from the Baseline treatment of the Costless Contract Choice experiment were presented to a new sample of 60 subjects in the role of outside observers. Subjects had to estimate the average efforts under the fixed wage and contingent compensation. We can use this experiment to compare first and third party beliefs. As Figure C1 in Online-Appendix C shows, the observers' average estimate of efforts under the fixed wage is closer to the true effort than the first party estimate, which was substantially smaller than true efforts (mean effort: 34.66, third party belief: 36.40, $p = 0.4933$, first party belief: 29.50, $p = 0.0864$, two-sided WSR test). This supports the conjecture that agents adapt first party beliefs in a self-serving manner. But, by contrast, outside observers substantially overestimate effort under the contingent wage (mean effort: 44.49, third party belief: 53.22, $p = 0.0001$, first party belief: 42.31, $p = 0.8252$, two-sided WSR test). This may be due to the fact that self-serving beliefs play a weaker role here, but on the other hand, it may be easier to predict effort choices for agents who had actually made that same effort choice decision before.

[23] In the first sessions we did not use the strategy method for the principal's choices and, hence, there was hardly any variation in observed behavior which makes it impossible to evaluate causal effects of information about the norm on contract choices. In these sessions 15.22% of principals choose the fixed wage contract in the Costless Baseline and 46.43% in the Costly Baseline treatment. Due to the low prosociality shown in the in the Costless Norms treatment, principals offered the fixed wage only in 4.3% of the cases in this treatment and in 25% in the Costly Norms treatment.

[24] We implemented this design element in the Costly contract choice setting since this setting allowed us to construct realistic tables close to real decision behavior, in which either the contingent or the trust contract are more profitable.

the agents were unaware that principals had learned the past behavior of other agents. In the Norms treatment, on the other hand, principals knew that the agents' were notified about their superior information – just as in the initial experiment. Hence, in the Norms treatment there was common knowledge that principals had information about social norms of behavior.

The principals were asked to make a contract choice for each of the five tables, which were presented in random order on the screen.[25] For the analysis we ranked tables according to the difference in average profits between the trust and contingent contract, with the table where the trust contract "outperforms" the contingent contract by the highest amount occupying rank 1. The table with the true efforts from the previous experiment had rank 4.

We ran simple linear probability and probit regressions to study whether principals indeed adapt their contract choice according to information on agents' behavior in the previous experiment. To do that we pooled the data from both treatments and include a dummy variable indicating whether an observation comes from the Norms treatment, i.e., the treatment where there is common knowledge that the principal has superior information.

TABLE 2

Principals' contract choice

	(1) - OLS	(2) - Probit (marginal effects)
	Dummy Fixed wage	Pr(Fixed wage = 1)
Norms treatment	-0.07	-0.09
	(0.06)	(0.07)
Table rank 1	0.13**	0.13***
	(0.05)	(0.05)
Table rank 2	0.12**	0.12**
	(0.05)	(0.05)
Table rank 4	-0.43***	-0.41***
	(0.06)	(0.05)
Table rank 5	-0.42***	-0.40***
	(0.06)	(0.05)
Female	0.05	0.07
	(0.06)	(0.07)
Age	0.00	0.00
	(0.01)	(0.01)
Constant	0.52**	
	(0.21)	
Observations	460	460
R-squared	0.27	
Pseudo R		0.22

Note: Robust standard errors in parentheses. The two-sided significance levels are indicated with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[25] To check the credibility of the different tables, principals were asked after their choices to state for each of the tables on a 5-point Likert scale whether they thought it was likely that the table "originated from a previous experiment" (from 1 ="very unlikely to originate from a previous experiment" to 5="very likely to originate from a previous experiment"). The ratings varied only between 2.7 and 3.3, such that none of the tables was considered to be unlikely.

As the regressions reported in Table 2 show, principals indeed react strongly to the information about behavior in the previous experiment. As compared to the reference table with rank 3, principals choose the fixed wage significantly more often when observing more prosocial behavior (i.e., for tables with rank 1 and 2). They chose it significantly less often when observing more selfish behavior, such as in the (actually truthful) table 4 and the even more selfish table 5. Note that the dummy for the Norms treatment is not significantly different from zero. A potential interpretation is that principals do not anticipate that agents choose higher efforts under the fixed wage in the norms treatment. However, we caution that principals might have perceived that the efforts shown in the table (which came from a session from the Baseline treatment) already reflected the effect of the Norms intervention.

5.3 Effects of Explicit Norms Disclosure

To investigate the last element of the proposed mechanism we provide a direct test of whether information about others' behavior affects agents' effort choices in our framework. We explore the extent to which explicit information about actions of others affects agents' decisions. Note that our key conjecture is well in line with the existence of "social history" or "conformity effects" in experiments. A large number of experiments have already established that knowledge about past actions of others in the same situation affects behavior (examples are Berg, Dickhaut, and McCabe (1995), Bardsley and Sausgruber (2005), Bicchieri and Xiao (2009), Servátka (2009), Gächter, Nosenzo, and Sefton (2012), and Gürerk (2012)). The purpose of this section is thus not so much on presenting novel evidence, but rather to study whether conformity effects also occur in the setting of our main experiment. In order to do so, we designed a simple further experiment, in which we induce different norms of behavior in a rather straightforward way.

The design of this experiment is similar to our Costless Baseline treatment. The only difference is that now the principals and not the agents see a table similar to the one in the Norms treatment, with efforts of 10 selected employees from a previous experiment.[26] We ran two different treatments: *Selfish Norm* and *Prosocial Norm*. For each of the two treatments we selected a different sample of actual effort contributions from the Baseline treatment in our first experiment. In the Prosocial Norm treatment, we displayed a sample of 10 selected agents with very high contributions under the fixed wage. The average effort of the selected sample was 60.1 under the fixed wage and 47.9 under the contingent compensation. To obtain a ceteris paribus comparison, the displayed sample of subjects in the Selfish Norm treatment (also taken from real observations in the Baseline) was very similar with respect to the efforts under the

[26] We intentionally spoke of "selected agents" to avoid deception but made no information available on the specific selection procedure.

contingent compensation but with substantially lower efforts under the fixed wages. To be specific, the average effort was 47.1 under the contingent contract and 19 under the fixed wage.[27] Hence, we expect subjects to exert higher efforts after the fixed wage in the Prosocial Norm than in the Selfish Norm treatment, whereas the efforts under the contingent compensation should not differ between the treatments.

The principals knew that the agents had seen the decisions of the 10 selected agents from the previous sessions but didn't know the efforts themselves, and the agents were aware of this. A total of 120 subjects took part in this experiment (30 in the role of principal and 30 in the role of agent in each treatment). The experiment lasted about one hour. All payments were made individually and anonymously. The average earnings were €10.57 per subject, including a show-up fee of €2.50.

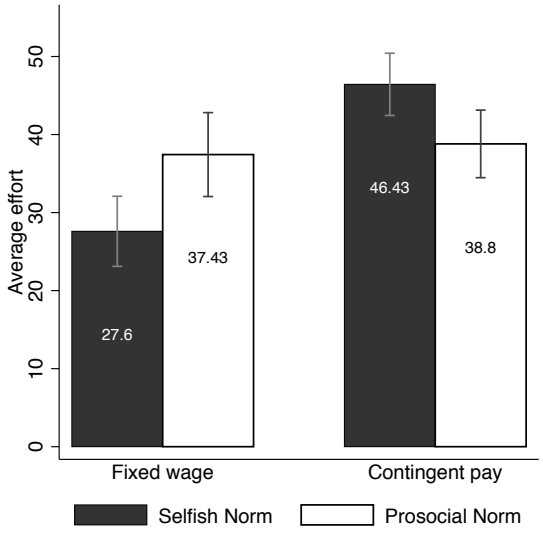

FIGURE 4
Average efforts and standard errors of means in the Explicit Norms Disclosure experiment

As can be seen from Figure 4, we observe a 36% higher average effort under the fixed wage in the Prosocial Norm treatment (37.43) than in the Selfish Norm treatment (27.6), but this difference is only significant when we use a one-sided test (the two-sided MWU p-value is 0.1092). However, the between-treatment difference in the span of efforts between the contingent compensation and fixed wage is highly significant ($p = 0.0129$, two-sided MWU test). This highly significant difference-in-difference is apparently also partially driven by a difference in effort under the contingent compensation (which is 46.43 in the Selfish Norms treatment and 38.8 Prosocial Norm treatment but this difference is not significant, $p = 0.3396$, two-sided MWU test). Finally, the within-subjects difference in the effort choices

[27] The exact individual values are reported in Tables D8 and D9 in Online-Appendix D.

for the respective compensation form is highly significant in the Selfish Norm treatment ($p = 0.0044$) but not in the Prosocial Norm treatment ($p = 0.8933$, two-sided WSR test).[28]

To sum up, we indeed find evidence for the three elements of the conjectured mechanism: (i) beliefs about the behavior of others are affected by knowledge about the contract choice of an informed principal; (ii) principals' contract choices are affected by information about behavior in the population; and (iii) information about other agents' choices affects agents' behavior.

5.4 Costs of Control and the Restriction Game

We also apply our experimental manipulation in the context of a different experiment, the "Cost of Control" experiment by Falk and Kosfeld (2006). The results are reported in detail in the Online-Appendix C. Here the principal decides whether to impose a minimum on the agent's contribution (i.e. to control the agent) or not (i.e. to trust him). As Falk and Kosfeld have shown, the choice of control can have "hidden costs" and leads to lower efforts. Hence, in contrast to our initial setting, "control" should be detrimental already in the Baseline setting. But the mechanism proposed in this paper suggests that we may observe stronger costs of control when the principal is informed about the behavior of others as imposing a restriction can reveal that most others behaved very selfishly.

We find a statistically significant effort reduction when control is imposed in the Norms setting where principals are informed about behavior of other agents but not in the Baseline setting were the principal is uninformed. We also find that it again led to a reduction in the variance of behavior. However, there are no significant differences between Baseline and Norms with respect to average efforts. Hence, the Norms intervention here did not lead to economically stronger average costs of control but made the effect statistically more stable due to the increased consistency of agents' behavior.

6. CONCLUSION

We have shown in a series of lab experiments that contract choices can convey information about the behavior of other agents previously observed by the contract designer, and this information can have an impact on agents' behavior. Individuals may react very differently to an identical contract when they know that its selection is based on richer information about the prior reactions of others. Contract choices thus can reveal information about prevalent social norms and also indirectly shape behavior beyond direct

[28] See Table A6 in Appendix A for details.

material incentives. We find substantial effort effects in our main Contract choice experiments where the use of a fixed wage led to significantly higher efforts when it was chosen by an informed principal.

It is important to stress that in our experiments these signaling effects occur even though agents' behavior is not observed by peers, and that ex-post they do not even receive information on the distribution of choices. Hence, the mechanism relies on an apparent intrinsic tendency for conformity and not on technological complementarities or image concerns. It is thus applicable to, and should be relevant for, a broader number of contexts, namely, all situations in which a first mover's choice can reveal information about behavior in a broader population which, in turn, can affect the behavior of second movers beyond their direct economic motives.

Our results also have implications for the design of incentive schemes in practice. A direct implication is that when employees (or citizens) are not well informed about norms of behavior, but the designer of an incentive scheme (or a law) is, the choice of the scheme can have signaling effects as it reveals information about prevalent norms.[29] This seems particularly important when uncertainty about the norm is large, such as in newly founded companies or those formed through a merger. A particular view about the set of norms that form a firm's culture may become "self-fulfilling" when this view shapes the design of the incentive structure and thereby reveals itself to the employees. Granting a high degree of autonomy, for instance, can reveal that the employer is convinced that employees will not exploit this trust – and this signals to employees that the exploitation of trust is apparently not the "usual" behavior in the firm. It may thus reinforce a culture of trust.

Of course, many important questions still need to be addressed. A key challenge is to study the consequences of changes in incentive structures on social norms in field settings, for instance by exploiting information from employee surveys or using lab experiments in firms to elicit social norms before and after a change (see, for example, Burks and Krupka (2012) for an approach to elicit norms in firms). Moreover, in smaller firms or communities, people may have rather precise information about norms of behavior in their direct environment of colleagues or neighbors but not on broader groups of all employees in a large firm or most members of a society. It seems important to study the extent to which contract choices can affect norms of behavior in subgroups that can mutually observe each other.

The interplay between contracts and social norms in organizations is an important field for further research. While it is often easy to change formal rules in organizations, changing the complex system of informal rules is typically a much more demanding endeavor. But, as we have pointed out in this study, changes in formal rules affect perceptions about informal rules of behavior and thus shape these social

[29] See Bénabou and Tirole (2012), Section 4, for a related discussion on "expressive law," i.e., the role of law in conveying a society's norms of behavior, which may lead to the choice of "softer" laws in order to signal that, for instance, only very disreputable people do not follow the norm and, hence, the need to induce tough sanctions is low. See also the discussion in Bowles (2008).

norms. If we aim at giving better advice to practitioners on how to optimally design incentives, these indirect effects should be taken into account as they have significant potential to alter the way in which changes in the formal rules affect behavior and, in turn, the overall performance of organizations.

Acknowledgments

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APPENDIX A. ADDITIONAL TABLES AND FIGURES

TABLE A1

Treatment overview and sample size

	Baseline: Agents do not know that the principals have information concerning other agents	**Norms:** Agents know that the principals have information concerning other agents	Total
Costless: Principals bear no costs for the contingent pay	Agents: 92 (62) Principals: 92	Agents: 93 (63) Principals: 93	370
Costly: Principals pay €2 for the contingent pay	Agents: 81 (53) Principals: 81 [46]	Agents: 80 (52) Principals: 79* [46]	321
			691

Note: The numbers in the parenthesis indicate the size of the subsample where we collected agents' beliefs. The numbers in brackets indicate the size of the subsample where principals' contract choice via the strategy method (see 5.2 for more details). *In one session, one principal was missing as one computer terminal was left empty by mistake. The respective agent was matched with one randomly chosen principal at the end of the experiment. As the experiment was a one-short decision, we kept the data of the agent.

TABLE A2

Mean efforts in Costless and Costly treatments

	Treatments	N of independent observations	Fixed wage	Contingent pay	Δ Effort = Effort fixed wage – Effort contingent pay	*p*-values Fixed wage vs. Contingent pay WSR
Costless	Baseline	92	34.66 (31.32)	44.49 (21.87)	-9.83 (28.46)	0.0048
	Norms	93	43.31 (28.45)	43.91 (23.54)	-0.60 (29.78)	0.9586
	p-values Baseline vs. Norms	MWU	0.0575	0.8087	0.0552	
		Test of variances[a]	0.0583	0.6210		
Costly	Baseline	81	30.73 (28.85)	45.43 (21.60)	-14.70 (28.06)	0.0000
	Norms	80	43.53 (25.95)	43.23 (21.60)	0.30 (25.12)	0.6045
	p-values Baseline vs. Norms	MWU	0.0034	0.5031	0.0004	
		Test of variances[a]	0.0413	0.9964		

Note: N indicates the number of independent observations. Standard deviations are reported in parentheses. All reported *p*-values are two-sided. [a]Levene's robust tests for equality of variances. There is no significant difference in efforts between the Costless and Costly treatments (all *p*-values are above 0.50 as tested with the two-sided MWU test). There is no significant difference in the variance of efforts between Costless and Costly treatments ($p > 0.35$).

TABLE A3

Descriptive statistics of principals' payoffs and total welfare

A: Principals payoffs	Treatments	Fixed wage	Contingent pay	Δ = Fixed wage – Contingent pay	*p*-values Fixed wage vs. Contingent pay WSR
Costless	Baseline	5.16 (3.76)	9.11 (1.53)	-3.95 (3.32)	0.0000
	Norms	6.20 (3.41)	9.07 (1.65)	-2.88 (3.24)	0.0000
p-values Baseline vs. Norms	MWU	0.0575	0.8087	0.0292	
	Test of variances[a]	0.0583	0.6210		
Costly	Baseline	4.69 (3.46)	7.18 (1.53)	-2.49 (3.15)	0.0000
	Norms	6.22 (3.11)	7.03 (1.51)	-0.80 (2.78)	0.0724
p-values Baseline vs. Norms	MWU	0.0034	0.5031	0.0008	
	Test of variances[a]	0.0413	0.9964		
B: Total welfare					
Costless	Baseline	14.35 (1.81)	15.29 (1.11)	-0.95 (1.80)	0.0003
	Norms	14.97 (1.62)	15.21 (1.20)	-0.24 (1.93)	0.7672
p-values Baseline vs. Norms	MWU	0.0504	0.5178	0.0217	
	Test of variances[a]	0.0078	0.6313		
Costly	Baseline	14.22 (1.83)	13.33 (1.14)	0.88 (1.96)	0.0001
	Norms	15.09 (1.53)	13.25 (1.22)	1.844 (1.66)	0.0000
p-values Baseline vs. Norms	MWU	0.0028	0.6374	0.0014	
	Test of variances[a]	0.0000	0.8093		

Note: Standard deviations are reported in parentheses. All reported *p*-values are two-sided. [a]Levene's robust tests for equality of variances. There is no significant difference in fixed wage payoffs between the Costless and Costly treatments (all *p*-values are above 0.50 as tested with the two-sided MWU test). There is no significant difference in the variance of payoffs and welfare between Costless and Costly treatments ($p > 0.30$).

TABLE A4

Mean beliefs in Costless and Costly treatments

	Treatments	N of independent observations	Fixed wage	Contingent pay	Δ Belief = Belief fixed wage – Belief contingent pay	*p*-values Fixed wage vs. Contingent pay WSR
Costless	Baseline	62	29.5 (26.97)	42.31 (20.95)	-12.81 (31.90)	0.0093
	Norms	63	38.24 (24.25)	42.63 (21.47)	-4.40 (31.50)	0.2961
	p-values Baseline vs. Norms	MWU	0.0424	0.8723	0.1562	
		Test of variances[a]	0.2719	0.8132		
Costly	Baseline	53	27.81 (25.50)	44.26 (21.94)	-16.45 (30.39)	0.0005
	Norms	52	32.40 (25.70)	45.71 (18.39)	-10.31 (30.68)	0.0394
	p-values Baseline vs. Norms	MWU	0.0870	0.7115	0.3523	
		Test of variances[a]	0.6733	0.0973		

Note: N indicates the number of independent observations. Standard deviations are reported in parentheses. All reported *p*-values are two-sided. [a]Levene's robust tests for equality of variances. There is no significant difference in beliefs between the Costless and Costly treatments (all *p*-values are above 0.36 as tested with the two-sided MWU test). There is no significant difference in the variance of beliefs between Costless and Costly treatments ($p > 0.125$).

TABLE A5

Online Belief Elicitation Experiment

Treatments	N of independent observations	Fixed wage	Contingent pay	Δ Belief = Belief fixed wage – Belief contingent pay	*p*-values Fixed wage vs. Contingent pay WSR
Contingent Contract Beliefs	57	49.12 (28.24)	59.28 (18.04)	-10.16 (30.05)	0.0178
Trust Contract Beliefs	61	62.36 (20.29)	49.13 (21.30)	13.23 (30.92)	0.0018
p-values Contingent contract vs. Trust contract	MWU	0.0006	0.0088	0.0002	
	Test of variances[a]	0.2534	0.4161		

Note: N indicates the number of independent observations. Standard deviations are reported in parentheses. All reported *p*-values are two-sided. [a]Levene's robust tests for equality of variances.

TABLE A6

Explicit Norms experiment

Treatments	N of independent observations	Fixed wage	Contingent pay	Δ Effort = Effort fixed wage – Effort contingent pay	*p*-values Fixed wage vs. Contingent pay WSR
Selfish norm	30	27.6 (2459)	46.43 (21.83)	-18.83 (32.18)	0.0044
Prosocial norm	30	37.43 (28.45)	38.8 (23.71)	-1.367 (24.32)	0.8933
p-values Contingent wage vs. fixed wage	MWU	0.1092	0.3396	0.0129	
	Test of variances[a]	0.1089	0.1836		

Note: N indicates the number of independent observations. Standard deviations are reported in parentheses. All reported *p*-values are two-sided. [a]Levene's robust tests for equality of variances. As for the comparison between the Explicit Norms treatment and the Costless experiment, there is no significant difference in efforts except that fixed wage effort under the Selfish Norm is significantly lower than the fixed wage effort in the Costless Norms treatment ($p = 0.0073$, tow-sided MWU test).

Here are decisions about effort from 10 participants of the last session of this experiment who were in the role of employees:

	Employee 1	Employee 2	Employee 3	Employee 4	Employee 5	Employee 6	Employee 7	Employee 8	Employee 9	Employee 10
Effort under trust compensation	60	34	0	20	69	60	0	18	25	0
Effort under contingent compensation	25	60	31	25	60	70	45	38	10	65

Please note that your assigned employee has never participated in this experiment before. Additionally, he is not informed about the levels of effort of the employees in the previous experiment. He knows, however, that you are informed about these.

FIGURE A1

Information for principals in the Norms treatments (example from Costless treatment, translated from German)

Note: In the Norms treatment principals observed decisions of 10 agents from the preceding session of the same experiment. This table is a screenshot with such information used in one Norms session of our main experiment. The displayed values refer to the actual decisions of (all) 10 agents from an earlier Baseline session. In the second session of the Norms treatment we used data from the second session of the Baseline treatment ("Effort under trust compensation: 50, 51, 25, 35, 0, 80, 24, 35, 70, 0;" "Effort under contingent compensation: 25, 48, 38, 70, 32, 50, 20, 58, 60, 28").

Note: The employer has information about the efforts of 10 other employees from the previous experiment. He is participating for the first time. The employer sees the following table where instead of xx, the decisions of the employees from the past experiment are displayed.

	Employee 1	Employee 2	Employee 3	Employee 4	Employee 5	Employee 6	Employee 7	Employee 8	Employee 9	Employee 10
Effort under trust compensation	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Effort under contingent compensation	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

FIGURE A2

Information for agents in the Norms treatments (translated from German)

Note: This table was presented to all agents in the Norms treatment who did not have any information on the actual effort choices by other agents. However, they knew that their principal was informed about decisions of 10 participants from the previous experimental session and would observe an identical table but with numbers instead of "xx."

APPENDIX B. A FORMAL MODEL

We consider a generalization of Sliwka (2007) to the case of continuous types, which we apply to the framework studied in the experiment. An agent A works for a principal P who only cares about her profits. Agents have a utility function

$$u_i(\pi_A, \pi_P) = \pi_A + \theta_i \cdot \pi_P$$

such that θ_i measures the degree of prosociality of an agent. Agents are either "steadfast" or "conformists." For steadfast agents, the θ_i is exogenously given and follows a density function $f_N(\theta)$ on $[0,1]$, which has the property that $N = E[\theta|N]$ such that N is the *average prosociality in the population*. Both principal and agents have a common prior belief on the distribution of N with mean N_0 and support $[0,1]$ with a continuous density $g(N)$. Principals observe the population mean N prior to their contract choice. A conformist's degree of prosociality θ_C is equal to his conditional expectation on θ given the prior expectation and the principal's action. Hence, conformists try to be as prosocial as the population average N. Let η be the fraction of steadfast agents in the population which is assumed to be common knowledge.[30] After having observed s_N the principal chooses between two exogenously given contracts $C \in \{t, c\}$, a "trust contract" or a "contingent contract." After the contract choice the agents exert effort e_i which affects the principal's earnings. With probability e the principal receives a payoff of B (and 0 otherwise). When contract $C = t$ is chosen, the agent receives a fixed wage w irrespective of the performance outcome, when choosing $C = c$ the agent works under a performance contingent contract, which pays out a bonus b only if the principal earns B. We assume that the use of the contingent contract may impose an additional cost $k < w$ which is borne by the principal.

Equilibrium Analysis

As the principal has private information on the population norm N, which is relevant for the decision of a conformist agent, the game is a signaling game. We now characterize Perfect Bayesian Equilibria of this game. First we determine the optimal effort choice of an agent under each contract type for given beliefs about the norm. Under the trust contract an agent of type θ (where $\theta = E_A[N|C = t]$ if the agent is a conformist) maximizes

$$\max_{\theta} w + \theta(Be - w) - \frac{c}{2}e^2$$

[30] It is of course also conceivable that knowledge about the proportion of steadfast types is not common knowledge. In particular when the principal does not observe the prior norm *N* perfectly but observes behavior in a sample of agents this leads to an additional inference problem, as behavior in the sample not only reflects the behavior of steadfast agents but also the beliefs of conformist types.

and thus chooses an effort level of

$$e_t(\theta) = \frac{\theta B}{c}$$

which is strictly increasing in the "degree of prosociality." Under the contingent contract the agent maximizes

$$\max_e e\, b + \theta\big((B-b)e\big) - \frac{c}{2}e^2$$

choosing an effort level

$$e_c(\theta) = \frac{b + \theta(B-b)}{c}.$$

Note that efforts are increasing in θ under both contracts, but the effect of θ on effort is larger under the trust contracts as $\frac{\partial e_t}{\partial \theta} = \frac{B}{c} > \frac{\partial e_c}{\partial \theta} = \frac{B-b}{c}$. Hence, the conformists' behavior is more sensitive to their beliefs about the norm under a trust than a contingent contract. Furthermore, $\frac{b+\theta(B-b)}{c} > \frac{\theta B}{c}$ such that effort is always larger under the contingent contract when there is full information.

Now we can consider the principal's optimal choice given the agent's reaction. For ease of notation, let $N_C = E[N|C]$ be the agent's rational expectation about the norm after a contract choice $C \in \{t, c\}$ on the equilibrium path – which, in turn, determines the conformists efforts. When choosing a trust contract the principal's expected profits are

$$\begin{aligned} E[eB - w|C = t] &= E[e|C = t]B - w \\ &= (\eta N + (1-\eta)N_t)\frac{B^2}{c} - w \end{aligned} \tag{1}$$

and under the contingent contract

$$\begin{aligned} E[e(B-b) - k|C = c] &= E[e|C = c)](B-b) - k \\ &= \frac{b + (\eta N + (1-\eta)N_c)(B-b)}{c}(B-b) - k. \end{aligned} \tag{2}$$

Note that the principal's profits are always increasing in N_t and N_c, i.e., the principal benefits when the agent believes that the norm *N* is high. Given the agent's beliefs and optimal response, the principal prefers to choose a trust contract iff (1) is larger than (2), which after some rearrangement is equivalent to

$$N > \frac{b(B-b) + (1-\eta)(N_c(B-b)^2 - N_t B^2) + (w-k)c}{\eta b(2B-b)}. \tag{3}$$

Using this, we can show the following result:

Proposition 1. *(i) If* $B\frac{b}{c} > w - k$ *and there are sufficiently many steadfast agents (i.e.,* η *is sufficiently large), there is a unique separating equilibrium characterized by a cut-off value* $\bar{N}$ *such that the principal*

proposes the trust contract if and only if $N > \bar{N}$. *The agents' expectation about the norm and thus the conformists' degree of prosociality is larger after the choice of a trust contract*

$$N_t = E[N|N \geq \bar{N}] > N_0 > N_c = E[N|N < \bar{N}].$$

(ii) The cut-off value $\bar{N}$ *is strictly decreasing in* k.

Proof: To establish claim (i), we have to show that the fixed point equation

$$F(\bar{N},k) = \bar{N} - \frac{b(B-b) + (1-\eta)(E[N|N \geq \bar{N}](\bar{N})(B-b)^2 - E[N|N \geq \bar{N}](\bar{N})B^2) + (w-k)c}{\eta b(2B-b)} = 0$$

has a unique solution. We will show that under the stated conditions, $F(1,k) > 0$, $F(0,k) < 0$ and $\frac{\partial F(\bar{N},k)}{\partial \bar{N}} > 0$. By continuity of $F(\bar{N},k)$ the result then follows.

First note that $F(1,k) > 0$ iff

$$1 - \frac{b(B-b) + (1-\eta)(N_0(B-b)^2 - B^2) + (w-k)c}{\eta b(2B-b)} > 0$$

which is equivalent to

$$\frac{1}{1-N_0}\left(1 + \frac{Bb-(w-k)c}{(B-b)^2} - N_0\right) > \eta. \qquad (4)$$

As $\frac{Bb-(w-k)c}{(B-b)^2} > 0$ iff $B\frac{b}{c} > w-k$, condition (4) always holds (even for $\eta \to 1$) if $B\frac{b}{c} > w-k$.

Note that $F(0,k) < 0$ is equivalent to

$$b(B-b) + (w-k)c > (1-\eta)N_0B^2$$

which holds if η is sufficiently large. To show that $\frac{\partial F(\bar{N},k)}{\partial \bar{N}} > 0$ if η is large enough we use that

$$\frac{\partial E[N|N \geq \bar{N}]}{\partial \bar{N}} = \frac{f(\bar{N})}{1-F(\bar{N})}(E[N|N \geq \bar{N}] - \bar{N}) \text{ and}$$
$$\frac{\partial E[N|N < \bar{N}]}{\partial \bar{N}} = \frac{f[\bar{N}]}{F[\bar{N}]}(\bar{N} - E[N|N < \bar{N}])$$

to obtain

$$\frac{\partial F(\bar{N},k)}{\partial \bar{N}} = 1 - \frac{(1-\eta)\left(\frac{f[\bar{N}]}{F[\bar{N}]}(\bar{N} - E[N|N < \bar{N}])(B-b)^2 - \frac{f(\bar{N})}{1-F(\bar{N})}(E[N|N \geq \bar{N}] - \bar{N})B^2\right)}{\eta b(2B-b)}$$

which will be strictly positive whenever

$$\frac{\eta b(2B-b)}{(1-\eta)B^2} > \frac{f[\bar{N}]}{F[\bar{N}]}(\bar{N} - E[N|N < \bar{N}])\frac{(B-b)^2}{B^2} - \frac{f(\bar{N})}{1-F(\bar{N})}(E[N|N \geq \bar{N}] - \bar{N})$$

which will always hold when

$$\frac{\eta b(2B-b)}{(1-\eta)B^2} > -\left[\frac{f(\bar{N})}{1-F(\bar{N})}(E[N|N \geq \bar{N}] - \bar{N}) - \frac{f[\bar{N}]}{F[\bar{N}]}(\bar{N} - E[N|N < \bar{N}])\right]$$

The right hand side is bounded on $[0,1]$ (see Benabou/Tirole 2012, Appendix, Properties of the Δ function). As $\lim_{\eta \to 1} \frac{\eta b(2B-b)}{(1-\eta)B^2} = \infty$ there is a unique separating equilibrium when η is sufficiently large.

We establish claim (ii) by implicit differentiation

$$\frac{\partial \bar{N}}{\partial k} = -\frac{\frac{\partial F(\bar{N},k)}{\partial k}}{\frac{\partial F(\bar{N},k)}{\partial \bar{N}}}$$

We know already that $\frac{\partial F(\bar{N},k)}{\partial \bar{N}} > 0$ (if η is large enough) and

$$\frac{\partial F(\bar{N},k)}{\partial k} = \frac{c}{\eta b(2B-b)} > 0,$$

which completes the proof. ■

We can also compare this to a situation without norms signaling (i.e., when the principal is uninformed), where the conformists stick to their prior beliefs about the norm $N_0 = E[N]$. Proposition 1 then directly implies the following:

Corollary 1. *In any separating equilibrium in a game where norms signaling is feasible, efforts are higher under a trust contract and lower under a contingent contract as compared to a setting where the contract choice reveals no information about the norm.*

Recall that the principal is always better off with a contingent contract when all agents are selfish. In a next step, we explore under which conditions pooling equilibria exist, in which the principal will always choose the contingent contract even when conformity matters and agents are uncertain about the norm. Of course, the existence of pooling equilibria hinges on assumptions about out-of-equilibrium beliefs. We take a conservative approach and impose no restriction on these beliefs and characterize the largest set of potential pooling equilibria.

Proposition 2. *A pooling equilibrium can exist, in which the principal always chooses the contingent contract if*

$$\eta \leq \frac{b(B-b) + c(w-k) + N_0(B-b)^2}{b(2B-b) + N_0(B-b)^2}. \qquad (5)$$

If $w - k < B\frac{b}{c}$ no pooling equilibrium exists if η is sufficiently large.

Proof: When the principal chooses the trust contract her profits are

$$\eta N \frac{B^2}{c} - w.$$

A necessary condition for the existence of this equilibrium is that it must be beneficial to choose the contingent contract, even if agents believe that $N = 0$ after a deviation to the trust contract. In that case profits under the contingent contract are

$$\frac{b + (\eta N + (1-\eta)N_0)(B-b)}{c}(B-b) - k.$$

The principal thus prefers the contingent contract iff

$$\frac{b + (\eta N + (1-\eta)N_0)(B-b)}{c}(B-b) - k \geq \eta N \frac{B^2}{c} - w \Leftrightarrow$$

$$b(B-b) + c(w-k) + (1-\eta)N_0(B-b)^2 \geq \eta N(B^2 - (B-b)^2).$$

A pooling equilibrium exists if this is the case even for $N = 1$ or

$$b(B-b) + c(w-k) + (1-\eta)N_0(B-b)^2 \geq \eta(B^2 - (B-b)^2)$$

$$\Leftrightarrow \frac{b(B-b) + c(w-k) + N_0(B-b)^2}{b(2B-b) + N_0(B-b)^2} > \eta.$$

Note that the cut-off is strictly positive. It is straightforward to check that it is strictly smaller than 1 iff

$$w - k < B\frac{b}{c}.$$

■

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