Measuring Corruption in the Field Using Behavioral Games*

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Abstract

Corruption is often harmful for economic development, yet it is difficult to measure due to its illicit nature. We propose a novel corruption game to characterize the interaction between actual political leaders and citizens, and implement it in Northern Mozambique. Contrary to the game-theoretic prediction, both leaders and citizens engage in corruption. Importantly, corruption in the game is correlated with real-world corruption by leaders: citizens send bribes to leaders whom we observe appropriating community money. In corrupt behavior, we identify an important trust dimension captured by a standard trust game. (*JEL* D10, D70, D72, D73, C90, C93)

Keywords: Corruption, Game, Trust, Lab-in-the-field, Citizen, Political leader, Incentives, Behavior, Elite capture.

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Corruption is considered to be harmful for economic development (Bhargava, 2005), with micro-level evidence confirming its detrimental effects in areas such as the provision of public goods (Reinikka and Svensson, 2004; Bertrand et al., 2007; Reinikka and Svensson, 2011; Ferraz et al., 2012) and firm efficiency (Fisman and Svensson, 2007; Sequeira and Djankov, 2014).[1] On the macro side, empirical evidence is inconclusive (Mauro, 1995; Svensson, 2005). Due to its illicit nature, how to best measure the magnitude and nature of corruption remains not only a central focus of the literature in political economy, but also an open question. All instruments used to measure corruption, from perception-based and survey measures, to audit studies, present disadvantages (Sequeira, 2012).[2] In particular, while audit studies can reveal the extent of missing resources, they are unable to shed light on the mechanisms of corruption at the local level, i.e., the ones that characterize the interaction between citizens and the public sector in everyday situations (Justesen and Bjørnskov, 2014).

This paper advances the literature by studying the culture of corruption at the local level through a novel lab-in-the-field experiment. We introduce a neutrally-labeled game featuring citizens competing to be chosen for a financially valuable opportunity granted by the actual political leader at the village level. Citizens must choose between a personal investment or a bribe to the leader. The leader keeps all bribes and chooses one citizen after observing the anonymous decisions. The chosen citizen is then rewarded.

This design innovates by combining two important features. First, because it is always in the best interest of the leader to choose the individual who made the greatest personal investment, the game leads to a subgame-perfect Nash equilibrium (SPNE) in which no citizen gives any bribes. With the exception of the archetypal game of Abbink et al. (2002), the majority of lab or lab-in-the-field studies of corruption involve equilibria with partial or full corruption.[3] Second, in common with Gneezy et al. (2019), the game moves away from the two-player trust game paradigm of the conventional corruption game, and is therefore better equipped to capture group dynamics.

[1] Little evidence highlights corruption as beneficial (Huntington, 2017; Méon and Weill, 2010). Olken and Pande (2012) provide a comprehensive review on the topic.

[2] Earlier measurements focused on perception indexes based on surveys of individuals, experts or businesses, which may suffer from reporting bias. More recently, audit studies have relied on the accuracy of public records to capture corruption (see, e.g., Olken, 2006; Ferraz and Finan, 2008, 2011; Niehaus and Sukhtankar, 2013).

[3] See, e.g., Frank and Schulze (2000); Schulze and Frank (2003); Alatas et al. (2009a,b); Barr and Serra (2009); Cameron et al. (2009); Armantier and Boly (2013); Banerjee (2016a,b); Guerra and Zhuravleva (2021). Abbink and Serra (2012) and Armantier and Boly (2012) provide summaries of the literature on lab experiments studying corruption. The game of Abbink et al. (2002) is also used by Abbink (2004); Abbink and Hennig-Schmidt (2006); Van Veldhuizen (2013).

We implement our lab-in-the-field experiment with citizens and local political leaders in 206 communities in Northern Mozambique. Mozambique, one of the poorest countries in the world (UNDP, 2020), is considered as "partly free" in terms of democratic rights (Freedom House, 2020), and is ranked 149th out of 180 countries on 2020 Transparency International's Corruption Perceptions Index. The local leaders (village chiefs or *chefes de aldeia*) are the official political representatives of their communities, and they were empowered as part of the decentralization process implemented in Mozambique in the 1990s (West and Kloeck-Jenson, 1999). Discretionary power, combined with a lack of competitive political forces, present favorable conditions for corruption to arise, involving rent-seeking and nepotism, and increased collusion between citizens and leaders to siphon off government funds (Basurto et al., 2020; Ferraz and Finan, 2011; Shleifer and Vishny, 1993; Véron et al., 2006). As decentralization is closely linked to corruption when accountability is low (Fisman and Gatti, 2002; Fan et al., 2009; Jacoby et al., 2021; Lessmann and Markwardt, 2010), this setting is particularly relevant for many low- and middle-income nations which have significantly reformed their political structures towards greater autonomy of local political leaders (Bardhan and Mookherjee, 2006; Ribot and Oyono, 2012).

Despite the stark theoretical predictions of our corruption game, both citizens and leaders engage in corrupt transactions. Ninety-one percent of citizens send a strictly positive bribe to the leader, and 39% of leaders do not choose the profit-maximizing choice of selecting the person with the highest private investment. This results in a significant transfer from citizens to their leaders: citizens earn about two-thirds of their expected (equilibrium) payoff, but leaders earn over *five times* theirs.

We establish a clear link between behavior in the game and corrupt behavior observed outside of the game by looking at the interaction between citizens and real political leaders in an incentivized setting. Finding an ideal external measure of corruption is not straightforward in our context because it should relate to explicit engagement in a corrupt activity, but also not be subject to self-reporting bias. For our study, we unobtrusively measured village leaders' appropriation of funds earmarked for their community using a structured community activity (Casey et al., 2012). During the game, citizens send significantly more bribes to leaders who are observed appropriating these funds, providing evidence that the lab-in-the-field experiment captures real corruption dynamics within these communities. This provides novel direct evi-

dence on the external validity of individual behavior in a corruption game.[4]

Finally, employing survey questions and a standard trust game played between citizens and local leaders, we show a strong correlation between trust and behavior in the corruption game. This is in line with the reciprocal nature of corruption, as an individual pays a bribe in expectation that the act will be reciprocated (Abbink and Hennig-Schmidt, 2006). While Gneezy et al. (2019) observe only a minor role for reciprocity among non-connected participants, we find that 39% of leaders go against their self-interest in the corruption game and reciprocate citizens' bribes. Citizen giving in the trust game is also predictive of leaders' observed appropriation. Incentivized trust games may measure particular forms of financial trust and reciprocity that can enable greater corruption. Linking trust and corrupt behavior in and outside the lab presents a further novel contribution of this study.

1 Context and sampling

Corruption is particularly relevant in the presence of natural resource wealth. Together, they could lead to the natural resource curse and civil conflict (Auty, 1993; Treisman, 2000; Collier and Hoeffler, 2004; Ross, 2004). These concerns are particularly salient in our context: the Cabo Delgado province in Mozambique, where one of the largest off-shore reserves of liquefied natural gas (LNG) in the world was recently discovered (Frühauf, 2014).

Cabo Delgado is the northernmost province of Mozambique, a low-income country, ranking 7th from the bottom worldwide in terms of GDP per capita (US$1,247, PPP current international $, The World Bank, 2017) and on a decreasing trend in terms of voice and accountability (Freedom House, 2020; UNDP, 2020). Mozambique has had a tumultuous history of conflict since the 1960s, from its war of independence from Portugal to a civil war. Although the war formally ended in 1992, violence has resurged in recent years. Cabo Delgado province is primarily rural, with a total of 1.8 million inhabitants, and within the country it ranks lowest in

[4]Though it compares different participants, the work of Armantier and Boly (2013) shows evidence of the external validity of corruption experiments through their finding of similar treatment effects in the lab and the field in Burkina Faso and Canada. Additionally, Barr et al. (2009) relate corrupt behavior in their experiment to the experience of their population of interest, but the focus is on how different treatments alter corrupt behavior within the game, rather than relating it to external behavior. Banerjee (2016b) intentionally over-pays subjects in a corruption lab game and shows a slight positive correlation between failure to report the over-payment and in-game behavior. Related work on the external validity of behavior in the lab includes work on dishonesty (Dai et al., 2018; Hanna and Wang, 2017; List, 2009; Potters and Stoop, 2016; Rustagi and Kroell, 2022), and collective action (Beekman et al., 2014; Kosfeld and Rustagi, 2015).

human development (INE, 2015a).

Like many countries in Africa, Mozambique underwent a decentralization process in the 1990s that resulted in the creation of newly empowered political leaders at the community level (West and Kloeck-Jenson, 1999). The main authority is to resolve issues of land disputes, enforce justice, and be consulted before the implementation of rural development or aid programs in the community. While leaders are in theory tasked with the dual role of representing their communities and acting as authority figures for the state, the reality leans much closer to the latter (Buur and Kyed, 2005). There is no systematic formal democratic process for electing local leaders in rural villages: the selection must be in accordance with the traditional rules of the respective community, and the state has the final say over the appointment (Buur and Kyed, 2005).

Our study involves a representative set of communities in the province, each led by a local leader. We randomly selected 206 communities from the list of all 454 polling stations in the province, stratified on urban, semi-urban, and rural areas. Of the 206, 169 communities (80%) were located in rural areas. This sample was part of a larger field experiment on the provision of information about the discovery of natural gas in the province, with further details provided in Armand et al. (2020).[5]

Local leaders are clearly-identified in the community, thus we have a total of 206 participating leaders. In addition, selection of citizens to participate in the study was the product of physical random walks within the communities. In each house, heads of households were selected to participate. In each community, 10 individuals participated in the games, for a total of 2060 participating citizens. Panel A in Table 1 presents descriptive statistics for both citizens and leaders. The majority of citizens is male, with an average age of 46 years, with primary education only (65%), and of Muslim religion (56%). Leaders are predominantly male (98%), more educated and with more assets relative to citizens, and have been in power on average for 10 years. In terms of religion, the distribution among leaders is comparable to the one of citizens.

[5]Different variations of information provision were delivered after randomly allocating communities in three groups. In a *control group*, communities did not receive any information module. In a *leader treatment* group, the information module delivered to the leaders only, while in a *community treatment* group, the information module was provided to both the leaders and the local community. The behavioral measurements presented in Section 2 were conducted from August to November 2017, after the completion of interventions in Armand et al. (2020). While interventions were randomized and do not pose a threat to our analysis, we control for treatment indicators in all specifications including community characteristics as control variables (see Section 3.1).

2 The corruption game

The game encompasses 11 participants, including 10 citizens and the local leader, but it can be easily adapted for any number of citizens ≥ 2. The game script is provided in Appendix A. Each citizen receives an endowment of 10 tokens worth 10 Meticais (MT) each, for a total of 100 MT (US$1.5). The total endowment corresponds to approximately two-thirds of daily income (INE, 2015b). Each citizen must choose how many tokens to send to the leader (which we refer to as a *bribe*), with the remaining units being kept for oneself (which we refer to as *private investment*). The leader's only action is to choose one citizen after observing the allocation chosen by all of them, without observing their identity.

In terms of payoffs, the leader keeps the bribes from *all* citizens, independent of which citizen they chose. Citizens not chosen by the leader keep their private investment. In contrast, the citizen chosen by the leader receives a bonus of 300 MT (US$4.5), but the entirety of their private investment accrues to the leader.[6]

The leader receives all units sent as bribes from all citizens, plus the private investment of the selected citizen. The dominant strategy of the leader is thus to choose the citizen who made the largest private investment. This format is analogous to a setting in which the leader is incentivized to select the most qualified entrepreneur. Knowing the leader's behavior, citizens' best responses are to send no bribes, and allocate their full endowment to their private investment. The simplicity of the game is intentional to guarantee understanding in contexts with low literacy.

The main theoretical feature of this game, characterized by a subgame-perfect Nash equilibrium (SPNE) in which no citizen gives any bribes, is shared by the game of Abbink et al. (2002). They present a neutrally-framed lab experiment resembling a modified trust game in which reciprocation is interpreted as returning the favor from a bribe. Our game is instead designed to capture group dynamics, while moving away from the trust game paradigm. Also related is the game of Gneezy et al. (2019), who study how bribes affect the judgment of individuals with discretionary power. In their experiment, two individuals compete to be selected

[6]Citizens deposited their bribes in small purses, which were brought to a separate enumerator who recorded them privately on a tablet. A software aggregated the information and the tablet was brought to the leader who was presented with the options in the form of an anonymous ordered list. When the leader selected an amount that was sent by multiple citizens, the software randomly selected one of them for payment. After citizens made their decisions, they were also asked for their incentivized belief about the size of the private investment that would be chosen by the leader.

by a referee, who, depending on the treatment, can either accept only the bribe of the individual they choose as the winner, or can accept both bribes and choose the winner at their discretion. An important difference with our design and this latter treatment is that leaders in our game are incentivized to always choose the lowest bribe, whereas referees in Gneezy et al. (2019) are financially indifferent, leading to multiple equilibria. Their focus on selfish versus reciprocal motives in corrupt decisions with anonymous populations is different from, but complementary, to our interest in studying potentially corrupt relationships among connected individuals.[7]

Our game uses neutral terminology, leaving it free of strong norms about socially appropriate behaviors.[8] We use the terms *corrupt behavior* and *bribes* to help elucidate the mapping from game behavior to real community dynamics. An alternative interpretation of the game is one of rent-seeking, in which citizens seek to accrue rents from the leader by paying bribes rather than engaging in a productive activity. This distinction can get blurred because rent-seeking is sometimes referred to as a form of corruption (Rose-Ackerman, 1999). Previous experiments on rent-seeking have typically studied the contest model of Tullock (1980).[9] Our game shares some similarities as citizens also compete to be chosen by the leader in rent-seeking games (Lambsdorff, 2002). However, rather than an exogenous rule with expenditures monotonically increasing the probability of earning the fixed prize, it is the leader who has complete autonomy to allocate the prize. While both rent-seeking and corruption are typically assumed to generate deadweight losses, we excluded this feature from our design to minimize complexity. Following the results of Abbink et al. (2002), we hypothesized that deadweight losses would not significantly alter behavior.

While we conducted a one-shot version of the game with our participants, our interest is not purely with in-game decisions per se, but relates to how these decisions reflect the real dynamics between citizens and leaders. Due to the leader's central authority in their community, they are involved in many interactions with ordinary citizens. If citizens and leaders view the game as being similar to real life interactions, they may approach the game with the mentality that these interactions are repeated (Cardenas and Carpenter, 2005). In repeated interactions

[7] In addition to the benefits of ruling out profit-maximization as a motive for engaging in corruption, a further methodological advantage over the game of Gneezy et al. (2019) is that we do not require the use of context-specific real effort tasks (such as writing jokes or tasting fruit). The simple and standard format of our game makes it easy to be conducted in various settings. See Appendix A.1 for game scripts.

[8] Decisions in the game were described literally by either keeping the money or sending it to the leader. We confirmed during piloting that there were no negative associations with giving tokens to the leader.

[9] In these experiments individuals tend to over-compete relative to the Nash prediction (Sheremeta, 2018). These games are rarely linked to corruption, and behavior appears to be driven by preferences for winning competitions or by bounded rationality (Lim et al., 2014).

leaders may wish to cultivate a reputation of corruptibility using the language of Ryvkin and Serra (2012). Leaders are able to increase their long-term earnings through a culture of corruption, which more than offsets the immediate losses from selecting less productive citizens. Therefore, in the infinitely repeated version of the game, there are multiple equilibria with corruption (see Appendix B.1 for a discussion). For example, there exists an equilibrium in which three citizens send maximum bribes of 100 MT each, while all other citizens send zero. Assuming the leader's strategy is to reward whoever sends the largest bribe, then each of these citizens receives an expected payoff of 100 MT, with the non-corrupt citizens also receiving their private investment of 100 MT. The leader thus earns a per-period payoff of 300 MT. By cultivating a reputation of corruption in repeated interactions, the leader earns three times their static equilibrium payoff (the theoretical upper-bound), while citizens earn five-sixths of their analogous static expected payoff of 120 MT (Appendix B.1). Total welfare is identical, but the distribution is substantially more unequal in the equilibrium with corruption. Relating private investments to productive activities, the citizens being selected are no longer the most qualified.

2.1 Additional measurements

We supplement information about behavior in the corruption game with additional survey and behavioral measurements, summarized in this section. Additional information about these measurements can be found in Armand et al. (2020). Panel B in Table 1 presents descriptive statistics for these variables.

Survey measures. We have available survey measures about citizens, leaders, and the community. These were collected in three separate questionnaires. The household questionnaire was answered by the household head and included questions on the demographic traits of the respondent and his/her household, trust, public goods provision, assets, exposure to crime, as well as a Raven's test to proxy cognitive ability. The leader questionnaire had a similar structure. The community survey was completed by an individual (or group) which was knowledgeable about the community. For citizens, the main variables of interest are the self-reported attitudes in favor of bribes and trust in leaders. For leaders, the main variable of interest is on their views about whether accountability is supported by community.[10]

[10]For attitudes in favor of bribes, the survey question reads as follows: "Do you agree that the best way to overcome problems is to pay bribes?". For trust in leaders, the survey question reads as follows: "How much do you trust the leader in your village?". The survey question asked to measure accountability among leaders reads as follows: "Do you agree that the community in your village supports accountability for your decisions as leader?".

Behavioral measurements. We implemented a real-life behavioral measurement of the leader's corruption, often classified as a structured community activity (Casey et al., 2012). We observed whether leaders appropriated funds that had been set aside to cover refreshments and snacks for their citizens. Leaders were privately given 400 MT (US$6) and asked to purchase refreshments and snacks for community meetings. The size of these meetings was fixed across villages. Quantities and types of food items purchased were observed and recorded by enumerators during the meetings, and the cost of each item was inquired at the nearest store. Of the 400 MT, we observe actual expenditure by leaders, with the remainder recorded as *appropriation*. The vast majority of leaders (80%) appropriated a strictly positive amount of funds, while 14% were recorded as spending the exact amount.[11] Overall, appropriation was 27% on average, with 9% of leaders appropriating the full value. The remaining leaders who appropriated a positive amount typically did so by buying lower quantities of goods, noting that there was little variation in the price of goods across villages.

In addition, we conducted a variant of the classic trust game (Berg et al., 1995) between leaders and citizens. The trust game involved the same participants as in the corruption game. Each citizen received an endowment of 100 MT in the form of 10 tokens worth 10 MT each; leaders did not receive any endowment. Citizens had to decide to keep this income for themselves or send a portion to the leader. The funds sent to the leader were tripled and the leader had to decide how much to give back to the citizens. For the leader's decision, we used the strategy method: for every possible positive amount sent from 1 to 10 tokens (which became 3 to 30), the leader was asked how much he/she would like to send back. This was used to implement the outcome for each citizen, while the leader was paid for one random citizen's decision. The main variable of interest for citizens is the amount sent, while for leaders it is the share returned (averaged across the 10 conditional responses).[12] The average citizen gave 4.15 out of 10 tokens, while leaders returned on average 4.66 tokens (37%) when faced with a citizen who gave 4.15 (becoming 12.45) tokens.

[11] Six percent of leaders were recorded as spending more than the amount they were given, with a median amount over-spent of 10%. We re-coded these values as zero. Our results are robust to this transformation.

[12] We conducted three behavioral games with citizens: the corruption game, the trust game, and the public goods game. The order was randomized; results are robust to controlling for order. Outcomes were not revealed until after all games had been conducted. We do not focus on the public goods game because it does not involve the leader.

3 Results

In the corruption game, citizens sent on average 4.22 tokens as bribes to the leader (Panel B in Table 1). This substantially deviates from the prediction of zero corruption. Compared to the trust game, which involves similar dynamics and equilibrium predictions but does not involve competition among participants, citizens send slightly more tokens in the corruption game. Leaders' behavior is instead closer to the SPNE prediction: on average, leaders select a citizen who sent a bribe of 2.60 tokens. Consistent with these behaviors, leaders payoffs are extremely high (496 MT or US$7.5). In contrast, unlike giving in the trust game, bribery in the corruption game is a losing proposition. Citizens earned on average 81 MT (US$1.2), significantly less than their endowment of 100 MT.[13] Leaders earn *five times* their one-shot theoretically predicted payoff, while citizens earn less than two-thirds of theirs. If we consider the leader's maximum equilibrium payoff in case the game were infinitely repeated, the leader still earns 67% more than the theoretical upper bound of 300 MT.

Figure 1 presents the behavior in the corruption game in more detail by looking at distributions. Denoting the size of the bribe sent by a citizen to the leader as $b \in [0, 10]$, just under 9% of citizens send the predicted amount of $b = 0$ (highlighted by darker shading in Panel A). In contrast, 30% of leaders chose a citizen who sent $b = 0$. This underestimates the number of leaders choosing the SPNE action, as some leaders may not have had the option to choose it if no citizen sent $b = 0$. This situation happened in 50% of the communities. In total, 61% of leaders chose the SPNE action by selecting the minimum bribe available (highlighted by darker shading in Panel B), while 39% of leaders go against their direct material interest.

Citizens tend to overestimate the likelihood that leaders will choose individuals who send positive bribes and/or underestimate the extent of bribery by others. To verify this result, we examine (incentivized) data on beliefs about the level of the bribe the leader would choose. The vast majority of citizens projected that intermediate levels of tokens would be selected by the leader: the average belief is 4.6 tokens, similar to the average bribe sent. Only 13% of citizens selected one of the extremes of 0 or 10.

[13] Potential payoffs ranged from 0 to 310. Beyond the maximum payoff of the game of 300 MT, a bonus of 10 MT could be earned if the citizen had correct beliefs about the leader's decision. See Appendix A for the scripts.

3.1 Citizens' and leaders' behavior inside and outside the lab

Within the game, corruption depends on both citizens' willingness to engage in corruption by sending bribes, and leaders' willingness to engage in and reward corruption. We first assess the aggregate relationship between behavior in the corruption game and two key measures of leaders' preferences: corrupt behavior, as measured by appropriation, and trust game reciprocation. Figure 2 shows (unconditional) non-linear relationships between citizens' and leaders' behavior in the corruption game and leaders' appropriation outside the game (Panel A), and between citizens' and leaders' behavior in the corruption game and leader's reciprocation in the trust game (Panel B). This provides a first step to understanding who engages in corruption and whether bribery in the corruption game arises for all leaders or only for leaders at the extremes of both corrupt behavior and reciprocation in the trust game.

We observe a positive association between corruption game behavior and leaders' appropriation and reciprocity; this is true for the corruption game behavior of both citizens and leaders. In terms of appropriation, behavior in the corruption game by both citizens and leaders is relatively flat in the central part of the distribution, while it is steeper at the extremes. Bribery in the corruption game tends to be smaller for leaders that appropriate little, and much larger for leaders that appropriate most of the funds. While the relationship between bribery by citizens is linear in the leader's reciprocation in the trust game, the relationship between the bribe chosen by the leader and its reciprocation is mainly driven by leaders who return a very large share in the trust game.

To delve deeper into these relationships, Table 2 presents OLS regressions of the bribe sent by the citizen to the leader on attitudes and behavior gathered outside the game. We refer to measures of citizens' attitudes and behavior outside the game as *citizen variables*, and to measures of leaders' attitudes and behavior outside the game as *leader variables*.

Column (1) presents a specification without controls, column (2) adds controls for citizens' characteristics, and column (3) adds controls for leaders' characteristics. Citizens' and leaders' characteristics include gender, age, education, religion, ethnicity, household size, marital status and wealth. Citizens' controls also include a measure of cognitive ability proxied by the Raven's test score (Raven, 1936). Leaders' controls also include the leaders' time in power. Column (4) adds controls for community characteristics, which include an infrastructure index, a natural resource index, community size (measured by the number of tables in the polling

station), district fixed effects, and indicator variables for the treatment groups and the randomization strata studied in Armand et al. (2020). Finally, column (5) introduces community fixed effects, which absorb the leader variables. Results are robust to a wide variety of alternative specifications (Appendix B.2), and to conditioning on the aforementioned treatment groups (Appendix B.3).

Regarding the determinants of citizen bribery in the corruption game, contrary to expectations, citizens' accommodating attitudes toward paying bribes are not associated with bribery in the game. On the contrary, trust game giving is positively associated with sending bribes, significant at the 1% level. The magnitude is large: every additional token sent by citizens to their leaders in the trust game being associated with approximately one-third of an additional token given in bribes. The same is not true for the survey measure of trust (Section 3.2).[14]

While focusing on how leaders' attitudes and behavior outside the game affect citizens' bribe decisions in the game, we observe three main results. First, citizen bribery in the game is associated with the extent to which leaders engage in actual corruption. Leaders' appropriation of community funds is positive and significantly associated with citizen bribery. Column (4) shows that moving from no to full appropriation increases the bribe by 0.820, which corresponds to an increase of 19% as compared to the average bribe size.[15] This suggests that citizens are, on average, able to perceive how corrupt their leaders are, and consequently send more bribes to more corrupt leaders. Second, citizen bribery in the game is associated with trust game behavior of leaders: citizens send significantly more bribes to leaders who return more in the trust game, suggesting that expectation of reciprocation (trustworthiness) is an important factor in bribery decisions. The magnitude is comparable to the effect of the proportion appropriated. Third, citizens send significantly fewer bribes to leaders who believe accountability is supported by their community.

While we showed that citizens condition their bribe sending behavior on leaders' characteristics, we now ask whether these characteristics analogously predict leaders' choices. In

[14] Incentivized and survey measures of trust are positively related, but this relationship is only marginally significant (Appendix B.4). Most demographic variables are not significantly related to bribe decisions (Appendix B.5). An exception is gender: female citizens are more likely to send bribes (significant at the 10% level). In addition, we do not find a significant relationship between citizens' trust in their leader and their own willingness to accommodate bribes. Appendix B.6 investigates heterogeneous effects by citizens' degree of connectedness to the leader, as well as whether the leader is established or not.

[15] In Appendix B.7 we show that conditioning regressions on self-reported leader's attitudes towards corruption does not alter the results. There, we further include an investigation of potential alternative relationships with available secondary measures of corruption.

our setting, this analysis is more complex, owing to the fact that the choice set of leaders is determined by the citizens themselves. As citizens send more bribes to more corrupt leaders, this raises an issue for identification in the case of leader behavior in the game. We treat this analysis as more exploratory, and present the corresponding regressions in Appendix B.8.

Appendix Table B7 presents village-level regressions using the bribe chosen by the leader as dependent variable and leader variables as independent variables, including alternative sets of control variables. We find significant relationships between leaders' bribe choice and leader appropriation, trust game behavior, and accountability attitudes – analogous to those in Table 2. Given the concern that these relationships may be endogenous to the options presented by citizens, Appendix B.8 further discusses specifications that restrict the sample to the subset of leaders who selected an intermediate bribe (suggestive that the bribe chosen reflected these leaders' preferences). Though exploratory, these specifications suggest that leaders' characteristics may similarly influence both citizen and leader choices.[16]

3.2 Trust and corruption

The previous findings highlight a relationship between corrupt behavior and trust game behavior, for both citizens and leaders. Appendix B.9 summarizes behavior in the trust game and shows that citizens' behavior predicts their leaders' corruption. This relationship can have potential consequences in the communities, as corruption is associated with higher crime and lower public good provision (Appendix B.10). This suggests that trust games in certain contexts may involve a "dark-side" which could enable corrupt transactions. While corrupt behavior is widely perceived as harmful for development, trust is often viewed as enhancing investment and growth (Zak and Knack, 2001). Paradoxically, corrupt acts can require a high degree of reciprocal affect-based trust (Rose-Ackerman, 2001; Finan and Schechter, 2012). Previous literature has studied the relationship between trust and corruption, noting both that political corruption can decrease trust (Anderson and Tverdova, 2003), and low generalized trust may enable corruption (Uslaner, 2005). While Finan and Schechter (2012) show that politicians

[16] In an alternative approach, we study whether the bribe selected by the leader depends on the bribe sent by the citizens, and how this relationship differs depending on the leader's characteristics. We estimate specifications in which we use a dummy variable for whether the bribe sent by the citizen is selected by the leader as dependent variable, and the bribe sent by citizen interacted with leader characteristics as independent variables. Appendix Table B9 shows that, conditional on community fixed effects, the bribe sent by the citizen is significant, but among interaction terms, only the interaction with the share returned by the leader in the trust game is significantly different from zero.

broadly target reciprocal voters in vote-buying, we find that citizens send more bribes to specific leaders who are more reciprocal.

By contrast, we do not find any significant association using the self-reported measure of trust in leaders, which holds true whether or not we control for trust game behavior (Appendix B.2). Behavior in the corruption game is also more robustly associated with leaders' appropriation as compared with trust game behavior. Citizens send significantly more in the trust game to leaders that appropriate more outside the game and have more corrupt attitudes (Appendix Table B10). These associations are diminished by conditioning on behavior in the corruption game, while they continue to be significant for leaders' appropriation. These results are in line with the literature highlighting differences between survey and incentivized measures of trust. Survey measures might be capturing different dimensions of trust, such as "trustworthiness" or expectations about others' behavior (Glaeser et al., 2000; Sapienza et al., 2013), while sender behavior in the trust game may also be motivated by other considerations, such as risk-aversion or altruism (Cox, 2004; Schechter, 2007).

4 Conclusion

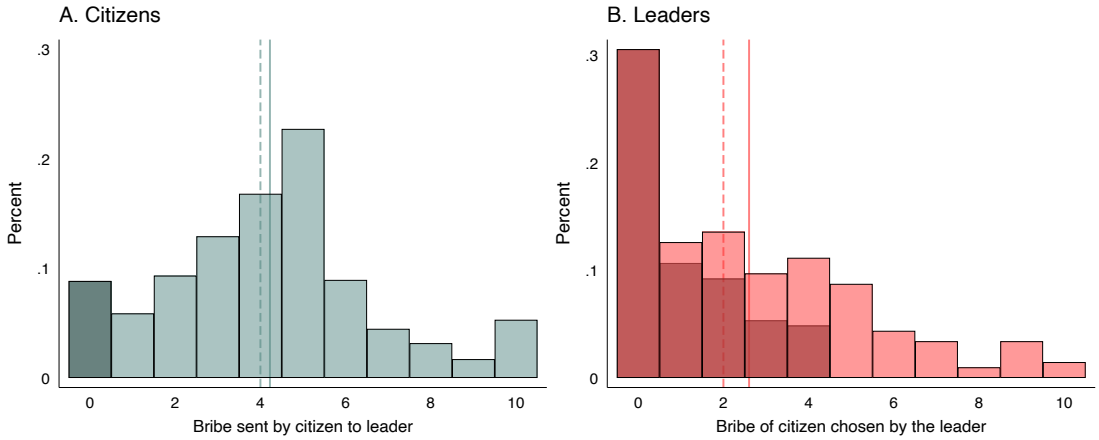
This paper introduces a novel corruption game in a setting in which citizens play with their actual political leaders. The game is simple to implement and understand: the SPNE predicts that there will be no corruption in any one-shot game. However, this prediction is not borne out in the data. In addition, citizens' bribery in the game is strongly predicted by their *leader's* corrupt behavior, measured by a behavioral observation of appropriation of community funds. Most importantly, beyond the variation we document in leaders' propensity to engage in corrupt behavior, is our key result that citizens are correctly able to anticipate it within the context of the game. The resulting outcome is a large transfer of wealth from citizens to their leaders, with leaders earning five-times their equilibrium predicted payoff.

We also record a novel important relationship between one dimension of trust and corruption, suggesting that the type of reciprocity measured by the trust game can also enable corruption. This finding also highlights a potential warning for social scientists using trust games. Because survey measures of trust are not positively associated with corruption, diversifying the measurement of trust can address these concerns. While the literature on trust has typically focused on its positive benefits, our results suggest that they may also capture corrupt

relationships.

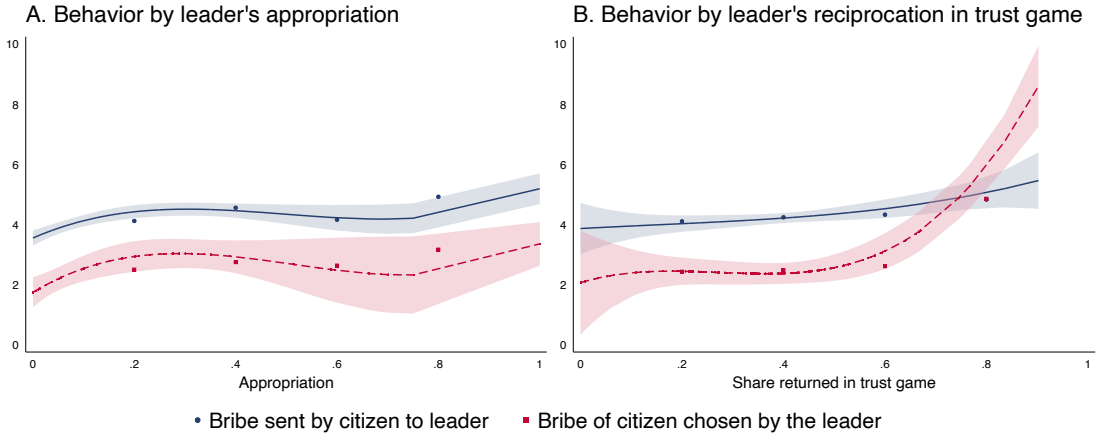
Sensitive measures of corrupt behavior by leaders can be captured through simple and appropriately designed lab-in-the-field games. This is critical for measuring and understanding corruption at the local level, particularly in areas with low levels of transparency and less developed institutions, where traditional survey methods may fundamentally suffer from reporting bias. While we highlight negative associations between corruption and community outcomes, the extent to which such corruption is harmful for local development remains an important unanswered question.

Figure 1: Bribery in the corruption game



Note. Panel A shows the distribution of the number of tokens sent by citizens to the leader as bribe ($N = 2060$). Panel B shows the distribution of the number of tokens sent by citizens as bribes restricting to individuals chosen by leaders ($N = 206$). The share choosing the SPNE actions is reported with darker shading. The vertical lines indicate the sample mean (solid line) and the median (dashed line). Details about the game are provided in Section 2. The scripts are provided in Appendix A.1.

Figure 2: Behavior in the corruption game, by leaders' corrupt behavior and reciprocation



Note. Panel A shows a cubic fit between citizen's and leader's behavior in the corruption game and appropriation, i.e., the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity. Panel B shows a cubic fit between citizen's and leader's behavior in the corruption game and the share returned by the leader in the trust game. *Bribe sent by citizen to leader* is the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. *Bribe of citizen chosen by the leader* is the number of tokens sent by citizens as bribes restricting to individuals chosen by leaders, ranging from 0 (citizen chosen gave no bribe) to a maximum of 10. Details about the game are provided in Section 2. Confidence intervals are built assuming a 90% confidence level and assuming standard errors clustered at the community level in Panel A and robust standard errors in Panel B. Point and squares are averages of the corresponding variables computed in equally spaced intervals of the horizontal axis.

Table 1: Descriptive statistics

	Mean	Std. dev.	Percentiles		N
			1st	99th	
	(1)	(2)	(3)	(4)	(5)
A. Demographics					
Citizens					
Female	0.28	0.45	0.00	1.00	2052
Age	45.94	15.71	20.00	85.00	2052
Primary education	0.65	0.48	0.00	1.00	2052
Secondary or higher education	0.12	0.33	0.00	1.00	2052
Muslim	0.56	0.50	0.00	1.00	2052
Macua ethnic group	0.63	0.48	0.00	1.00	2052
Household members	5.97	2.90	1.00	14.00	2052
In monogamous relationship	0.74	0.44	0.00	1.00	2052
Wealth index	0.28	0.14	0.07	0.60	2052
Raven's test score	5.01	2.36	0.00	10.00	2052
Leaders					
Female	0.02	0.15	0.00	1.00	206
Age	55.46	9.86	32.00	77.00	206
Primary education	0.75	0.43	0.00	1.00	206
Secondary or higher education	0.20	0.40	0.00	1.00	206
Muslim	0.58	0.49	0.00	1.00	206
Macua ethnic group	0.66	0.48	0.00	1.00	206
Household members	6.54	3.34	2.00	17.00	206
In monogamous relationship	0.78	0.42	0.00	1.00	206
Wealth index	0.39	0.13	0.13	0.67	206
Number of years in power	9.81	8.92	1.00	40.00	206
B. Behavioral and survey attitudes					
Citizens					
Corruption game: bribe sent to leader	4.22	2.49	0.00	10.00	2060
Corruption game: payoff	81.41	77.13	0.00	310.00	2060
Accommodates bribes	0.21	0.41	0.00	1.00	2042
Amount sent in trust game	4.15	2.26	0.00	10.00	2060
High trust in leaders	0.63	0.48	0.00	1.00	2052
Leaders					
Corruption game: bribe chosen by leader	2.60	2.62	0.00	10.00	206
Corruption game: payoff	496.31	124.83	230.00	820.00	206
Appropriation	0.27	0.29	0.00	1.00	205
Share returned in trust game	0.37	0.16	0.00	0.84	206
Accountability	1.51	0.76	0.00	2.00	205
Accommodates bribes	0.14	0.35	0.00	1.00	206

Note. Summary statistics of demographic, as well as behavioral and survey attitudes for citizens and leaders. Demographics are obtained from surveys. There are 8 cases for which we do not have survey data for the participants in the games. Variables for citizens' demographics present missing values ranging from 0 to 0.7% of observations, depending on the variable. For these variables, we impute missing values with the median value in the community. The wealth index is computed as the average of 15 indicator variables for whether the household owns a radio, a television, a bicycle, a motorbike, a car, a fishing boat, a fishing net, an electric or gas oven, an oven for bread, a typical coal oven, a fridge, a bed, a table, a cell phone, and a watch. The index is rescaled to be between 0 (lowest) and 1 (highest). Behavioral and survey attitudes are defined as follows: *bribe sent to the leader* and *payoff* are the number of tokens sent by the citizen to the leader in the corruption game and the citizen's final payoff; *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the respondent (the citizen or the leader) reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting the leaders in their community "a lot" (highest of four options), and 0 otherwise; *bribe chosen by the leader* and *payoff* are the number of tokens sent by the citizen that is chosen by the leader in the corruption game and the leader's final payoff; *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity; *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). Details about the game and the variables are provided in Section 2. The scripts of the games are provided in Appendix A.1.

Table 2: Behavior in the corruption game

	Dep. variable: bribe sent by citizen to leader				
	(1)	(2)	(3)	(4)	(5)
A. Citizen variables					
Accommodates bribes	-0.054	-0.032	-0.038	-0.017	0.057
	(0.135)	(0.139)	(0.140)	(0.131)	(0.147)
Amount sent in trust game	0.324***	0.321***	0.316***	0.303***	0.257***
	(0.032)	(0.031)	(0.032)	(0.032)	(0.036)
High trust in leaders	-0.048	-0.010	0.005	0.016	-0.073
	(0.106)	(0.108)	(0.107)	(0.111)	(0.116)
B. Leader variables					
Appropriation	0.990***	0.911***	0.897***	0.820***	
	(0.276)	(0.275)	(0.269)	(0.305)	
Share returned in trust game	1.149**	0.986*	0.859*	0.869*	
	(0.512)	(0.503)	(0.507)	(0.494)	
Accountability	-0.268**	-0.258**	-0.275**	-0.237**	
	(0.110)	(0.105)	(0.110)	(0.106)	
Observations	2022	2022	2022	2022	2022
R^2	0.131	0.139	0.149	0.163	0.320
Citizen controls	-	Yes	Yes	Yes	Yes
Leader controls	-	-	Yes	Yes	-
Community controls	-	-	-	Yes	-
Community fixed effects	-	-	-	-	Yes

Note. Results based on OLS regressions at citizen level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is defined as the number of tokens sent by the citizen to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity; *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1. The number of observations differs from the total number of participants in the corruption game (N =2060) due to missing data in the independent variables.

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ONLINE APPENDIX

Measuring corruption in the field using behavioral games

Alex Armand, Alexander Coutts, Pedro C. Vicente, Inês Vilela

A Game scripts

This section provides the translation of the original instructions for the corruption game (Appendix A.1) and the trust game (Appendix A.2). Scripts are translated from the local languages used in the implementation of the game.

A.1 Corruption game

The participants are 10 citizens and the leader. Everyone must be seated individually, with two small bags [numbered inside]: one green and one blue. The leader must not be able to identify the numbers of the individuals. The materials necessary for the game are 10 beans for each citizen (that will be used for the decision made by each participant), 10 beans for each citizen (that will be used to capture beliefs for each participant), 10 green bags and 10 blue bags (for choices), and 10 brown bags (for beliefs).

The script for **Part I** of the game is the following:

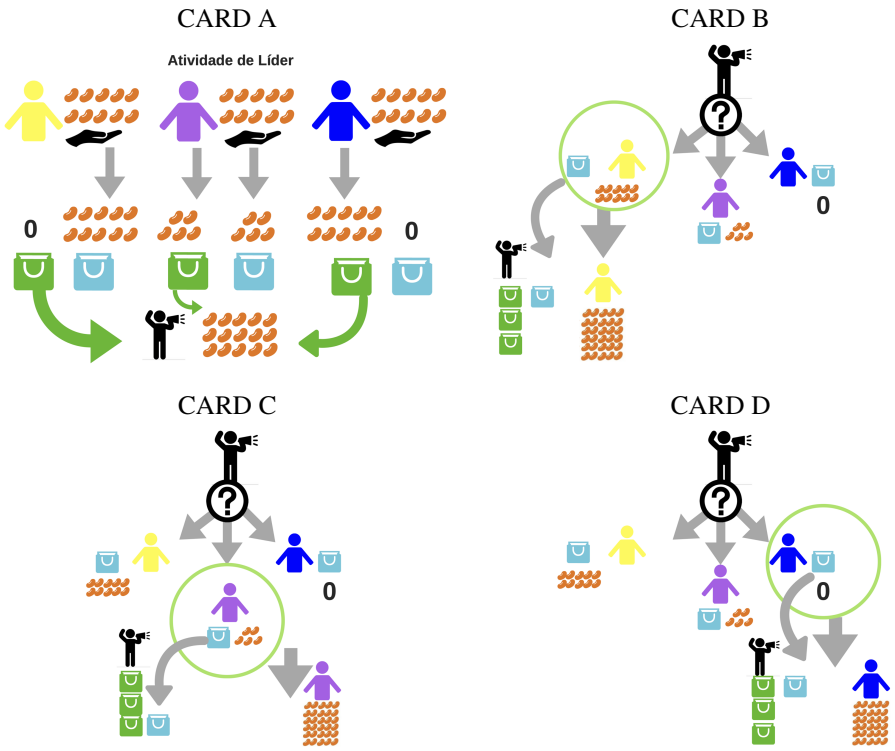
> All 10 participants will be doing the same activity today. You will notice the leader is present as well, he will participate, but he will have to make different decisions from you. You will all been given 10 beans. Each bean is worth 10 MT. Therefore, you have a total of 100 MT. You have two bags: one green and one blue. All the beans you put in the blue bag will be yours to keep. All the beans you put in the green bag will go to the leader.
>
> You can choose to put in the green and blue bags any combination of beans, but you must use all 10 beans. ALL decisions must be taken in private. No one, including us, will know how you decided. The final decisions will be analyzed by another enumerator who does not know who you are.
>
> After your choice, the leader is going to make an important decision. The leader will know how many beans are in each pair of blue and green bags. He will know that he will keep all the beans put by all citizens in the green bags.
>
> The leader must choose ONE person and will get all the beans in their blue bag. That person will receive 300 MT for being chosen. All other participants who were not chosen will earn the amount they kept in their blue bags.

There are two ways to earn money in this activity: 1) keep beans in the blue bag (10 MT for each bean); 2) be chosen by the leader (300 MT).

The leader receives more money in this activity when there are more beans in the green bags. After the leader observe the content of the bags, he will earn more money if he chooses a person who puts more in the blue bag. If you want to be chosen by the leader, you have to decide how the leader will choose. There is no right or wrong answer. Are there any questions?

To show you how the game works, we will do a short example. Remember you can allocate the beans the way you prefer, the example is just for understanding better the tasks. [For the example, we made use of *visual cards* depicted in Figure A1]

Figure A1: Visual help used in the corruption game



Let's imagine the three of us are playing this activity. *Person 1* puts 0 beans in the green bag. How many in the blue bag? Answer: 10. This means person 1 keeps 100 MT for himself, and doesn't give any to the leader. *Person 2* puts 5 beans in the green bag. How many in the blue bag? Answer: 5. This means person 1 keeps 50 MT for himself, and gives 50 MT to the leader. *Person 3* puts 10 beans in the green bag. How many in the blue bag? Answer: 0. This means person 1 keeps 0 MT for himself, and gives 100 MT to the leader.

How much will the leader have? Answer: 15 beans = 150 MT. Whoever the leader chooses, the leader will receive the beans in their blue bag. That person will instead receive 300 MT. If the leader chooses person 1, he will receive an extra 100 MT, 250 MT total, and person 1 receives 300. If the

leader chooses person 2, he will receive an extra 50 MT, 200 MT total, and person 2 receives 300. If the leader chooses person 3, he will not receive any extra MT, 150 MT total, while person 3 receives 300. Remember your decisions are private, and you should not reveal them to anyone. Are there any questions?

The script for **Part II** of the game is the following:

The leader should leave now. You can start the activity after all questions have been answered. After all participants have made their decisions and the bags have been collected, the game continues.

Now, we will add one extra task to this activity. We want you to estimate how the leader will make his choice. To do so, we are giving you a brown bag and 10 new beans. You have to estimate how many beans will be in the blue bag of the person the leader will chose. We will collect the bags and then the enumerator in the other room will check how many beans were in the blue bag of the person the leader actually chose. If you estimated correctly the number, you will earn a bonus of 10 MT. Are there any questions?

A.1.1 Suggested implementation notes:

Note 1: Independence of leader decisions:

For our implementation we had enumerators enter the number of beans placed by citizens in their bags, on a tablet. The leader then saw these numbers, and selected an amount corresponding to the citizen(s) they wanted to choose.[2]

When implementing this game **we recommend** that the leader is shown *all* possible options *independent of citizens' choices* and then told to select their most preferred choice. In the event their most preferred choice is not available (e.g. they choose a citizen who sent a bribe of 3, but there happen to only be citizens who sent 2 or 4), the citizen sending the next closest amount should be selected. If (as in this example) multiple citizens are equally distant from the leader's preferred choice, then the chosen citizen should be selected at random from these citizens. This process should also be public information for all participants.

Note 2: Deadweight loss variation:

In addition to the primary game, one can play a variation which involves a deadweight loss to corruption. In this version, if a citizen chooses to send any strictly positive amount to the leader, this requires a fixed cost (e.g. 5% of the endowment).

[2] In the event more than one citizen sent an amount chosen by the leader, the tablet randomly selected one citizen.

A.2 Trust game

The participants are 10 citizens and the leader. Everyone must be seated individually, with two small bags [numbered inside]: one green and one blue. The leader must not be able to identify the numbers of the individuals. The materials necessary for the game are 10 beans for each citizen (that will be used for the decision made by each participant), 15 beans for each citizen (that will be used for the beliefs of each participant), 10 green bags and 10 blue bags (for choices), and 10 brown bags (for beliefs).

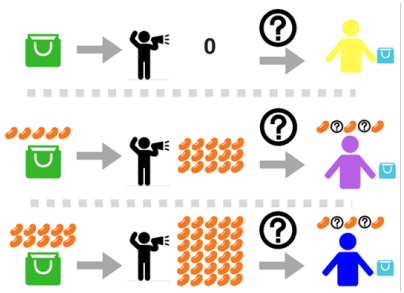
The script for **Part I** of the game is the following:

> Every participant will be doing the same activity today. You will notice the leader is present as well, he will participate, but he will have to make different decisions as compared to you. You will all been given 10 beans. Each bean is worth 10 MT. Therefore, you have a total of 100 MT. You will also have two bags: one green and one blue. All the beans you put in the blue bag will be yours to keep. All the beans you put in the green bag will go to the leader.
>
> You can choose to put in the green and blue bags any combination of beans, but you must use all 10 beans. ALL decisions must be taken in private. No one, including us, will know how you decided. The final decisions will be analyzed by another enumerator who does not know who you are.
>
> The beans that go to the leader (in the green bags) are going to be tripled. Next the leader will decide how many of these beans, if any, he would like to return to you. Remember the leader does not know your identity. Your earnings will be all of the beans you kept in the blue bag plus the beans the leader returns to you. The leader will make all decisions, but will only be paid for one of them, that will be chosen by chance.
>
> There are two ways to earn money in this activity: 1) keep beans in the blue bag (10 MT for each bean); 2) put beans in the green bag and observe if the leader will return some. There is no right or wrong answer. Are there any questions?
>
> To show you how the game works, we will do a short example. Remember you can allocate the beans the way you prefer, the example is just for understanding better the tasks. [For the example, we made use of *visual cards* depicted in Figure A2]
>
> Let's imagine the two of us are playing this activity with the leader. *Person 1* puts 0 beans in the green bag. How many in the blue bag? Answer: 10. This means person 1 keeps 10 beans for himself, and does not give any to the leader. How much does person 1 earn? Answer: 100 MT. *Person 2* puts 5 beans in the green bag. How many in the blue bag? Answer: 5. This means person 2 keeps 5 beans for himself, and gives 5 beans to the leader. Those 5 beans that go to the leader are tripled, to become? Answer: 15 beans. Then the leader must decide how much out of 15 beans to give back. If the leader returns 0 beans, how much will person 2 earn? Answer: 5 beans = 50 MT.

Figure A2: Visual help used in the trust game

CARD A

CARD B



How much will the leader earn? Answer: 15 beans = 150 MT. If the leader returns 10 beans, how much will person 2 earn? Answer: 15 beans = 150 MT. How much will the leader earn? Answer: 5 beans = 50 MT. Remember your decisions are private and you should not reveal them to anyone. Are there any questions?

The script for **Part II** of the game is the following:

The leader should leave now. You can start the activity after all questions have been answered. After all participants have made their decisions and the bags have been collected, the game continues.

Now, we will add one extra task to this activity. Imagine that someone sent 5 beans, tripled to 15 beans. We want you to estimate how much you think the leader will send back out of the 15 beans (150 MT). We are giving you a brown bag and 15 new beans. You have to estimate how many beans the leader will send back from 0 to 15 by introducing them in the brown bag. We will collect the bags and then the enumerator in the other room will check how much the leader actually sent back. If you estimated correctly the number, you will earn a bonus of 10 MT. Are there any questions?

B Additional analysis

B.1 The repeated corruption game

In this section, we consider an infinitely repeated version of the corruption game, where all players have discount factors $\delta \in (0, 1)$. In this version of this game, the best-responses of the one-shot game continue to lead to a subgame-perfect Nash equilibrium (SPNE), the equilibrium without corruption. However there are additional equilibria, involving corruption.

Consider only pure strategies and denote bribes from citizens by b. Note that the minimum

average payoff of citizens in any equilibrium is 100, which they can guarantee by setting $b = 0$. Due to the zero-sum nature of bribes, this also fixes the leader's maximum average payoff at 300 (which would mean the leader is able to appropriate the full surplus deriving from the bonus). Here we illustrate only one such equilibrium, although there are many. In this equilibrium three citizens send $b = 10$ bribes, while the remaining seven send $b = 0$. The leader's strategy is always to choose the player who sends the highest bribe, randomizing for ties. The payoff to these three citizens is then 100 in expectation $\left(\frac{300}{3}\right)$. The payoff to each of the other seven is their private investment of 100. As can be seen, there is no profitable deviation for citizens. The bribing citizens would stand to gain nothing (or would lose) from sending fewer bribes. The non-bribing citizens could only earn the bonus by sending $b = 10$, but then their payoff would be lowered to $\frac{300}{4} = 75$.

We thus know the citizens are playing best responses. But what about the leader? Assume that citizens play a grim-trigger strategy, where any deviation of the leader to not choosing the highest bribe results in citizens choosing to forever send zero bribes. In this case the leader's continuation payoff from not deviating is: $300 + \delta 300 + \delta^2 300 + ...$.

And the leader's continuation payoff from deviating is: $400 + \delta 100 + \delta^2 100 + ...$.

The leader will not deviate so long as:

$$400 + 100(1 + \delta + \delta^2 + ...) \leq 300(1 + \delta + \delta^2 + ...)$$
$$400 \leq 200\frac{1}{1-\delta}$$
$$\delta \geq \frac{1}{2}$$

Note that in this equilibrium the leader makes 300 per period, while all ten citizens make 100 in expectation. There are equilibria where the leader earns less, e.g., another equilibrium is for only two citizens to send $b = 10$, and in this case the leader receives an average of 200 per period. There are also equilibria which involve more citizens giving bribes, although these involve a different strategy from leaders (e.g., there exists an equilibrium where five citizens send $b = 5$, with the others sending $b = 0$, and the leader only rewards citizens sending $b = 5$. In this equilibrium the citizens also earn 100 in expectation, while the leader earns 300. In the no bribery equilibrium, the leader makes 100, and all 10 citizens make in expectation $\frac{9 \cdot 100 + 300}{10} = 120$.

To summarize, there are multiple equilibria in the repeated game which involve corruption. In the unique equilibrium with no corruption, the distribution of payoffs approaches equality (with all citizens receiving the same amount). In the most favorable equilibrium for the leader, the leader will receive the theoretical maximum equilibrium payoff of 300, triple the amount received by the average citizen, corresponding to the minimum equilibrium payoff of 100.

B.2 Alternative specifications

Table B1 presents alternative specifications as compared to our main estimates presented in Table 2. To show robustness of partial correlations, we examine specifications where the studied variables are separately added to the estimating equation. All regressions include citizen, leader, and community controls. The specification in column (12) in Table B1 corresponds to the specification estimated in column (4) in Table 2.

Table B1: Citizen behavior in the corruption game: alternative specifications

	Dep. variable: bribe sent by citizen to leader											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Citizen variables												
Accommodates bribes	-0.184	-0.130	-0.056	-0.016							-0.057	-0.017
	(0.132)	(0.131)	(0.132)	(0.131)							(0.132)	(0.131)
Amount sent in trust game			0.315***	0.303***	0.317***	0.304***	0.316***	0.304***			0.315***	0.303***
			(0.033)	(0.032)	(0.032)	(0.032)	(0.033)	(0.032)			(0.033)	(0.032)
High trust in leaders							0.036	0.026	0.082	0.070	0.029	0.016
							(0.109)	(0.110)	(0.113)	(0.113)	(0.110)	(0.111)
B. Leader variables												
Appropriation		1.041***		0.821***		0.807***		0.806***		1.024***		0.820***
		(0.333)		(0.305)		(0.304)		(0.304)		(0.333)		(0.305)
Share returned in trust game		0.976*		0.869*		0.874*		0.874*		0.988*		0.869*
		(0.571)		(0.494)		(0.493)		(0.493)		(0.569)		(0.494)
Accountability		-0.278**		-0.237**		-0.240**		-0.240**		-0.280**		-0.237**
		(0.109)		(0.106)		(0.105)		(0.105)		(0.109)		(0.106)
Observations	2042	2022	2042	2022	2052	2032	2052	2032	2052	2032	2042	2022
R^2	0.077	0.097	0.149	0.163	0.148	0.162	0.148	0.162	0.075	0.095	0.149	0.163
Citizen controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Leader controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Results based on OLS regressions at the citizen level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is the number of tokens sent by the citizen to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game (Section 2); *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game (Section 2); *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1.

B.3 Effect of randomized interventions on behavior in the corruption game

Table B2 shows estimates of treatment effects on citizens' and leaders' behavior in the corruption game. We condition on citizen and leader variables because the interventions had a significant effect on appropriation (Armand et al., 2020), which is also an important determinant of behavior in the game. The results show that, on average, the leader treatment has no effect on the behavior in the corruption game.

Table B2: Behavior in the corruption game: effect of information campaigns

	Dep. variable: bribe sent by citizen to leader				
	(1)	(2)	(3)	(4)	(5)
A. Randomized interventions					
Leader treatment	0.289	0.342	0.353	0.349	0.195
	(0.258)	(0.246)	(0.239)	(0.233)	(0.208)
Community treatment	0.160	0.187	0.202	0.170	0.140
	(0.231)	(0.223)	(0.214)	(0.206)	(0.185)
B. Citizen variables					
Accommodates bribes					-0.023
					(0.131)
Amount sent in trust game					0.305***
					(0.033)
High trust in leaders					0.021
					(0.110)
C. Leader variables					
Appropriation					0.728**
					(0.314)
Share returned in trust game					0.756
					(0.515)
Accountability					-0.254**
					(0.104)
Observations	2060	2052	2052	2052	2022
R^2	0.002	0.025	0.041	0.071	0.159
Citizen controls	-	Yes	Yes	Yes	Yes
Leader controls	-	-	Yes	Yes	Yes
Community controls	-	-	-	Yes	Yes

Note. Results based on OLS regressions. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is defined as the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. In Panel A, *randomized interventions* refer to indicator variables for treatments of Armand et al. (2020). In Panel B, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel C, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of citizen and leader controls is provided in Table 1. Community controls include an infrastructure index, a natural resource index, community size (measured by the number of tables in the polling station), district fixed effects, and indicator variables for the randomization strata studied in Armand et al. (2020).

B.4 Incentivized versus self-reported trust

Table B3 presents OLS regressions of citizens' and leaders' behavior in the trust game on citizens' self-reported trust in leaders.

Table B3: Incentivized versus self-reported trust

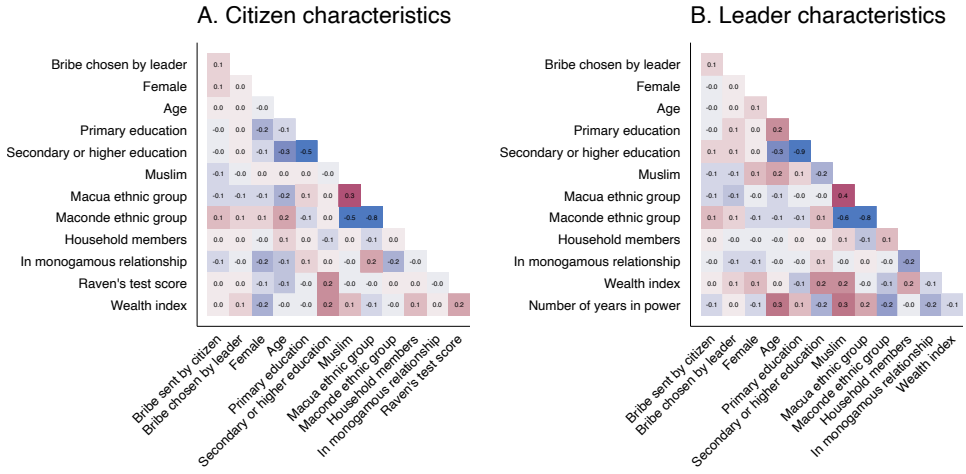
Dep. variables:	**Amount sent in trust game**			**Share returned in trust game**		
	(1)	(2)	(3)	(4)	(5)	(6)
High trust in leaders	0.207*	0.240**	0.143			
	(0.109)	(0.105)	(0.100)			
High trust in leaders (avg)				0.075	0.121**	0.077
				(0.053)	(0.061)	(0.069)
Observations	2052	2052	2052	206	206	206
R^2	0.002	0.041	0.116	0.007	0.158	0.267
Citizen controls	-	Yes	Yes	-	Yes	Yes
Leader controls	-	Yes	Yes	-	Yes	Yes
Community controls	-	-	Yes	-	-	Yes
Level of analysis	Citizen	Citizen	Citizen	Leader	Leader	Leader

Note. Results based on OLS regressions at the citizen level in columns (1)–(3), and at the leader level in columns (4)–(6). In columns (4)–(6), independent variables measured at the citizen level are averaged at the community level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. Dependent variables are defined by column: (1)–(3) the amount sent by the citizen to the leader in the trust game (Section 2); (3)–(6) proportion returned by the leader in the trust game (Section 2). *High trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. The full list of controls is provided in Section 3.1.

B.5 Behavior in corruption game and observable characteristics

Figure B1 presents partial correlations between citizen's and leader's behavior in the corruption game with observable characteristics. Panel A shows correlations with citizen's characteristics, while Panel B shows correlations with leader's characteristics.

Figure B1: Behavior in the corruption game and observable characteristics



Note. Behavior in the corruption game is measured by: *corruption game* refers to: *bribe sent by citizen* is the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10; *bribe chosen by leader* is the number of tokens sent by the citizen that is chosen by the leader in the corruption game, ranging from 0 (citizen chosen gave no bribe) to a maximum of 10. Observable characteristics are from surveys (see Section 2.1).

B.6 Heterogeneity by connectedness and power

Here we further analyze whether behavior is reflecting citizens' private information about their leader, measured by whether the citizen personally knows the leader, and by whether the leader is an established leader, measured by the time in power being equal or larger than the sample median of 7 years. Table B4 provides estimates in line with Table 2 restricting the sample according to these dimensions.

Citizens' behavior in the trust game significantly predicts behavior in the corruption game among both connected and non-connected citizens, and for both established and non-established leaders. However, the leader's corrupt behavior and reciprocity in the trust game robustly predicts bribery by citizens in the corruption game only among those not connected to their leaders. One potential explanation is that the behavior of citizens is not driven by private information about the leader, but is driven by a desire to gain favors from a leader that they do not know personally.[3] However, we are unable to rule out other explanations.

Apart from real-life leaders' corruption, we also observe differences for citizen's behavior according to whether the leader is established or not. Specifically, the leader's behavior in the

[3] Although bribe decisions were anonymous, this could occur if citizens behave as-if their interactions will be repeated due to real-life relationships, or if there is post-game communication that we do not observe (talk may not be cheap; e.g. if individuals are averse to lying, or can partially signal behavior due to the lack of anonymity at the group level).

corruption game relates to leader's characteristics outside the game more strongly among not-established leaders. This could suggest that citizens may anticipate greater benefits to reacting to the characteristics of these less established leaders.

Table B4: Connectedness and power

	Dep. variable: bribe sent by citizen to a [...] leader			
	Not connected	Connected	Not established	Established
	(1)	(2)	(3)	(4)
A. Citizen variables				
Accommodates bribes	-0.261	0.060	-0.140	0.197
	(0.221)	(0.176)	(0.157)	(0.255)
Amount sent in trust game	0.282***	0.344***	0.261***	0.371***
	(0.049)	(0.041)	(0.047)	(0.046)
High trust in leaders	-0.035	0.016	0.071	-0.074
	(0.167)	(0.136)	(0.152)	(0.152)
B. Leader variables				
Appropriation	1.402***	0.541*	1.174***	0.632*
	(0.376)	(0.300)	(0.407)	(0.352)
Share returned in trust game	1.681**	0.340	1.800***	-0.118
	(0.709)	(0.546)	(0.680)	(0.841)
Accountability	-0.229	-0.303***	-0.251*	-0.306*
	(0.147)	(0.113)	(0.145)	(0.159)
Observations	815	1207	1073	949
R^2	0.149	0.177	0.146	0.189
Citizen controls	Yes	Yes	Yes	Yes
Leader controls	Yes	Yes	Yes	Yes
Community controls	Yes	Yes	Yes	Yes

Note. Results based on OLS regressions at the citizen level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is defined as the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. Column (1) restricts the sample to citizens that do not personally know the leader (not connected leader), and column (2) to citizens that personally know the local leader (connected leader), using network data among citizens (see Armand et al., 2020 for details). Column (3) restricts the sample to leaders that are not established (i.e. in power for less than 7 years, which corresponds to the sample median), while column (4) restricts the sample to leaders that are established. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1.

B.7 Alternative measures of corruption

Table B5 presents analogous analysis to Table 2, but conditioning on the survey measure on whether the leader holds favorable attitudes towards paying bribes (accommodate bribes), in addition to the incentivized measure of appropriation. Alternatively, replacing appropriation with the survey measure leads to comparable results. Alternatively, Table B6 presents instead estimates of the specification presented in column (4) of Table 2 replacing the measure of appropriation with or controlling for alternative potential measures of corruption studied in Armand et al. (2020). The following variables are used in the table. *Elite decided about use* is an indicator variable equal to 1 if the elite decided about use in the zinc roof tiles SCA, and 0 if the decision was made by the community. Information is self-reported by the leader. *Private use* is an indicator variable equal to 1 if the zinc roof tiles were used for individual purposes in the zinc roof tiles SCA, and 0 if the tiles were used for the community or not used yet. Use is observed and recorded by enumerators at endline. *Average Raven's scores* is the average score on Raven's test performed by individuals chosen by the leader in the taskforce SCA. Information is recorded by enumerators implementing the activity. *Preference for mid-performers* is an indicator variable equal to 1 if the community is in the 2nd, 3rd, or 4th quintiles of the sample distribution of the difference between the average Raven's scores of individuals chosen by the leader in the taskforce SCA, and of representative individuals selected for the survey in the same community. Information is recorded by enumerators implementing the activity. *Preference for men* is the percentage of men chosen by the leader in the taskforce SCA. Information is recorded by enumerators implementing the activity. Detailed information about these variables is reported in Armand et al. (2020).

Table B5: Behavior in the corruption game controlling for leaders' attitudes

	Dep. variable: bribe sent by citizen to leader					
	(1)	(2)	(3)	(4)	(5)	(6)
A. Citizen variables						
Accommodates bribes	-0.060	-0.052	-0.054	-0.017	-0.050	-0.024
	(0.134)	(0.130)	(0.135)	(0.131)	(0.135)	(0.130)
Amount sent in trust game	0.328***	0.305***	0.324***	0.303***	0.316***	0.298***
	(0.032)	(0.033)	(0.032)	(0.032)	(0.032)	(0.033)
High trust in leaders	-0.059	0.025	-0.048	0.016	-0.043	0.018
	(0.105)	(0.110)	(0.106)	(0.111)	(0.106)	(0.110)
B. Leader variables						
Accommodates bribes	0.632***	0.568***			0.510***	0.508***
	(0.188)	(0.178)			(0.184)	(0.168)
Appropriation			0.990***	0.820***	0.875***	0.742**
			(0.276)	(0.305)	(0.278)	(0.298)
Share returned in trust game	1.050**	0.827*	1.149**	0.869*	1.222**	0.912*
	(0.506)	(0.477)	(0.512)	(0.494)	(0.511)	(0.483)
Accountability	-0.315***	-0.253**	-0.268**	-0.237**	-0.266**	-0.238**
	(0.112)	(0.105)	(0.110)	(0.106)	(0.110)	(0.106)
Observations	2032	2032	2022	2022	2022	2022
R^2	0.126	0.161	0.131	0.163	0.136	0.166
Citizen controls	-	Yes	-	Yes	-	Yes
Leader controls	-	Yes	-	Yes	-	Yes
Community controls	-	Yes	-	Yes	-	Yes

Note. Results based on OLS regressions at the citizen level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is defined as the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the leader reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity; *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1.

Table B6: Behavior in the corruption game: alternative measures of leader's corruption

	Dep. variable: bribe sent by citizen to leader									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Citizen variables										
Accommodates bribes	-0.034	-0.002	-0.043	-0.015	-0.045	-0.015	-0.054	-0.022	-0.048	-0.019
	(0.131)	(0.131)	(0.131)	(0.132)	(0.130)	(0.131)	(0.131)	(0.132)	(0.130)	(0.131)
Amount sent in trust game	0.310***	0.302***	0.310***	0.302***	0.306***	0.300***	0.310***	0.303***	0.311***	0.303***
	(0.033)	(0.033)	(0.032)	(0.032)	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)
High trust in leaders	0.028	0.022	0.020	0.014	0.034	0.026	0.031	0.021	0.016	0.011
	(0.110)	(0.110)	(0.110)	(0.111)	(0.109)	(0.110)	(0.109)	(0.110)	(0.110)	(0.110)
B. Leader variables										
Appropriation		0.834***		0.803***		0.769**		0.805***		0.764**
		(0.304)		(0.307)		(0.301)		(0.303)		(0.314)
Share returned in trust game	0.805	0.892*	0.770	0.867*	0.735	0.791	0.805*	0.879*	0.843*	0.908*
	(0.490)	(0.497)	(0.495)	(0.498)	(0.477)	(0.492)	(0.484)	(0.493)	(0.477)	(0.487)
Accountability	-0.253**	-0.234**	-0.258**	-0.240**	-0.228**	-0.214**	-0.252**	-0.235**	-0.238**	-0.224**
	(0.105)	(0.106)	(0.107)	(0.107)	(0.108)	(0.108)	(0.105)	(0.105)	(0.104)	(0.104)
Elite decided about use	0.197	0.227								
	(0.211)	(0.213)								
Private use			-0.150	-0.107						
			(0.214)	(0.219)						
Average Raven's scores					0.100*	0.085				
					(0.054)	(0.055)				
Preference for mid-performers							-0.123	-0.077		
							(0.152)	(0.149)		
Preference for men									-0.671	-0.537
									(0.438)	(0.448)
Observations	2032	2022	2032	2022	2032	2022	2032	2022	2032	2022
R^2	0.157	0.163	0.157	0.163	0.159	0.165	0.157	0.163	0.159	0.164
Citizen controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Leader controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Results based on OLS regressions at citizen level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is defined as the number of tokens sent by the citizen to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1.

B.8 Leader Behavior

Here we investigate the relationship between leaders' bribe choice in the corruption game and their characteristics of interest. As we noted in Section 3.1, because the bribe amounts available to the leader are determined by citizens' choices, this poses a potential identification issue. Hence this section should be viewed as exploratory.

Table B7: Bribe chosen by the leader

	Dep. variable: bribe chosen by the leader			
	(1)	(2)	(3)	(4)
Leader variables				
Appropriation	1.203**	1.025*	1.110*	1.581**
	(0.540)	(0.590)	(0.621)	(0.679)
Share returned in trust game	3.579***	3.293***	3.939***	3.982***
	(1.208)	(1.211)	(1.271)	(1.332)
Accountability	-0.466**	-0.430*	-0.512**	-0.606**
	(0.215)	(0.230)	(0.221)	(0.233)
Observations	204	204	204	204
R^2	0.089	0.126	0.211	0.295
Average citizen controls	-	Yes	Yes	Yes
Leader controls	-	-	Yes	Yes
Community controls	-	-	-	Yes

Note. Results based on OLS regressions at the leader level. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is the number of tokens sent by the citizen that is chosen by the leader in the corruption game, ranging from 0 (citizen chosen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. *Leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1. *Average citizen controls* are the citizen level control variables averaged at the community level.

Table B7 presents analogous results to Table 2 in the main paper, aggregated to the village level. Echoing the earlier results for citizens, leaders who appropriate more community funds also appear to be significantly more likely to select citizens giving larger bribes. Turning to the other leader variables of interest, leaders' reciprocation in the trust game is significantly associated at the 1% level with the selection of citizens who sent higher bribes. In addition, leaders who are more likely to agree that accountability is supported by the community are significantly less likely to select citizens who send bribes.

Given that leaders' choice set was determined by citizens, we can investigate further. One obvious concern arises if, for example, some leaders strictly prefer to choose citizens sending bribes of $b = 0$, but may have faced a set of citizens who all sent $b \geq 1$. Our next approach is to condition the analysis only on those leaders which were unconstrained in their choice of bribe. These leaders faced a choice set which included both smaller and larger bribes than the

Table B8: Bribe chosen by the leader when unconstrained

	Dep. variable: bribe chosen by the leader			
	(1)	(2)	(3)	(4)
Leader variables				
Appropriation	1.181	1.254	1.501	2.243*
	(0.862)	(0.928)	(0.992)	(1.213)
Share returned in trust game	3.905***	3.813**	4.515**	4.526**
	(1.348)	(1.531)	(1.732)	(1.943)
Accountability	-0.732**	-0.777**	-0.800**	-0.865**
	(0.301)	(0.338)	(0.348)	(0.393)
Observations	125	125	125	125
R^2	0.116	0.199	0.258	0.392
Average citizen controls	-	Yes	Yes	Yes
Leader controls	-	-	Yes	Yes
Community controls	-	-	-	Yes

Note. Results based on OLS regressions restricting the sample to games in which leaders choose an intermediate bribe: there existed bribe options which were both smaller and larger, but which were not selected. Bribe choices of 0 or 10 are not excluded; these choices are constrained by game parameters not citizen behavior. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. The dependent variable is the number of tokens sent by the citizen that is chosen by the leader in the corruption game, ranging from 0 (citizen chosen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. *Leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of controls is provided in Section 3.1. *Average citizen controls* are the citizen level control variables averaged at the community level.

Table B9: Bribe selected by the leader in the corruption game

	Dep. variable: bribe sent by citizen i is selected by leader				
	(1)	(2)	(3)	(4)	(5)
Bribe sent by citizen to leader	-0.059***	-0.060***	-0.092***	-0.053***	-0.095***
	(0.006)	(0.008)	(0.016)	(0.012)	(0.022)
× appropriation		0.003			0.005
		(0.019)			(0.020)
× share returned in trust game			0.086**		0.097***
			(0.037)		(0.037)
× accountability				-0.004	-0.002
				(0.007)	(0.007)
Observations	2052	2042	2052	2042	2032
R^2	0.215	0.217	0.221	0.215	0.224
Citizen controls	Yes	Yes	Yes	Yes	Yes
Community fixed effects	Yes	Yes	Yes	Yes	Yes

Note. Results based on OLS regressions. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. Dependent variables is an indicator variable equal to 1 if the bribe sent by the citizen is chosen by the leader, and 0 otherwise. *Bribe sent by citizen to leader* is the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. Details about the game and the variables are provided in Section 2. The variable is interacted with independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). The full list of citizen controls is provided in Table 1.

one they selected. Under an independence and a monotonicity assumption, these leaders have thus revealed their preference for the bribe they chose.[4] Table B8 continues to suggest that unconstrained leaders who appropriate more do appear to choose larger bribes, although this is now significant at the 10% level. While the coefficient is larger, these regressions only include 125 of 206 villages, leading to noisier estimates. Those that return more in the trust game are also significantly more likely to choose larger bribes. Finally, those who are more likely to agree that accountability is supported by the community select smaller bribes.[5] In essence, this specification could imply that citizens correctly anticipate these leader qualities which were associated with more bribe-giving in the first place.

While suggestive, one may be concerned that the assumptions required for the previous specification are too strong. This could occur if the independence assumption fails, and leaders are behaviorally influenced by the distribution of bribes sent by citizens. For this reason, we also examine a more stringent specification. Specifically, we aim to hold constant the average amount of bribes that the leader receives, and instead study the interaction between the size of the bribe chosen by the leader and the leader variables of interest. Table B9 studies the relationship between the bribe selected by the leader and the bribes sent by citizens. The table presents estimates of citizen-level regressions in which the dependent variable is an indicator variable equal to 1 if the bribe sent by the citizen is chosen by the leader, and 0 otherwise. The independent variables are the bribe sent by the citizen interacted with leader characteristics (appropriation, share returned in the trust game, and accountability). All specifications include citizens controls and community fixed effects. Here we find that, of the leader variable interactions, only the interaction with the trust game is significant. This result suggests some caution regarding the previous findings, though we also note the conservative nature of this specification, as one would not anticipate significant interactions if citizens are well-calibrated in the amount of bribes sent to their leader.

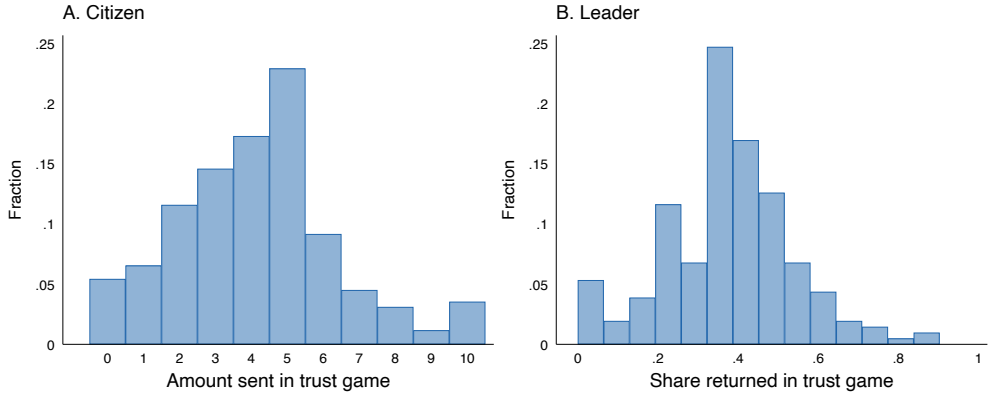
[4] Note that choices of 0 and 10 are included in this specification, since these choices are constrained by game parameters, not citizen behavior. The independence assumption requires that leaders' preferences are not influenced by the behavior of citizens. In other words, leaders' preferences are the same before and after observing the amount of bribes that citizens send. The monotonicity assumption requires that leaders' utility is either (weakly) increasing or decreasing in bribe amounts. Imagine this is not the case, e.g., suppose a leader with lexicographic preferences first prefers even-sized to odd-sized bribes, then prefers smaller bribes overall. Then for a choice set of $\{3, 4, 5\}$ the leader will choose 4, but would have preferred 0.

[5] Additional significant predictors of the bribe chosen by the leader are the leader's age (the effect is non-linear, with initially negative effects on selecting citizens sending higher bribes, turning to positive effects at older ages), leader's education (decreasing bribes), and leader's household size (increasing bribes).

B.9 Trust and corruption

Figure B2 shows the distribution of the amount sent by citizens in the trust game (Panel A), and of the share returned by the leader (Panel B). To investigate the relationship between trust and corruption, Table B10 presents a regression with measures of leader's corruption as the dependent variable, against measures from both the corruption game and the trust games, as well as survey measures of trust. In columns (1)–(3), the dependent variable is the leader's appropriation of community funds, while in columns (4)–(6), the dependent variable is the survey measure of leader's attitudes towards bribes.

Figure B2: Behavior in the trust game



Note. Panel A shows the distribution of the amount sent by citizens in the trust game ($N = 2,052$). Panel B shows the distribution of the share returned by the leader in the trust game ($N = 206$). Details about the game are provided in Section 2.1, while scripts are provided in Appendix A.

Column (1) confirms our main results: the behavior in the corruption game, both from citizens and leaders, is significantly associated with leaders' appropriation of funds. Column (2) showcases a potentially surprising result: in the trust game, citizens send more of their endowment to more corrupt leaders. The coefficient is significant at the 5% level. This result is not confirmed by looking at citizens' survey-measured trust in their leader. In addition, there is no association between leaders' reciprocity in the trust game and their level of appropriation. Column (3) incorporates both the behavior in the corruption game and trust measures in the specification. There is continued evidence that citizen behavior in the corruption game is associated with leader appropriation, at the 10% level of confidence. Citizen's behavior in the trust game is no longer significant, after accounting for behavior in the corruption game. Columns (4)–(6) shows that replacing the incentivized measure of appropriation with a survey measure about leader's attitudes towards corruption leads to similar conclusions.

Table B10: Corruption among leaders and trust

Dep. variables:	Appropriation			Leader accommodates bribes		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Corruption game						
Bribe sent by citizen (avg)	0.040**		0.034*	0.058***		0.055***
	(0.017)		(0.018)	(0.021)		(0.020)
B. Trust (citizen)						
Amount sent in trust game (avg)		0.035*	0.018		0.042	0.015
		(0.019)	(0.020)		(0.033)	(0.035)
High trust in leaders (avg)		0.060	0.032		-0.040	-0.085
		(0.124)	(0.122)		(0.150)	(0.149)
C. Trust (leader)						
Share returned in trust game		-0.078	-0.097		-0.061	-0.096
		(0.129)	(0.131)		(0.225)	(0.221)
Observations	205	205	205	206	206	206
R^2	0.393	0.385	0.398	0.272	0.254	0.276
Average citizen controls	Yes	Yes	Yes	Yes	Yes	Yes
Leader controls	Yes	Yes	Yes	Yes	Yes	Yes
Community controls	Yes	Yes	Yes	Yes	Yes	Yes

Note. Results based on OLS regressions at the level of the community. Citizen-level variables are averaged at the level of the community. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. Dependent variables are defined by column: (1)–(3) proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity; (3)–(6) survey measure defined as an indicator variable equal to 1 if the leader reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise. Details about the game and the variables are provided in Section 2. In Panel A, *bribe sent by citizen* is the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10. In Panel B, *trust (citizen)* refers to: *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel C, *trust (leader)* refers to: *share returned in the trust game* is the proportion returned by the leader in the trust game. The full list of citizen and leader controls is provided in Table 1. Community controls include an infrastructure index, a natural resource index, community size (measured by the number of tables in the polling station), district fixed effects, and indicator variables for the treatment groups and the randomization strata studied in Armand et al. (2020). *Average citizen controls* are the citizen level control variables averaged at the community level.

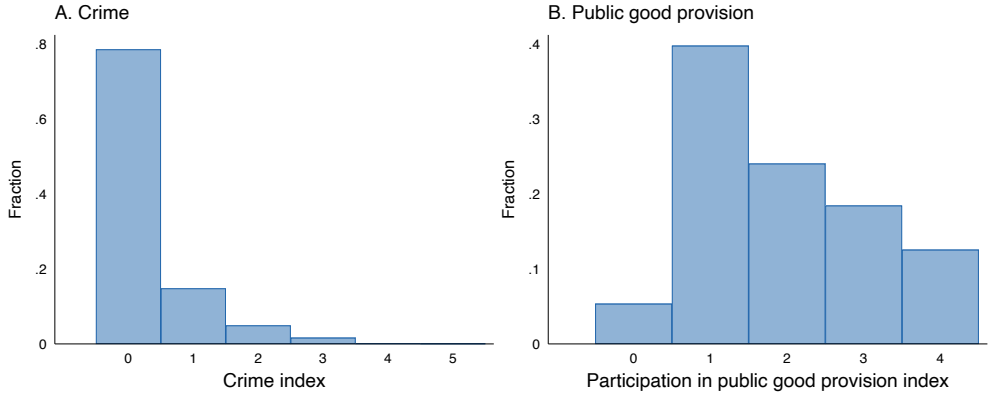
B.10 Crime and participation in public good provision

This section studies whether there are significant associations between corruption and broader community outcomes. First, we examine whether citizens witnessed and were involved in any violent event. We build a *crime* index using information about whether the citizen was involved in the following type of violence in the three months previous to the interview: verbal violence, physical violence, violence against women, theft, and property destruction. The index is constructed using an equally-weighted linear combination of the indicator variables for the involvement in each type of crime. The index ranges from 0 (no crime) to 5 (all types of crime). Panel A in Figure B3 shows the distribution of the crime index in the sample of citizens.

The second outcome of interest is citizens' *participation in public good provision* within their communities. We construct an index which aggregates four survey questions about whether

the citizen contributed towards public goods in the 12 months previous to the interview. The questions asked whether the citizen attended community meetings, provided any financial contribution for the community, provided any material contribution to the community, or contributed with labor. The index is constructed through a simple equally-weighted linear combination of the four binary variables, thus ranging from 0 (no contribution) to 4 (contributed in all means). Panel B in Figure B3 shows the distribution of the participation in public good contribution index in the sample of citizens.

Figure B3: Crime and participation in public good provision



Note. Panel A shows the distribution of the crime index ($N = 2,045$). The index ranges from 0 (no crime) to 5 (all types of crime). Panel B shows the distribution of the participation in public good contribution index ($N = 1,994$). The index ranges from 0 (no contribution) to 4 (contributed with all means).

Both the crime and the public good contribution variables provide us with a sense of the broader implications of our measurements for critical community outcomes. Table B11 show the results for crime in columns (1)–(4) and for public goods contributions in column (5)–(8). Examining involvement with crime, the survey-based measure of trust in leaders is negative and significant, indicating that higher trust in leaders is associated with lower levels of violence. We also observe a significant positive relationship between leader appropriation and the crime index. This suggests that the appropriation of funds we privately observe is associated with real negative consequences for citizens. In addition, citizens with leaders who agree that their community supports accountability are also significantly less likely to experience crime.

Regarding participation in public good provision, we observe that citizens' attitudes towards bribes are significantly associated with their contributions. The direction is as expected: citizens who hold favorable attitudes towards bribes are less likely to contribute to public goods in their community. Concerning other dimensions, the appropriation of the leader is negatively related with public goods contributions, but estimates are only marginally significant.

Table B11: Behavior, crime and participation in public good provision

Dep. variables:	Individual crime index				Participation in public good provision			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Citizen variables								
Accommodates bribes (avg)	0.058	0.040	0.043	0.027	-0.148**	-0.130**	-0.127**	-0.116**
	(0.037)	(0.037)	(0.037)	(0.038)	(0.061)	(0.058)	(0.057)	(0.058)
Amount sent in trust game	0.006	0.007	0.008	0.007	0.010	0.002	0.000	-0.007
	(0.008)	(0.007)	(0.007)	(0.008)	(0.012)	(0.011)	(0.011)	(0.012)
High trust in leaders	-0.067**	-0.086***	-0.088***	-0.091***	0.104**	0.089*	0.080	0.054
	(0.032)	(0.032)	(0.032)	(0.032)	(0.053)	(0.052)	(0.051)	(0.052)
B. Leader variables								
Appropriation	0.082	0.118**	0.120**	0.137**	-0.225**	-0.250***	-0.243***	-0.101
	(0.054)	(0.053)	(0.055)	(0.063)	(0.091)	(0.089)	(0.091)	(0.106)
Share returned in trust game	-0.032	0.013	0.007	-0.070	0.230	0.237	0.273*	0.289
	(0.098)	(0.096)	(0.100)	(0.106)	(0.164)	(0.158)	(0.165)	(0.178)
Accountability	-0.046**	-0.050**	-0.045**	-0.052**	-0.036	-0.033	-0.012	-0.003
	(0.022)	(0.022)	(0.022)	(0.022)	(0.035)	(0.034)	(0.034)	(0.035)
C. Corruption game								
Bribe sent by citizen	-0.005	-0.003	-0.003	-0.002	-0.000	0.005	0.007	0.009
	(0.007)	(0.007)	(0.007)	(0.007)	(0.011)	(0.011)	(0.011)	(0.011)
Bribe chosen by leader	-0.009	-0.006	-0.007	-0.009	-0.004	-0.005	-0.007	-0.010
	(0.006)	(0.006)	(0.006)	(0.006)	(0.010)	(0.010)	(0.011)	(0.011)
Observations	2008	2008	2008	2008	1959	1959	1959	1959
R^2	0.009	0.052	0.055	0.079	0.010	0.093	0.112	0.133
Citizen controls	-	Yes	Yes	Yes	-	Yes	Yes	Yes
Leader controls	-	-	Yes	Yes	-	-	Yes	Yes
Community controls	-	-	-	Yes	-	-	-	Yes

Note. Results based on OLS regressions. Statistical significance at * 0.1; ** 0.05; *** 0.01. Standard errors clustered at community level. Dependent variables are defined by column: (1)–(4) individual crime index, ranging from 0 (no crime) to a maximum of 5; (5)–(8) individual public good index which ranges from 0 (no contribution) to a maximum of 4. Details about the game and the variables are provided in Section 2. In Panel A, *citizen variables* refer to independent variables pertaining to citizen behavior or survey measures and are defined as follows: *accommodates bribes* is a survey measure defined as an indicator variable equal to 1 if the citizen reports agreeing that the best way to overcome problems is to pay bribes, and 0 otherwise; *amount sent in trust game* is the amount sent by the citizen to the leader in the trust game; *high trust in leaders* is a survey measure defined as an indicator variable equal to 1 if the citizen reports trusting leaders "a lot" (highest of four options), and 0 otherwise. In Panel B, *leader variables* refer to independent variables pertaining to leader behavior or survey measures and are defined as follows: *appropriation* is the proportion of community funds that is observed as being appropriated by the leader in the incentivized structured community activity (see Section 2.1); *share returned in the trust game* is the proportion returned by the leader in the trust game; *accountability* is a survey measure indicating whether the leader reports agreeing that the community supports accountability and takes values 0 (disagree), 1 (neither agree nor disagree), and 2 (agree). In Panel C, *corruption game* refers to: *bribe sent by citizen* is the number of tokens sent by citizens to the leader as bribe in the corruption game, ranging from 0 (citizen gave no bribe) to a maximum of 10; *bribe chosen by leader* is the number of tokens sent by the citizen that is chosen by the leader in the corruption game, ranging from 0 (citizen chosen gave no bribe) to a maximum of 10. The full list of citizen and leader controls is provided in Table 1. Community controls include an infrastructure index, a natural resource index, community size (measured by the number of tables in the polling station), district fixed effects, and indicator variables for the treatment groups and the randomization strata studied in Armand et al. (2020).