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Cooperation, Bribery, and the Rule of Law

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Abstract

Corruption is a severe impediment to economic development and societal cooperation. Fighting corruption is challenging, not least as it is intertwined with the rule of law. Thus, causal evidence on institutional conditions that amplify or protect from its negative externalities is hard to identify. In a laboratory experiment, we investigate how the effect of corruption on cooperation interacts with the rule of law, i.e., whether punishment rules protect cooperators. In a repeated public goods game, citizens can contribute, and an official can punish. We vary whether bribery is possible and whether high contributors are protected from punishment (strong rule of law) or not (weak rule of law). Bribery deteriorates cooperation only under a weak rule of law, but not when punishment rules protect high contributors from harassment bribery – even if citizen-driven (collusive) bribery persists. Strong institutions limiting officials´ power are crucial to protect from the societal costs of corruption.

Keywords: bribery, cooperation, corruption, institutions, punishment, rule of law, development economics.

JEL codes: D6, D9, H1, H4, K4, O2.

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1 Introduction

Countries with high levels of corruption perform poorly on economic measures. Corruption discourages investment, increases government spending, and directs government spending excessively towards less efficient but more manipulable public projects at the cost of underfunding public services like education, health, and infrastructure (e.g., Cingano & Pinotti, 2013; Finan & Mazzocco, 2021; Lehne, Shapiro, & Vanden Eynde, 2018; Wei, 2001).

Corruption reduces social well-being not only directly, but also indirectly because it undermines social capital (Banerjee, 2016) as well as incentives for civic behavior and may generate descriptive norms that promote behavior both selfish and negligent of the negative externalities it may produce (Abbink et al., 2018; Galeotti, Maggian, & Villeval, 2021). This is a pressing issue in all contemporary societies, as we are all facing a broad array of collective problems and our societal welfare crucially depends on citizens' cooperation. For example, citizens' cooperation is required to protect the environment, finance public services, provide community services, manage commons such as water resources and fisheries (e.g., Ostrom, Walker, & Gardner, 1992; Van Vugt et al., 2012), for voting behavior (Chong et al., 2015), to combat a pandemic (Korn et al., 2020; Schmelz, 2021), or to address the current energy crisis. Unequivocally, corruption is a pressing problem in developing countries, though no country or community is immune to the possibility that corruption may undermine higher-level cooperation (e.g., see Asiedu et al., 2021, for a discussion on ethics in social sciences).

The cultural aspects of corruption aside (Banuri & Eckel, 2012; Barr & Serra, 2010; Cameron et al., 2009), the renown negative externalities of corruption (e.g., Fisman & Svensson, 2007; Mauro, 1995; Rose-Ackerman, 2006; Treisman, 2000) are hard to disentangle from those associated with variations in the rule of law, as cross-country studies suggest (Langbein & Knack, 2010; Muhammad & Long, 2021). Corruption may have negative effects on institutions as, according to the World Bank, it "undermines development by distorting the rule of law and weakening the institutional foundation on which economic growth depends" (Munhoz, 2007, p. 692). However, the interaction effect may also be positive as advances in institutional quality are likely to have spill-over effects on decreasing corruption (Billger & Goel, 2009; Elbahnasawy & Revier, 2012). For instance, corruption has been shown to decrease with the age of a democracy (Blake & Martin, 2006; Treisman, 2000), which is consistent with the idea that older democracies have more "mature" systems of checks, balances, and transparency (Rock, 2009).

Improving our understanding of these interactions contributes to the development of approaches that effectively limit the externalities of corruption. However, the strength of the evidence discussed above is limited for two methodological reasons. First, these data largely rely on subjective measures of corruption and the rule of law. Second, directional effects are typically inferred from cross-country correlational data. Thus, the existing evidence is suggestive but does not allow for disentangling the relationship between the rule of law and corruption, as well as their effects on society.

Performing a non-causal cross-cultural analysis suggests that the prevalence of corruption and the rule of law are associated with societal norms of cooperation: The Worldwide Governance Indicators *Control of Corruption* and the *Rule of Law* (The World Bank, 2022) are positively associated with *Norms of Civic Cooperation* as measured by the World Values Survey (WVS, Haerpfer et al. (2022);

based on 52 countries, r=0.406, p=0.003 and r=0.392, p=0.004, respectively).[4] This correlational evidence suggests that cross-country variations in the pervasiveness of corruption and the quality of the rule of law may affect variations in people´s cooperative norms (see the supplementary text in Appendix B1 for details). Moreover, the two indicators *Control of Corruption* and the *Rule of Law* are highly correlated themselves (r=0.965, p<0.001). In particular, this strong correlation between the absence of corruption and the rule of law in the field calls for an experimental setup to disentangle the respective impact of the two institutional deficiencies on citizens' cooperation.[5]

This paper studies the causal effects of corruption and the rule of law on citizens' cooperation. We rely on an economic laboratory experiment in which corruption and its consequences are observed directly, and potential causes are systematically varied. We study how the effect of corruption on civic cooperation is moderated by the rule of law, where whether punishment rules protect or do not protect cooperators is our variation of the rule of law.[6] We focus on the "just laws" principle of the rule of law because variation in sanctioning rules generate conditions for the emergence of two different forms of bribery: collusive bribery and harassment bribery. Collusive bribery (Abbink, 2006) refers to a citizen-driven exchange in which guilty citizens (low contributors in our setting) bribe to avoid just punishment that would normally be imposed in a context in which bribery is not an option. In contrast, harassment bribery (Abbink et al., 2014; Basu, 2011; Ryvkin & Serra, 2020) refers to an official-driven exchange in which an innocent citizen (here, a high contributor) is forced to bribe to avoid unjust punishment that would not be employed in a context without the possibility of bribery.[7] These two bribery mechanisms have been studied experimentally (e.g., Abbink et al., 2014; Abbink, Irlenbusch, & Renner, 2002; Mawani & Trivedi, 2021), but their consequences on societies' welfare are poorly understood. Our findings provide insights on how the rule of law can limit these negative effects of corruption.[8]

Research on cooperation in public goods in the field (Janssen et al., 2010) as well as in economic experiments (Fehr & Gächter, 2000; Henrich et al.) has consistently shown that cooperation is highly unstable or even declining over time. The reason is that contributions succumb to the influence of

[4] In the WVS, respondents state the extent to which they believe non-cooperation in social dilemma situations can be justified (Likert scale ranging from 1: "Never justifiable" to 10: "Always justifiable"). Following Herrmann, Thöni, and Gächter (2008), we average respondents´ scores concerning the following three items making up the *Norms of Civic Cooperation* index: "Claiming government benefits to which you are not entitled", "Avoiding a fare on public transport", and "Cheating on taxes if you have a chance", and we inverted the scores so that higher values reflect higher norms of civic cooperation.

[5] Using alternative measures of institutional quality yields very similar correlations: Both the *Corruption Perception Index* (CPI, 2022; higher values indicate more transparency and less corruption) and the *Rule of Law Index* (RoLI) of the World Justice Project (WJP, 2022) are positively associated with *Norms of Civic Cooperation* (based on 54 countries, r=0.41, p=0.002 and r=0.32, p=0.02, respectively); and the CPI and RoLI are also highly correlated (r=0.953, p<0.001).

[6] The Encyclopedia Britannica emphasizes in its definition of the rule of law that it "generally prevents the arbitrary use of power" (Choi, 2022). Similarly, the *Rule of Law Index* by the *World Justice Project* (WJP, 2022) identifies "just laws" as one of the core principles of the rule of law. In our experimental setup, we implement this core aspect of the rule of law by punishment rules that protect or do not protect cooperators.

[7] Of course, some officials are always interested in extracting bribes and may also engage in coercing bribes from citizens who are guilty, refraining from their deserved punishment. This is not harassment bribery, which bears the distinctive feature of the institution not protecting innocent citizens who show civic behavior.

[8] Laboratory experiments on corruption and cheating have been shown to generalize to the field (Armantier & Boly, 2013; Cohn & Marechal, 2018).

free-riders (non-cooperators) and the selfish tendency of imperfect conditional cooperators (Fischbacher & Gächter, 2010; Fischbacher, Gächter, & Fehr, 2001), leading to the renowned "Tragedy of the Commons" (Hardin, 1968). Sanctioning mechanisms have been shown to be effective deterrents of selfish behavior in social dilemmas. Commitment to self-sanctioning (Gerber & Wichardt, 2009) as well as peer punishment, i.e., the possibility of group members to impose sanctions, serve to stabilize and increase cooperation (Fehr & Gächter, 2000; Gächter, Renner, & Sefton, 2008 2008; Henrich et al.; Janssen et al., 2010).

An even more efficient way to stimulate cooperative behavior is centralized punishment (Baldassarri & Grossman, 2011; O'Gorman, Henrich, & Van Vugt, 2009). Compared to peer punishment, punishment by a central authority has the advantage of reducing or eliminating inefficiencies such as redundant or uncoordinated punishment (O´Gorman et al., 2009), retaliation (anti-social punishment from lower-contributors who had been punished; Herrmann, Thöni, and Gächter (2008)), and second-order free riding (contributors who are not willing to incur the costs of punishing low contributors; Dreber et al. (2008)). When given the choice, experimental participants prefer centralized over peer punishment to enforce cooperative norms (Traulsen, Röhl, & Milinski, 2012), a decision that modern democracies have made as well.

Nonetheless, reality suggests that centralized monitoring and sanctioning is vulnerable to corruption, which has been captured theoretically by Mookherjee and Png (1995), Bardhan and Mookherjee (2005), Abdallah et al. (2014) or Liu and Chen (2022). The experimental literature shows that, though the mere presence of a police officer reduces crime even if she is corrupt (Abbink, Ryvkin, & Serra, 2020), not only her rent-extraction, but also the possibility of bribing the official or undermines contributions to a public good (Buffat & Senn, 2018; Cagala et al., 2019; Muthukrishna et al., 2017). This negative externality of corruption may happen as the authority, after being bribed, does not apply sanctions to low-contributors, thus removing the incentives to sustain group cooperation. As introduced above, this is collusive bribery where "bad" citizens bribe the authority to avoid justified punishment. A typical real-world example is the driver who bribes the policeman after a traffic infraction to avoid a fine.

Bribery can also involve "good", cooperating citizens who are forced into harassment bribery by an authority threatening them with unjustified punishment. An example of harassment bribery may involve a policeman who wrongly claims speeding or illegal parking and demands a private payment from the driver to avoid a fine. This second mechanism can only work under a weak rule of law, namely if the authority´s power is not sufficiently bounded and, thus, is able to trample on citizens´ rights. In fact, the experimental literature closely related to this article investigates corruption in settings of a weak rule of law (Buffat & Senn, 2018; Muthukrishna et al., 2017), which allows for both bribery mechanisms. Our study complements this research as we explicitly vary whether the institutional environment protects cooperative citizens from punishment (precluding harassment bribery) or not.

2 Methods

The purpose of this study is to disentangle the effects of corruption and the rule of law on cooperation. To do so, we developed a new experimental design that we present in the following section. Then we derive our hypotheses and detail the practical procedures.

2.1 The experimental design

In a laboratory experiment, we show how bribery and the quality of the institutional environment affect cooperation in a public goods setting with centralized sanctioning. We implemented a 2x2 factorial design. The first dimension captures the possibility of bribery (*Bribery1* vs. *Bribery0* treatments; hereafter, *B1* and *B0*). In the *B1* treatments, citizens could bribe the official, which was not possible in the *B0* treatments. The second dimension refers to the strength of the rule of law in terms of whether harassment punishment was possible, i.e., whether high contributors were protected from excessive punishment. In the *HPun1* treatments, harassment punishment was possible, which means that punishment was unrestricted.[9] In *HPun0*, harassment punishment was not possible, i.e., punishment was restricted to the points withheld from the public good. Accordingly, in our experimental design, the rule of law was captured by just punishment rules. Note that our notation implies that the treatments *B1* and *HPun1* point to a societally problematic environment. Thus, we expect the treatments holding the 1 having a negative effect on cooperation.

How does our stylized experimental design map to real-world situations? Think about the public goods setting, for example, in terms of paying taxes where citizens have the choice to make their tax declaration honestly and contribute to the common pool, or to withhold taxes on their private account. The *Bribery* treatment dimension reflects whether offering a payment to the clerk in charge of your tax return for not checking too thoroughly is possible. Our *B0* treatments represent institutional procedures that do not permit bribery, for instance, because the procedure does not allow for any private communication between the citizen and the official. The *B1* treatments reflect the possibility to pay an official in order to avoid sanctions imposed by the official.

Turning to the rule of law dimension, the *HPun0* treatments capture environments where the fine applies to the taxes withheld, while honest citizens who pay their taxes reliably can be sure to be protected from punishment. In this environment, only collusive bribery is possible, which means bribery by citizens who do not follow the rule. In contrast, the *HPun1* treatments reflect institutions where authorities can even threaten honest tax payers with an arbitrary fine to receive a private payment (harassment bribery). Thus, our experiment captures both channels of bribery observed in reality as discussed above. As suggested by the correlations between corruption and the rule of law across countries mentioned above as well as previous literature (Aidt, 2003), the combination of bribery and rule of law in our treatments *B1_HPun1* and *B0_HPun0* occur more naturally in reality than the combinations *B1_HPun0* and *B0_HPun1,* underlining the value of the experimental approach for acquiring insights in the institutional features critical for cooperation.

The core of our experimental setup is a public goods game with centralized punishment. Participants interacted in groups of four, consisting of three citizens and an official. In each group, three members were randomly assigned the role of citizens (named as participants A) and one member was randomly assigned the role of the official (named as participant B). Roles were kept constant across rounds. Citizens' labels and order on the screen were reshuffled between each round to preclude officials' responses to individual citizens' behavior in earlier rounds. Participants interacted repeatedly in 20 rounds, employing a partner design (i.e., group membership was constant across all rounds). Each round comprised a Contribution Stage, followed by a Bribing Stage and a Punishment Stage, as shown in Table 1.

[9] Punishment was unrestricted with respect to citizens' income, while imposing losses was not possible.

Contribution stage **(Stage 1)**	• Endowment (citizens and official) = 20 points. ◊ Citizens contribute between 0 and 20 points. • MPCR (marginal per capita return): 0.39 for citizens and 0.13 for the official. • Contributions are public information.
Bribing stage **(Stage 2)**	• Endowment (citizens and official) = 5 points. ***B1* treatments** ◊ Citizens decide whether to offer the 5 points to the official. ◊ The official decides whether to accept the bribe offers. • Offers are private information. ***B0* treatments** • Citizens cannot not make any offer to the official.
Punishment stage **(Stage 3)**	◊ The official decides about punishment. ***B1* treatments** • Citizens whose offer got accepted cannot be punished. • Punishment and acceptance of offers are private information. ***B0* treatments** • Punishment is private information. ***HPun0* treatments** • Maximum punishment = non-contributed points in Stage 1. ***HPun1* treatments** • Maximum punishment > non-contributed points in Stage 1.

Table 1. Sequence and details of the stages in a round depending on the experimental treatment. MPCR: marginal per capita return from contributions to the common pool. The symbol "◊" indicates decisions. Punishment is never allowed to induce net losses.

In the Contribution Stage, each of the four participants received an endowment of 20 points.[10] Citizens decided how much to contribute to the common pool and how much to keep on their private accounts. The official did not have the option to contribute and kept his full endowment. Participants received a marginal per capita return (MPCR) 0.39 from the public good, and the official received 0.13 for each

[10] The official also received this endowment to rule out inequity-driven motivations for citizens' transfers (Fehr & Schmidt, 1999).

point contributed.[11] This represents a social dilemma as it is in the citizens´ selfish interest not to contribute to the common pool, while they could earn more if everyone contributed than if everyone defected.

In the Bribing Stage, all four participants received another 5 points on their private accounts. In *B0* treatments, participants directly moved to the Punishment Stage after receiving this second endowment. In the *B1* treatments, citizens could offer the official to transfer those points to her, i.e., to bribe the official. When a bribe offer was made, the official decided whether to accept or to reject.

Finally, in the Punishment Stage, the official decided how many points to deduct from each of the three citizens. The official beard costs of two points per participant punished, regardless of the amount deducted.[12] If the official accepted a bribe, the corresponding citizen could not be punished in that round. In the *HPun0* treatments, maximum punishment was restricted to the number of points not contributed in the Contribution Stage, which implies that full contributors could not be punished. In the *HPun1* treatments, maximum punishment was only limited by the number of points earned in the Contribution Stage (i.e., non-contributed points plus points received from the common pool), such that even full contributions could not preclude punishment.

At the end of the Contribution Stage, contributions were disclosed (all group members were informed about each member´s contribution). To capture the secrecy of corruption, bribe offers as well as punishment remained private information. The game was presented in a neutral frame. In particular, we never mentioned the terms “bribing” (phrased as “offering points to participant B”) or “punishment” (phrased as “deducting points”). For an English translation of the instructions, see Appendix A.

2.2 Hypotheses

Before turning to the effects of bribery and the rule of law on cooperation, we first outline the general behavior expected in our setting, starting with the simplest setup. In a basic public goods game, players with selfish preferences do not contribute to the common pool, while players with sufficiently strong social preferences contribute at least part of their endowment (e.g., Ledyard, 1995). Empirically, we observe declining contributions over time, which can be explained by free-riders and imperfect conditional cooperation (Fischbacher & Gächter, 2010). Introducing a punishment mechanism has been shown to increase contributions as detailed above, as long as the official makes use of this option (Fehr & Gaechter, 2002). Selfish officials might not apply costly punishment and consequentially, their groups fail to maintain cooperation. Officials with social preferences are willing to bear costs to discipline free riders, which effectively stabilizes contributions in their groups.

The possibility of bribing may undermine the effectiveness of the punishment mechanism as bribing the official becomes an alternative to contributions in order to avoid punishment (Buffat & Senn, 2018;

[11] The MPCRs are constructed as follows: Points contributed to the public good are multiplied by 1.3. Every citizen received a share of 30% from each point in the common pool (1.3*0.3=0.39) and the official received 10% (1.3*0.1=0.13). We chose the citizens’ MPCR to induce medium contributions, leaving room upwards and downwards for treatment effects. The MPCR for the official was lower not only because she could not contribute, but also to balance the relative importance of bribery and her benefit from contributions.

[12] We implemented flat punishment costs to give room for excessive punishment, which is crucial in our design. This design element makes officials very powerful and enables them to cheaply exploit their power under a weak rule of law, strengthening the external validity of our setting.

Muthukrishna et al., 2017). In particular, in the *B1_HPun1* treatment, bribing is an attractive alternative to contributing because the official can enforce a bribe even from full contributors.

We now present our specific hypotheses with respect to (1) bribery, (2) punishment and (3) cooperation in the four experimental treatments. Cooperation is our main outcome of interest (Hypothesis 3), while behavior with respect to bribery (Hypothesis 1) and punishment (Hypothesis 2) are important to understand the mechanisms driving potential treatment differences in cooperation.

H1: In the B1 treatments, there is more bribery under a weak rule of law (HPun1) than under a strong rule of law (HPun0). This is because (a) High (i.e., equal-or-above-average) contributors bribe more if they are unprotected from punishment than if they are protected; while (b) Low contributors do not make this distinction.

Our first hypothesis concerns citizens' bribing decisions. While low contributors could be similarly inclined to bribe in both treatments to avoid punishment, high contributors are safe from punishment in the *HPun0* but not in the *HPun1* treatment. This makes us predict that bribery is more frequent in the latter case as a strategy to avoid excessive punishment with respect to contributions. Put differently, we expect collusive bribery independent of the rule of law and harassment bribery only under a weak rule of law.

H2: (a) In all treatments, lower contributors are punished more than higher contributors. (b) In both B1 treatments, lower contributors who are not bribing are punished more than lower contributors bribing. (c) In the B1_HPun1 treatment, higher contributors are punished more when they do not bribe, compared to when they bribe and when they are in any other treatment.

Our second hypothesis refers to punishment. Punishment has the function to discipline low contributors, which corresponds to our Hypothesis 2a. In addition, when corruption is possible, punishment can also be used to enforce bribes.

For lower contributors, bribes can be cheaper than being punishment in both the *B1_HPun0* and the *B1_HPun1* treatments, which motivates Hypothesis 2b. In the case of higher contributors, harassment can only occur in the *HPun1* treatments, because high contributions preclude strong punishment in the *HPun0* treatments. Thus, according to our Hypothesis 2c, we expect non-bribing cooperators to be punished more strongly in the *B1_HPun1* treatment, in which excessive punishment can be employed to extract bribes as high contributions do not protect against punishment.

H3: (a) Contributions are lower in the B1 treatments than in the B0 treatments. (b) Within the B1 treatments, contributions are lower in the HPun1 treatment than in the HPun0 treatment. Taking (a) and (b) together implies (c) that contributions are lowest in the B1_HPun1 treatment.

Since the *B1* treatments offer an alternative to contributing in order to avoid punishment, we expect lower contributions than in the *B0* treatments (Hypothesis 3a). In the *B1_HPun1* treatment, we expect the worst outcome in terms of contributions for two reasons. First, as already explained, we expect the bribery mechanism to reduce contributions compared to the *B0_HPun1* treatment. Second, compared to the *B1_HPun0* treatment, high contributors may be discouraged from contributing

because even a full contribution does not preclude punishment and they can be harassed into bribery (implying Hypothesis 3b).[13]

2.3 Participants and practical procedures

We recruited 244 students (mean age = 21.6 years, sd = 3.8; 61% women) from a wide range of disciplines (capturing economics and business administration; other behavioral and social sciences; humanities; engineering; life and natural sciences) at the Universidad Nacional del Sur, Bahía Blanca, Argentina. The laboratory where the experiment was conducted is located at the Instituto de Investigaciones Económicas y Sociales del Sur (IIESS), UNS-CONICET Bahía Blanca and counts 20 visually isolated computers. The experiments were conducted using the software z-Tree (Fischbacher, 2007). We ran 16 sessions between November 2016 and December 2017, and each person participated only once. All sessions were conducted by the first author. Our protocols have been reviewed and approved by the Bioethical Committee of the Hospital Municipal "Dr. Leónidas Lucero", Bahía Blanca, Argentina, which is an independent institution in charge of ethical assessment of research protocols.

The procedure of each session was as follows. To ensure common knowledge of the game, we first read a summary of the instructions aloud. Then, participants read the detailed written instructions on their desks, before answering a series of control questions on their computers. Once we ensured that all participants had understood the instructions and had answered all control questions correctly, participants played the 20 rounds of the game. At the end of the session, participants answered post-decision and socio-demographic questionnaires. Finally, they received their monetary payoffs in cash. Sessions took nearly two hours, and participants' average earnings were (mean ±1 std. dev.) AR$81 ±17 (i.e., slightly above the minimum wage of employees in Argentina at the time of the experiment and corresponds to nearly 5 $US).

3 Results

We first show our main result on contributions and then explain the mechanism driving this result (i.e., punishment and bribes). Thus, we will present our results in the reversed order to the hypotheses. We will discuss how the rule of law in terms of whether or not cooperators are protected affects contributions, and how bribery mediates the effect of those institutional features on contributions.

3.1 Contributions

Figure 1 shows average contributions over time for all treatments. As predicted, contributions are lowest when both bribery and harassment punishment are possible, i.e., in the *B1_HPun1* treatment.

[13] We refrain from making explicit predictions comparing cooperation in the two *B0* treatments as we lack a theoretical basis (and the comparison is not in the core of our interest). In the absence of bribery, the *HPun0* and the *HPun1* treatments involve two potential mechanisms, and their relative size is hard to assess ex-ante. First, the feature of the *HPun0* treatment that full contributions preclude punishment provides an incentive to contribute. Second, higher maximum punishment is possible in the *HPun1* than in the *HPun0* treatment, which may incentivize higher contributions in order to avoid higher punishment.

The other three treatments yield similar levels of contributions, in particular in the second half of the experiment.

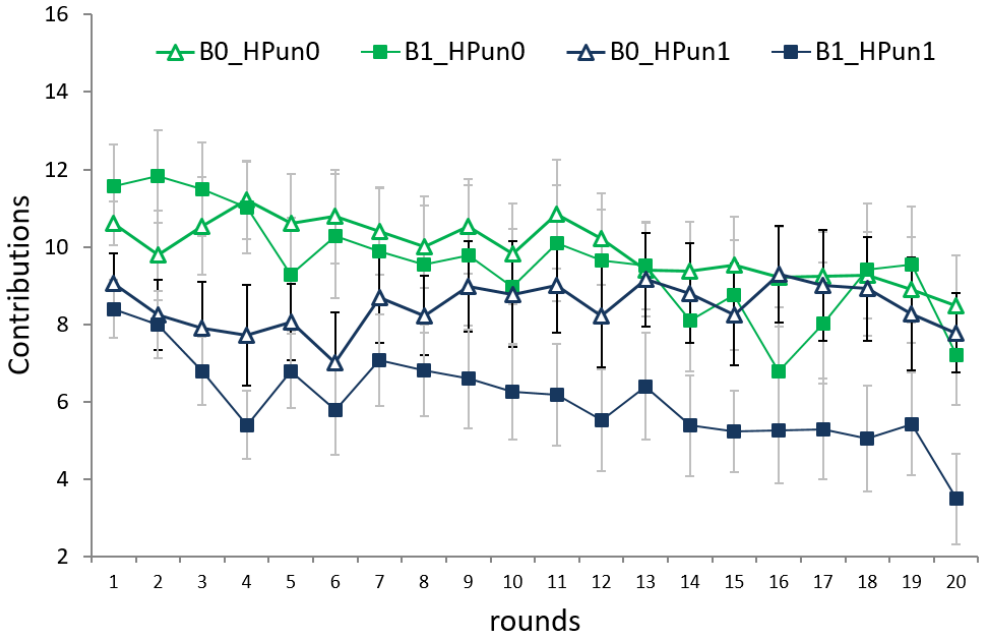

Figure 1. Contributions (averaged on the group level) over time in the four treatments. Error bars denote standard errors based on OLS and clustered on the group level.

3.1.1 Testing Hypothesis 3: contributions (main result)

The observation that contributions in the *B1_HPun1* treatment are lower than in other treatments is confirmed by OLS regressions with contribution as the dependent variable and dummy variables for each treatment as predictors as shown in Figure 2. Only in the in the *B1_HPun1* treatment, contributions are significantly different from the treatment *Bribery0_HPun0* which serves as our baseline. The effect size is substantial as contributions are lowered by nearly four points (*b=-3.883, p<0.01;* a difference of almost 40%).[14] Analyzing the time trends reveals that there is a significant decline of contributions in the *B1* treatments (*B1_HPun0*: -0.185 points per round, *p=0.012*; *B1_HPun0*: -0.153 points per round, *p=0.012*, see Table B1 and associated *F-tests* in the Appendix) but not in the *B0* treatments (*B0_HPun1*, *p=0.599*; *B0_HPun0, p=0.257*). Our treatment effects are robust to this time trend as we observe the same qualitative result when restricting the data to the first or second half of the experiment, and when controlling for gender as well as the field of studies (Figures B1 and B2 of the Appendix). Non-parametric tests on the differences between our treatments also confirm that contributions are lower in the *B1_HPun1* treatment than in all other treatments and not significantly different between the other three treatments (Tables B2-B4 in the Appendix).

[14] Note that all regressions reported in this article specify standard errors clustered on the group level.

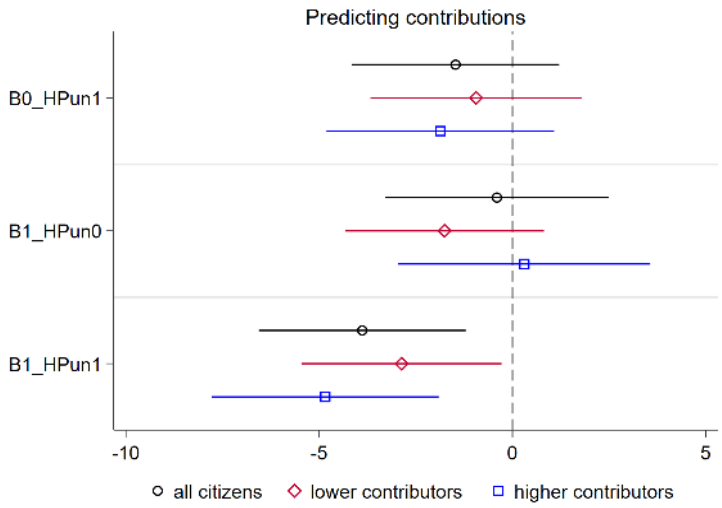

Figure 2. Predicting contributions as a function of our four treatments. Shown are the coefficients and 95% CI, estimated in OLS regressions with clustered standard errors at the group level. The baseline reflects the *B0_HPun0* treatment. The model including all citizens relies on 3,660 observations, the model restricted to lower contributors (below the average contribution in the respective period and group) includes 1,716 observations, and the model restricted to higher contributors includes n=1,944 observations. These results are robust to including socio-demographics as shown in Figure B1 in the Appendix.

Concerning contributions, the data only partly confirm Hypothesis 3a: while the possibility to bribe reduces contributions under a weak rule of law (i.e., in the *B1_HPun1* treatment), it does not harm average contributions when high contributors are protected from punishment (i.e., in the *B1_HPun0* treatment). Moreover, our results confirm Hypothesis 3b: if corruption is possible, a weak rule of law in terms of punishment rules not protecting cooperators has a harmful effect on contributions. Consequentially, as predicted in Hypothesis 3c, contributions are lowest in treatment *B1_HPun1* where both institutional grievances, bribery and harassment punishment, coincide. These findings are the central contribution of our paper.

3.1.2 Complementary analyzes on contributions

These main findings also apply when distinguishing between lower contributors who contribute less than the group average to the common pool, and higher contributors contributing the average or more.[15] In the absence of the possibility to bribe, contributions of both types are unaffected by the rule of law (first panel of Figure 2, capturing the regressor *B0_HPun1*). Similarly, when harassment punishment is not possible, the possibility to bribe neither affects the contributions of lower nor higher contributors in a meaningful way (see the second panel of Fig. 2, capturing the regressor *B1_HPun0*). However, when both institutional grievances are simultaneously present, both lower and higher

[15] High and low contributors are determined in each period separately. This implies that across periods and across groups the share of the two groups is rather constant.

contributors get discouraged from contributing (as shown in the bottom panel of Fig. 2, capturing the regressor *B1_HPun1*).

Our data also reveal a notable pattern of how malfunctioning institutional features demotivate higher, but not lower contributors. OLS regressions with clustered standard errors at the group level represented in Figure 2 reveal that not being protected from the law discourages higher contributors from contributing if bribery is possible (*B1_HPun1* as regressor with *B1_HPun0* as baseline*, -5.150, p=0.006)*, and the possibility to bribe also tends to discourage them when unprotected (*B1_HPun1* as regressor with *B0_HPun1* as baseline, *-2.977, p=0.069).* Those two findings do not apply to lower contributors (*p-values* > 0.16) and are in line with the interpretation that harassment bribery is driving this result, as we will discuss in Subsection 3.2.3 below.

The observation that bribery does not harm contributions when punishment rules protect cooperators is surprising to us (i.e., the lack of a difference in contributions between the *B1_HPun0* and the *B0_HPun0* treatments). We had expected bribery to be an effective strategy to get away with defecting to the common pool without punishment, also when punishment protects cooperators. Thus, we predicted contributions to suffer if bribery is possible (Hypothesis 3a).[16]

Why does the possibility to bribe not harm contributions when high contributors are protected from excessive punishment? We observe that those who bribe contribute significantly less than citizens in the *B0_HPun0* treatment, while those who do not bribe contribute significantly more than citizens in the *B0_HPun0* treatment (see Table 1). Even though this difference can also result from selection, it suggests that these two countervailing effects appear to compensate each other and explain the absence of an overall impairing effect of bribery on average contributions under a strong rule of law. We will explore this mechanism in more detail when turning to the punishment patterns next.

DV: Contribution	
B1_HPun0, those who bribed	-4.018***
	(1.279)
*B1_HPun*0, those who did not bribe	3.466**
	(1.615)
Constant	9.934***
	(0.895)
Observations	1,800
R-squared	0.154

Table 1. OLS regression with clustered standard errors at the group level in parenthesis. The dependent variable is contribution, and the baseline reflects the *B0_HPun0* treatment. *** p<0.01, ** p<0.05, * p<0.1

[16] Before introducing the harassment punishment dimension to our design, we conducted pilot sessions only in *HPun0* settings where the main treatment variation was whether or not bribery was possible, implemented with specifications slightly different from the design employed here. In these pilots where harassment punishment was not possible, we never found a detrimental effect of bribery on cooperation, which is in line with the findings of this paper.

3.2 Punishment

To test our punishment hypotheses, we distinguish between cooperators and defectors across treatments. Accordingly, we provide a detailed analysis of punishment, including a section dedicated to harassment punishment.

3.2.1 Testing Hypothesis 2: punishment

In order to investigate punishment, we distinguish between higher and lower contributors, i.e., between citizens who contributed at least as much as the group average and those who contributed less. In the *B1* treatments, we also distinguish whether or not a bribe was offered. Figure 3 presents these data. It is based on OLS regressions as shown in Table 2, which regress punishment on the variables that are used in the figure, including the interaction of relative contribution and bribery attempt for the *B1* treatments.

The first finding evident from the regressions in Table 2 and Figure 3 (comparing the left- and the right-hand sides) is that lower contributors are punished more than higher contributors in all treatments, regardless of whether or not bribery attempts are controlled for. Thus, punishment is directed more towards lower contributors, confirming Hypothesis 2a. This is a common finding in the experimental economics literature on public goods games with punishment, implying that punishment is typically used to turn free-riders into cooperators (e.g., see Fehr and Gaechter (2002)).

The reducing effect of bribes on punishment depends on the relative contribution and on the treatment (see models 5 and 6 of Table 2 and Figure 3). For lower contributors, bribes reduce punishment significantly in both *B1* treatments (*B1_HPun0* treatment, *F-test*, $p<0.007$; *B1_HPun1* treatment, *F-test*, $p<0.0176$), confirming Hypothesis 2b. For higher contributors in the *B1_HPun0* treatment, punishment is relatively low independently of the presence of bribery. In contrast, higher contributors in the *B1_HPun1* treatment who do not bribe are punished significantly more than those who do bribe (see Higher contributor, Bribe in models 5 and 6 of Table 2), thus confirming Hypothesis 2c.

Our findings on punishment suggest that, in a context where bribery is possible but the rule of law protects cooperators, two alternative strategies emerge that effectively avoid punishment: low contribution with bribery and high contribution without bribery (as discussed above and shown in Table 1, those who bribe contribute less and those who do not bribe contribute more in the *B1_HPun0* treatment than citizens in the *B0_HPun0* treatment). Indeed, bribery does not affect punishment in a meaningful way for high contributors in the *B1_HPun0* treatment (Model 5 Table 2, *-0.758, p=0.128*).

In contrast, when bribery is possible and the rule of law fails to protect cooperators, high contribution without bribing is not an effective strategy to avoid punishment. In the *B1_HPun1* treatment, high contributors who do not offer a bribe suffer substantial punishment and those who bribe see their punishment significantly reduced (Model 6 of Table 2: *-4.240, p=0.001*, also see the right hand-side of Figure 3).[17]

[17] The results of robustness regressions with absolute (instead of relative) contributions interacted with bribery attempts are consistent with the findings presented: when cooperators are protected by the rule of law, two alternative strategies exist to avoid punishment (high contributions without bribing or contributing

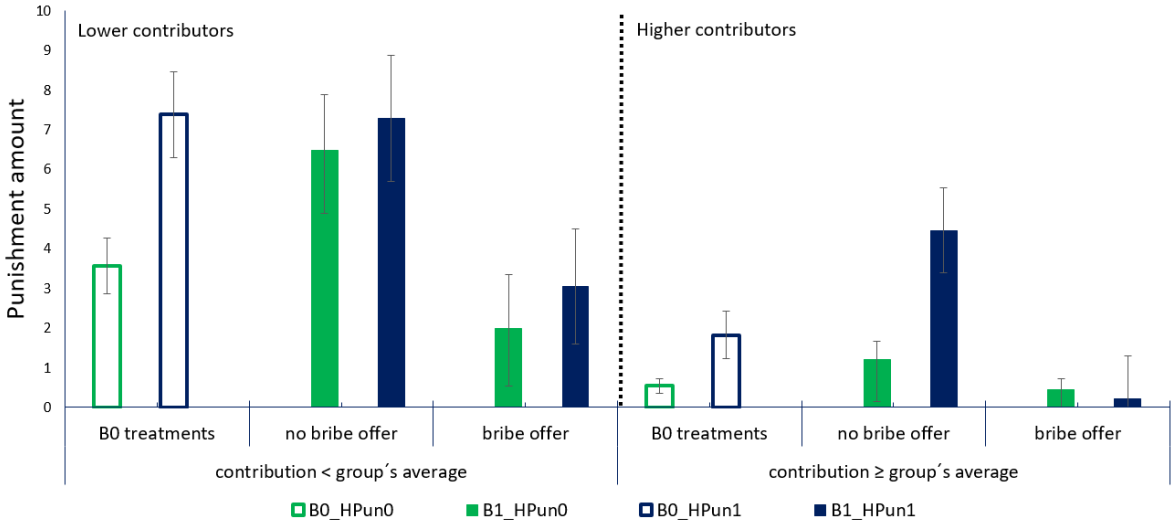

Figure 3. Average number of punishment points per round as a function of treatment, bribe offer, and relative contribution. Error bars denote standard errors based on OLS regressions and clustered on the group level.

	B0_HPun0	*B0_HPun1*	*B1_HPun0*	*B1_HPun1*	*B1_HPun0*	*B1_HPun1*
DV: Punishment amount	(1)	(2)	(3)	(4)	(5)	(6)
Lower contributor	3.016***	5.562***	2.162***	1.986***		
	(0.698)	(0.108)	(0.479)	(0.635)		
Interaction of Lower contributor x Bribery attempt						
Lower contributor & Bribe					0.777	-1.415
					(0.616)	(1.296)
Lower contributor & No bribe					5.266***	2.819***
					(1.387)	(0.941)
Higher contributor & Bribe					-0.758	-4.240***
					(0.468)	(1.070)
Constant	1.981***	2.338***	1.624***	3.921***	1.210***	4.467***
	(0.421)	(0.520)	(0.435)	(0.947)	(0.278)	(1.067)
Observations	3,660	1,830	1,830	3,660	900	960
R-squared	0.026	0.033	0.021	0.033	0.129	0.102

Table 2. OLS regressions with clustered standard errors at the group level in parenthesis. The dependent variable is punishment amount. Each model shows an independent regression for one of the four treatments. *** p<0.01, ** p<0.05, * p<0.1

low and bribing), while bribing appears to be the only strategy to avoid punishment when cooperators are unprotected by the rule of law.

3.2.2 Punishment patterns and harassment

The difference in punishment of more than four points between higher contributors who do and do not offer a bribe under a weak rule of law is substantial. Can this pattern be interpreted as harassment towards cooperative citizens not bribing? Higher contributors fulfil their civic duty by relatively high cooperation, but nonetheless, experience substantial punishment unless they make a private payment to the punisher. In contrast to the *B1_HPun1* treatment, in the other three treatments, relatively high contributions are sufficient to minimize punishment (as evident from the right-hand side of Figure 3).

Is this pattern mechanistic in the sense that for higher contributors, few points are left on the account accessible for punishment in the *HPun0* treatments? The answer is no, as there remains room for punishment in these treatments. For instance, the average contribution of high contributors is around 13 points in the *B1_HPun0* treatment, meaning that up to 7 points can be deducted, while actual punishment of high contributors does not even reach 1 point on average in this treatment.

Whether punishment towards non-bribing high cooperators actually is harassment ultimately depends on the punishers´ intention. Given our setup, we cannot be certain about whether punishment is intended to incentivize contributions or bribery. Even if the purpose of punishment towards higher contributors is to still increase their contributions in subsequent rounds, higher contributors in the *B1_HPun1* treatment may nonetheless fear harassment because of the rules allowing for excessive punishment. Our data are in line with this reasoning on how higher contributors may perceive the punishers' intentions. Relying on OLS regressions, we analyze the effects of punishment on the change in contribution as well as bribery attempts in the subsequent round for higher contributors. The results differ characteristically depending on the rule of law. First, while punishment significantly increases subsequent contributions of higher contributors under a strong rule of law (*B1_HPun0:* 0.482, *p=0.016*), it does so only marginally and to a much lesser extent when the rule of law is weak (*B1_HPun1:* 0.062, *p=0.074*). Second, punishment fosters bribe attempts in the subsequent round only when punishment rules do not protect cooperators (*B1_HPun1:* 0.0117, *p=0.009*; *B1_HPun0:* 0.001, *p=0.914*; regressions are reported in Tables B5 and B6 of the Appendix). Thus, punishers were unsuccessful at collecting bribes from higher contributors when punishment rules protect them. After being punished, cooperative citizens chose to increase contributions instead of bribing, precluding more intense punishment. In contrast, unprotected higher contributors opt for offering bribes rather than increasing contributions as a seemingly more secure way to avoid punishment. This pattern supports the interpretation of harassment bribery (a bribe needs to be paid to avoid punishment that would *not* occur if bribery was not possible).

3.3 Bribery behavior

So far, we have discussed how contributions and bribery affect punishment. Now we examine how citizens used bribery. Figure 4 shows the coefficients of Logit regressions with *Bribery attempt* as the dependent variable, the *B1_HPun1* treatment as regressor, and the *B1_HPun0* treatment as the baseline.

Our results support Hypothesis 1: Bribe offers are more frequent under a weak rule of law where punishment rules do not protect cooperators. As evident from the models in Fig. 5 restricted to higher and lower contributors, higher contributors bribe significantly more in the *B1_HPun1* treatment than

in the *B1_HPun0* treatment (confirming Hypothesis 1a), while lower contributors do not make this distinction (confirming Hypothesis 1b). Thus, the treatment differences in bribery attempts are fully driven by higher contributors.[18]

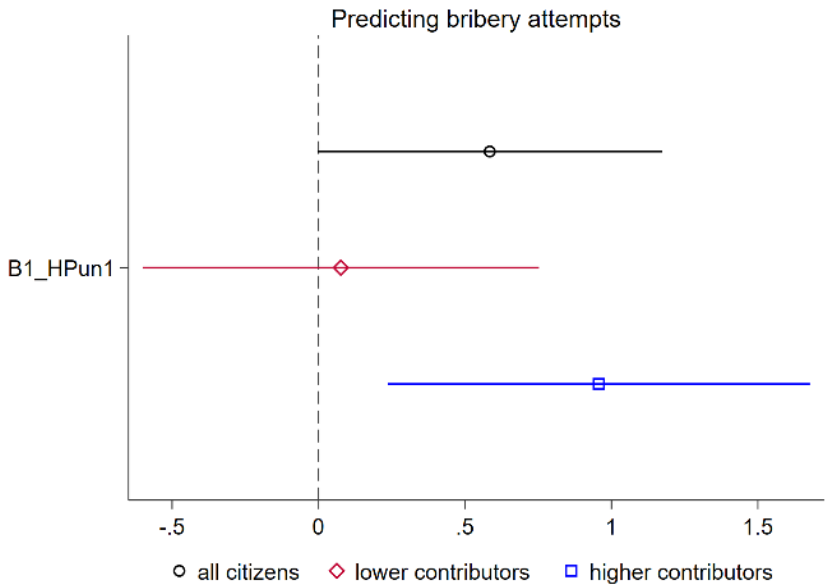

Figure 4. Predicting bribery attempts (i.e., bribe offer) as a function of our two bribery treatments. Shown are the coefficients and 95% CI, estimated in logistic regressions with clustered standard errors at the group level. The baseline reflects the *Bribery1_HPun0* treatment. The model including all citizens relies on 1,860 observations, the model restricted to lower contributors includes 853 observations, and the model restricted to higher contributors includes 1,007 observations. These results are robust to including socio-demographics as shown in Figure B3 of the Appendix.

Figure 5 complements these findings. Shown are the bribery patterns, distinguishing between bribery by lower contributors (upper panel) and bribery by higher contributors (lower panel) in the two *B1* treatments where harassment punishment is not possible (left column) and where it is possible (right column). The figure details over the course of the experiment whether attempts of bribery are made and whether they are successful (i.e., accepted).

Overall, there is no time trend in the bribing patterns, and the rejection rate of bribes is low.[19] Lower contributors bribe frequently and their bribing does not depend on the treatment (75% in the *HPun0*

[18] Our findings are robust to the inclusion of sociodemographics, and when restricting our data to the first and second half of the experiment (see Figures B3 and B4 of the Appendix).

[19] In both *B1* treatments, rejected bribes of lower contributors are followed by higher punishment than no bribe attempts (for *B1_HPun0*, the mean difference is 6.22, and for *B1_HPun1*, the mean difference is 6.16, *F-tests*, p=0.001, and p=0.0428, respectively), suggesting that group-minded officials punish bribe offers. The same pattern applies to higher contributors under a strong rule of law (punishment difference of 11.29 for rejected bribes vs. no bribe, *F-test*, p=0.002; have in mind that mean punishment of higher contributors who have their bribes rejected in *B1_HPun0* relies just on six observations). However, higher contributors' bribe

treatment and 76% in the *HPun1* treatment). Higher contributors bribe less frequently (signed rank tests on frequency per group, p<0.01 in *HPun0* and *HPun1* treatments) and their bribing frequencies do depend on the treatment. In the *HPun0* treatment, bribes by high contributors are less frequent (33%) than in the *HPun1* treatment (56%) where even a full contribution cannot avoid punishment (rank sum test on frequency per group, p=0.020).

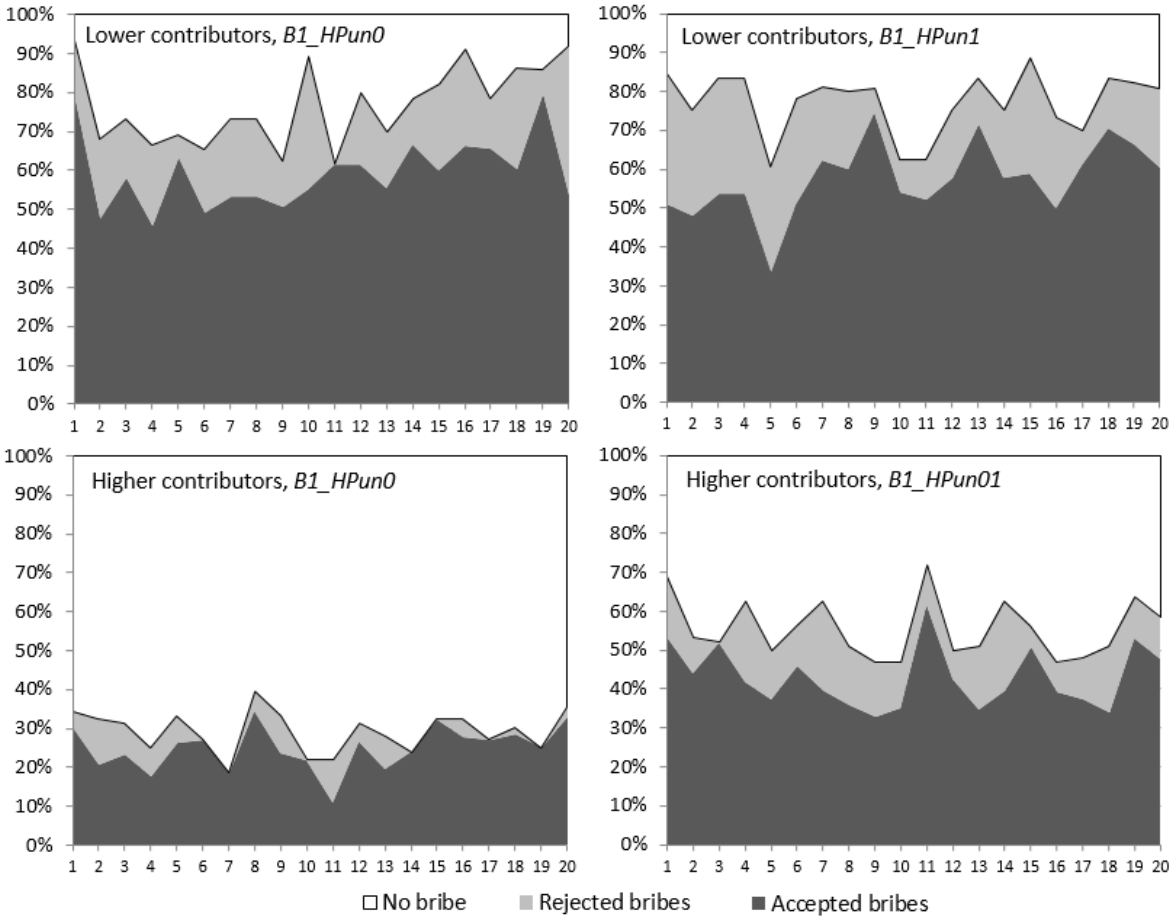

Figure 5. Percentages of bribes accepted (dark gray), bribes rejected (light gray), and no offers (white) across rounds as a function of the treatment (*HPun0* vs. *HPun1*) and relative contribution (lower or higher-equal than the group´s average).

A logit regression with bribery attempt as dependent variable and the interaction of the *B1* treatment (*B1_HPun0* vs. *B1_HPun1*) with relative contribution (lower vs. higher contributors) replicates the above findings (Table B7 in the Appendix), again confirming Hypothesis 1a and 1b. Thus, collusive bribery (bribery from lower contributors) exists and is similar in the *HPun0* and the *HPun1* treatments.

offers always decrease punishment under a weak rule of law, no matter whether they are rejected (mean punishment difference of -3.41*, F-test*, p=0.008) or accepted (mean punishment difference of -4.46*, F-test*, p<0.001).

In contrast, harassment bribery (bribery from higher contributors) dominates only in the *HPun1* treatment.

In a nutshell, it is harassment bribery that sets cooperation in the *B1_HPun1* treatment apart. In this treatment, contributions are lower than in the other treatments because high contributions are not a safe way to prevent punishment. Indeed, officials effectively use the threat of punishment in order to induce bribes.

Contrary to our hypothesis, bribery does not decrease cooperation under a strong rule of law (i.e., in the *B1_HPun0* treatment relative to the *B0_HPun0* treatment). A possible explanation lies in two strategies to avoid punishment is this setting: bribing or higher contributions. This pattern may suggest that also under a strong rule of law, bribery has negative externalities as it leads to a diverging society with more free riding exploiting the higher cooperation of good citizens, increasing their welfare differential. In fact, the possibility to bribe tends to increase income differences between higher and lower contributors (the latter always earn more), but not significantly so (*B0_HPun0*: difference of 2.3 points; *B1_HPun0*: difference of 3.6 points, *F-test:* p=0.329). We conclude that the possibility to bribe is not that devastating on a societal level as long as cooperative citizens are protected from punishment.

4 Conclusions

The quality of a society's institutions has many dimensions. In reality, good (or bad) institutional features are often correlated (Langbein & Knack, 2010) and they are likely to affect societal outcomes. In this paper, we disentangle the causal effects of corruption and the strength of the rule of law on cooperation. To discern their interaction and externalities, we employ an economic laboratory experiment and elucidate the role of the rule of law in moderating the effects of corruption. In particular, we show an asymmetry in the negative externalities of collusive and harassment bribery, two forms of corruption whose success and pervasiveness may vary with the strength of the rule of law in society.

We study cooperation in the context of public goods provision and vary whether or not bribery is possible to avoid punishment in environments with a strong or weak rule of law (captured by punishment rules that do or do not protect cooperators). On the one hand, we find that collusive bribery is equally present in its frequency and consequences in both environments differing in the strength of the rule of law. On the other hand, authorities´ coercion of high contributors into harassment bribery was only possible in the treatment with a weak rule of law, while under a strong rule of law, participants could avoid punishment by fully cooperating. In fact, harassment bribery led to a significant decrease in cooperation. We show that an institution that does not protect cooperative citizens from exploitation by the authorities is a key element in causing negative societal externalities associated with corruption: bribery undermines cooperation on the aggregate level only if punishment towards civically behaved people is possible.

Contradicting our hypothesis, in an environment where just laws protect high contributors from punishment, the possibility to bribe does not affect average contributions compared to an environment where bribery is ruled out. This is because the possibility to bribe under just laws leads to two coexisting strategies to avoid punishment: First, as expected, low contributors replace their contributions by bribes, which lowers contributions for this group. Second, by increasing their

contributions, high contributors successfully avoid punishment without bribes. Aggregating the effects of those two mechanisms yields a level of contributions similar to an environment with just laws where it is impossible to bribe.

According to our evidence, corruption led by citizens (collusive bribery) does not affect the overall level of civic behavior in a society, at least within the time horizon of our experimental setup. In contrast, we find clear evidence that corruption led by authorities (harassment bribery) has strong negative externalities as shown in the decline of cooperation.

Our findings highlight the potential of systems targeting corrupt officials. For example, Gneezy, Saccardo, and van Veldhuizen (2019) suggest that preserving moral costs associated with corruption may help to reduce self-interested decisions of the officials. Larreguy, Marshall, and Snyder (2020) show accountability-enhancing effects of media reports on malfeasance in local governments. Serra (2012) introduces a combined top-down and bottom-up accountability system where citizens also can report corrupt officials. Related to this literature and in line with Basu (2011), our results support the potential advantage of a system of asymmetric liability, that is, where the public official (bribe-taker) is prosecuted and punished only, and the ordinary citizen (bribe-giver) is imposed no legal burden – at least in a society with a weak rule of law. Abbink et al. (2014) have already reported evidence on the benefits of asymmetric liability in an experimental bribery game. Importantly, they found such a system to be successful in reducing bribery only if the public official could not retaliate after being reported for corruption. This result converges with our findings towards the conclusion that limiting authorities´ power to trample on citizen´s rights is a crucial element in the fight against corruption.

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Data and Code Availability

The experimental data and code files to replicate the results of the paper will be deposited at GESIS SowiDataNet datorium (German Data Archive for the Social Sciences) upon acceptance of the paper.

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Supplementary material for:

Cooperation, Bribery, and the Rule of Law

Esteban Freidin, Katrin Schmelz and Urs Fischbacher

This version: March 27, 2023

Appendix A provides the instructions, and Appendix B provides statistical analyzes complementing those of the main text.

Appendix A

English translation of participants´ written instructions as a function of experimental treatment.

This appendix contains the translated instructions. We here combine the instructions of all treatments and mark their differences as follows. Parts of the instructions specific to the

- *ProtectedCooperators* treatments are highlighted in green;
- *UnprotectedCooperators* treatments are highlighted in yellow;
- *Bribery* treatments are written in red;
- *NoBribery* treatments are written in blue.

Needless to say, treatment differences were not marked in the original instructions.

The instructions for the two roles (contributors, named as participants A and punishers, named as participants B) only differed in the role assignment and were identical in all other aspects.

Note that, to simplify reading of the English translation, we refer to participant A as male ("his") and to participant B as female ("her"). In the original Spanish instructions, there was no such distinction as the third person pronoun is the same for both genders.

Welcome to this decision-making study!

You are participating in an economic decision-making study.

From now on we ask that you remain silent and not to talk to other participants until the session is over.

If you have questions during the session, please raise your hand and wait for one of the attendees to come to you.

The money you earn in this experiment depends on your decisions and the decisions of other participants. During the session, gains will be calculated in points. At the end, the total number of points you earn will be converted to pesos. The conversion rate is of:

1 point = 1 peso

Your decisions are anonymous, that is, no one will be able to associate them with your real identity. At the end of the session, you will receive the total amount of money you earned by your decisions in a sealed envelope in cash.

Please read the instructions carefully. On the next page, you will learn about the general procedure of this session. Afterwards, you will find more detailed explanations of each stage.

When everyone has finished reading the instructions, you will answer a few questions to make sure that you have understood everything correctly. Then we will start with the experiment.

General procedure

Each participant is randomly assigned to one of two possible roles: A or B. Of every 4 participants, 3 participants are assigned to role A and 1 participant is assigned to role B. The assignment of roles A and B remains unchanged throughout the experiment, which lasts for **20 rounds**.

You are participant A. / You are participant B.

At the beginning of the experiment, the participants will be randomly divided into groups of 4. The composition of the groups remains the same during the 20 rounds. Therefore, your group is composed of the same 4 members in all rounds.

Each group includes 3 participants A and 1 participant B. The 3 participants A are called A1, A2 and A3. The designation of a participant A changes across rounds: in some rounds a participant A will be named A1 and in other rounds she will be named A2 or A3, which will be determined randomly in each round. In each group, participant B will always be called participant B.

You will participate in 20 rounds. Each round consists of 3 stages and follows the same procedure. Each participant owns a "private account" of points, and there exists also a group account. In each round, all participants start with points in their private accounts. In Stage 1, participants A decide whether to contribute points from their private account to the group account. In Stage 2, everyone receives 5 points in their private accounts, but no one makes decisions. In Stage 2, participants A decide whether to offer points (from their private account) to participant B's private account (and B will be informed of these offers). In Stage 3, participant B decides whether to accept or reject the offers received, and then she decides whether to deduct points from participants A in her group.

Please find an overview of the 3 stages below, which will be explained in detail on the following pages.

Stage 1	Stage 2	Stage 3
Initial amount: Each participant (including B) receives 20 points on her/his private account of Stage 1.	**Initial amount**: Each participant (including B) receives 5 points on her/his private account of Stage 2.	**Initial amount**: For Stage 3, the points that each A **did not contribute to the group account received in total** in Stage 1 of that round are relevant.
Decisions: •**Each A decides** how many points to contribute to the group account. The points in the group account are multiplied and then divided among the group members (including B). •**B does not make decisions** and does not contribute to the group account, but receives a share of the group account.	**Decisions**: •**No one makes decisions** in Stage 2. •**Each participant A decides** whether to offer points to the participant B of his group. •**B does not make decisions.**	**Decisions**: •Participants **A do not make decisions.** •For each A, **B decides**: 1) whether to accept the Stage 2 offer (if any); and 2) whether to deduct points from that participant (the maximum she can deduct are the points A kept in his private account received in total in Stage 1). Deducting points is costly for B.
Information: The 4 group members are informed about the contributions of A1, A2 and A3.	**Information**: Participant B is informed about who offered him points.	**Information**: Each A is informed about how many points B deducted from him. Each A is informed whether B accepted his offer and, if points were deducted, how many.
Earnings: Depends on the points kept in the private account and the amount obtained from the group account.	**Earnings**: 5 points. Depends on whether points were offered (by A) and accepted (by B).	**Earnings**: Zero or negative; depends on the number of points B deducted from each A.

Stage 1

Initial amount

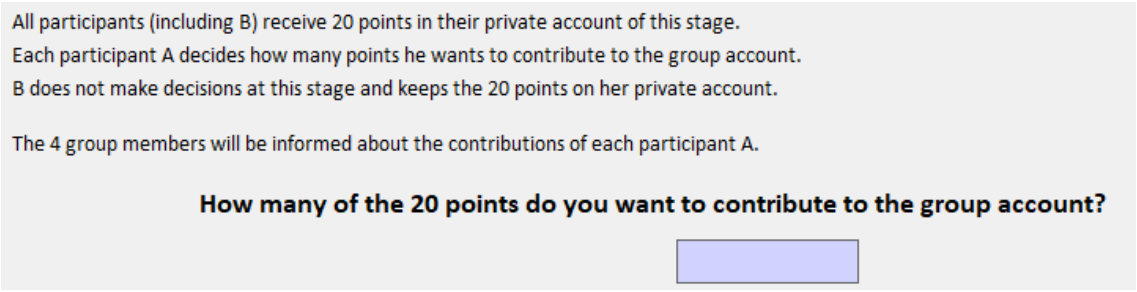
Each participant (including B) starts with 20 points in her/his private account of Stage 1.

Decisions

Each participant A decides how many points to contribute from his private account to the group account. Participants A can contribute any amount between 0 and 20 points to the group account. Accordingly, the amount of points each A keeps on his private account of Stage 1 corresponds to 20 points minus his contribution to the group account.

Participant B does not make decisions in Stage 1.

Decision of participants A in Stage 1: A's screen will look as follows.



Information

Once A1, A2 and A3 have made their decisions, all 4group members (i.e., including B) are informed of each participant A's contribution to the group account.

Earnings

In Stage 1, the earnings of each group member consist of two parts:

1) points kept in the private account, and 2) points received from the group account.

The points each participant receives from the group account are calculated as follows: a) the points A1, A2 and A3contributed to the group account are added up; b) the result of this sum is multiplied by 1.3; and c) the amount resulting from the multiplication is divided among the four members of the group such that each A receives 30% and B receives the remaining 10% (30%+30%+30%+10%=100%). Accordingly, each participant A receives the same amount of points from the group account, regardless of his own contribution.

Earnings of Stage 1	**=**	**Points kept in the private account**	**+**	**Points received from the group account**
Earnings of each **A** in Stage 1	=	20 points - contribution of that A to the group account	+	sum of contributions to the group account x 1.3 x**30**%
Earnings of **B** in Stage 1	=	20 points	+	sum of contributions to the group account x 1.3 x **10**%

Stage 2

Initial amount

Each participant (A1, A2, A3 and B) receives 5 points on her/his private account of Stage 2.

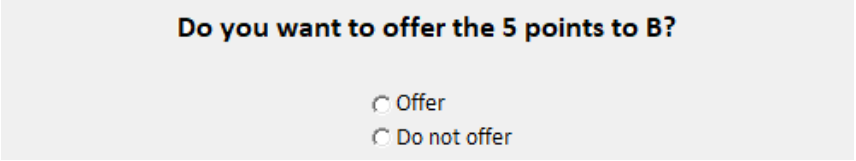
Decisions

No one makes decisions in Stage 2.

Each A decides whether to offer points from his private account of Stage 2 to the participant B of his group. In other words, each participant A offers B either 0 points or 5 points. If a participant A does not offer the 5 points to B, then those 5 points remain in his private account of Stage 2.

Participant B does not make decisions in Stage 2.

Decision of participants A in Stage 2: A's screen will look as follows.



Information

Once A1, A2 and A3 have made their decisions, participant B will learn who offered points to her.

No participant A will ever be informed of offers made to B by other participants.

Earnings

In Stage 2, each participant earns 5 points.

In Stage 2, the earnings of each participant A depend on whether or not he offered the 5 points to B and, if he made an offer, whether B accepted or rejected it. At this stage, participant A's earnings are zero if he offered the points to B and B accepted the offer, while participant A's earnings are 5 points if he did not offer the points to B or if B rejected the offer (i.e., if the offer is rejected, participant A retains the 5 points offered). It is important to note that if B accepts a participant A's offer, she cannot deduct points from that participant in the Deduction Stage of that round (see more details about Stage 3 on the next page).

Participant B's earnings in Stage 2 depend on the offers received and accepted. If no participant offered points to her or if B rejected all offers, B only earns 5 points in Stage 2 (the 5 points she received at the start of the stage).

each A´s earnings	= 5 points **- points offered by that A and accepted by B**
B´s earnings	= 5 points **+ sum of the points offered (by A1, A2 and A3) and accepted by B**

Stage 3

Initial amount

For Stage 3, the number of points each participant **kept in his private account** of Stage 1 is relevant (corresponds to points not contributed to the group account).

For Stage 3, the points each participant A **received in total** in Stage 1 are relevant.

Decisions

Participants A do not make decisions in Stage 3.

Participant B must first decide whether to accept or reject the offer that each participant A made to him in Stage 2 (if there was any). Second, for each participant A,B decides whether to deduct points and how many. The maximum B can deduct from a given A is what that A did not contribute to the group account in Stage 1 of that round (i.e., the points kept in the private account). Accordingly, the points A contributed to the group account in Stage 1 cannot be deducted. The maximum B can deduct from a given A is what that A earned in total in Stage 1 of that round (i.e. the points kept in the private account + those received from the group account). However, if B accepted the Stage 2 offer from a particular participant A, she cannot deduct points from that participant A in that round.

Deducting points entails costs for B. For each participant from whom B deducts, B pays 2 points out of her private account. In other words, if she deducts points from only 1 participant A, B pays 2 points; if she deducts points from 2 participants A, B pays 4 points; and if B deducts points from all 3 participants A in her group, B pays 6 points.

Participant B's decisions in Stage 3: B's screen will look as follows (on the real screen, the letters "x" will be points depending on A's decisions in Stages 1 and 2).

		A1	A2	A3
Stage 1	Points contributed to the GROUP ACCOUNT	x	x	x
	Points kept on the PRIVATE ACCOUNT of Stage 1	x	x	x
	Total income of points in Stage 1			
Stage 2	Points each participant received in his private account	5	5	5
	Points participants A offered to you	x	x	x
	Do you accept or reject the points offered?	○ accept ○ reject	○ accept ○ reject	○ accept ○ reject
Stage 3	**How many points do you want to deduct?**			

Information

Before making decisions in Stage 3, B will receive a reminder of participants A's contributions to the group account in Stage 1and the points held in their private accounts in Stage 1/ and of the total profit of each participant A in Stage 1. B will also be informed about those who offered her points in Stage 2.

After B makes her decisions in Stage 3, each participant A will be informed whether B accepted or rejected his Stage 2 offer (if there was any) and, if points were deducted, how many. No participant A will know whether B accepted or declined offers or deducted points from other participants.

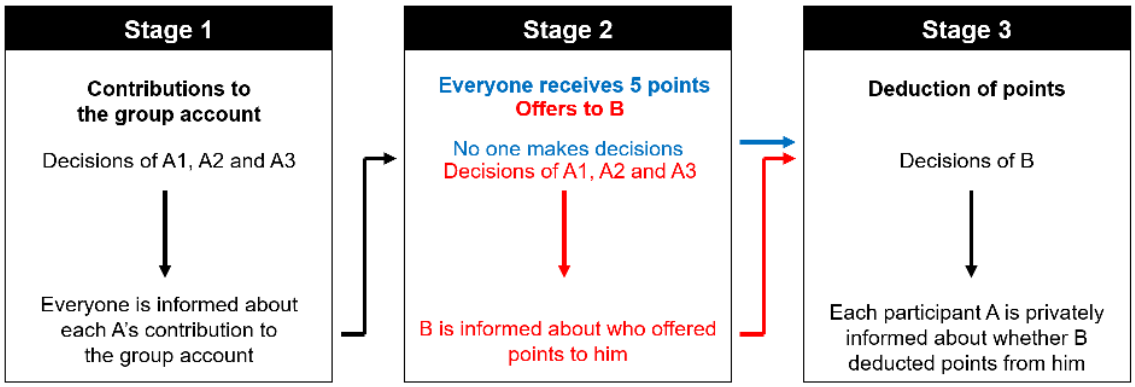
After B makes her decisions in Stage 3, each participant A will be informed of how many points she discounted from him. No participant A will know if B deducted points from other participants.

Earnings

The earnings of Stage 3 arezero or negative for all participants.

Participants **A**'searnings in Stage 3	=	-			number of points deducted by B
Participant **B**'s earnings in Stage 3	=	-	2	x	number of participants from whom she deducted points
Final information					

Summary of the procedure



Total earnings

At the end of each round, your earnings from the three stages of that round are added. Those points are yours and do not come into play in subsequent rounds (i.e. you cannot lose them).

At the end of the session, the points you have earned throughout the 20 rounds will be added up and converted to pesos.

Ready for comprehension questions?

If you have read and understood the instructions, please click the "Inform" button at the bottom right of the screen.

You can access the instructions at any time during the experiment. Please pay attention to the screen, such that you will not miss when the experiment continues.

Appendix B

Supplementary data analyzes

We first provide supplementary information on the introduction of the paper, describing the indices measuring corruption, the rule of law, and norms of civic cooperation (Appendix B1). Second, we report supplementary analyzes on our experimental data (Appendix B2).

B1. Cross-country indices on corruption, the rule of law and cooperation

We proxy cooperation, our main dependent variable of the experiment, by *Norms of Civic Cooperation* as derived from the World Values Survey (WVS, Haerpfer et al., 2022, questions Q177, Q178 and Q180). *Norms of Civic Cooperation* relate to our experimental implementation of a public goods provision as they measure people´s judgment about how justifiable non-cooperative behavior is across various social dilemmas, where individual and group incentives are partially in conflict (see Footnote 3 of the paper).

As global measures of our independent variables in the experiment, namely corruption and the rule of law, we rely on the Worldwide Governance Indicators *Control of Corruption* and *Rule of Law* (The World Bank, 2022).[1] These two indicators are defined by the World Bank as follows: *Control of Corruption* "reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests." *Rule of Law* "reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." The Worldwide Governance Indicators rely on surveys and other assessments of governance, including the views of individuals, firms and public officials.

For robustness checks, we employ alternative indices of institutional quality from Transparency International (*Corruption Perception Index, CPI,* 2022) and the World Justice Project *(Rule of Law Index, RoLI;* WJP, 2022*)*. These indices are also based on expert assessments and opinion surveys. The CPI ranks countries by their perceived levels of public sector corruption, where higher CPI values reflect higher transparency and, thus, lower corruption. The RoLI evaluates countries based on eight different factors, of which *Limited Government Power* is most closely related to our Rule of Law treatment in the experiment (i.e., whether or not harassment punishment by officials is possible).

In our correlational analyzes, we use survey data from the 52 countries for which the World Bank as well as WVS measures are available from 2021 (54 countries for our alternative indices CPI, RoLI). For all measures we use, higher values are better in the sense that they reflect less corruption, a stronger rule of law, or higher cooperative norms.

[1] The World Governance Indicators are composed of six dimensions and the remaining four dimensions (less relevant to our experimental setting) are: *Voice and Accountability, Political Stability and Lack of Violence, Government Effectiveness*, and *Regulatory Quality*.

B2. Supplementary analyzes of our experimental data

Table B1. OLS regression with clustered standard errors at the group level in parenthesis. The dependent variable is contribution, and the baseline reflects the *B0_HPun0* treatment. The predictors include treatments, period of the game (round), and their interactions.

	(1)
B1_HPun1	-3.353**
	(1.338)
B0_HPun1	-2.836*
	(1.427)
B1_HPun0	0.462
	(1.701)
Period	-0.103
	(0.0897)
*B1_HPun1 * Period*	-0.0505
	(0.108)
*B0_HPun1 * Period*	0.130
	(0.104)
*B1_HPun0 * Period*	-0.0822
	(0.115)
Constant	11.01***
	(1.122)
Observations	3,660
R-squared	0.069

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Below, we present the F-tests to test whether the slope of contributions across rounds for each treatment is different from zero (the variable Period in Table B1 refers to treatment *B0_HPun0*):

B1_HPun1 treatment: F(1, 60) = 6.68; Prob > F = 0.0122

B0_HPun1 treatment: F(1, 60) = 0.28; Prob > F = 0.5993

B1_HPun0 treatment: F(1, 60) = 6.72; Prob > F = 0.0120

Table B2. Nonparametric tests of pair-wise contrasts (Mann-Whithney U tests) between treatments on average contributions in the 20 rounds of the game. The overall test with all treatments showed a significant effect (Kruskal Wallis, χ^2=10.170, df=3, p=0.0172). *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)
NoBribery_ProtectedCooperators (1)			
NoBribery_UnprotectedCooperators (2)	U=88		
Bribery_ProtectedCooperators (3)	U=108	U=93	
Bribery_UnprotectedCooperators (4)	U=42***	U=75*	U=68**

Table B3. Nonparametric tests of pair-wise contrasts (Mann-Whithney U tests) between treatments on average contributions in the first 10 rounds of the game. The overall test with all treatments showed a significant effect (Kruskal Wallis, χ^2=12.92, df=3, p=0.0048). *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)
NoBribery_ProtectedCooperators (1)			
NoBribery_UnprotectedCooperators (2)	U=81		
Bribery_ProtectedCooperators (3)	U=112	U=80	
Bribery_UnprotectedCooperators (4)	U=44***	U=90	U=73*

Table B4. Nonparametric tests of pair-wise contrasts (Mann-Whithney U tests) between treatments on average contributions in the last 10 rounds of the game. The overall test with all treatments shows a significant effect (Kruskal Wallis, χ^2=8.569, df=3, p=0.0356). *** p<0.01, ** p<0.05, * p<0.1

	(1)	(2)	(3)
NoBribery_ProtectedCooperators (1)			
NoBribery_UnprotectedCooperators (2)	U=98		
Bribery_ProtectedCooperators (3)	U=99	U=111	
Bribery_UnprotectedCooperators (4)	U=47***	U=56**	U=70**

Table B5. OLS regression with clustered standard errors at the group level in parenthesis. The dependent variable is change in contribution from round *n* to round *n+1* for higher contributors, whereas the predictors represent the interaction between *B1* treatments and the amount of punishment received in round *n*.

	(1)
*B1_HPun0 * punished_amount*	0.444**
	(0.167)
*B1_HPun1 * punished_amount*	0.0620*
	(0.0334)
Constant	-2.498***
	(0.245)
Observations	954
R-squared	0.036

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B6. OLS regression with clustered standard errors at the group level in parenthesis. The dependent variable is the offer of a bribe in round *n+1* for higher contributors, whereas the predictors represent the interaction between *B1* treatments and the amount of punishment received in round *n*.

	(1)
*B1_HPun0 * .punished_amount*	0.000967
	(0.00889)
*B1_HPun1 * punished_amount*	0.0117***
	(0.00417)
Constant	0.521***
	(0.0493)
Observations	954
R-squared	0.009

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table B7. Logit regression with clustered standard errors at the group level in parenthesis. The dependent variable is the offer of a bribe, whereas the predictors represent the interaction between *B1* treatments and whether the contribution on that round was below or equal-above the group´s average. The baseline reflects Higher contributors in the *B0_HPun0* treatment.

	(1)
B1_HPun0, Lower contributor	1.784***
	(0.304)
B1_HPun1, Higher contributor	0.957***
	(0.368)
B1_HPun1, Lower contributor	1.861***
	(0.361)
Constant	-0.699***
	(0.259)
Observations	1,860

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The χ^2 tests of between-treatment comparisons (*B1_HPun1* vs. *B1_HPun0*) of the coefficients in the above regression are as follows:

Lower contributors: $\chi^2\ (1) = 0.05,\ p = 0.8256$

Higher contributors: $\chi^2\ (1) = 40.14,\ p < 0.001$

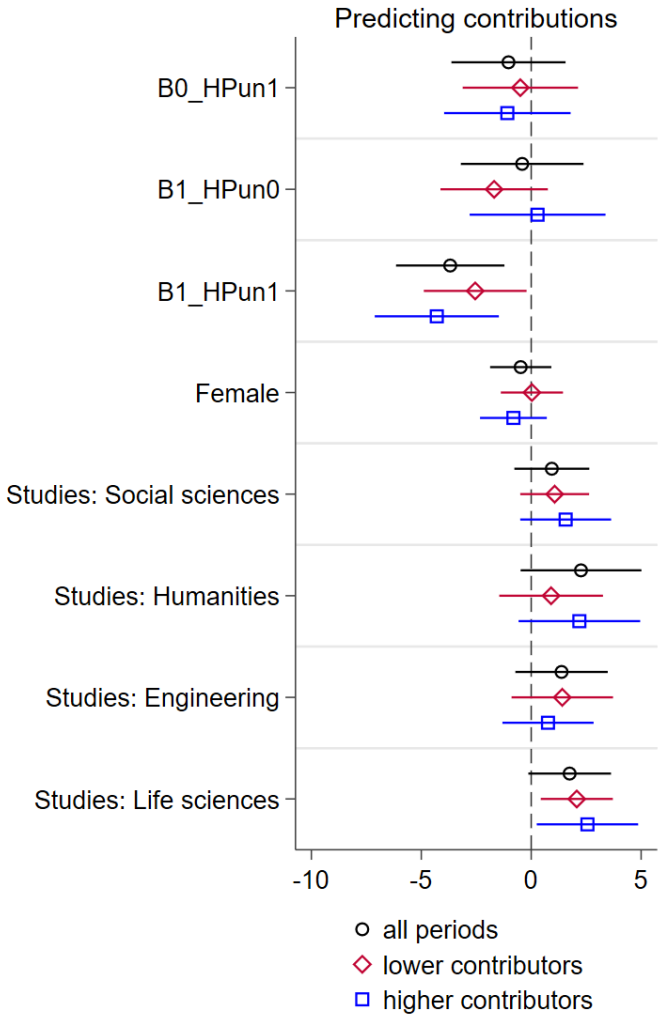


Figure B1. Predicting contributions as a function of our four treatments and sociodemographic controls. Shown are the coefficients and 95% CI, estimated in OLS regressions with clustered standard errors at the group level. The baseline reflects the *NoBribery_ProtectedCooperators* treatment, and the baseline field of studies is *Economics*. The model including all citizens relies on n=3,660 observations, the model restricted to lower contributors includes 1,716 observations, and the model restricted to higher contributors includes n=1,944 observations.

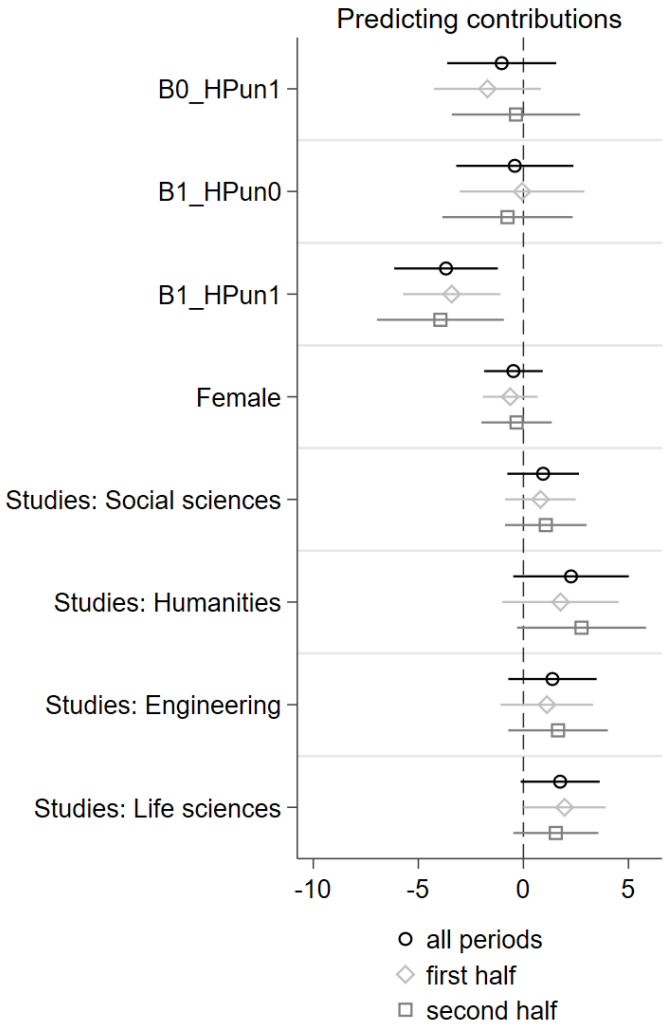


Figure B2. Predicting contributions as a function of our four treatments and sociodemographic controls. Shown are the coefficients and 95% CI, estimated in OLS regressions with clustered standard errors at the group level. The baseline treatment reflects the *NoBribery_ProtectedCooperators* treatment, and the baseline field of studies is *Economics*. The regressions including all rounds rely on n=3,660 observations, while those restricted to the first and second half of rounds rely on n=1,830 observations. Note that the model labeled "all rounds" is identical to the model labeled "all citizens" in Figure B1.

Figure B3. Predicting bribery attempts (i.e., bribe offer) as a function of our two bribery treatments. Shown are the coefficients and 95% CI, estimated in logistic regressions with clustered standard errors at the group level. The baseline reflects the *Bribery_ProtectedCooperators* treatment, and the baseline field of studies is *Economics*. The model including all citizens relies on 1,860 observations, the model restricted to lower contributors includes 853 observations, and the model restricted to higher contributors includes 1,007 observations.

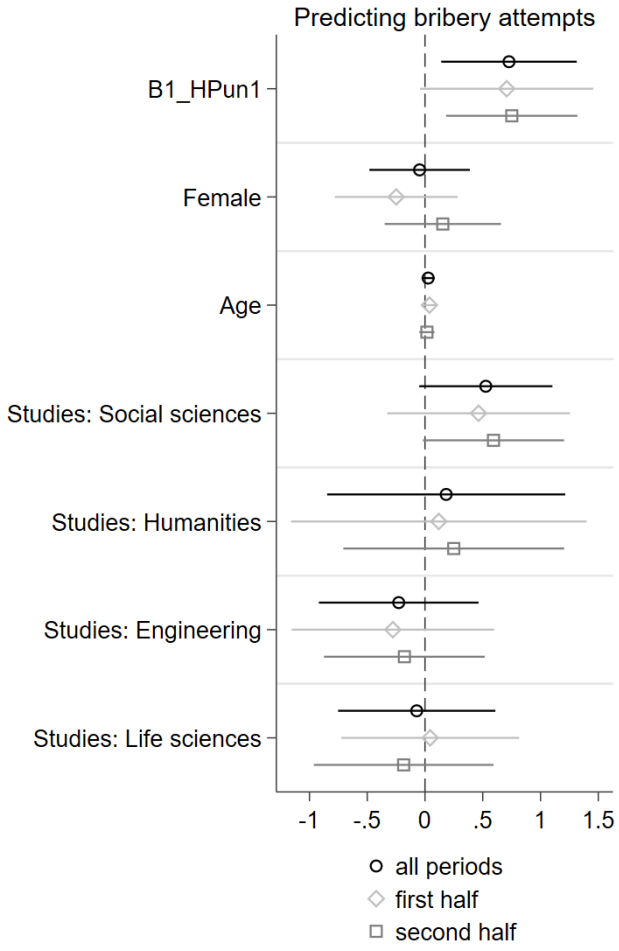


Figure B4. Predicting bribery attempts (i.e., bribe offer) as a function of our two bribery treatments and sociodemographic controls. Shown are the coefficients and 95% CI, estimated in logistic regressions with clustered standard errors at the group level. The baseline reflects the *Bribery_ProtectedCooperators* treatment, and the baseline field of studies is *Economics*. The regressions including all rounds rely on n=1,860 observations, while those restricted to the first and second half of rounds rely on n=930 observations. Note that the model labeled "all rounds" is identical to the model labeled "all citizens" in Figure B5.

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