Social image in context: The role of social norms and social networks

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ABSTRACT

Social image effects are a common phenomenon, yet strongly heterogeneous across situations and people. We use a lab-in-the-field experiment in small-scale societies of Papua New Guinea to study the drivers of heterogeneity in social image effects, focusing on the roles of social norms and social network relationships. Participants played a dictator game, both, in private and in front of an observer. This data is accompanied by incentive-compatibly measured information on the social norm location and detailed social network data. First, we present causal evidence that social norms serve as reference points for social image effects, with participants' behavior shifting toward the norm when observed. Second, our analysis reveals that the strength of norm enforcement depends on the participant-observer relationship. We find that norm enforcement is stronger when i) social distance increases, ii) cooperative ties weaken, and iii) observer centrality in communication networks decreases.

1. Introduction

People are innately concerned with their social image; that is, they care about what others think of them. These social image concerns are powerful motivators that shape behavior across a wide range of life domains and cultural contexts. Social image effects can, for example, be found in voting (Dellavigna et al., 2017), charitable giving (Dellavigna et al., 2012), educational attainment (Bursztyn et al., 2019), consumption choices (Bloch et al., 2004; Bursztyn et al., 2018; Rao, 2001), cooperative behavior (Grimalda et al., 2016), or energy-saving decisions (Allcott, 2011). Due to their widespread influence and their tendency to promote socially desirable behavior (see, e.g., Bradley et al., 2018), image effects are frequently leveraged by firms and governments as motivational tools.[1] However, social image concerns can also lead to counterproductive outcomes when social expectations conflict with what is personally or socially beneficial and preferred (e.g., Ariely et al., 2009; Bursztyn et al., 2019; Brudermann et al., 2015; Bursztyn and Jensen, 2015; Friedrichsen et al., 2018). Overall, the literature reveals considerable heterogeneity in both the direction and magnitude of social image effects (Bursztyn and Jensen, 2017). Despite their well-documented significance in shaping behavior, empirical evidence on the underlying drivers of heterogeneity in social image effects remains limited.

We contribute to this literature by providing empirical evidence on two intertwined plausible causes for variation in social image effects: a dependence on social norms and social network relationships. Social norms and social image effects are conceptually

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closely aligned. Social norms are defined as rules and standards of a community that specify what is considered proper or appropriate behavior.[2] Simultaneously, a positive social image is typically associated with behavior that aligns with what observers approve of (compare, e.g. Bénabou and Tirole, 2006). This alignment renders social norms a very likely reference point of social image effects from a conceptual point of view. Assuming a norm-dependence of image effects might, based on the literature on social norms, in fact explain two key dimensions of heterogeneity in social image effects: First, unlike universal meta-morals, social norms are highly context-specific (e.g. Bicchieri, 2006; Granovetter, 2017; Krupka et al., 2022). This context-dependence could account for variations in image effects across different situational settings (e.g., undressing at a swimming pool vs in a bus). Second, conformity to social norms is inherently tied to the identity of the observer, a relationship described as the reference group dependence of social norm enforcement (Bicchieri, 2006). This dependence on social norms could therefore also plausibly explain variations in social image effects across different audiences, even when the situational context remains unchanged.

We empirically test for a norm- and network-dependence in social image effects using data collected in a lab-in-the-field experiment conducted in small-scale societies in Papua New Guinea (N = 365). This population belongs to what Henrich et al. (2010b) classify as non-WEIRD (Western, Educated, Industrialized, Rich, and Democratic) societies, making it particularly well-suited for studying deep-rooted questions about human psychology. Individuals from WEIRD societies are relatively novel within evolutionary history and often display traits that occupy the extreme ends of the worldwide behavioral distributions (Henrich, 2020; Muthukrishna et al., 2020). For this reason, data from non-WEIRD and small-scale societies is considered essential to test hypotheses about human decision-making. Finally, due to the absence of centralized institutions and strong cultural customs, reputation and social norms are central regulating forces of social life in Papua New Guinea (PNG) (Cooper, 2018; Regan and Griffin, 2015; Walton et al., 2020; Henrich et al., 2005; Bernhard et al., 2006b).[3]

Within this population, we first verify that social norms serve as reference points for image effects. To do so, participants played the Dictator Game (DG), in which they decided how to share an endowment of 10 Kina (the local currency) with another unknown person. To introduce social image effects, the dictator game was played once in private and once under the eyes of an observer. The social norm in the DG was measured through an incentive-compatible elicitation of second-order normative beliefs, i.e., what one believes others believe is the normatively appropriate thing to do (Krupka and Weber, 2013; Bicchieri, 2006). The findings provide robust evidence in support of the social norm dependence of social image effects. Specifically, we identify a social norm of 50:50 sharing in the dictator game, consistent with previous studies conducted in small-scale societies (e.g. Henrich et al., 2001; Engel, 2011). Despite a considerable proportion of individuals following the norm in private, we find an average absolute deviation from the norm of 2.75 Kina in the private condition. Importantly, these deviations occur in both directions from the norm. Comparable to the behavior of participants in previous studies (compare e.g., Engel, 2011), nearly half of the participants (49,4%) share less than 5 Kina. Notably, however, roughly every fifth participant (19.8%) shares more than the norm demands in the private condition. This allows us to cleanly distinguish between three major signaling motives - i.e., self-interest, prosociality, and norm conformity: A preference for signaling prosociality (self-interest) would imply that only those giving less (more) than the norm in private adjust their behavior in the direction of greater generosity (greater selfishness) when observed. If both groups move toward the norm rather than away from it, we can rule out both of these competing motives for image effects. Looking at behavior in the public condition, the average deviation from the norm significantly decreases by approximately 6.5% (0.18 Kina). This change is driven by two behavioral responses: i) those who shared less than the norm in private increased their sharing in public, and ii) those who shared more than the norm in private decreased their sharing in public. Consequently, we find strong evidence in favor of a preference for signaling norm conformity, whereas we find no support for a preference for signaling prosociality or self-interest when being observed.

Second, we analyze how the observer's identity — specifically, their social proximity to participants and position in the social network — shape social image effects. An observer's identity can plausibly be assumed to influence the degree to which people care about having a good image in the eyes of this observer (from hereon referred to as *importance of image effect*, see e.g. Leider et al., 2009; Karlan et al., 2009; Bohnet and Frey, 1999; Bicchieri et al., 2022; Gächter and Fehr, 1999; Breza et al., 2019): Previous research shows that people are more likely to conform to the behavior of people whom they are close to or whom they like to associate with Akerlof and Kranton (2000), Akerlof (1997), Bicchieri et al. (2022), Goette and Tripodi (2021), Schneeberger and Krupka (2022), Bicchieri (2006). Also, they care more about the judgments of those they are close to Gino et al. (2008). The importance of a positive image especially in the eyes of close observers could arise for several reasons. For example, it might result from a reputation dependence of (future) cooperative relationships, a need to belong, or a larger power of close observers to punish misconduct. In line with these arguments, we formulate three hypotheses. First, we hypothesize that social image effects decrease with social distance between participants and observers. Second, drawing on theories of indirect reciprocity, we anticipate stronger image effects when observers share direct cooperative ties with the decision-maker, as preserving a favorable image is more instrumentally valuable in relationships that support (future) cooperation. (e.g., Henrich, 2016; Henrich and Henrich, 2007; Nowak and Sigmund, 1998, 2005; Nowak, 2006; Panchanathan and Boyd, 2004; Breza et al., 2019). Finally, because observers who are well-connected in the social

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[2] This definition is common in the social sciences (compare e.g., Cialdini et al., 1990; Elster, 1989; Granovetter, 2017; Henrich, 2016; Krupka and Weber, 2013; Sunstein, 1996). Some authors have proposed more elaborate definitions, such as Bicchieri (2006). However, the normative quality of the rules is also a key element of Bicchieri's definition. Furthermore, in the terminology of Cialdini et al. (1990, 1991), the above definition corresponds to *injunctive* rather than *descriptive* norms.

[3] For other studies on the relationship of social image, social norms, and social networks based on experiments conducted in non-WEIRD societies see e.g. Breza et al. (2019), Breza and Chandrasekhar (2019), Chandrasekhar et al. (2018b), Banerjee et al. (2019), Bursztyn et al. (2017), Bernhard et al. (2006a), Henrich et al. (2015), Diekert et al. (2022), Iacobelli and Singh (2020).

network can spread information more widely—and thus pose a greater reputational threat—we hypothesize that they will induce a stronger tendency toward norm-conforming behavior than less connected observers.

To investigate these postulations, we use in-depth information on the social relationship between the decision-maker and the observer. PNG is one of the remaining places with locally cohesive communities, allowing us to collect detailed social network data on six different network dimensions (Cooper, 2018; Regan and Griffin, 2015; Walton et al., 2020; Henrich et al., 2005; Bernhard et al., 2006b). Out of these six dimensions, three map communicative relationships (conversation, advice, gossiping) and three cooperative relationships (food sharing, labor assistance, support in hardship). This data accounts for direct ties between participant and observer and the observer's position in each network. To ensure variation in the social relationship between observer and participant in the DG, we drew observers from different centrality percentiles of the village network.

Using this setup, we show that the observer effect on norm conformity is highly sensitive to variations in interpersonal relationships. The social distance between observer and participant significantly influences the degree to which observation induces norm conformity. Notably, distant observers show the strongest effect on norm conformity, reducing the deviation from the norm by up to 43% (compared to 6.5% for the average observer). Conversely, the effect fully ceases for close observers. In line with this, we find that the effect of observation on norm conformity is largest for observers who do not share a cooperative link with the participant and for observers with low levels of centrality in the communication network. While these results contrast with the importance of image argument, we discuss alternative rationalizations, such as a *signaling strength argument*: the closer the relationship between observer and decision-maker, the less informative the observation of the decision-maker's behavior becomes for the observer.

The findings presented in this paper provide three important contributions: First, we demonstrate that social norms qualify as reference points for social image effects, providing empirical support for an often-suggested, intuitive framework to explain the observed heterogeneity in social image effects.[4] Since social norms are local and enforced by different reference groups, beliefs about appropriate behavior vary by group and context (Bicchieri, 2006, 2017; Krupka et al., 2022), influencing the direction of social image effects (compare also Graf et al., 2023) Simultaneously, our finding provides empirical support for the effectiveness of observability as a widely promoted norm-enforcement tool.[5] While we are not the first to address this question (e.g., Brudermann et al., 2015; Andreoni and Bernheim, 2009; Bateson et al., 2013; Huber et al., 2023; Kawamura and Kusumi, 2017; Fosgaard et al., 2023; Rege and Telle, 2004; Gächter and Fehr, 1999; Xiao, 2017), we add the first results from a study combining i) state of the art tools for the incentivized elicitation of social norm perceptions of study participants, ii) a setting that allows to cleanly distinguish between preferences for signaling norm following and prosociality, and iii) a relevant social image manipulation avoiding contamination of observation effects with payoff dependence. This allows us to abstract from a large range of alternative motives interfering with a straight forward interpretation of results as evidence of a social norm dependence of social image effects (Kimbrough and Vostroknutov, 2016; Lance Howe et al., 2023).

Second, we demonstrate that the observer's identity significantly shapes the magnitude of social image effects, contributing to the limited empirical evidence on how variations in third-party observer characteristics influence observed behavior.(e.g., Breza et al., 2019; Breza and Chandrasekhar, 2019; Asulin et al., 2024; Meyer and Tripodi, 2021). Studying the role of specific network variables further provides empirical evidence on often hypothesized but rarely studied relations between social norms and social networks (Coleman, 1988, 1990; Granovetter, 2017; Jackson et al., 2017). Notably, our findings that norm enforcement becomes stronger as i) social distance to the observer increases, ii) cooperative ties weaken, and iii) observer centrality in communication networks decreases provide evidence of the sensitivity of image-driven norm enforcement to network-related observer characteristics, and consequently, a potential structural foundation for the size of image effects. At the same time, they are challenging the validity of the *importance of image argument*. This simultaneously calls for investigating alternative mechanisms underlying the influence of social distance on social image effects and raises the important question of which reference groups are most relevant for norm enforcement (Bicchieri et al., 2022; Bohnet and Frey, 1999; Gächter and Fehr, 1999). Whether close or distant others trigger stronger image effects is central to designing social image–based policy interventions and to understanding the broader dynamics of social norm enforcement (Dimant, 2019; Bicchieri et al., 2022; Gächter et al., 2017; Isler and Gächter, 2022).

Finally, our results show that the behavioral impact of interpersonal relationships differs between communication and cooperation networks, highlighting the importance of understanding the instrumental role of different network types. This finding supports earlier results by D'Exelle and Riedl (2010) and Jackson et al. (2012), who show that the extent to which certain measures of network structure — such as degree or centrality — are related to a person's generosity and support for others depends on the specific network dimension considered. While their studies place relevance on different network dimensions for second-party interactions, we extend this finding to third-party interactions.

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[4] For theoretical models of social norms and social image effects containing cross-references see, e.g., Lane et al. (2023), Andreoni and Bernheim (2009), Bernheim (1994), Bénabou and Tirole (2006), Bursztyn et al. (2017), Ali and Bénabou (2020), Bicchieri (2006, 2017), and for empirical papers implementing treatment manipulations that assume its validity see, e.g., Bursztyn and Yang (2022), Dear et al. (2019).

[5] While the existence of convergent second-order beliefs about appropriateness is a necessary precondition, it is not sufficient to ensure social norm following within a community. Instead, norm following needs to be enforced by establishing a preference for conformity in a sufficiently large part of the community (Bicchieri, 2006, 2017). A preference for conformity is often attributed to two sources: i) fear of punishment for norm violations, or ii) future benefits from signaling norm conformity (indirect reciprocity) (e.g., Nowak and Sigmund, 1998; Bowles and Gintis, 2004; Fehr and Fischbacher, 2004a,b; Fehr et al., 2002; Henrich et al., 2010a). Both sources can trigger norm conformity only if behaviors are observable. Hence, visibility of behavior and a concern for what others think about one's behavior, i.e., social image concerns, are indispensable for norm enforcement.

The paper is structured as follows. Section 2 introduces the conceptual framework, followed by a description of the study population in Section 3. Section 4 outlines the empirical procedure and presents our hypotheses. Section 5 provides descriptive statistics on the social context of the sample, while Section 6 reports the main results. Section 7 discusses the findings, and Section 8 concludes.

2. Conceptual background

We assume that individuals care about their social image, such that the utility derived from an action *a* increases the more that action is perceived to contribute positively to their social image. In widely used frameworks, this social image component typically depends on two elements: (i) the weight an individual places on being seen favorably by others, and (ii) the expected belief that an observer will form about the individual's underlying type after observing action *a* (e.g., Bursztyn and Jensen, 2017; Bénabou and Tirole, 2006; Andreoni and Bernheim, 2009; Friedrichsen et al., 2018).

Within this representation of image effects, we test two forms of context dependence. The first channel operates through the observer's interpretation of the action, i.e. the expected type belief. Social norms define what is regarded as appropriate within a given community (e.g., Cialdini et al., 1990; Granovetter, 2017; Krupka and Weber, 2013; Bicchieri, 2006), and observers evaluate a decision maker's action in light of these norms. Actions that are closer to what is considered appropriate are therefore more likely to be interpreted as signals of a "good" type, whereas actions that deviate from the norm invite less favorable evaluations. While upwards and downwards deviations form the norm are not necessarily sending the same signal per se to an observer, we propose that the mere degree of norm alignment as given by the absolute deviation of the action from what is considered socially appropriate, entails a value judgment.

The second channel concerns how much the decision maker cares about her social image in front of a particular observer. We propose that individuals place greater weight on the opinions of some observers than others. One reason for this proposition is that cooperative relationships often depend on maintaining a positive reputation, making it more valuable to send favorable type signals to existing or prospective cooperation partners (Henrich and Henrich, 2007; Nowak and Sigmund, 1998; Panchanathan and Boyd, 2004). A second reason is the variability of people's need to belong, which can increase the preference to signal conformity to socially close others (Tajfel and Turner, 1979; Akerlof and Kranton, 2000). Finally, observers differ in their ability to influence the decision maker's reputation: cooperation partners can reward by maintaining support or punish by withdrawing it, while highly connected individuals in the social network can amplify the diffusion of either positive or negative reputational information (e.g., Breza and Chandrasekhar, 2019; Banerjee et al., 2019). These sources of heterogeneity imply that the weight placed on the observer's opinion — and thus the strength of image concerns — should systematically vary across observers.

While both channels have individually been discussed in the literature — audience-dependent image concerns for example in Bursztyn et al. (2017), and norm-based evaluations in e.g., Andreoni and Bernheim (2009), Krupka and Weber (2013), Kimbrough and Vostroknutov (2016), Barr et al. (2017), Xiao (2017) — we provide a joint empirical test of their relevance in shaping behavior.

3. Study area

The field study was conducted on the island of Bougainville in PNG (see Fig. 1). People on this island live in small coastal or mountain villages, maintaining their subsistence mainly through horticulture and pig husbandry, supplemented by fishing, hunting, and foraging (Regan and Griffin, 2015). Geographically and socially, the population of PNG is clustered into more than 800 tribes and language groups.[6] Even though some tribes exist who are largely secluded to the present day, there is an exchange between most tribes through a common lingua franca called "Tok Pisin". The most common religion in PNG is Christianity, average life expectancy is 66 years, and the national average years of formal education amount to 4.9 years. Globally, PNG ranks 154 out of 192 countries in terms of human development (UNDP, 2024).

As in many (non-WEIRD) communities, a lack of strong centralized institutions renders social status and informal rules such as social norms crucial features in the organizations of everyday life (Bernhard et al., 2006a; Henrich et al., 2005; Walton et al., 2020). Social relationships in Bougainville center around the figure of the 'Big Man'. Big men hold exclusive knowledge and play key roles in imposing discipline and upholding traditional ways of life. They typically oversee or directly intervene in social disputes or coordination issues between clans. With their informal authority, big men act as 'guardians of morality' within society, and individuals strive to maintain a positive social image in their eyes (Sahlins, 2013). Furthermore, social norms guide behavior and maintain social order. Norms around reciprocity and communal support are vital and deeply rooted in the so-called "Wantok" culture (De Renzio, 2000). Wantok, translating to "one talk", culture dictates cooperation and mutual reciprocity between people who speak the same language or are of the same kinship group. This way it establishes a strong socio-economic support network (Nanau, 2011). Its norms ensure that social and economic activities are conducted harmoniously, preserving the cultural fabric of these societies (Oliver, 2013). While being rather salient in PNG, informal systems of reciprocity are an artifact of most, if not all, societies (Walton et al., 2020). Lastly, the extensive social fragmentation in PNG creates small, tight-knit communities where social relationships are largely confined to the village level. Villages are small, sometimes with no more than 100 households. This renders PNG one of the few remaining places on earth where high-quality social network data can be collected.

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[6] retrieved from https://www.ethnologue.com/country/PG/, visited 06.08.2024

Fig. 1. Sampling region.

Bougainville, Papua New Guinea (PNG).

In sum, PNG provides a rare combination of (i) a reputation-based social system, (ii) a social life that is regulated mostly by informal rules such as social norms due to the absence of centralized institutions (Bernhard et al., 2006a; Henrich et al., 2005), and (iii) small, tight-knit communities. In addition, the largely traditional lifestyle in PNG provides ideal conditions to study deep-rooted facets of human psychology, compared to the relatively novel anomalies of WEIRD societies. Concerning these kinds of questions, non-WEIRD societies are found to provide a more representative sample of the human species compared to the predominantly Western samples commonly used in behavioral research (Henrich et al., 2010b; Rad et al., 2018).

4. Experimental design and procedure

4.1. Economic game and social norm elicitation

Participants played the dictator game (DG). This means every participant obtained 10 Kina[7] and was asked to split this money between herself and an anonymous other person.[8] After the "dictator" makes her choice, the game ends. This simplicity implies a relatively abstract and artificial decision context, which may feel unfamiliar to participants. However, due to this simplistic structure, the DG abstracts from the presence of many behavioral motives and increases experimenter control, allowing us to more cleanly observe how our two channels — norm-based interpretation of actions and audience-dependent image concerns — influence behavior. In addition, it strongly reduces cognitive demand, rendering this game particularly adequate for a participant pool with large heterogeneity in literacy and numerical skills (compare Fig. C.9 in the Appendix).

In the baseline (private) condition, choices were made under a double-blind protocol — meaning neither during the session the participant's decision was observed nor could it later be linked to the participant's identity by the research team. After the game was explained, the interviewer left the room, and the participant privately allocated the endowment by placing money into two envelopes labeled "my money" and "money for the other person." Both envelopes were then deposited into a sealed box. Once finished, the participant rang a bell to signal that the interviewer could return. Choice boxes were only opened at the end of the day, and envelopes were marked with an anonymized participant ID and the round number. These identifiers were used for data entry and payout calculation. Finally, the payout was distributed in sealed envelopes, indicating the participant ID. Thus, at no point could the enumerator or payment distributor link decisions to individual participants, ensuring full procedural anonymity.

To introduce image effects, we used a within-subject manipulation of image concerns. Every participant played the dictator game twice - once in a private and once in a public condition. In the public condition, an observer watched the decision made by the participant, i.e., how much money the participant placed in each of the envelopes. The observer was a randomly assigned other villager who watched but did not communicate with the participant. Observers were instructed that it is crucial not to communicate with the participant in any way and that their compensation would only be paid if they complied with that rule. Even while being outside the tent, the interviewer remained close to the area to verify that the participant and observer did not talk to each other. The order of the public and the private choice was randomized, and at the time of their first decision, participants did not know which other decisions they would have to make afterwards. The participants received instructions that they had to make several decisions,

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[7] 10 Kina had a local purchasing power equivalent to 4.63 US-Dollar at the time of data collection (World Bank Group, 2024).

[8] We varied whether the person was "identified" as someone from the participant's village (in-group) or from another village (out-group). Fig. B.7 and Table B.9 in the Appendix show that this in-group/out-group variation has no effects on norm perception or decisions in the DG. Thus, we do not present the results of this group variation in the main body of this paper.

of which one was chosen for payment. For each condition, a different recipient was chosen. This was made salient to render the setup more intuitive for participants.

To identify social norms in the DG, we collected an incentivized measure of second-order normative beliefs (SONBs), i.e. what a person thinks how appropriate others consider certain behaviors. SONBs are a core element of social norms (Bicchieri, 2006, 2017; Bicchieri and Xiao, 2009) and closely related to the method introduced by Krupka and Weber (2013). After participants made their decision in the DG, they were presented with three short hypothetical scenarios, each describing an interaction between two villagers: one person (Person 1) deciding how much of an endowment of 10 Kina to share with another person (Person 2). In the scenarios, Person 1 either (i) keeps all 10 Kina, (ii) shares 5 Kina, or (iii) gives all 10 Kina to Person 2. For each of these three cases, participants were asked to guess how another villager would evaluate the moral appropriateness of Person1ʼs behavior, using a 4-point scale ("very inappropriate", "rather inappropriate", "rather appropriate", "very appropriate"). While the DG itself has 11 possible choice options, we intentionally limited the norm elicitation task to three key focal points. This design choice was made to reduce cognitive load for participants while still capturing the most salient and commonly chosen outcomes.

To incentivize accuracy, we had previously collected appropriateness ratings (i.e., first-order beliefs) from a separate sample of villagers who did not participate in the main experiment. Participants in the main study earned 1 Kina for each guess that matched the response of a randomly drawn villager from this separate sample. Thus, second-order beliefs — participants' expectations about what others in their village consider appropriate — were directly incentivized.[9] In addition to the norm elicitation, we asked participants how confident they were in their guesses, using a 3-point scale ("fully certain", "rather uncertain", "fully uncertain"). We also elicited empirical expectations by asking how much money participants believed others in their village would give to another person in the DG. These measures add information on the perceived strength of the norm at the individual level.[10] Finally, we also collected second-order normative beliefs from a group of 45 participants who had not participated in the dictator game before completing the norm elicitation task. This serves as a robustness check to examine whether prior engagement in the DG might influence participants' perception of prevailing social norms, ensuring that elicited social norms reflect independent beliefs rather than post hoc rationalizations of behavior. Following Gelfand et al. (2011), we define the presence of a social norm as the convergence of these second-order normative beliefs.

4.2. Social distance and social network measures

To trace the relationship between participant and observer, we collected detailed social network data for our sample (also used in Grimalda et al., 2023). We applied a similar approach as Apicella et al. (2012) and mapped the social network ex-ante to the experiment in each of the participating villages using an image-supported name generator procedure. For this, we first took images of all the villagers. Then, every villager was shown pictures of the other villagers on a tablet and asked to answer relational questions by marking the pictures of the respective people. Overall, we mapped six distinct network dimensions - three cooperation-related networks (i. food sharing: "Whom did you share your food with within the past week?" ii. gardening: "With whom did you do garden work together in the past month?" iii. trust: "Whom do you ask if you need someone to take care of something important to you?") and three communication-related networks (iv. advice: "Whom do you turn to for advice?" v. conversation: "Whom did you talk to in the past week?" vi. gossip: "Suppose you see someone misbehaving, whom would you go talk to about it?"). From the answers to these questions, we constructed three network types: one aggregate network for cooperation links (cooperation network), one for communication links (communication network), and one combining links from all six network dimensions (union network). Aggregation is done by adding up the number of links two persons have with one another in each network layer and using this sum as weight on the link between the two persons in the resulting aggregate network. For example, if two individuals share food (1 link), garden together (1 link), and trust each other with important matters (1 link), their link weight in the cooperation network would be three. The maximum link weight is thus three in the cooperation and communication network, and six in the union network.

In the public condition, we systematically varied the social centrality of the observers. In particular, per village, we randomly chose one observer from each decile of the centrality distribution of the union network of a village.[11] Using a fixed pool of observers per village allowed us to identify observer effects at the participant level and simultaneously account for unobservable observer-level effects. Additionally, we ensured that participant–observer pairs were not family members to avoid potential confounding due to shared household interests. As both the observer and participant can be located within each of the networks, we gain a profound understanding of interaction patterns between participant and observer.

Social distance is measured as weighted network distance in the union network.[12] For this measure, link weights are inverted and summed up along the path connecting any two individuals. For example, a direct link (path length = 1) present in all six dimensions (weight of 6) results in a social distance of $1/6$ ($\frac{1}{6} \cdot 1$). An indirect link between two people (path length = 2) in which each step is present in only one dimension (weight per link = 1) results in a distance of two ($\frac{1}{1} \cdot 1 + \frac{1}{1} \cdot 1$). Since the distance weights are the inverted link weights, i.e., dimensions in which a link between the two people exists, they range between $1/6$ (link in all six network dimensions) and 1 (link present in only one network dimension).

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[9] Our approach is, thus, similar to the elicitation task procedure by Bicchieri (2017), but differs from Krupka and Weber (2013) in that we do not employ a coordination task.

[10] For the relevance of empirical beliefs for norm following see (e.g. Bursztyn and Yang, 2022; Bicchieri, 2017, 2006; Bursztyn et al., 2020)

[11] The centrality measure used was page rank centrality. Running ex-post regressions, we verified that perceptions of what is appropriate in the game are consistent across participants with different levels of centrality.

[12] We use the igraph package in R and compute social distance using Dijkstra's algorithm, well suited for weighted directed networks.

To validate this distance measure, we additionally elicited perceived social distance utilizing the Inclusion of Other in Self (IOS) Scale (Aron et al., 1992; Gächter et al., 2015). This scale maps the degree to which a person identifies with another person. It is measured by presenting participants with seven images of two entities that gradually move from being fully separated (1) to largely overlapping (7). After the dictator games and, consequently, after learning who the observer is, participants were asked which of these images best reflects their relationship with the observer. The IOS scale represents a valuable measure of interaction quality that goes beyond what is retrievable from interaction patterns measured by social network data, as it also accounts for contact quality or history, capturing, for example, (dis-)similarities in individual-level characteristics, shared experiences, or differences in attitudes and convictions. If social distance measures include interaction quality, they should correlate with IOS scale ratings.

For the study of an observer's influence on a participant's cooperative ties, we focus on two aspects of network patterns: the observer-participant relation and the observer's network position. Regarding the observer-participant relation, we are interested in whether a participant and the observer have a direct link in the network. Within the set of network statistics this is captured by adjacency (compare e.g. Jackson, 2010) - a binary variable which is equal to one whenever participant and observer have a direct link in the network, i.e., either the observer was nominated by the participant, the other way around, or both, and zero otherwise. The observer's position in a network is measured through closeness centrality (Beauchamp, 1965). Centrality, in general, captures the degree of influence a person has on others in a network. Closeness centrality measures the (inverted) average distance a person has to all other network participants. It reflects how quickly information originating from this person can reach everyone else in the network. Most other measures that can be used to understand social centrality (e.g., eigenvector centrality: Breza and Chandrasekhar (2019), Cruz et al. (2017), Iacobelli and Singh (2020), Chandrasekhar et al. (2018a), diffusion centrality: Bloch et al. (2021), Banerjee et al. (2013, 2019)) compute centrality based on the number of links a person has (reported to have) with others in the network and potentially also accounting for how many links those others have to yet other network participants, and so forth. Closeness centrality, while being related, goes beyond that as it does not ask how many people a person can reach but rather how long it takes a person to reach everyone in the network. In that sense, it provides a valuable measure of the full spreading potential of a person above and beyond the reported contacts.[13] Both, the adjacency between participant and observer and the observer centrality are derived for the communication and the cooperation network separately.

4.3. Hypotheses

Based on the conceptual basis provided at the beginning of the paper, we put forward the following hypotheses for the interplay between social image effects, social norms, and interpersonal relationship patterns in our experimental setting:

H.1 *[Social norms serve as reference points for image effects.]* Under observation, average sharing moves in the direction of the social norm.

H.2 *[People care most about a positive image towards closer others.]* The effect of observation on norm conformity decreases with increasing social distance between participant and observer.

H.3 *[Signalling norm conformity is most relevant towards observers with whom the participant cooperates.]* The effect of observation on norm conformity is larger if the participant and observer have direct relational ties in cooperation networks.

H.4 *[Signalling norm conformity is most relevant towards observers who can pass on information about the participants' behavior to others easily.]* The effect of observation on norm conformity is larger if the observer has a central position in communication networks.

Regarding the last two hypotheses, we have data on two network dimensions (cooperation and communication). This implies that we can verify that the identified relationship is indeed specific to the specified network dimension. Thus, we simultaneously expect that relational ties between participant and observer in communication networks do not influence the observer effect, and that observer centrality in cooperation networks does not influence the observer effect on norm conformity.

4.4. Implementation

The data collection took place in seven villages. Every village was visited for several days, during which village residents first participated in the network survey and then in the experimental sessions. We selected small villages such that a high network coverage was feasible.[14] For this reason, the average number of residents above the age of 18 was 131 across our sampled villages.

Fig. 2 summarizes the experimental procedure in villages. On the first and second day of each village visit, trained local enumerators conducted a complete social network survey among adult residents. On the third day, no research activities were scheduled to allow for rest and to minimize potential spillovers. The experimental sessions were held on the fourth and fifth day. All games were conducted in Tok Pisin. Economic games were implemented in private tents by locally trained enumerators. It was ensured throughout

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[13] Which contacts are reported is always shaped by the design of the network questions. If asked, for example, for communication partners during the last week, the reported contacts might not exhaust the communicative potential a person can mobilize if he or she seeks to spread news rapidly.

[14] The seven villages were randomly selected out of a pool of villages in the northern half of the island. Due to general (long-term or short-term) absence as well as sickness of some village members, we were unable to include all villagers in the network elicitation. Still, we achieved overall moderate to high coverage levels with an average of 75%.
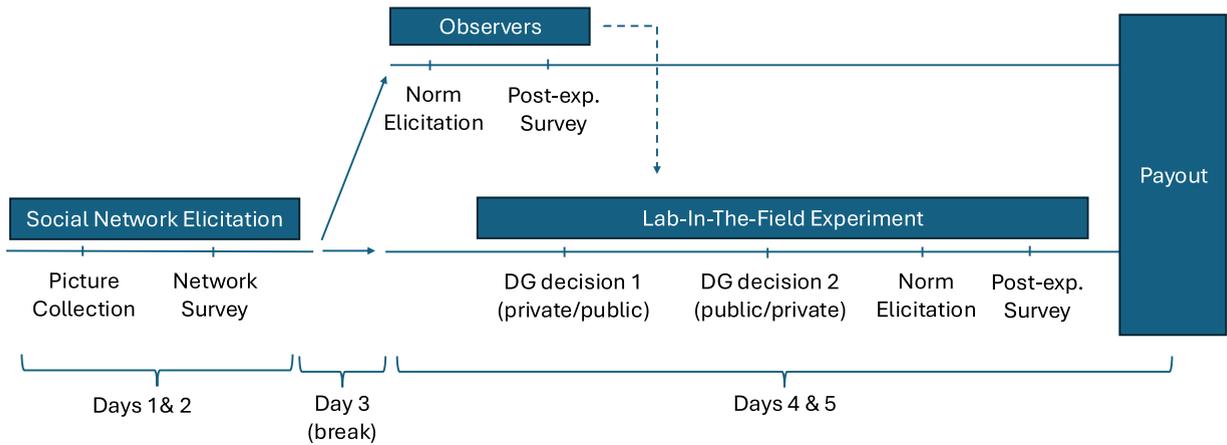
Fig. 2. Experimental design and procedure.

that no other villagers were within sight or hearing distance of the experimental area. Each session — including the dictator game (in private and public), norm elicitation, and post-experimental survey — lasted approximately 45 minutes.[15]

Before the start of the experimental sessions, individuals randomly selected to act as observers were invited to a designated area near the tents. In this area, enumerators provided an explanation of the observer's task, conducted a short practice session, and emphasized that communication with participants was not allowed at any point (for details, see observer instructions in the Supplementary Materials). Before the start of the experimental sessions, each observer privately completed a norm elicitation task and a post-experimental questionnaire. Observers were then randomly assigned to participants. The specific identity of the observer remained unknown to the player until the public decision. For their participation, observers received a remuneration of 20 Kina per day, which reflects the locally accepted daily wage for unskilled labor at the time of the field study.

Participants were randomly drawn from the network survey roster and invited to participate if they were at least 18 years old. For each time slot, seven to nine individuals received a standardized group briefing before proceeding individually to private booths. To minimize contagion or spillover effects, multiple sessions were conducted each day. Following a general introduction and verbal consent, participants were assigned a random ID and directed to one of two experimental areas, each supervised by an enumerator. The dictator game was explained using a visual board and real money (10 Kina) to maximize understanding. Comprehension of both the dictator game and the subsequent norm elicitation task was tested through structured verbal checks before participants proceeded with their decisions.[16] Each participant completed two rounds of the dictator game — one in private, one in public — followed by a second-order norm elicitation and a post-experimental questionnaire. The order of the private and public conditions was randomized. Participants were informed of the presence of an observer in the public condition immediately before making their choice. At the end of the fifth day, participants and observers received their payouts. For details on the instructions and procedures see the Supplementary Material.

In total, 479 individuals participated in the experimental sessions. Of these, 62 were excluded for being underage, 51 for procedural errors (e.g., interruptions, non-compliance), and 1 for missing outcome data. This results in a final sample of 365 participants.[17]

5. Descriptives

5.1. Sample composition

Table C.11 provides descriptive statistics of our sample. The sample of participants is well-balanced in terms of gender. The average participant is 38 years old and shows a good understanding of the experiment. Given the history of violent conflict in Bougainville (Thompson, 1991; Regan, 1998), we collected information on participants' war involvement. This variable is a proxy for exposure to violence during the civil war, measured as the mean answer across six yes/no questions. This variable shows an average of 0.41 on a scale from 0 to 1 and notable heterogeneity within the group of participants. As violence exposure can significantly affect individuals'

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[15] Every participant in the experiment also took part in another experimental session unrelated to the research question developed in this paper. This other session involved a prisoner's dilemma game and was conducted prior to our study session (Grimalda et al., 2023). Participants typically had a break between the sessions. Treatment assignment in our experiment was fully independent of the earlier session, and we find no evidence that the previous experience affected behavior in the dictator game or norm perceptions (see Fig. C.8 and Table C.10 in the Appendix).

[16] Understanding was ensured by having enumerators repeat comprehension questions until participants provided correct responses. At the end of the session, enumerators rated each participant's overall understanding on a scale from 1 (low understanding) to 5 (perfect understanding). This comprehension score is used in the subsequent analysis. For details on the comprehension questions, see the experimental protocol in the Supplementary Materials.

[17] Results are robust to the inclusion of excluded participants. See Appendix Tables A.5–A.8.
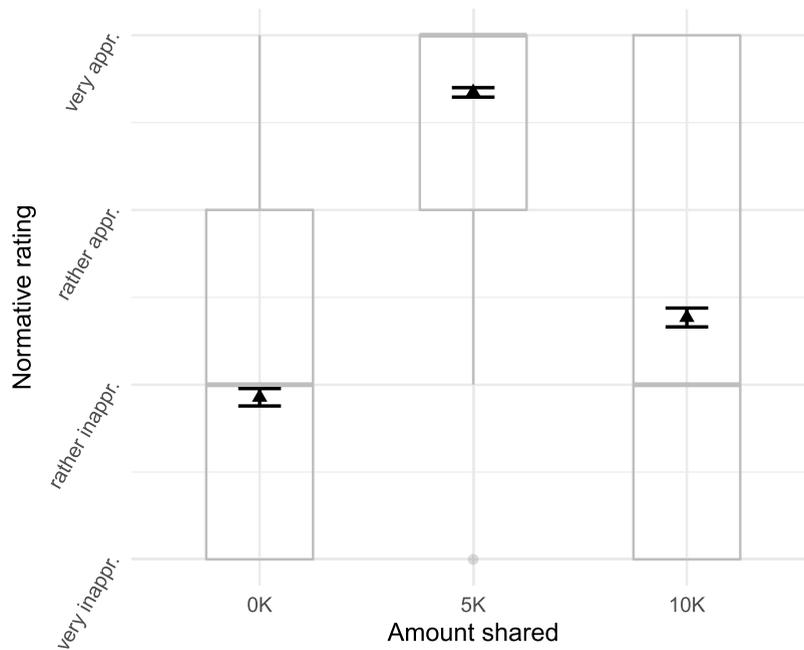
Fig. 3. Norm perception.

Notes: Second-order normative beliefs about the appropriateness of giving 0K/5K/10K. Mean evaluations and corresponding standard errors are embedded in a boxplot.

social demeanors (e.g., Voors et al., 2012; Bauer et al., 2016), it is included as one of the socio-demographic control variables in the analyses. Regarding the DG play, we find the average amount shared to be 3.77 Kina in the private condition and 3.63 Kina in the public condition (compare also Fig. 4).

Compared to the DG participants, the group of observers is slightly older, with an average age of 45 years, contains more individuals who hold a leader position within the community, and is composed of slightly more males than females (63% male / 37% female). Other than that, they show characteristics comparable to those of the average DG participant.

5.2. Social norm

Fig. 3 shows the distribution of second-order normative beliefs (SONBs) about the appropriateness of the three sharing options 0 Kina, 5 Kina, and 10 Kina. The figure shows the mean evaluation (including standard errors) as well as a boxplot informing about the underlying distribution of answers (For a jitter plot visualizing the distribution in more detail, see Fig. C.10 in the Appendix). SONBs converge on the evaluation of giving 5 Kina as being very appropriate and giving 0 Kina as being inappropriate.[18] There is normative heterogeneity surrounding giving 10 Kina to the recipient. In particular, we find a mean just slightly below neutrality and no visible convergence in answers for giving 10 Kina. Intuitively, while giving more can be considered generous in WEIRD societies, it is traditionally considered a misdemeanor in societies with strong rules of reciprocity, as it implies obligating the recipient (Ensminger and Henrich, 2014). We also collected SONBs from a group of villagers who did not play the DG, and can rule out that our incentivized norm elicitation is influenced by the preceding decision in the dictator game (compare Fig. C.11 in the Appendix). In addition, the same pattern of SONBs is present at the village level across all villages in our sample (compare Fig. C.12).

At an individual level, we can verify that the perceived average location of the social norm is similar for DG participants and observers. To do so, we calculate the Average Most Appropriate Choice (AMAC) for each sample. Specifically, for each participant, we determine which allocation(s) — 0K, 5K, or 10K — they believed would be considered most appropriate by others in their village. Some participants identified a single option; others selected multiple if they perceived a tie in appropriateness. We then computed the average of the lowest and highest values in each person's set of most appropriate choices. This yields a lower and upper bound of the AMAC for the sample next to the sample mean. Among DG participants, the mean AMAC was 5.51 Kina (SD = 2.12), the lower bound was 4.73 Kina (SD = 2.44), and the upper bound was 6.32 Kina (SD

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[18] One may argue that low comprehension leads participants to default to the middle option (5 Kina) in the norm elicitation. However, participants rated each amount (0, 5, 10 Kina) separately, so confusion would flatten the distribution rather than create a peak at 5 Kina. In line with this, we find that higher comprehension is associated with stronger convergence on 5 Kina as appropriate ($\beta = 0.12$, $p < .001$), suggesting the norm reflects genuine beliefs rather than uncertainty.
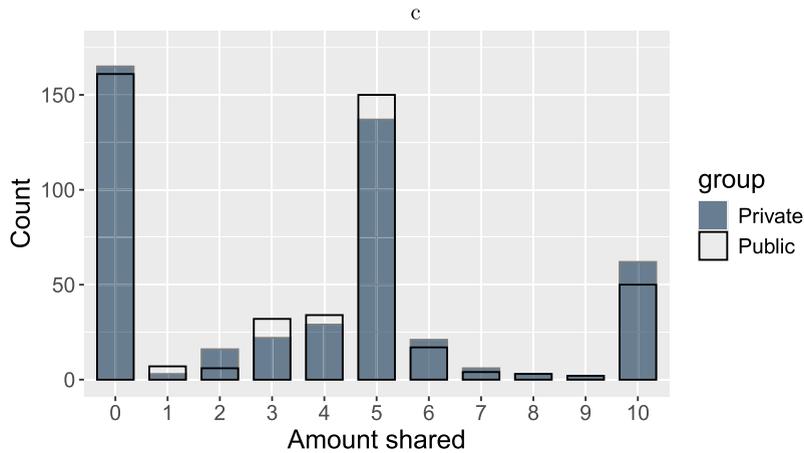
Fig. 4. DG sharing.

Notes: Distribution of the amount sent in the Dictator Game.

= 2.63). This is similar for observers, with a mean AMAC of 5.71 Kina (SD = 2.22), a lower bound of 5.32 Kina (SD = 2.18) and an upper bound of 6.11 Kina (SD = 2.61). The mean and upper bound values are statistically indistinguishable between the two groups (*t*-test: p = 0.4942/0.5776, MWU: p = 0.4923/0.5735), merely the lower bound shows some difference (*t*-test: p = 0.0457/, MWU: p = 0.0609).

Furthermore, we investigate the perceived strength of the social norm at the individual level by using measures of both the certainty in the SONB elicitation task and empirical expectations. Nearly half of all participants report being fully certain about their responses, while only approximately 5% of respondents indicate complete uncertainty. In addition, 61% of participants in the DG expect that a randomly selected villager would choose a sharing amount consistent with the social norm. Beyond this, the histogram of dictator game choices in the private condition (Fig. 4) reveals a quarter of respondents behaving in line with the social norm of giving 5 Kina in private, despite no one being watching. Taking these results together, we consider a widely shared social norm to exist for the 50:50 split in the DG.

When comparing our findings to evidence from WEIRD samples, two notable differences emerge.[19] First, while a 50-50 sharing norm is also commonly observed in Western settings, offers above the equal split are still perceived as appropriate, whereas in our sample they are generally not viewed as appropriate (see, e.g., Kimbrough and Vostroknutov, 2016; Krupka and Weber, 2013). Second, regarding dictator game choices in private conditions, we observe similar focal points as in Western samples, with participants most frequently choosing to give nothing, split the endowment equally, or give the entire amount. However, giving above 50-50 is rare in Western dictator games but occurs in about 20% of our sample (see, e.g., Engel, 2011; Krupka and Weber, 2013). This pattern — where there is (i) no consensus that giving the full amount is appropriate and (ii) a substantial share of participants give above 50-50 — suggests that in our setting, the normative optimum is neither aligned with the selfish nor with the fully prosocial choice, allowing us to differentiate between those motives.

5.3. Social interactions

Looking at social interaction patterns mapped through the network survey, we find that networks are rather dense and largely homogeneous in their characteristics across villages. Table C.12 in the Appendix summarizes network characteristics across villages and network type. On average, village networks include 131 individuals, with each person naming about 35 others. This results in an average network density of 0.29, meaning roughly 29% of all possible directed ties are realized.[20] Despite the overall density, there is notable variation in how individuals are connected. On average, the farthest distance between any two connected individuals in a village network is just over four steps — where a step refers to one link in a chain of social ties. These patterns are consistent across villages, except in the largest one, where density falls to 0.17.

Close social ties are also evident in the average social distance between participants and their observers. Fig. 5 displays the distribution of social distance between participant-observer pairs. The observed distances indicate close social relations, with a median weighted distance slightly above one. The largest finite (weighted) distance between observer and DG participant is approximately

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[19] We note that most evidence from Western societies relies on student subject pools and laboratory experiments, so such cross-cultural comparisons should be interpreted with caution.

[20] Network density is calculated as the ratio of actual to possible directed ties, i.e., Density = $\frac{\text{Observed ties}}{N \times (N-1)}$ where N is the number of individuals in the network. For example, with 4870 observed ties and 131 individuals, the density is $\frac{4870}{131 \times 130} \approx 0.29$.
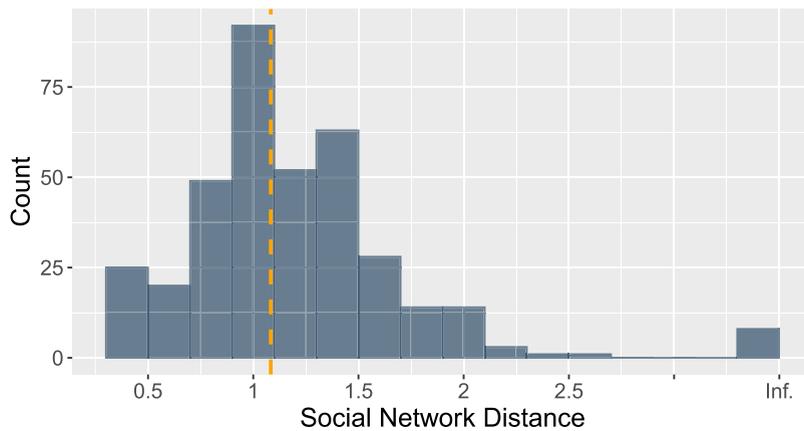
Fig. 5. social distance between participant and observer.

Notes: Distribution of social distance between participant and observer in our dataset. Social distance is measured by the mean number of steps between the participant and observer in the union network. Distance measures are weighted from 1/6 (link present in all six network dimensions) to 1 (link present in only one network dimension), and infinite social distance is computed as missing.

three, corresponding to, for example, a chain of three weak links (each based on one relational dimension).[21] Only eight participant-observer pairs are not connected in any network (having infinite social distance). We excluded these pairs from the data analysis.[22]

A similar picture emerges from the IOS-scale ratings, with a median score of 6 on a scale from 1 (maximum distance) to 7 (minimum distance) for participant–observer pairs (see Fig. C.13 in the Appendix). Moreover, the network-based measure of social distance correlates significantly with IOS ratings (Pearson's $r = -0.115$, $p = .03$; Spearman's $\rho = -0.089$, $p = .09$), and a one-step increase in network distance is associated with a drop of 0.78–0.89 points on the 7-point IOS scale, corresponding to a 15–20% decrease relative to the average level (see Table C.13). This validates the emotional relevance of the network distance between participant and observer.

Comparing the aggregated cooperation and communication network, slight differences in network characteristics are identifiable in line with the nature of the underlying social pattern they are supposed to map (compare Table C.12 in the Appendix). Specifically, communicative relationships require arguably less personal effort to be established than cooperative relationships. Following this intuition, there is a higher number of average links, a higher number of nominations (indegree), and a marginally lower degree of reciprocity in the communication network than in the cooperation network.[23] Still, in sum, these differences between the two networks are minimal.

Table C.11 in the Appendix shows descriptive statistics of the participants' and observers' centrality and adjacency to one another in the communication and cooperation networks.[24] The average observer centrality is 0.35 (sd = 0.10) in the communication network and 0.40 (sd = 0.15) in the cooperation network; similar to the average centrality across DG participants. The average adjacency between participant and observer is 0.56 (sd = 0.50) in the communication network and 0.38 (sd = 0.48) in the cooperation network. Intuitively, this means that 56% (38%) of the DG participants share a direct link with the observer in the communication (cooperation) network. We verify that the sampling of observers from different centrality deciles of the village's union network successfully induced heterogeneity in the relevant observer characteristics within the cooperation as well as communication network. In particular, correlation coefficients of each of the variables with the page rank centrality in the union network that was used for the observer draw are significant for most characteristics.[25] The only exception is the observer's centrality in the communication network. Nevertheless, we find considerable degrees of variation in this observer characteristic, even though this variation does not appear to be induced by our observer sampling strategy.

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[21] Note that with an average diameter of 4 in our sample the theoretical maximum (finite) distance for any two connected network participants would be 4, assuming each link is present in only one network dimension (see summary statistics of diameter at bottom of Table C.12).

[22] These pairs were excluded because they have infinite network distance, which cannot be meaningfully represented in a continuous distance measure.

[23] Reciprocity measures the degree to which person B also nominates person A, given that person A nominated person B. We interpret the difference in reciprocity values for the two networks as a sign of slightly more ambiguity in the degree to which both interaction partners agree on the interaction pattern in the communication network than in the cooperation network.

[24] Centrality values are rescaled through multiplication with 100 to increase precision in the presentation while keeping the number of decimal places the same across variables.

[25] Communication - Adjacency: corr = 0.5962 (p = 0.000), Communication - Centrality: corr = 0.17 (p = 0.1859), Cooperation - Adjacency: corr = 0.2172 (p = 0.090), Cooperation - Centrality: corr = 0.2609 (p = 0.0405). Social Distance: corr = -0.5472 (p = 0.000)

Table 1
OLS regression results - Norms as reference points.

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.176***	−0.176***	−0.176***
	(0.054)	(0.053)	(0.052)
Baseline	2.751***	2.747***	2.747***
	(0.201)	(0.027)	(0.027)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	730	730	730
R^2	0.044	0.214	0.225

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

6. Results

To test our hypotheses, we estimate the following panel-data regression model:

$$y_i = |x_i - x^*| = \beta_0 + \beta_1 Public_i + \gamma_1 \Gamma_i + \gamma_2 V_i + \gamma_3 O_i + \gamma_4 C_i + \epsilon_i,$$

where the dependent variable y_i is the absolute deviation of the amount shared from the community norm of 5 Kina ($|x_i - x^*|$). Higher values indicate larger deviations from the norm (either more or less sharing), while lower values indicate closer adherence to it. $Public_i$ is an indicator for the public (observed) condition, Γ_i includes experimental controls (assistant fixed effects, interview day, decision order, and comprehension level), V_i and O_i denote village and observer fixed effects. Including village fixed effects is important to absorb unobserved heterogeneity across villages, such as differences in cultural norms or network coverage, which may affect the precision of network-level statistics like centrality. Observer fixed effects account for unobserved differences between observers, for example, variation in their social status or local reputation. Finally, C_i contains individual-level covariates (age, gender, level of war involvement, and a community leader dummy). Standard errors are clustered at the village level and calculated via wild bootstrapping to account for the limited number of clusters.[26]

The main result tables report three versions of this model: Model 1 includes only $Public_i$ and Γ_i, Model 2 adds village (V_i) and observer (O_i) fixed effects, and Model 3 additionally includes individual-level controls C_i. To verify robustness given the bounded outcome variable, we also report Tobit regression results in the Appendix (Tables H.18, H.19, H.20, H.21).

6.1. Social norms as reference points

Under H1, we claim that observation leads to an increase in norm following. Table 1 presents the results of the regression analysis. We find a negative average observer effect on the absolute deviation from the norm of around 0.18 Kina. This equals a reduction in the deviation from the norm of around 7 percentage points under observation for the average participant-observer pair. The result is robust to the addition of village and observer fixed effects as well as to controlling for socio-demographic variables of the participant. Additionally, we test the robustness against alternative reference points, acknowledging the fact that we have heterogeneity in norm perceptions as well as a limited choice space for the norm elicitation. Importantly, the result holds also using the individual specific perception of the social norm as a reference point (compare Table E.16 in the Appendix), and the convergence towards the reference point ceases quickly for reference points larger and lower than 5 (see Fig. E.14 in the Appendix), providing support to the behavioral relevance of our social norm measure. Lastly, we also exploit the panel structure of our dataset further and confirm the robustness of our result from Table 1 when employing individual fixed effects (compare Table C.14 in the Appendix).

Fig. 6 presents subsample results. In particular, it shows the observer effect on the average choice in the DG separated by the three subgroups: a) sharing below the norm in private, b) sharing in line with the norm in private, and c) sharing above the norm

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[26] Bootstrapping was implemented in R using the *vcovBS* function from the *sandwich* package (Zeileis et al., 2020; Zeileis, 2004).
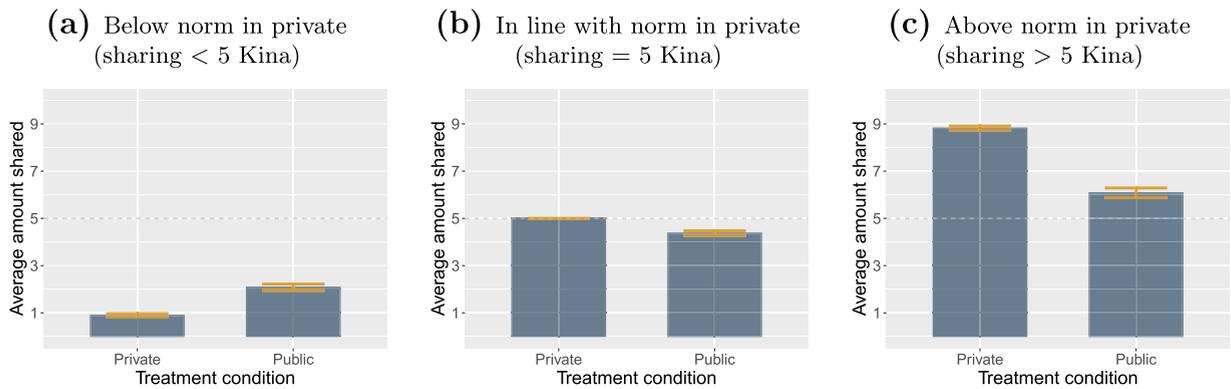
Fig. 6. Observer effect on average DG choice.

Notes: Average giving in private and public for those giving below (a)/in line with (b)/above the norm in private (c). Orange bars show standard errors.

in private. Table D.15 in the Appendix provides the corresponding regression results. Given that we condition on the location of sharing in private for the subsample separation, participants self-select into the two comparison groups. This self-selection, however, works against our hypothesis: The selection in private reveals whether participants have stronger self-interest or stronger prosociality preferences. Under observation, the increased signaling concerns need, thus, to be weighed against the alternative motive most relevant to the participant. The findings show that, first, our result is driven by those deviating from the norm in private. Second, convergence towards the norm is found within the subsample of those who share less than 5 Kina in private (panel a) i.e. those who face the tradeoff between signaling self-interest and norm-conformity or prosociality, as well as within the subsample of those who share more than 5 Kina in private (panel c) i.e. those who face the trade-off between signaling prosociality and norm conformity or self-interest. For the average amount shared, this movement towards the norm from two directions entails that the increase in norm conformity in our data is not accompanied by an increase in average prosociality.

6.2. Role of social network characteristics

6.2.1. Social distance

To investigate H.2, we next report specifications with interaction terms between social distance and the treatment condition (Table 2). Compared to the result from Table 1, we find a positive observer effect on the deviation from the norm (*Public*) once we account for heterogeneity in the social distance between participant and observer. This effect is counterbalanced by a large negative interaction effect between the treatment dummy and social distance between participant and observer (*Public x Netw. Distance*). In contrast to H.2, participants who are observed by someone distant converge more towards the social norm in public compared to participants who are observed by someone who is close in their social network. This result is robust against the inclusion of fixed effects for village and observer, as well as controlling for individual-level socio-demographic variables (compare columns 2 and 3).

These coefficients can be used to construct predicted observer effects on norm conformity for different levels of social distance between participant and observer (compare Fig. F.15 in the Appendix). Doing so, we find that the coefficients from model (3) of Table 2 imply that the most distant observers in our sample increase norm conformity by up to 43%.

6.2.2. Direct links

We further hypothesized (H.3) that direct links within the cooperation network enhance an observer's norm enforcement power, while direct links within the communication network are not relevant. Thus, we run regressions that include information about participant-observer adjacency (Table 3). Given that cooperation adjacency is a subset of communication adjacency for a specific participant-observer pair, variables for adjacency in each of the networks are included conjointly. The results support a differential role for adjacency in cooperation networks and adjacency in communication networks: There is no effect of communication adjacency on the observer effect, yet a significant interaction between the treatment dummy and cooperation network adjacency. However, the sign of the coefficient is contrary to our prediction. In fact, the average norm-enforcing effect of observation is largely offset if the participant and observer are directly linked in the cooperation network. This finding is, again, robust to the inclusion of fixed effects for village and observer and controlling for individual-level socio-demographic variables (compare columns 2 and 3).

6.2.3. Centrality

Lastly, we hypothesized (H.4) that norm enforcement is largest if observed by observers who have a central position in the communication network. With regard to the cooperation network, we do not expect to find an observer's centrality to play a role. We thus include the observer's position in the cooperation and communication network in our regressions in Table 4. Columns 1–3 test for

Table 2

OLS regression results - Role of social distance.

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	0.649***	0.649***	0.649***
	(0.228)	(0.233)	(0.225)
Netw. Distance	0.308	0.232	0.170
	(0.188)	(0.236)	(0.168)
Public x Netw. Distance	−0.731***	−0.731***	−0.731***
	(0.201)	(0.207)	(0.197)
Baseline	2.735***	2.731***	2.731***
	(0.221)	(0.020)	(0.020)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	722	722	722
R^2	0.036	0.188	0.197

Notes: Role of social distance between observer and participant on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Netw. Distance is the weighted social distance between the participant and the observer in the union network. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table 3

OLS regression results - Role of direct links (adjacency).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.407***	−0.407***	−0.407***
	(0.082)	(0.082)	(0.088)
Direct link (coop. netw.)	−0.223	−0.337	−0.358
	(0.218)	(0.255)	(0.266)
Direct link (comm. netw.)	−0.313**	−0.327	−0.280
	(0.131)	(0.251)	(0.266)
Public x Direct link (coop. netw.)	0.511***	0.511***	0.511***
	(0.143)	(0.141)	(0.144)
Public x Direct link (comm. netw.)	0.063	0.063	0.063
	(0.117)	(0.118)	(0.124)
Baseline	2.998***	3.051***	3.035***
	(0.176)	(0.151)	(0.129)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	724	724	724
R^2	0.052	0.218	0.228

Notes: Role of direct observer-participant links on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Direct links are measured as adjacency between participant and observer, which is one if a link exists and 0 otherwise. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table 4
OLS regression results - Role of observer centrality.

	Dependent variable:					
	Dev. from community norm (abs.)					
	Communication			Cooperation		
	(1)	(2)	(3)	(4)	(5)	(6)
Public	−0.733***	−0.733***	−0.733***	−0.321**	−0.321**	−0.321**
	(0.128)	(0.129)	(0.126)	(0.152)	(0.157)	(0.154)
Netw. Centrality (comm.)	−0.311	−0.937	−1.064			
	(1.397)	(0.839)	(0.834)			
Public x Netw. Centrality (comm.)	1.617***	1.617***	1.617***			
	(0.401)	(0.396)	(0.391)			
Netw. Centrality (coop.)				0.883	0.874	0.714
				(0.798)	(0.798)	(1.044)
Public x Netw. Centrality (coop.)				0.365	0.365	0.365
				(0.346)	(0.372)	(0.364)
Baseline	2.844***	3.062***	3.107***	2.392***	2.399***	2.462***
	(0.378)	(0.283)	(0.279)	(0.313)	(0.300)	(0.395)
Village FEs	No	Yes	Yes	No	Yes	Yes
Observer FEs	No	No	No	No	No	No
Ind. Controls	No	No	Yes	No	No	Yes
Observations	724	724	724	724	724	724
R^2	0.047	0.115	0.121	0.051	0.115	0.120

Notes: Role of observer centrality on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Centrality is measured by closeness centrality in the communication or cooperation networks, respectively. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

the role of the observer's network centrality in the communication network, and columns 4–6 for cooperation network centrality.[27] Again, the findings support the claim of differential roles of centrality in communication and cooperation networks for an observer's power to enforce norms: There is no effect of cooperation network centrality on the observer effect, yet a significant interaction between the treatment dummy and communication network centrality. Furthermore, again, the direction of the effect is opposing our hypothesis. The negative coefficient of the treatment dummy is counterbalanced by the positive interaction effect between the public dummy and observer centrality in communication networks. This finding is robust to the inclusion of village fixed effects and controlling for individual-level socio-demographic variables (compare columns 2 and 3/ 5 and 6). Since higher observer centrality might also imply a higher likelihood of the observer having a direct link with the decision-maker, we run an additional analysis controlling for direct links in the cooperation network next to centrality (compare Table G.17 in the Appendix). The results are robust to this exercise corroborating the role of observer centrality in communication networks.

7. Discussion

Taken together, the results provide robust support for a social norm-dependence of image effects, as hypothesized under H1. Behavior reliably shifts toward the prevailing social norm under observation. Furthermore, they provide robust evidence for a dependence of social image effects on the interpersonal relationship between decision-maker and observer. Other than hypothesized under H2-H4, however, this effect is largest for observers who are not closely related to the participant, who do not share cooperative ties with the participant, and who are less central in communication networks. While this rejects the validity of the *importance of image argument* in our data, the consistent direction of our findings regarding the role of interpersonal relationships in observer effects strongly points towards the presence of an alternative channel through which interpersonal relationships affect image effects.

Our initial hypotheses are based on the assumption that interpersonal relationships enter the utility framework via a decision maker's concern for having a positive social image. Alternative to that, interpersonal relationships might enter the equation as well via the observer's interpretation of the decision maker's action by altering the extent to which the observer learns something

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[27] Note that there is no necessity for cooperation network centrality of a person to imply communication network centrality as closeness centrality depends on the link structures within the specific network. Consequently, both attributes are included separately in the regressions.

new about the observed person (*signaling strength argument*). Quite plausibly, the closer, i.e., more familiar the observer is with the decision-maker, the more likely the observer already knows the decision maker's type ex-ante. This might reduce the probability that any further type-signal is informative to the observer. In support of this, Exley (2018) shows how experiment participants can free-ride on a positive social image in later interactions with an observer. Furthermore, Adriani and Sonderegger (2019) show formally that the truncation of a prior belief distribution — such as when social distance between the observer and decision-maker decreases — negatively affects signaling incentives. Consequently, the probability that a signal sent to an observer will actually change the observer's opinion about the decision maker might plausibly be assumed not to be constant across observers but to depend on the amount of information the observer already has on the decision-maker beforehand.

Importantly, all three of our network-related results can be rationalized along this alternative pathway of social distance on observer effects. Social distance between the decision-maker and observer increases the informative value of signaling norm conformity, explaining a positive relation between social distance and image effect size. Similarly, cooperation partners can be assumed to know each other well, thus leaving less room to learn about the other. Consequently, observers who do not have a cooperative link with the participant induce a larger increase in norm conformity than observers with a cooperative link to the participant. Finally, observers who are central in communication networks can, arguably, be assumed to hold more information about any other network participant than observers who are peripheral in communication networks. This could explain why less central observers have stronger effects on norm conformity.

Following this rationalization of results, the support for the *signaling strength argument* seems to outweigh any potential support for the *importance of image argument* in our data. What we cannot infer, however, is the general irrelevance of the *importance of image argument* due to the composition of our data set. Our data is taken from a sample with dense social networks in all of the communities studied, with barely any true outsiders and high average IOS ratings. Even the most distant person is not a complete stranger. Consequently, our results pertain to the lower end of the social distance gradient, and we cannot rule out a notable presence of the *importance of image argument* at the upper end of the distance gradient. Beyond that, there are alternative explanations, such as a change in the social norm itself, differences in norm strength when behavior is observed by socially distant versus proximate others, or reduced need for justification toward close observers who are familiar with contextual nuances (Tetlock, 1985; Xiao, 2017). We cannot rule out the relevance of these additional mechanisms. This paper thus provides an important foundation for future empirical investigations into how an observer's identity shapes social image effects.

8. Conclusion

Social image effects are a powerful and nearly universal driver of human behavior, yet they remain poorly understood. This substantially limits our ability to assess the external validity of many (lab) experimental findings and to predict the effectiveness of policy interventions. Fundamentally, addressing the following questions is crucial: In which direction does behavior change under observation? Who is most susceptible to image effects? And which situational factors determine the magnitude of image effects?

This paper advances this agenda by studying the dependence of social image effects on two key contextual factors: (i) alignment with social norms and (ii) the social relationship between observer and decision-maker. Using lab-in-the-field experiments in Papua New Guinea, participants played a dictator game either privately or under observation by another randomly selected villager, while incentivized measures of social norms were collected. Results show that observation reduces deviations from the social norm, with distant observers increasing norm conformity by up to 43 compared to an effect of 7% for the average observer. However, this effect vanishes for the closest observers. Moreover, image effects weaken when participant and observer share direct cooperation links and decrease with the observer's communication centrality. These findings, partly deviating from our hypotheses, can be rationalized assuming that signals toward socially close observers may be less informative, thereby dampening the power of observation to enforce norms.

Building on these findings, the paper raises broader conceptual questions about the mechanisms driving image effects. While existing evidence emphasizes the *importance of image* hypothesis — predicting stronger image concerns when observed by close peers — our results align more closely with an alternative *signaling strength* pathway. Understanding how these two mechanisms interact, whether they can be reconciled, and in which contexts one dominates the other is a critical avenue for future research. Additionally, other mechanisms may be at play beyond these two channels. This has implications not only for the literature on social image effects but also for research on social norms, where the reference group is central to norm enforcement. Our findings challenge the common assumption that closer ties always enhance enforcement power. At minimum, the results highlight an upper bound on this intuition and call for a more precise understanding of which reference group compositions most effectively enforce norms. From a policy perspective, this translates into an open question: under what conditions should behaviors be made public to strengthen compliance, and when might privacy be more effective?

Our study was intentionally designed to test the *importance of image* hypothesis in small-scale communities. This focus entails certain limitations for external validity and for our ability to fully disentangle mechanisms behind image effects. First, the sample consists of densely connected social networks with very few true outsiders. As a result, we lack sufficient variation in social distance to explore how image effects might operate with distant observers or complete strangers—contexts where the balance between *signal strength* and *importance of image* may differ. Second, although observers were instructed not to communicate with participants and enumerators monitored compliance, non-verbal cues in the public condition cannot be fully ruled out. In ex post analysis, however, we find that the data pattern speaks generally against systematic bias from this: norm enforcement is weaker with close observers — those with the largest incentive to coordinate implicitly — and stronger with more distant observers. Moreover, observer fixed effects absorb any remaining unobserved heterogeneity, including differences in expressiveness or status. Nonetheless, due to this design

setup our findings are most reminiscent of real-world situations where non-verbal signaling between observer and decision-maker may occur. Third, the norm elicitation used three focal points (give nothing, half, or all), simplifying choices to reduce cognitive burden. Future work should extend this to finer-grained sharing options and include richer individual-level controls (e.g., income or wealth) to better characterize norm followers and above/below-norm sharers. Finally, while conducting the study in a non-WEIRD context broadens evidence on image effects, additional research is needed to establish robustness in WEIRD populations. Existing findings provide partial confirmation: Asulin et al. (2024) report that, in Israeli schools, friends are less effective than acquaintances at motivating effort in a donation task, and for example Engel (2011) find that higher social proximity between decision-maker and recipient reduces giving in dictator games. However, evidence on social proximity toward observers remains scarce.

While we acknowledge these limitations, our findings make an important contribution by identifying alignment with social norms and the social distance between decision-makers and observers as central determinants of social image effects. By showing how these contextual factors shape norm enforcement, the study advances our understanding of when and why observation influences behavior and points towards important questions for future research. In doing so, our paper provides an important step forward in deriving a structural basis for policy design aimed at leveraging social image to promote norm compliance.

Data availability

Data will be made available on request.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Susann Adloff reports financial support was provided by German Research Foundation. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

Supplementary material

Supplementary material associated with this article can be found in the online version at 10.1016/j.jebo.2026.107506.

Appendix A. Robustness against including omitted observations

The sample used for the main analyses excludes participants who were underaged at the time of the interview and those who were experiencing any kind of procedural errors during the experimental elicitations that interfered with the planned protocol. In the following we rerun the analyses from our main results tables using a sample that includes also those observations (Table A.5, A.6 and A.7).[28] They provide full support that the results presented in this paper are not driven by the exclusion of those observations.

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[28] Note: That the sum of observation nonetheless is still below the 958. This is due to the fact that of the observations with procedural errors there are for example some where the record sheet with all additional information aside from the DG choice was not available, consequently we are not able to include them in our regressions still. Similarly for some participants information on some of the regressors is not available such that observation numbers might vary between tables.

Table A.5
OLS regression results - Norms as reference points (non-robust sample).

cmidrule(lr)2-4	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.160***	−0.160***	−0.160***
	(0.054)	(0.054)	(0.055)
Baseline	2.821***	2.819***	2.819***
	(0.182)	(0.028)	(0.028)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	920	920	920
R^2	0.052	0.177	0.183
Note:	*p<0.1; **p<0.05; ***p<0.01		

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table A.6
OLS regression results - Role of social distance (non-robust sample).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	0.358*	0.358	0.358*
	(0.212)	(0.223)	(0.214)
Netw. Distance	0.246	0.354*	0.299*
	(0.208)	(0.201)	(0.173)
Public x Netw. Distance	−0.474***	−0.474***	−0.474***
	(0.176)	(0.181)	(0.178)
Baseline	2.813***	2.811***	2.811***
	(0.191)	(0.023)	(0.022)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	886	886	886
R^2	0.063	0.183	0.190

Notes: Role of social distance between observer and participant on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Netw. Distance is the weighted social distance between the participant and the observer in the union network. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table A.7

OLS regression results - Role of direct links (adjacency - non-robust sample).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.382***	−0.382***	−0.382***
	(0.067)	(0.065)	(0.067)
Direct link (coop. netw.)	−0.196	−0.370*	−0.390
	(0.184)	(0.222)	(0.260)
Direct link (comm. netw.)	−0.342**	−0.389	−0.349
	(0.159)	(0.255)	(0.227)
Public x Direct link (coop. netw.)	0.363***	0.363***	0.363***
	(0.130)	(0.135)	(0.132)
Public x Direct link (comm. netw.)	0.129	0.129	0.129
	(0.109)	(0.109)	(0.108)
Baseline	3.076***	3.177***	3.166***
	(0.167)	(0.166)	(0.149)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	896	896	896
R^2	0.064	0.189	0.195

Notes: Role of direct observer-participant links on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Direct links are measured as adjacency between participant and observer, which is one if a link exists and 0 otherwise. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table A.8

OLS regression results - Role of observer centrality (non-robust sample).

	Dependent variable:					
	Dev. from community norm (abs.)					
	Communication			Cooperation		
	(1)	(2)	(3)	(4)	(5)	(6)
Public	−0.545***	−0.545***	−0.545***	−0.265	−0.265	−0.265
	(0.107)	(0.104)	(0.109)	(0.161)	(0.163)	(0.163)
Netw. Centrality (comm.)	0.379	0.059	0.030			
	(0.752)	(0.944)	(0.743)			
Public x Netw. Centrality (comm.)	1.065***	1.065***	1.065***			
	(0.313)	(0.307)	(0.313)			
Netw. Centrality (coop.)				0.966**	1.552***	1.408**
				(0.464)	(0.529)	(0.690)
Public x Netw. Centrality (coop.)				0.223	0.223	0.223
				(0.364)	(0.377)	(0.370)
Baseline	2.689***	2.798***	2.808***	2.44***	2.217***	2.277***
	(0.231)	(0.32)	(0.248)	(0.263)	(0.204)	(0.262)
Village FEs	No	Yes	Yes	No	Yes	Yes
Observer FEs	No	No	No	No	No	No
Ind. Controls	No	No	Yes	No	No	Yes
Observations	896	896	896	896	896	896
R^2	0.056	0.103	0.110	0.063	0.110	0.116

Notes: Role of observer centrality on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Centrality is measured by closeness centrality in the communication or cooperation networks, respectively. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Appendix B. Robustness against receiver variation

In the original design there is a variation whether the recipient in the dictator game was from the same villages as the decision maker or from another village. We do not distinguish between recipient groups in this paper as there is virtually no differences in how participants behave vis-a-vis the two recipient types - neither in norm perception nor in average sharing.
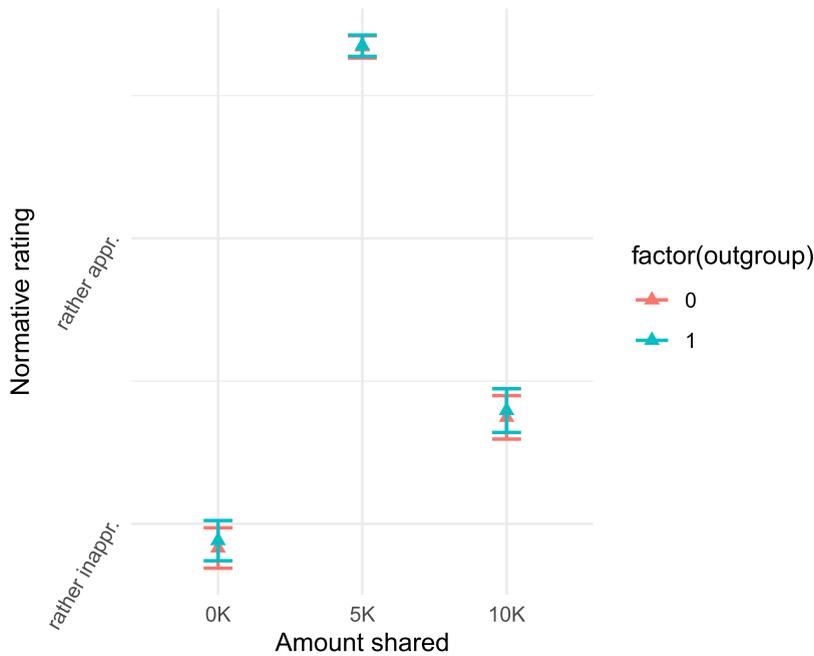
Fig. B.7. Norm perception - Receiver robustness.

Norm perception in terms of second-order beliefs about appropriateness of giving 0K/5K/10K to a recipient from the same village (ingroup) and from another village (outgroup). Shown are means with according standard errors.

Table B.9

Regression results - Role of recipient type.

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.227***	−0.227**	−0.227**
	(0.091)	(0.092)	(0.093)
OwnVillageRec	−0.273	−0.249	−0.217
	(0.301)	(0.239)	(0.227)
Public x OwnVillageRec	0.100	0.100	0.100
	(0.218)	(0.215)	(0.213)
Baseline	2.892***	2.876***	2.859***
	(0.278)	(0.111)	(0.106)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	730	730	730
R^2	0.046	0.216	0.226

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. OtherVillRec is a dummy variabe that is 1 if the recipient was from a different village and 0 if the recipient was from the same village as the dictator. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Appendix C. Robustness against previous game play

Before participating in our experimental session, respondents participated in another experimental session in which they had to play a Prisoners Dilemma (PD) in one out of three treatment conditions (baseline, observer, third party punishment). Between sessions participants had a break and the treatment assignment for our experiment is fully independent of the treatment allocation in the PD. Nonetheless the following figure and table test for any potential influence of the previous experiences on norm perceptions and behavior in the DG. While we find that participants experiencing the third party punishment condition in the previous experiment give significantly less in the private condition in the DG than other participants, we find no significant interaction effects with our observation effect and no difference in norm perception. Similarly, there is no difference in norm perception and behavior in the DG for participants who experienced the observer treatment in the previous experiment.
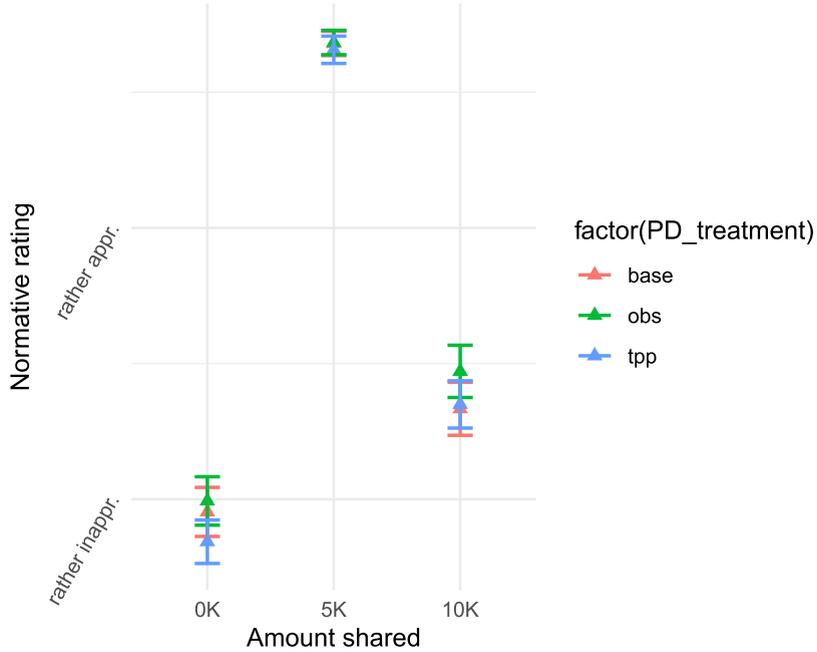

Fig. C.8. Norm perception - Previous experience robustness.
Norm perception in terms of second-order beliefs about appropriateness of giving 0K/5K/10K separated by experiences in previous experiment. Shown are means with according standard errors.
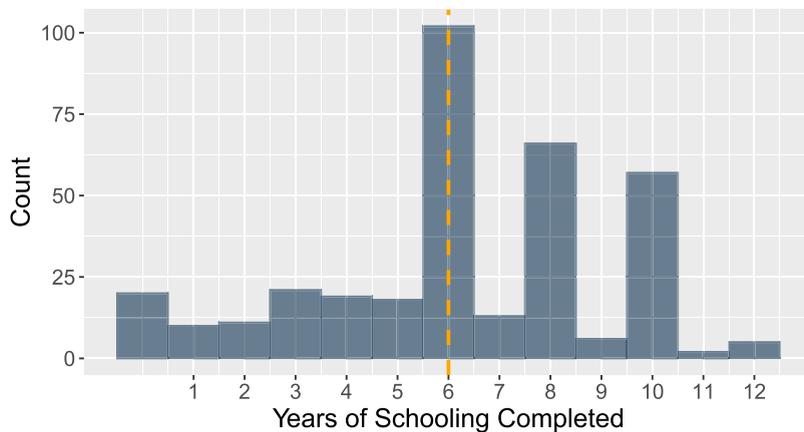

Fig. C.9. Education Histogram.
Notes: Histogram of the years of schooling completed of all participants in the sample used for analyses. Median is marked by the orange line.

Table C.10
Regression results - Role of previous experiment.

	Dependent variable:			
	Dev. from community norm (abs.)			
	(1)	(2)	(3)	(4)
Public	−0.220**	−0.220**	−0.130*	−0.130*
	(0.104)	(0.102)	(0.072)	(0.069)
Obs Treatment	0.163	0.171		
	(0.152)	(0.190)		
Public x Obs Treatment	0.132	0.132		
	(0.302)	(0.291)		
TPP Treatment			−0.631***	−0.524**
			(0.198)	(0.222)
Public x TPP Treatment			−0.134	−0.134
			(0.122)	(0.116)
Baseline	2.697***	2.69***	2.962***	2.922***
	(0.200)	(0.071)	(0.218)	(0.094)
Village FEs	No	Yes	No	Yes
Observer FEs	No	Yes	No	Yes
Ind. Controls	No	Yes	No	Yes
Observations	730	730	730	730
R^2	0.046	0.227	0.064	0.236

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. TPP/ Obs Treatment are indicator variables that are 1 if the DG participant was in the third party punishment/ observation treatment in the previous experiment and 0 else. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table C.11
Descriptive sample statistics.

	DG Participants		Observer		
	Mean	St. Dev.	Mean	St. Dev.	Min/Max
Gender (1 = male)	0.48	0.50	0.63	0.49	0/1
Age	38.05	13.67	44.60	14.71	18/76
Understanding (5 = very good)	3.96	1.10	4.31	1.15	1/5
War Involvement (1 = high)	0.41	0.28	0.47	0.31	0/1
Community Leader	0.07	0.26	0.40	0.49	0/1
DG behaviour:					
Sharing in private	3.77	3.35	-	-	0/10
Sharing in public	3.63	3.16	-	-	0/10
Network Characteristics:					
Netw. Distance to Obs./Part.	1.15	0.42	1.15	0.42	0.33/2.67
Communication					
Netw. Centrality*	0.35	0.10	0.35	0.10	0.004/0.62
Direct link (Adjacency)	0.56	0.50	0.56	0.28	0/1
Cooperation					
Netw. Centrality*	0.40	0.16	0.40	0.15	0.13/0.87
Direct link (Adjacency)	0.38	0.48	0.37	0.23	0/1
N	365		63		

Notes: Sample characteristics for the DG participants (columns 1 and 2) and the group of observers (columns 3 and 4). * PR - page rank

Table C.12

Descriptive network characteristics.

	Sample Average	Vill. 4	Vill. 7	Vill. 9	Vill. 6	Vill. 10	Vill. 8	Vill. 5	Communication	Cooperation
Nodes	131	161	128	70	126	215	120	97	131	131
Edges	4870.29	8462	5243	1565	4231	7859	3446	3286	3474.43	3155.14
Indegree (Mean)	35.5147	52.5590	40.9609	22.3571	33.5794	36.5535	28.7167	33.8763	25.2998	23.1127
Indegree (Std)	16.0045	21.6823	17.1471	11.0598	15.3828	20.0894	14.5025	12.1675	16.2073	8.5753
Density	0.2870	0.3285	0.3225	0.3240	0.2686	0.1708	0.2413	0.3529	0.2039	0.1869
Reciprocity	0.4244	0.4323	0.4661	0.4141	0.4216	0.3672	0.3836	0.4857	0.2951	0.3746
Transitivity	0.5714	0.6305	0.6170	0.6089	0.5609	0.4294	0.5127	0.6401	0.4877	0.4407
Diameter	4.14	4	4	4	4	4	5	4	4.43	5.14

Notes: Descriptive network characteristics averaged across the whole sample (column 1), each village's union network separately (column 2–8), and the aggregate communication and cooperation network. Nodes - number of network participants, Edges - overall number of links between nodes, Indegree - average number of links towards a node, Density - network tightness (total number of actual links divided by number of potential links), Reciprocity - likelihood of a reverse link for every link in the network, Diameter - maximum length of shortest network path.

Table C.13

Network centrality and IOS.

	Dependent variable: IOS Rating		
	(1)	(2)	(3)
Network Distance	−0.782***	−0.891***	−0.866***
	(0.243)	(0.260)	(0.264)
Constant	5.272***	4.909***	3.956***
	(0.716)	(0.781)	(0.884)
Proced. FEs	Yes	Yes	Yes
Village FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	357	357	357
R^2	0.229	0.255	0.269

Notes: Linear regression of ios scale rating on social network distance between participant and observer. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table C.14

Regression results - Norms as reference points (Ind. FEs).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
public	−0.173***	−0.173***	−0.173***
	(0.072)	(0.072)	(0.072)
Ind. FEs	Yes	Yes	Yes
Village FEs	No	Yes	Yes
Observer FEs	No	No	Yes
Observations	754	754	754
R^2	0.814	0.814	0.814

Notes: Observer effect on deviation from the norm in the DG using the panel data structure and including individual fixed effects throughout. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered at the village level and presented in parentheses. *p<0.1; **p<0.05; ***p<0.01.
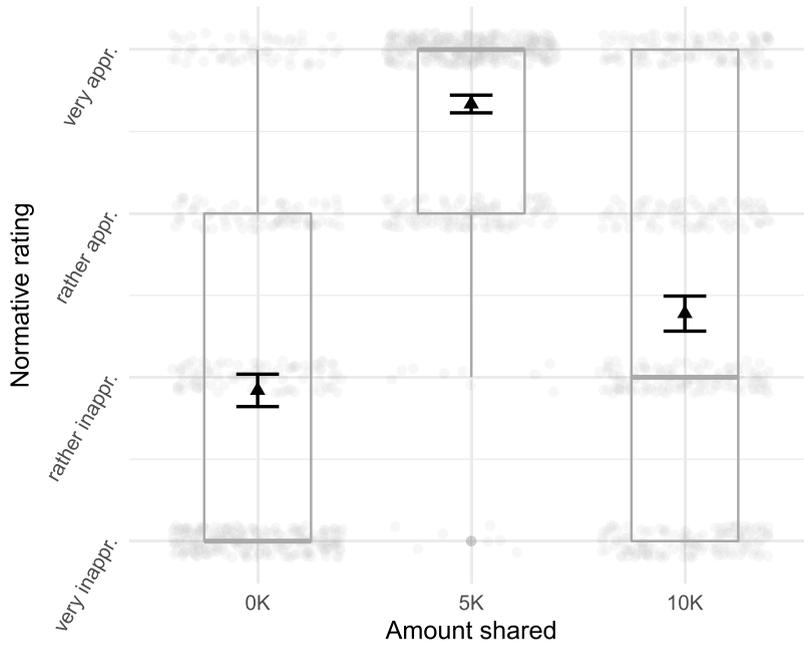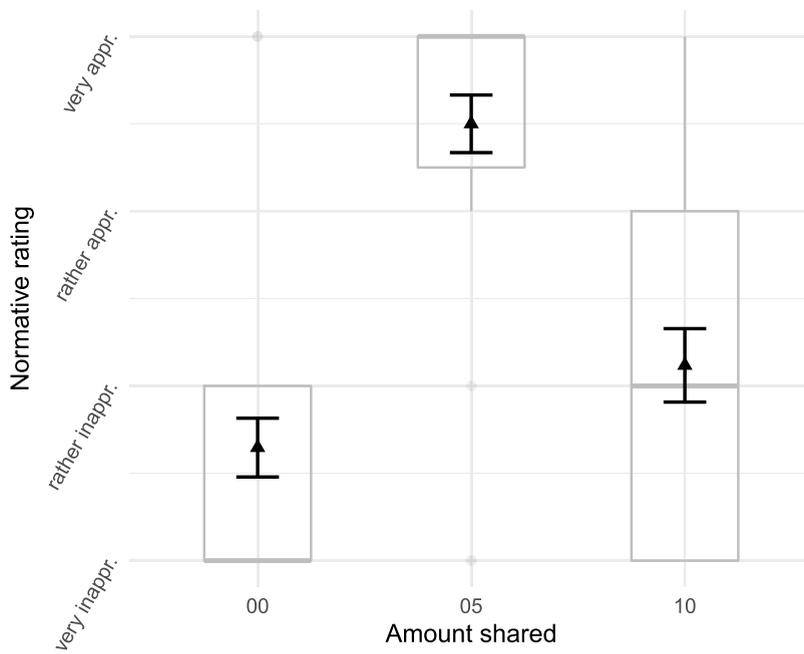
Fig. C.10. Norm perception.

Fig. C.11. Norm perception (norms only sample).
Notes: Second-order normative beliefs about appropriateness of giving 0K/5K/10K. Mean evaluations and corresponding standard errors are embedded in a boxplot. Sample: "Norms only" (additional respondents who only participated in the norm elicitation but not in the DG; N = 45).
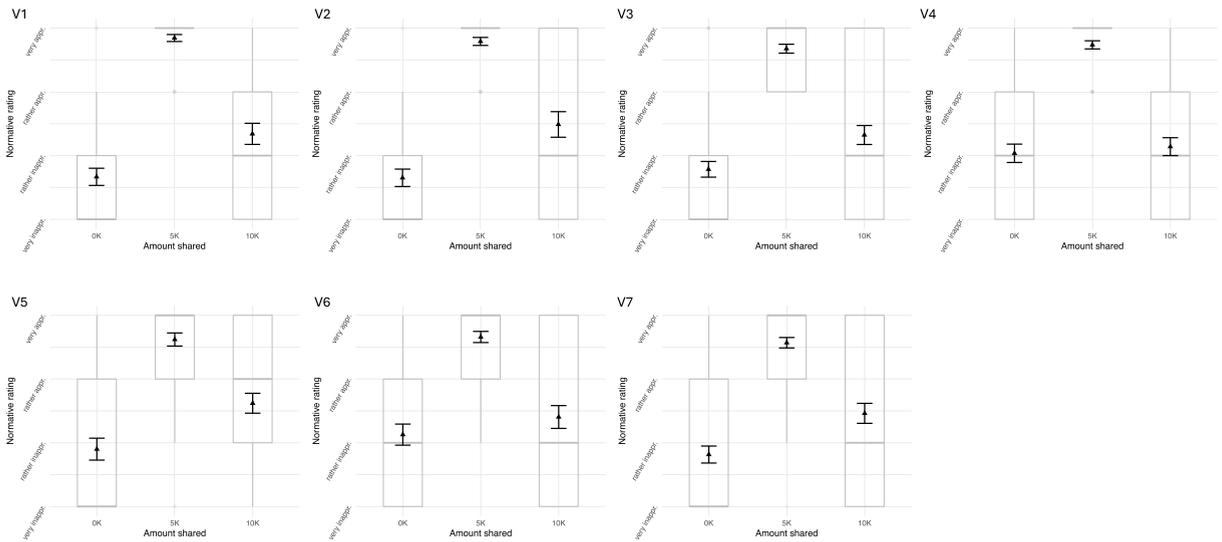
Fig. C.12. Norm perception (across villages).
Notes: Second-order normative beliefs about appropriateness of giving 0K/5K/10K for each village. Mean evaluations and corresponding standard errors are embedded in a boxplot.
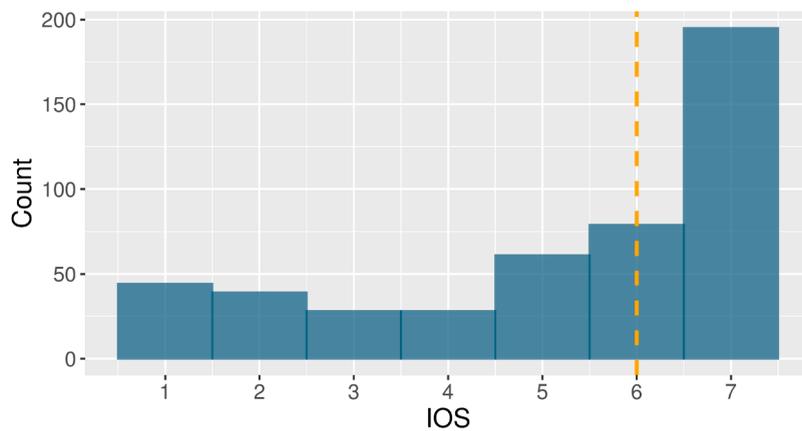

Fig. C.13. Perceived subject-observer distance.
Notes: Distribution of IOS scale ratings. 1 = no overlap at all (maximal distance), 7 = majority overlap (maximal proximity). The orange line marks the median answer.

Appendix D. Observation effect by sup-groups

Table D.15 shows the observer effect on the absolute deviation from the norm separated by the three subgroups a) sharing below the norm in private ($I(x < 5)$), b) sharing in line with norm in private (Baseline) and c) sharing above the norm in private (($I(x > 5)$)).

Table D.15

Regression results - Norms as reference points (by subgroups).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	0.427**	0.427*	0.427**
	(0.206)	(0.222)	(0.212)
$I(x_{priv} < 5)$	2.221***	2.151***	2.124***
	(0.196)	(0.277)	(0.267)
$I(x_{priv} > 5)$	1.977***	1.673***	1.644***
	(0.240)	(0.296)	(0.284)
Public x $I(x_{priv} < 5)$	−1.186***	−1.186***	−1.186***
	(0.268)	(0.283)	(0.276)
Public x $I(x_{priv} > 5)$	−0.789***	−0.789***	−0.789***
	(0.228)	(0.248)	(0.229)
Baseline	1.573***	1.634***	1.649***
	(0.192)	(0.148)	(0.150)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	730	730	730
R^2	0.180	0.313	0.319

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Appendix E. Alternative reference points

E.0.0.1. Personal Norm Perception.. Plausibly, the relevant reference point for a person's behavior might not be the community norm but instead the personally perceived location of the social norm, i.e. a person who states to think that others think sending an amount other than 5 is most appropriate, might follow his/her personal second order normative beliefs (SONBs) instead of 5 (the convergence of the SONBs within the community). To test for the robustness of our results regarding these considerations, we re-run our regressions on H1 using a person's personal SONBs as reference point instead of the community norm of sending 5 (note: for 58 of the sample 5 is also the personally perceived norm location). Importantly, personal SONBs are not forced to be single-peaked. A participant might provide high ratings for several choice options, such that the SONBs might not only specify a point as normative optimum but might equally well specify several outcomes as normatively optimal (compare description of the AMAC calculations in the main text). For this reason the deviation from personal SONBs is calculated as the distance to a) the minimum amount shared the participant considered to be rated most appropriate by others, in case the amount sent is below the range, or b) the maximum amount shared the participant considered to be rated most appropriate by others, in case the amount sent is above the range of highest SONBs. Fig. E.16 shows the results of these analyses. We find that the coefficient does not vary notably when exchanging the reference point to be personal SONBs instead of the community norm of 5. However, the results are less clearly identified. A result, that is little surprising given the fact that SONBs are intervals for several participants, whereas the norm of 5 is a point measure for all.

E.0.0.2. Vicinity of 5.. Additionally, to understand the convergence under observation more closely, we re-run the analysis under H1 again using each of the possible choice options as reference points. The results are shown in Fig. E.14 below. In fact, it can be seen that no convergence in behavior can be found for any point above 5 nor for the options of 0 and 1. Notably, a convergence in behavior that is comparably strong as we find for 5 can be identified for the options of sending 3 and 4 Kina, with the largest explanatory power being achieved using 4 and 5 as reference points.

Table E.16

Norms as reference points - Using personally perceived norm location as reference point.

| | Dependent variable: | | |
| | Dev. from own perceived norm location (abs.) | | |
	(1)	(2)	(3)
Public	−0.160*	−0.160*	−0.160*
	(0.094)	(0.095)	(0.097)
Baseline	2.536***	2.522***	2.521***
	(0.202)	(0.047)	(0.048)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	718	718	718
R^2	0.030	0.177	0.183

Notes: Observer effect on deviation from the norm in the DG, using the participants personal perception about the location of the social norm as reference point instead of the community norm of five. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.
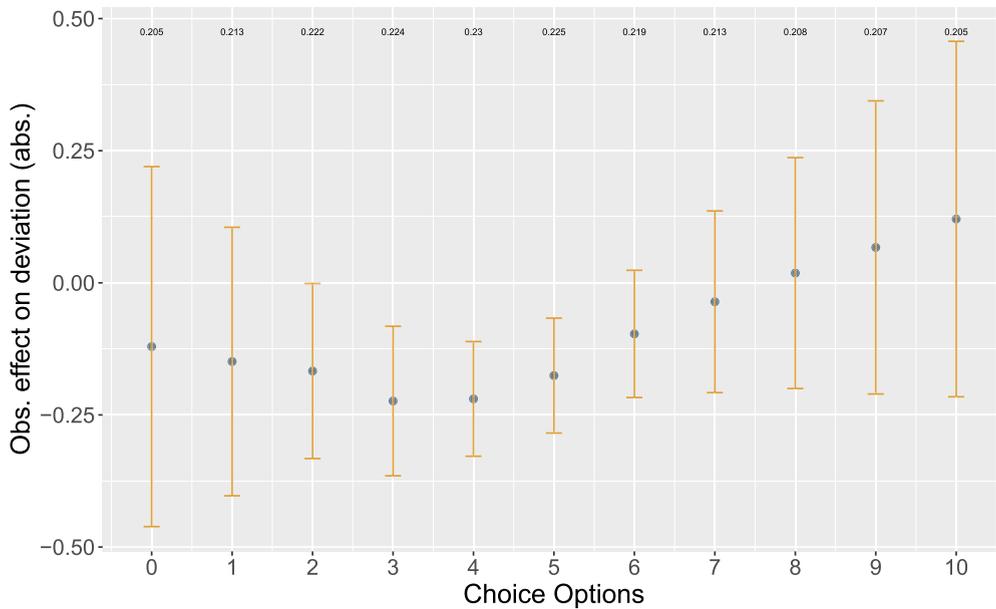

Fig. E.14. Observer effect on the absolute deviation from each of the possible choice options.

Notes: Coefficients from rerunning Model (3) of Table 1 with each possible outcome option as a reference point. Orange error bars show confidence intervals. numbers above the bars show R^2-values.

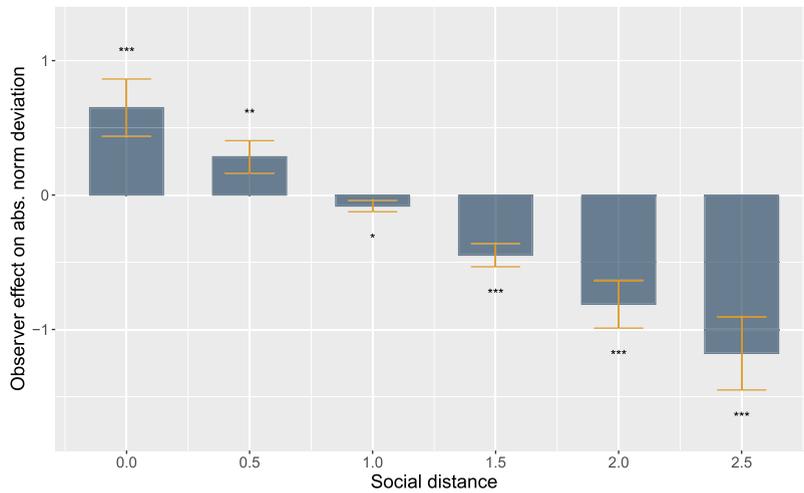## Appendix F. Predicted observer effect by social distance

Fig. F.15. Predicted observer effect along the social distance gradient.

Notes: Predicted observer effect for the average respondent in our sample for different degrees of social distance between participant and observer based on the estimation results from Model (3) in Table 2. Orange error bars depict standard errors. $^*p < .1; ^{**}p < .05; ^{***}p < .01$.

We additionally plotted the observer effect using the actual estimated coefficients from subsamples of different social distance levels (Fig. F.16). This approach allows to dismiss the linearity assumption along the social distance gradient. It shows that the positive effect for close observers diminishes, suggesting that the positive effect of observation on norm conformity for close observers might potentially be an artifact of the linearity assumption in the OLS model.
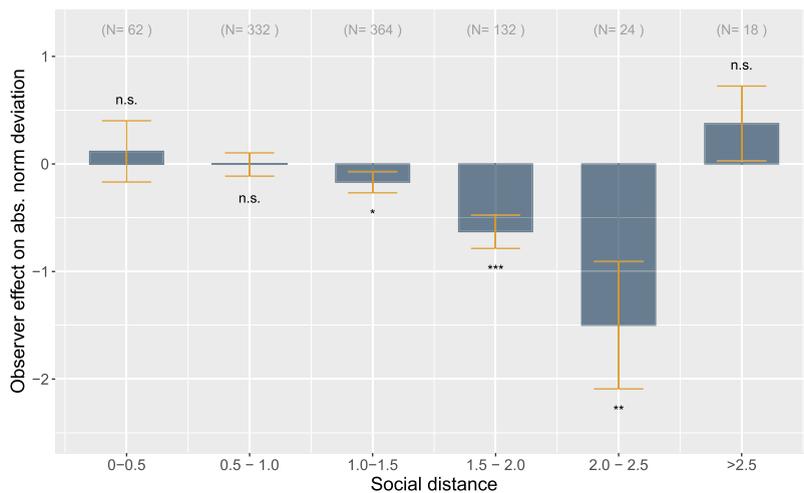

Fig. F.16. Observer effect along the social distance gradient (Split sample regression analysis).

Notes: Coefficients of the observer effect for different degrees of social distance between subject and observer based on rerunning the model (3) of Table 1 on subsamples with according social distance values. Orange error bars show standard errors. Number of observations are presented at the top. $^*p<0.1; ^{**}p<0.05; ^{***}p<0.01$.

Appendix G. Robustness of centrality results

Table G.17
Robustness - Role of observer centrality.

	Dependent variable:			
	Dev. from community norm (abs.)			
	Communication		Cooperation	
	(1)	(2)	(3)	(4)
Public	−0.733***	−0.712***	−0.321**	−0.373***
	(0.131)	(0.127)	(0.147)	(0.126)
Netw. Centrality (comm.)	−106.418	−33.284		
	(86.013)	(125.833)		
Public x Netw. Centrality (comm.)	161.698***	102.028***		
	(41.160)	(34.555)		
Netw. Centrality (coop.)			71.445	132.700*
			(81.205)	(76.546)
Public x Netw. Centrality (coop.)			36.548	−2.290
			(33.679)	(23.414)
Direct link (coop. netw.)		−0.413		−0.481*
		(0.269)		(0.259)
Public x Direct link (coop. netw.)		0.487***		0.539***
		(0.109)		(0.110)
Baseline	3.107	2.849	2.392	2.159
	(0.29)	(0.424)	(0.305)	(0.284)
Village FEs	Yes	Yes	Yes	Yes
Observer FEs	Yes	Yes	Yes	Yes
Ind. Controls	Yes	Yes	Yes	Yes
Observations	724	724	724	724
R^2	0.121	0.124	0.120	0.125

Notes: Role of observer centrality on deviation from the norm in the DG, controlling for direct links in the cooperation network. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Centrality is measured by closeness centrality in the communication or cooperation networks, respectively. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Baseline presents the constant accounting for these controls. It is derived as the average predicted outcome for public = 0 across all possible level combinations of the included controls. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Appendix H. Tobit regression results

Table H.18
Tobit regression results - Norms as reference points.

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−0.721**	−0.717**	−0.691**
	(0.318)	(0.299)	(0.289)
Intercept	8.856**	14.227***	15.416***
	(3.553)	(4.047)	(6.099)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	730	730	730
Log Likelihood	-1,015.054	−948.146	−944.3829

Notes: Observer effect on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *$p<0.1$; **$p<0.05$; ***$p<0.01$.

Table H.19
Tobit regression results - Role of social distance.

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	2.640**	2.552**	2.581**
	(1.243)	(1.139)	(1.186)
Netw. Distance	1.174	1.209	0.796
	(0.875)	(1.090)	(0.914)
Public x Netw. Distance	−2.971***	−2.907***	−2.904***
	(1.055)	(0.999)	(1.026)
Intercept	7.785*	12.833***	14.530**
	(4.356)	(3.865)	(5.846)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	722	722	722
Log Likelihood	−993.5	−931.1	−926.5

Notes: Role of social distance between observer and participant on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Netw. Distance is the weighted social distance between the participant and the observer in the union network. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered on village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement and whether the participant is a community leader. *$p<0.1$; **$p<0.05$; ***$p<0.01$.

Table H.20

Tobit regression results - Role of direct links (adjacency).

	Dependent variable:		
	Dev. from community norm (abs.)		
	(1)	(2)	(3)
Public	−1.607***	−1.613***	−1.598***
	(0.510)	(0.505)	(0.493)
Direct link (coop. netw.)	−1.282	−2.023*	−2.118*
	(0.945)	(1.196)	(1.246)
Direct link (comm. netw.)	−0.976*	−0.958	−0.753
	(0.549)	(1.413)	(1.366)
Public x Direct link (coop. netw.)	2.127***	2.142***	2.168***
	(0.640)	(0.568)	(0.582)
Public x Direct link (comm. netw.)	0.129	0.128	0.130
	(0.586)	(0.580)	(0.572)
Intercept	9.921***	15.895***	16.846***
	(3.211)	(4.315)	(6.280)
Village FEs	No	Yes	Yes
Observer FEs	No	Yes	Yes
Ind. Controls	No	No	Yes
Observations	724	724	724
Log Likelihood	−1003.2	−937.2	−933.7

Notes: Role of direct observer-participant links on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Direct links are measured as adjacency between participant and observer, which is one if a link exists and 0 otherwise. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

Table H.21

Tobit regression results - Role of observer centrality.

	Dependent variable:					
	Dev. from community norm (abs.)					
	Communication			Cooperation		
	(1)	(2)	(3)	(4)	(5)	(6)
Public	−2.898***	−2.873***	−2.879***	−1.065	−1.003	−1.003
	(0.686)	(0.652)	(0.651)	(0.837)	(0.829)	(0.819)
Netw. Centrality (comm.)	−0.369	−5.713	−6.115			
	(6.848)	(3.909)	(4.234)			
Public Netw. Centrality (comm.)	6.342**	6.317**	6.333**			
	(2.153)	(1.995)	(1.992)			
Netw. Centrality (coop.)				4.715	3.178	2.653
				(4.190)	(3.760)	(4.615)
Public Netw. Centrality (coop.)				0.898	0.768	0.771
				(1.948)	(1.866)	(1.842)
Intercept	9.237***	15.883***	17.191***	7.477*	13.121***	14.404**
	(2.760)	(3.374)	(4.990)	(3.494)	(3.155)	(4.509)
Village FEs	No	Yes	Yes	No	Yes	Yes
Observer FEs	No	No	No	No	No	No
Ind. Controls	No	No	Yes	No	No	Yes
Observations	724	724	724	724	724	724
Log Likelihood	−1004.5	−981.5	−979.5	−1003.0	−981.7	−979.8

Notes: Role of observer centrality on deviation from the norm in the DG. Public is an indicator variable that takes on the value 1 for the observer condition and 0 for the private condition. Centrality is measured by closeness centrality in the communication or cooperation networks, respectively. All regressions include controls for assistant, understanding of the participant measured on a scale from 1 (low understanding) to 5 (perfect understanding) by the interviewer, whether it was the first or the second day of interviews in the village, and choice order. Standard errors are bootstrapped clustered at the village level and presented in parentheses. Individual controls account for participant age, sex, level of war involvement, and whether the participant is a community leader. *p<0.1; **p<0.05; ***p<0.01.

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