

# Cooperation Under the Risk of Capture: Why Citizens Pay Taxes That Can Be Embezzled

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## Abstract

Why do citizens pay hard-to-enforce local taxes, if local governments are known to embezzle public funds? Evidence from behavioral experiments with village residents in Tanzania suggests that voluntary contributions to public goods are facilitated by local norms of moderation in embezzlement. In villages where greater moderation in embezzlement can be expected, citizens' contribution preferences are less sensitive to the possibility that their contributions can be embezzled. Voluntary moderation in embezzlement can be explained by several behavioral mechanisms, including in-group solidarity, reciprocity, and norms of trusteeship. The findings have important implications for our understanding of tax compliance and public goods provision in situations where limited enforcement capacity coincides with weak public accountability.

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**Online appendix:** <http://maltelierl.info/files/Lierl2015a-appendix.pdf>

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# 1 Introduction

The provision of local public goods in low-income countries frequently requires monetary, labor or in-kind contributions from citizens. These contributions are sometimes referred to as “informal taxes” (Olken and Singhal, 2011). Like formal taxes, informal contributions can be hard to enforce, especially if local governments have limited institutional capacity. For that reason, local revenue mobilization in developing countries is often conceptualized as a free riding dilemma (Miguel and Gugerty, 2005; Habyarimana et al., 2007). However, free riding is not the only threat to revenue mobilization. Public accountability is often equally weak. Citizens may fear that their contributions are embezzled, abused or misappropriated, given that embezzlement by local authorities can be substantial (e.g. Olken, 2007). Yet, surprisingly little is known about how the possibility of embezzlement actually affects citizens’ voluntary or quasi-voluntary compliance with local contributions. Are free riding dilemmas aggravated by the possibility that contributions can be embezzled?

To shed light on the relationship between free riding and the risk of resource misappropriation, this paper presents a series of behavioral experiments with 1826 village residents at 48 study sites in rural Tanzania, which are carefully validated with data on the embezzlement behavior of actual village leaders and on citizens’ contributions to village projects in natural settings. The evidence suggests that voluntary contributions to public goods are sensitive to the possibility of embezzlement, but that this effect can be mitigated by local norms of voluntary moderation in embezzlement. If village residents have reason to expect that embezzlement will be limited, cooperation can ensue, even if the benefits of cooperative efforts are vulnerable to being captured by an individual in their midst.

One of the most immediate contributions of this paper is to experimentally test how individuals’ preferences to cooperate in free riding dilemmas are affected by the possibility of embezzlement. The study intentionally focuses on individuals’ initial preferences for voluntary contribution in a free riding dilemma, rather than on the mechanisms through which cooperation is sustained in repeated interaction, because an initial disposition towards voluntary cooperation is instrumental for the emergence of cooperative norms and institutions through which cooperation can be sustained

over time (Trivers, 1971; Axelrod and Hamilton, 1981; Ostrom et al., 1992; Nowak and Sigmund, 1998; Fehr et al., 2002; Gülerk et al., 2006; Nowak, 2006; Kosfeld et al., 2009; Baldassarri, 2012). By examining the sensitivity of voluntary contribution preferences to the possibility of embezzlement, this paper thus provides an important starting point for understanding how cooperation can be sustained over time, if opportunities for free riding coincide with agency problems in the provision of public goods.<sup>1</sup>

A second contribution of the paper is to call attention to the behavioral foundations of tax compliance in situations where public funds are known to be vulnerable to embezzlement. Disparate strands of prior research have tackled the problems of tax enforcement and accountability of local authorities in isolation from one another, focusing either on the question how tax compliance can be sustained under weak enforcement capacity (see Luttmer and Singhal, 2014; Hallsworth, 2015 and Bodea and Lebas, 2016, for recent reviews of the literature), or on the question how variation in formal accountability (Olken, 2007; Björkman and Svensson, 2009; Litschig and Zamboni, 2012) or informal accountability (Tsai, 2007; Lierl, 2014) of local authorities affects public goods provision. Timmons and Garfias (2015) find a negative relationship between publicly revealed corruption and subsequent property tax revenues in Brazil, but cannot identify whether this is due to changes in tax compliance, revenue collection practices, or other processes (such as the adoption of participatory budgeting). Considering that a lack of tax enforcement capacity and a lack of fiscal accountability typically occur together, it is of great practical relevance to understand directly, from a behavioral perspective, how embezzlement risk shapes citizens' contribution behavior. To address this challenge, this paper uses behavioral experiments to study the relationship between contribution preferences and embezzlement risk directly in a population of interest – village residents in Tanzania. The paper not only examines the aggregate impact of embezzlement opportunities on voluntary contribution behavior, but also whether local norms of *moderation* in embezzlement can explain heterogeneous responses.

Finally, the paper contributes to a growing literature on taxation and rent extraction, by investigating sources of voluntary restraint in embezzlement. It presents the first experimental evidence that

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<sup>1</sup>See Lierl (2016) for evidence on the effectiveness of peer sanctioning in such settings.

locally contributed funds are less vulnerable to misappropriation than externally provided windfalls. This result is consistent with various observational studies, suggesting that local governments treat local tax revenue differently from fiscal transfers and other types of financial windfalls (Brollo et al., 2010; Hoffman and Gibson, 2006; Gadenne, 2014; Martinez, 2016). A widely acknowledged hypothesis states that tax revenue is less vulnerable to misappropriation, because taxation increases political accountability (Moore, 2008; Eubank, 2012). For example, it has been shown that taxation can make citizens more likely to seek information about government spending (Paler, 2013) and to sanction politicians for misappropriation (Martin, 2014). Without challenging this accountability hypothesis, this paper suggests an additional and possibly complementary mechanism: Taxpayer money might be less vulnerable to rent extraction than other types of public resources, because individuals have a preference to embezzle contributed resources less than windfalls, possibly out of reciprocity.

The paper will proceed as follows. Section 2 describes the case and context of this study, to motivate the larger empirical puzzle to which this study speaks – village residents’ willingness to make hard-to-enforce contributions to local public goods, despite the obvious possibility of embezzlement. Section 3 delves deeper into potential explanations for this conundrum, highlighting the specific contributions of this paper. Section 4 summarizes the research design. Section 5 explains the methodological choices and practical tradeoffs that had to be addressed in implementing this study. Section 6 presents experimental results on how the possibility of embezzlement affects contribution preferences, and how the fact that public resources originate from voluntary contributions affect embezzlement outcomes. Section 7 delves deeper into the relationship between embezzlement risk and contribution preferences, presenting observational comparisons across 48 villages and validating the behavioral experiment with data on embezzlement risk and voluntary contribution outcomes in natural settings. Section 8 discusses the findings and their implications.

## 2 Case and Context

In many parts of the world, the provision of village-level public goods is a matter of community self-governance. Tanzania is no exception. For example, villages are responsible for the maintenance of school buildings, water pumps, village roads, village offices, health posts, cattle dips and other local infrastructure. Villages are also self-governing in the management of common-pool resources, such as communal land and communal forests. Some villages employ individuals to provide services to the community, for example as school guards. Additionally, villages are often required to mobilize financial contributions to higher-level public goods, such as roads or secondary schools that are shared between neighboring villages within a ward or district. Most village projects in Tanzania are initiated and implemented by the communities themselves, occasional interventions by government agencies, non-governmental organizations or international donors notwithstanding. To provide these public goods, villages raise internal revenues – including project-specific contributions, user fees, and general contributions to the village budget – as well as labor and in-kind contributions from village residents.

The enforcement of such contributions can be very difficult, both at the village level and at higher levels of local government (Fjeldstad, 2001, 295ff). Depending on the village, between 60 and 100 percent of the citizens surveyed for this study affirmed that there are “serious problems with non-payment of contributions to village projects and activities”.<sup>2</sup> The structures for the enforcement of such contributions are primarily internal and often informal.<sup>3</sup> Internal enforcement structures

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<sup>2</sup>The survey question was administered to 480 randomly sampled adult residents between 18 and 70 years of age, in 32 villages covered by this study in Hanang and Mufindi districts. In the median village, 80 percent of respondents affirm that there are “serious problems with non-payment of contributions”.

<sup>3</sup>In principle, village governments have the possibility of appealing to external law enforcement institutions, for example by taking non-contributors to court. However, given the limited capacity of the legal system and the high up-front costs of suing a tax evader, the effort and time it takes to complete a court case stand in no relation to the payoff for the village government. Villages respond to this enforcement gap in various ways. Village assemblies may specify fines for non-contributors, but those fines suffer from the same enforcement problems. Many villages in Tanzania have enforcement volunteers (*mgambo*) who are trained in disciplinary action and act like a village police. Some villages additionally maintain an armed village militia (*sungusungu*), and it is not uncommon that it becomes involved the enforcement of contributions. Crucially, however, these internal enforcement structures are based on voluntary collective action within the village (Abrahams, 1989), their success varies with pre-existing collective action capacity (Paciotti et al., 2013), and there is no guarantee that they are not used to advance private, rather than public interests (e.g. Lund and Saito-Jensen, 2013). Thus, even the internal enforcement structures at the village level are public goods that require voluntary inputs from citizens which, in turn, are vulnerable to elite capture.

are highly vulnerable to conflicts of interest, because personal relationships between enforcers and contributors cause loyalty pressures, which may lead to collusion or conflict and can undermine the goal of revenue extraction (Lund, 2007). In situations of massive non-compliance, there is very little village leaders can do to enforce the payments and inputs that are needed to complete a public project.

Given their lack of direct coercive capacity, village leaders typically appeal to citizens' moral responsibility to their communities, rather than to the threat of enforcement. In some cases, this enables them to achieve remarkable levels of voluntary cooperation that would be difficult to attain through coercion alone. For example, some villages provide public goods above and beyond the basic amenities, such as school gardens, event spaces, public restrooms, markets, sports tournaments, etc. Across 32 villages in Hanang and Mufindi districts, the median household's cash contribution to village projects over the 12 months prior to the survey ranges from 5800 and 80000 TZS, with the median contribution in the median village being 20000 TZS. At the time of the study, this corresponded to 4 and 55 USD respectively, or between 1 and 16 modal daily wages of an unskilled worker in a rural village, with the median village at four daily wages or 13.80 USD. Such cash contributions exist alongside the provision of labor and physical inputs to local projects by citizens, which are potentially even more difficult to monitor and enforce.

Considering that both the coercive capacity of village governments and any formal accountability structures that could prevent village leaders from misappropriating public resources are weak, it is rather astounding to what extent citizens are willing to contribute to village projects. Corruption and rent extraction by village leaders are widespread and not only limited to the embezzlement of public funds. Also labor- and in-kind contributions by village residents can be vulnerable to misappropriation. For example, in the villages surveyed for this study, residents complained that village leaders cut trees for timber that had been collectively planted by the community, or that village leaders made citizens work on a road rehabilitation project, while colluding with the district authorities to pocket government funds that were intended for a public works contract. Yet in other cases, village leaders were accused of enriching themselves from communal farming activities. Not only are these forms of misappropriation very difficult to hide from the community, but village

leaders often do not even seem to attempt to do so.

Unsurprisingly, in 21 out of 32 villages surveyed, a majority of residents agreed with the statement that “most people in the village think that the village government is corrupt”. This perception is consistent with empirical studies highlighting the extent to which village leaders in Tanzania are able to capture certain public resources for their private benefit (Brockington, 2008; Pan and Christiaensen, 2012). For example, Pan and Christiaensen (2012) estimate that 60 percent of agricultural subsidy vouchers in the Kilimanjaro region were captured by elected village leaders, instead of being distributed to eligible households in the village. While some villages replace local leaders in connection with corruption scandals (e.g. Lund, 2007, 315), in many of the villages surveyed for this study corruption allegations had no apparent consequences. In one of the rare instances of village residents demanding an audit of the village government’s financial records, the village office burned down, ostensibly “by accident”, and the financial records were destroyed.

In view of village governments’ inadequate enforcement capacity and their varying levels of impunity for embezzlement, it may be surprising that almost all villages manage to sustain some level of contributions to village projects. How can such quasi-voluntary contribution behavior coexist with overt rent extraction by local leaders? And, why do some villages exhibit much greater capacity to mobilize contributions than others?

### **3 The Puzzle of Informal Taxation (And Potential Explanations)**

Research on tax compliance offers important theoretical starting points to understand why citizens make hard-to-enforce contributions, even if those contributions can easily be embezzled or misappropriated. For example, theories of predatory rule maintain that self-interested leaders can maximize their profits by sustaining a level of public trust that is just sufficient to ensure that citizens contribute quasi-voluntarily. Leaders have an incentive to limit their own rent extraction, because quasi-voluntary compliance minimizes the enforcement and transaction costs of revenue mobilization (Levi, 1988). According to this perspective, both tax compliance and moderation in

rent extraction are strategic, rather than driven by other-regarding preferences: The costs and consequences of coercion motivate citizens and rulers to enter a tax bargain, whereby citizens comply quasi-voluntarily and rulers strategically refrain from maximal rent extraction to minimize enforcement costs and to grow their tax base (Olson, 1993). However, such a bargain or fiscal contract can only be achieved with a latent threat of actual coercion (e.g. Kasara, 2007), even if coercion is not actually observed in equilibrium.

Theories of self-governance, on the other hand, emphasize that centralized coercive capacity is not always necessary to ensure compliance. To overcome free riding, informal institutions and social norms can substitute for formal enforcement capacity, and this can be aided by peer sanctioning and reputational incentives among the members of a community (Ostrom, 1990; Ostrom et al., 1992; Bowles and Gintis, 2002; Miguel and Gugerty, 2005; Ostrom, 2005). It has been argued that rent extraction by local leaders could be constrained in similar ways (Tsai, 2007; ?). However, if free riding dilemmas and embezzlement opportunities coincide, self-governance requires more than just the simultaneous existence of social norms against free riding, social norms against embezzlement, and a critical mass of individuals who are willing to take the risk and effort to enforce such norms. Norms and norm enforcement practices must additionally be robust to interactions between the problems of free riding and embezzlement. In other words, *for a community to be able to govern itself, its ability to control free riding must not be overly sensitive to failures in controlling embezzlement and vice versa*. By examining the sensitivity of contribution preferences to the risk of embezzlement, this paper helps to understand whether the existence of such robust cooperative norms is consistent with individuals' behavioral dispositions.

A growing literature on tax morale provides further insights into individuals' contribution preferences. Research on tax morale revolves around the question why individuals comply with taxes that cannot easily be enforced (Luttmer and Singhal, 2014). As potential sources of tax morale, the literature has identified altruistic motivations, such as a sense of civic duty (as Bodea and Lebas (2016) suggest, even in poorly functioning states), feelings of shame or guilt when cheating on tax obligations (Andreoni et al., 1998), an intrinsic desire to comply with the law (Dwenger et al., 2014), as well as generalized reciprocity, in the sense that citizens contribute to a public

good, because they perceive themselves as beneficiaries (Hallsworth and Metcalfe, 2014; Bodea and Lebas, 2016; Castro and Scartascini, 2016). Conversely, there is evidence that tax compliance is lower if taxes are not perceived as fair or legitimate (Besley, 2014), whereas legitimate institutions increase tax morale (Torgler, 2005) and compliance in voluntary contribution dilemmas (Grossman and Baldassarri, 2012; Dickson et al., 2015). Considering that embezzlement would undermine the reciprocity motive, and even the mere possibility of embezzlement might be sufficient to damage the legitimacy of a tax, these studies provide us with potentially important reasons why tax compliance should be sensitive to public malfeasance. Conversely, however, they do not help us understand why individuals would comply with hard-to-enforce contributions *despite* obvious opportunities for misappropriation or embezzlement.

Two potential explanations could resolve this puzzle:

**Hypothesis 0:** Individuals' motives for contribution are independent of whether their contributions can be embezzled or not.

**Hypothesis 1:** Voluntary contribution behavior is sensitive to embezzlement risk, but contributors collectively trust that actual embezzlement will be limited and others will continue to contribute.

Under the null hypothesis, voluntary contribution behavior is simply not sensitive to the risk of embezzlement, for example because it is motivated by an unconditional sense of duty (Bodea and Lebas, 2016). This would require that individuals' willingness to contribute depended neither on their the personal return from contributing, nor on distributive outcomes. Under the alternative hypothesis, the effect of embezzlement opportunities is mitigated by a collective expectation of moderation in embezzlement. This requires that the members of a community not only individually expect that embezzlement will be limited, but simultaneously expect that most others hold this expectation as well and are willing to tolerate limited free riding and embezzlement. In what follows, the paper shows that the null hypothesis is insufficient to explain patterns of voluntary contribution behavior under the possibility of embezzlement.

## 4 Research Design

### Overview

To distinguish between the two aforementioned hypotheses, the paper uses two interrelated behavioral experiments (Figure 1). The first experiment sheds light on the causal effect of embezzlement opportunities on village residents' preferences to voluntarily contribute to a public good. The second experiment extends the first by investigating plausible sources of voluntary moderation in embezzlement. This helps to establish under what conditions voluntary contributions to a public good remain collectively rational, even if they can be embezzled.

It is important to ensure that contribution and embezzlement decisions in the behavioral experiments are informative about compliance with village taxes and embezzlement of village funds in natural settings. To accomplish this, the decision exercises are carried out not only with randomly sampled village residents, but also very discreetly with the actual village leaders. To validate that the experimental decision situation is an adequate model of the embezzlement of village taxes, village leaders' decisions in the experiment are compared to their perceived embezzlement of contributions to village projects in the real world. Additionally, variation in contribution preferences in the experiment is cross-checked against village-level indicators of revenue mobilization in natural settings.

The first experiment sheds light on the causal effect of embezzlement opportunities on village residents' preferences to voluntarily contribute to a public good. In this experiment, a linear, one-shot voluntary contributions public goods game is compared to an otherwise identical decision situation with an added stage in which the pooled contributions can be embezzled by an individual. Confidential, one-shot decision exercises of this type are a widely recognized method of measuring individuals' social preferences in isolation from the mechanisms that may influence cooperation outcomes in repeated interaction (Levitt and List, 2007). Confidentiality and the impossibility of repeated interaction ensure that individuals' choices are not driven by intertemporal considerations or income effects, nor by reciprocity, reputational concerns, peer sanctioning, social standing or

role expectations, leadership, institution formation, third-party enforcement, or other confounding mechanisms. By focusing on voluntary contribution preferences, the first experiment can answer the following questions: Do village residents voluntarily contribute to public goods, even if their contributions can potentially be embezzled? If so, does the possibility of embezzlement have any effect at all on village residents' voluntary contribution behavior? Or is their willingness to contribute completely inelastic to the possibility of embezzlement?

In the second experiment, the embezzlement stage of the first experiment is compared to a decision situation that consists of the embezzlement stage without the voluntary contribution stage. In this embezzlement-without-contribution condition, study participants are presented with an opportunity to embezzle group resources that were provided to the group as a windfall from the experimenter, rather than by collecting voluntary contributions.<sup>4</sup> If embezzlement decisions are influenced by reciprocity, individuals may be more reluctant to embezzle group resources that originate from voluntary contributions, rather than from a windfall. Evidence of such reciprocity effects would suggest that voluntary contribution behavior and voluntary moderation in embezzlement can be mutually reinforcing.

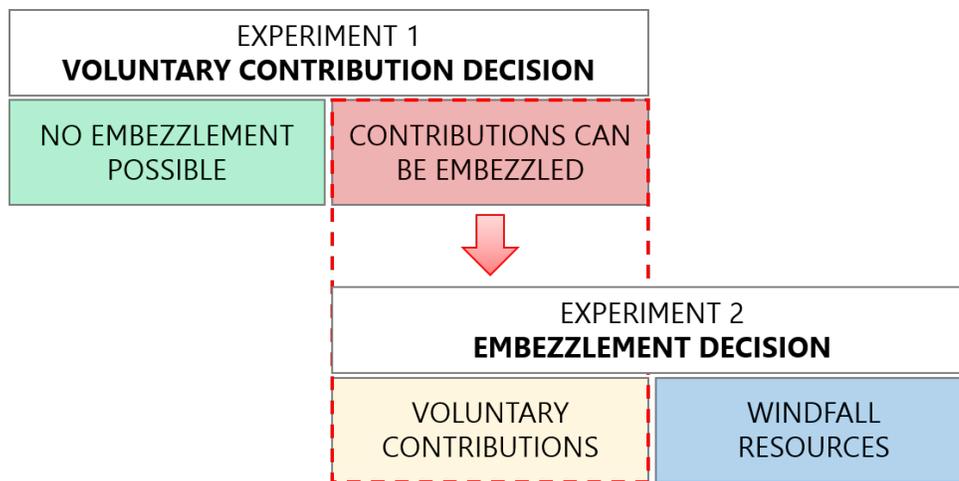
The two experiments are carried out with random samples of adult residents in a cross-section of 48 villages in Tanzania. Through observational comparisons between these 48 villages, the paper further investigates how the sensitivity of voluntary contributions to the possibility of embezzlement depends on how much embezzlement can actually be expected in a village, using out-of-sample comparisons. Through everyday social interactions and their knowledge of local norms, village residents can form generalized beliefs about their co-villagers' social preferences, which should influence their perceptions of embezzlement risk. If Hypothesis 1 is true and contribution preferences are partly driven by collective expectations of voluntary moderation in embezzlement, then contributions in villages where less *actual embezzlement* can be expected should also be less sensitive to the *possibility* of embezzlement, i.e. to the treatment in the first experiment. Thus, support for Hypothesis 1 can

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<sup>4</sup>The embezzlement stage loosely resembles the receiver's decision in a trust game that is played between a group and an individual, or, in the case of windfall resources, a dictator game between an individual and a group. However, unlike in dictator- or trust games, the dictator/responder has an equal stake in the group's payoff. Thus, an equitable or "fair" outcome is attained if the responder does not embezzle anything.

be gained by estimating treatment effect heterogeneity with respect to how much embezzlement can be expected in a village.

To validate that heterogeneous treatment effects at the village level are in fact driven by differences in local norms regarding how much embezzlement is deemed appropriate, the paper leverages a cross-cutting experimental manipulation: In both experiments, it is also varied whether groups consist of co-villagers or mutual strangers. If citizens' contribution preferences are shaped by village-level norms of moderation in embezzlement, the possibility of embezzlement should differentially impact contribution behavior in groups of co-villagers and groups of strangers.



**CROSS-CUTTING TREATMENT:** Co-Villager vs. Stranger Setting

**OBSERVATIONAL COMPONENT:** Heterogeneous effects in Experiment 1 by actual embezzlement risk in the village (out-of-sample measure, 48 villages).

**Figure 1: Study Design.**

## Experimental procedures

### *Voluntary Contribution Decisions*

The setup of the first experiment is straightforward. Study participants are informed that they are part of a group of eight study participants, in which each group member receives an endowment

of ten 100 Shilling coins.<sup>5</sup> Each group member decides individually and confidentially how much of their endowment to keep for themselves and how much to contribute to a group fund. All contributions to the group fund are doubled by the experimenter.

In both experimental conditions (embezzlement and no embezzlement), the rules corresponding to the respective condition were explained to the study participants prior to their contribution decisions (see Appendix A.10 for the instructions). Study participants' understanding of the rules was verified through comprehension checks, before they were allowed to proceed. If a study participant was unable to correctly answer a comprehension question, the interviewer would re-read the relevant passage of the instructions until the study participant was able to provide the correct answer.

In the no-embezzlement condition, study participants were informed that the group fund would be divided in equal shares among all eight members of the group. In the embezzlement condition, study participants were informed that their contribution decisions would be followed by a second stage, in which every group member would be asked to indicate what fraction of the group fund they would appropriate for themselves, if they were given the chance to do so and if the remainder of the group fund would be shared equally among the entire group. One of the proposals within the group would be selected at random and the group fund would be distributed according to this proposal. The fraction of the group fund the proposer appropriated for her-/himself would be paid exclusively to that person. The fraction of the group fund the proposer allocated to the group as a whole would be divided equally among all eight group members, including the proposer.

### *Embezzlement Decisions*

To record individual embezzlement proposals, study participants were presented with two jars, one labeled "Group" in Swahili (along with a pictogram showing eight people) and one labeled "Self"

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<sup>5</sup>At the time of the study, the endowment of 1000 Shillings was sufficient to buy a warm meal in a village. It corresponds to about one-fifth of the modal daily wage for unskilled labor in the rural areas. The choice of the relatively low pecuniary stakes in the experiment was driven by ethical reasons. A potential consequence of the low stakes is that study participants' concern about embezzlement is lower than it would have been if higher stakes were involved. If this were the case, the study would be biased in favor of the hypothesis that the actual risk of embezzlement does not matter for study participants' willingness to contribute to a public good. However, this is the mechanism the paper ultimately rejects.

(with a pictogram showing one person). The group fund was placed in the “Group” jar. Since study participants in the voluntary contribution condition were not informed *ex ante* about the size of the group fund, their expectations about the size of the fund were explicitly recorded along with their embezzlement proposals. The group fund was symbolically represented to them by 24 plastic tokens. Study participants indicated the *fraction* of the group fund they proposed to embezzle, by moving the desired proportion of tokens from the “Group” jar into the “Self” jar.

Comprehension checks ensured that every study participant understood the following: (1) Each member of their group of eight study participants made a proposal and one of the eight proposals within the group would be selected at random and implemented. (2) If their proposal was drawn and they had proposed to embezzle nothing, they would receive the same share of the group fund as every other group member. (3) If their proposal was drawn and they had proposed to embezzle the entire group fund, the other group members would receive no share of the group fund at all.

Thus, the second experiment compares a situation in which the group fund originated from voluntary contributions (the second stage of the embezzlement condition of the first experiment) to a situation in which the group fund was provided by the experimenter as a windfall. The voluntary contribution condition differs from the windfall condition in three respects: First, the group fund is voluntarily contributed by the group members instead of being a windfall. Second, in the voluntary contribution condition study participants have taken part in the contribution stage before making their embezzlement proposals. Third, in the voluntary contribution condition the amount of the group fund is unknown, whereas in the windfall condition it is known to be a flat amount of 12,000 TZS.

### *Neutral Framing*

The instructions were framed neutrally for both the voluntary contribution and embezzlement decisions. References to any normatively loaded concepts such as “public good”, “tax”, “capture” or “embezzlement” were consciously avoided. The neutral framing ensures that differences in study participants’ behavior between the treatment conditions can be attributed to the logic of the decision situation itself, rather than to framing effects. In particular, it reduces the risk that study

participants are primed about specific past experiences with embezzlement of public funds by their own village leaders. This makes it easier for study participants to form unbiased beliefs about the behavior of the other group members in the decision exercise.

#### *Co-villager/Stranger Manipulation*

Within both experiments and each of their treatment conditions, it was additionally varied whether groups consisted of co-villagers or mutual strangers who were all from different villages. In either case, the identity of the other seven group members was unknown to the study participants. To ensure that study participants could not infer the identity of the the other group members, all decisions took place in a confidential, one-on-one setting. Per village, a total of 48 study participants took part in the research activities. These 48 study participants were mapped into different groups. Thus, even if study participants found out who the else in their village was participating in the study, they could not infer who was part of their group of eight. In the co-villager condition, study participants were merely informed that all other group members were from their own village. In the stranger condition, they were informed that no two members of the group were from the same village.

#### *Implementation and Internal Validity Considerations*

Carrying out the decision exercises in confidential, one-on-one settings between the surveyors and the respondent has four advantages. First, it ensures the confidentiality of study participants' decisions. Second, it prevents study participants from learning about the identity of the other group members. Third, it minimizes the risks of spillover effects and post-experiment sanctioning among study participants within a village. Fourth, it minimizes the burden on study participants, by meeting them directly in their subvillage/hamlet or at their home, rather than asking them to appear at a research facility.

The fact that the decision exercise was carried out in one-on-one settings did not cause any problems with regard to study participants' understanding that their payoff depended on the choices of the other study participants in their group. Study participants understood well that every group member's decisions needed to be recorded individually before anyone's payoff could be calculated.

It was explained to the study participants that that surveyors would return to the village on a specific, agreed-on date to disburse the payoff once everyone else's decisions had been recorded. Comprehension checks were used to verify study participants' understanding of this, before they were allowed to proceed.

To prevent study participants' decisions from being contaminated by inter-temporal choices or by variation in their trust that the survey team would actually return with the payoff on the agreed-on date, study participants were informed in advance that *all parts of their payoff*, including the portion of their endowments which they decided to keep for themselves, would be disbursed at the same time, namely when the survey team returned to the village after all decisions had been collected. Accordingly, surveyors retained study participants' contributions to the group fund, as well as the portion of their endowments that was not contributed.

After completing the experiments in a batch of eight villages (grouped at random within a district), the data were synchronized and a program was run to randomly select embezzlement proposals for implementation and to calculate individual payoffs. On the agreed-on dates, the survey team returned to each of the eight villages, explained the payoff calculation, and confidentially disbursed the payoffs to each of the study participants. To ensure that these transactions were done correctly, they were monitored in person by a lead research assistant, receipts were obtained, and all transactions were painstakingly accounted for.

To minimize social desirability bias and social observability effects, surveyors were specifically instructed not to watch the study participants during their actual decisions. Once study participants had made their decision, the surveyors double-entered their decisions on tablet computers. The survey team consisted of seven highly skilled research assistants with extensive prior experience as professional surveyors or field researchers. The surveyor training was designed to minimize surveyor effects. Special attention was paid to administering the instructions identically across all study participants, controlling even intonation and facial expressions. Role play, simulations, field tests and peer feedback were used identify and eliminate potential sources of surveyor bias.

## **Treatment assignment**

The assignment of study participants' to the three different decision situations (the public goods game without embezzlement, the public goods game with embezzlement, or the windfall embezzlement decision) was physically randomized. Immediately prior to engaging with a study participant, surveyors blindly drew a token from an urn. The token indicated which decision situation the study participant was assigned to. The number of tokens per decision exercise was pre-determined and the tokens were drawn without replacement. A checklist ensured that no surveyor could draw more than one token at one time. When finished with a study participant, the surveyors would place the token into a different receptacle and mark it as used in a checklist. Once all tokens were used, the data collection in a village was complete. All study participants were sequentially assigned to both the co-villager and the stranger condition, in random order. The order of the co-villager and stranger exercises was individually randomized, via the tablet computers that were used for data entry.

## **Sampling and study population**

The experiments were conducted in 48 different villages between June 2013 and March 2014. The 48 villages in the study were sampled at random within three geographically distinct districts (Mpanda DC in the Katavi region, Hanang district in the Manyara region, and Mufindi district in the Iringa region, see Figure A.1.1 in the appendix). In the sampled villages, comprehensive listings of households by subvillage served as sampling frames for individual study participants. The study targeted village residents aged 18-70. This age range is normally approached for contributions to village projects. Within households, the gender of the study participant was selected at random. If multiple household members met the inclusion criteria, the household member whose birthday was coming up soonest was selected. The sampling procedure is described in detail in Appendix A.2.

For a companion study on the embezzlement behavior of village leaders (Lierl, 2014), village executive officers (VEO) and village chairpersons took part in the exact same decision exercise as the other study participants, but all village leaders were purposely assigned to the contribution/embezzlement

condition. The field team was instructed to carry out the decision exercise with the two village leaders discreetly and only after the decision exercises had been completed with all regular study participants in a village. That way, it was avoided that village residents were primed about their village leader's participation, and the decision exercise remained comparable across villages. Since there is no treatment variation among village leaders and they were purposely included in the experiment, rather than sampled at random, the data from village leaders are excluded from the experimental analyses in this paper.

In the 48 villages, a total of 1826 study participants were sampled for a set of research activities that included this study as well as two companion studies. The companion studies make use of the same decision exercises, but analyze an additional treatment condition that is excluded from the analysis in this paper. In this additional condition, for which study participants were matched into different groups, study participants' choices were attributable by name, rather than confidential, and revealed ex post to the other group members. This treatment was used to study the impact of social attributability and social incentives on free riding and embezzlement decisions. A discussion of these results is beyond the scope of this paper and will be published separately. Since the order of these additional treatments was also randomized within subjects, their impacts on study participants' behavior can easily be controlled for in the data analysis.

## **Pre-analysis plan**

The basic theoretical argument and expectations for this study were detailed in a pre-analysis plan (Appendix A.8). According to the pre-analysis plan (p. 2):

“The working hypothesis is that the presence of agency problems will reduce cooperation in public goods dilemmas, because the risk of capture of resources decreases the expected return from the public good. On the other hand, the beneficiaries of the public good may generally trust that capture is limited, and therefore contribute to a public good despite the risk that their contributions will not benefit everyone equally. Thus, agency problems might not cause a complete breakdown of cooperation in a public

goods dilemma.”

The pre-analysis plan specified two hypotheses:

- The possibility of capture in a public goods game causes lower contributions.
- When facing the choice how much money to allocate to themselves as opposed to having it shared equally with the other group members, individuals allocate less to themselves, if the money stems from contributions by the group members.

The data analysis in the paper largely follows the pre-analysis plan. A full report on the pre-analysis plan is provided in Appendix A.8 and A.9. The pre-analysis plan proposed to carry out the main hypothesis tests solely on data from study participants’ first decisions (omitting the data from 867 study participants who were assigned to a non-confidential decision exercise before the confidential decisions that are considered in this paper, as well as the data from study participant’s second decisions). This procedure was found to be unnecessarily conservative, so the analyses reported in this paper use all available data and control for the influence of prior decisions. However, the results can be reproduced with the restricted subsample as well (Appendix A.9).

Two obvious extensions of the analysis were omitted in the pre-analysis plan, but are expected to be uncontroversial: The reporting of the results for both the co-villager and stranger treatments, and the analysis of heterogeneous effects across villages to test whether differences in voluntary contributions between the co-villager/embezzlement and the co-villager/no-embezzlement conditions can be explained by actual embezzlement risk in the village.

## 5 Results

### Validating the decision exercise

Before discussing the results of the first experiment, it may be helpful to demonstrate that the experimental manipulation – introducing the possibility of embezzlement into a voluntary contributions game – is conceptually and empirically an adequate model of embezzlement of village taxes

in natural settings. To show this, the study leverages data on the embezzlement behavior of village executive officers in the decision exercise and compares it to their perceived embezzlement of village taxes in the real world. The village executive officer is an externally appointed civil servant who jointly heads the village government together with a locally elected village chairperson. Between the two village leaders, the VEO is most directly involved the management of village funds and the implementation of local projects, so that the VEO is the person with the greatest ability to extract rents by embezzling contributions to local projects.<sup>6</sup>

To validate that the embezzlement stage in the decision exercise is comparable to the embezzlement behavior of village leaders in natural settings, Table 1 examines the relationship between the VEO's embezzlement choice in the decision exercise and survey data on local residents' trust that their contributions to village projects are managed well. On a scale from 1 (do not trust at all) to 5 (trust completely), the median village government scores a 2.5, with values ranging from 1.7 to 3.5 across villages (sample mean among all respondents in a village). There is a significant negative relationship between the VEO's embezzlement of contributions in the decision exercise and citizens' trust that their actual contributions to village projects are managed well. This relationship is robust to controlling for respondents' age, gender and education, which may influence their trust levels. Thus, we can be confident that the embezzlement stage of the decision exercise evokes a similar behavior as embezzlement opportunities in natural settings and that variation in citizens' perception of embezzlement is consistent with the behavior of their village executive officer.

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<sup>6</sup>By contrast, the village chairperson is more able to extract rents by influencing allocative decisions in the village, for example by misappropriating food aid or agricultural subsidy vouchers, or by taking kickbacks on land allocation decisions (see Lierl, 2014).

**DV: Residents' Trust that Contributions to Village Projects are Managed Well**

Scale: 5="trust completely" to 1="do not trust at all" (mean=2.49)

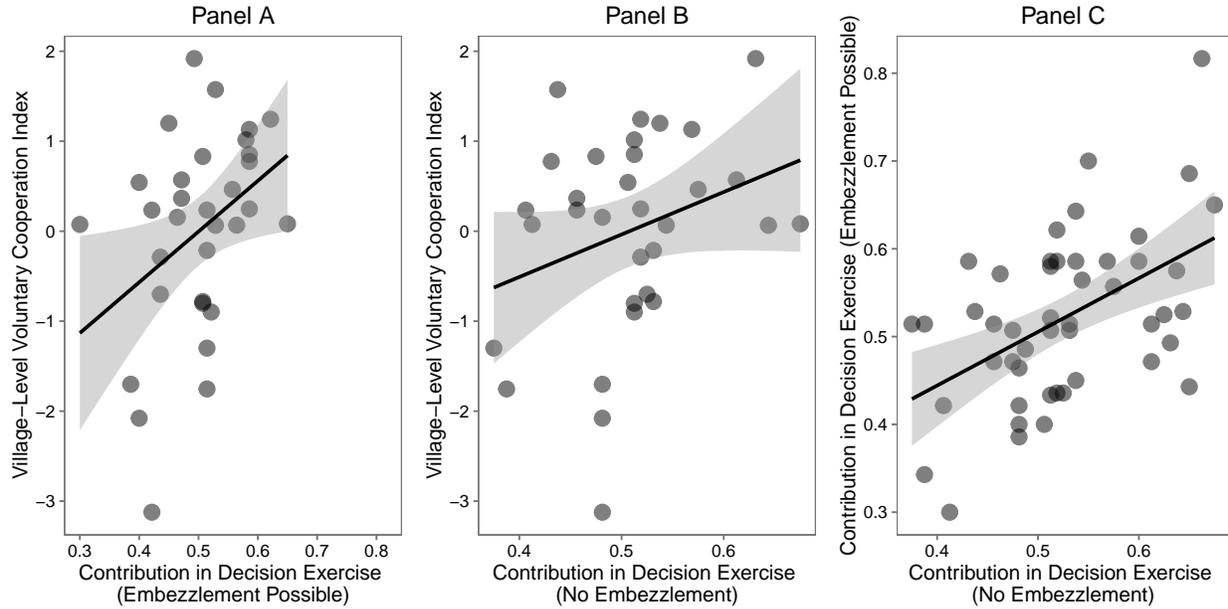
	(1)	(2)	(3)
<i>OLS coefficients</i>			
VEO's embezzlement choice in the decision exercise	-0.52* (0.26)	-0.54* (0.22)	-0.50* (0.21)
District fixed effects		yes	yes
Individual-level controls			yes
Observations (individuals)	783	783	783
Clusters (villages)	46	46	46

Standard errors in parentheses, adjusted for clustering by village. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

**Table 1: Embezzlement in the experiment mirrors embezzlement in natural settings.** Greater embezzlement by the VEO in the decision exercise is associated with lower trust by village residents that their real-life contributions to village projects are managed well. At the time of data collection, study participants did not know that their village leaders also participated in the decision exercise. The field team was instructed to discreetly approach the village leaders only after the surveys and decision exercises had been completed with all other study participants in a village.

Moreover, it may be useful to show that the decision exercise is sufficiently sensitive to pick up village-level variation in contribution behavior, given the sample size, sampling method and design of the decision exercise. Figure 2 compares average contributions in the decision exercise to an index of voluntary cooperation in the village.<sup>7</sup> In both experimental conditions, there is a significant positive correlation between average contributions in the decision exercise and voluntary cooperation in natural settings.

<sup>7</sup>This data is available for the 32 villages in Hanang and Mufindi districts.



**Figure 2: Voluntary contributions in the experiment and in natural settings.** In Panels A and B, the vertical axis shows an index of voluntary contribution outcomes in natural settings, the horizontal axis the average contribution in the decision exercise (by treatment condition). The index reflects the first principal component of the three available measures of voluntary cooperation in the village: (1) the median household’s monetary contribution to village projects in the past 12 months (weight: 0.6), (2) the proportion of survey respondents stating that “people in the village cooperate well” (weight: -0.451), (3) the proportion of survey respondents stating that there are “serious problems with non-payment of contributions in this village” (weight: 0.661). Panel C shows the relationship between village-level average contributions in the two experimental conditions.

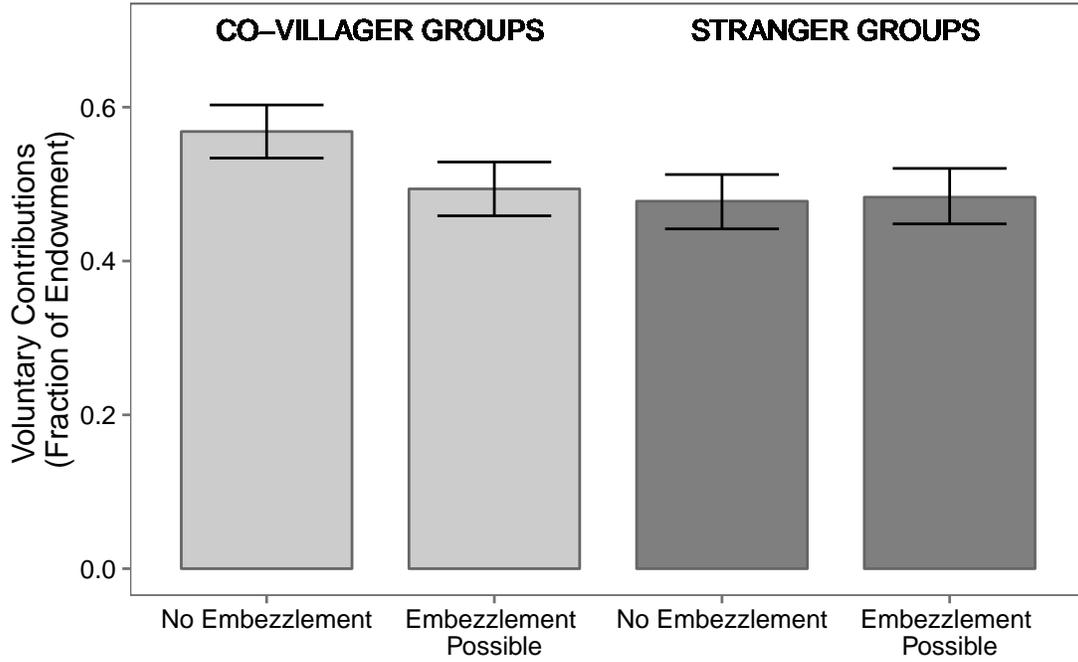
### Sensitivity of voluntary contributions to embezzlement

The first experiment estimates the causal effect of embezzlement opportunities on voluntary contributions to a public good. It also answers the question whether individuals contribute at all, if their contributions can be embezzled. The results do confirm that village residents continue to voluntarily contribute to a public good, even if their contributions can be embezzled. In the co-villager condition, village residents contribute on average 49 percent of their endowment if their

contributions can be embezzled; in the stranger condition 48 percent (Figure 3).

In the co-villagers setting, the possibility of embezzlement reduced average voluntary contributions by 0.34 standard deviations (s.e. 0.15 standard deviations) or eight percentage points (Table 2). Thus, at least in the co-villager condition, village residents' contribution preferences are sensitive to the possibility that their contributions can be embezzled. However, the effect is limited. Even if embezzlement is possible, average contributions in the co-villager condition do not fall below their levels in the stranger condition.

In groups of mutual strangers, average contributions remained unaffected by the possibility of embezzlement. This null result is unlikely to be due to problems with the comprehension of the decision exercise, not only because study participants' understanding of the embezzlement condition was verified by comprehension checks, but also because the same set of instructions and procedures produced a significant effect in the co-villager condition. It also appears unlikely that heterogeneous effects in the stranger condition averaged out to zero, since there is no plausible reason why the possibility of embezzlement would make anyone *more* willing to contribute. Thus, it remains puzzling why the possibility of embezzlement does not cause a greater drop in voluntary contributions. Study participants appear willing to tolerate the risk that their contributions can be embezzled.



**Figure 3: In co-villager groups, the possibility of embezzlement decreases voluntary contributions.** The bars represent mean contribution rates with 95% bootstrap confidence intervals, estimated with the data from study participants' first decisions (640 Obs.).

<i>DV: Voluntary Contributions to the Public Good</i>		
	(1)	(2)
Embezzlement Possible	0.0052 (0.026)	0.0068 (0.026)
Co-Villager	0.091*** (0.025)	0.081** (0.026)
Embezzlement Possible $\times$ Co-Villager	-0.080* (0.036)	-0.079* (0.036)
Village Fixed Effects		yes
Observations	2395	2395

Standard errors in parentheses, adjusted for clustering by individual. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

**Table 2: Average treatment effects.** The table reports coefficients and standard errors from OLS regressions (dependent variable: contributions as a fraction of study participants' endowments). Both specifications control for order effects.

### Sources of voluntary moderation in embezzlement

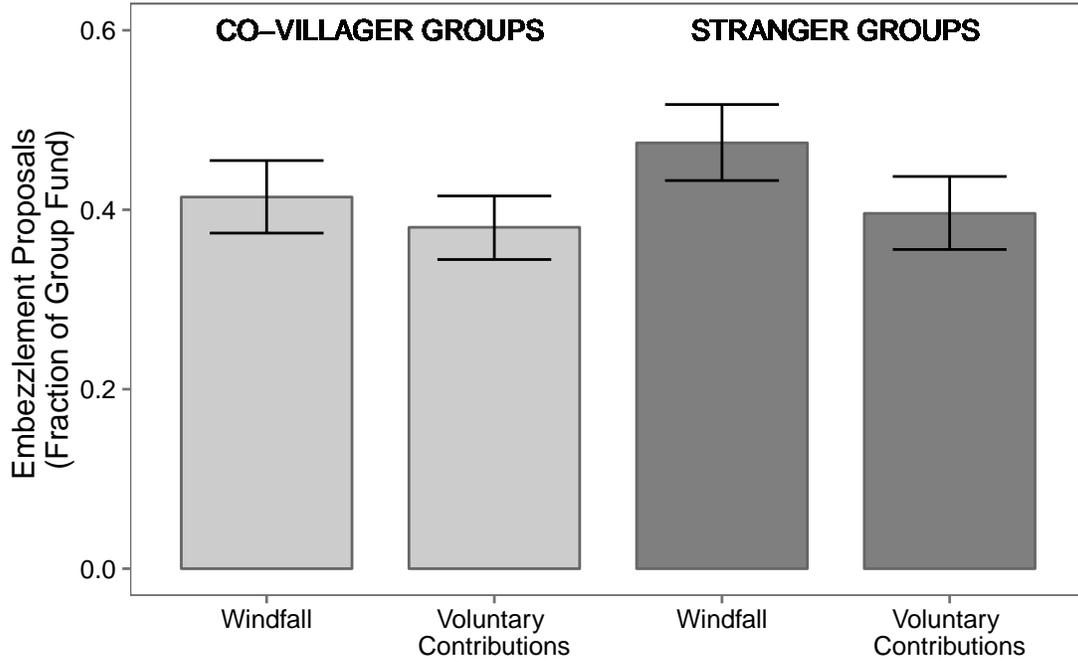
A closer look at actual embezzlement behavior can help us understand whether village residents' tolerance for the possibility of embezzlement reflects an unconditional willingness to contribute, or whether they can reasonably trust that contributing will pay off. The data on embezzlement decisions confirm that study participants voluntarily refrain from maximal embezzlement. Study participants proposed to embezzle on average 40 percent of contributions in the stranger setting and 37 percent in the co-villager setting (Figure 4). If a study participant's embezzlement proposal was selected, the expected combined payoff would be 47 percent of the group fund in the stranger setting and 45 percent in the co-villager setting. These outcomes resemble patterns of reciprocity in two-player trust games, where "responders" typically return half of the transfer (Berg et al., 1995; Levitt and List, 2007, 155).

Since contributions to the group fund were doubled by the experimenter, contributing to the group fund remained collectively profitable, if less than 50 percent of the group fund were embezzled.

Across all study participants, only 21.7 percent of embezzlement proposals were greater than 50 percent, and only 1.4 percent of study participants proposed to embezzle the entire group fund, whereas 8.7 percent refrained from embezzlement altogether. In 45 out of 48 villages the average contribution in the co-villager setting yielded a positive net return after embezzlement. Thus, while most study participants were willing to enrich themselves at the expense of the other group members, they did so in a way that left a net profit to the group as a whole, even though they had no instrumental reason for doing so.

By comparing the embezzlement of contributed funds to the embezzlement of windfall resources, the second experiment can shed light on plausible sources of voluntary moderation in embezzlement. One reason why individuals might voluntarily refrain from embezzling contributions is reciprocity. Because of reciprocity, individuals might be more reluctant to embezzle voluntarily contributed group funds, compared to group funds that were provided as a windfall by a third party. Having previously experienced the contribution stage, study participants in the voluntary contribution condition might forgo own profits to avoid disappointing their fellow group members' trust.

Indeed, the evidence confirms that voluntary contributions are embezzled at lower rates than windfall resources – definitely in the stranger setting, and possibly also in the co-villager setting (Figure 4). Average embezzlement of contributions is 0.3 SD (s.e. 0.12 SD) or eight percentage points lower than average embezzlement of windfall resources in the stranger condition. In the co-villager condition, windfall resources are already embezzled at significantly lower rates than in the stranger condition, so that the effect of voluntary contributions is weaker, decreasing embezzlement by 0.13 SD (s.e. 0.11 SD) or 3 percentage points. Thus, voluntary restraint in the embezzlement of contributions can in part be explained by reciprocity. However, in the co-villager condition, it is possible that there are crowding-out effects between reciprocity and directed altruism or in-group solidarity.



**Figure 4: Voluntary contributions are embezzled at lower rates than windfall resources.** The bars represent mean embezzlement proposals (as a fraction of the group fund) with 95% bootstrap confidence intervals, estimated with the data from study participants' first decisions (632 Obs.).

<i>DV: Fraction of Group Resources Embezzled</i>				
	(1)	(2)	(3)	(4)
Contributed Resources	-0.079*	-0.082**	-0.10**	-0.12***
	(0.031)	(0.030)	(0.033)	(0.033)
Co-Villager	-0.060*	-0.057	-0.060*	-0.057
	(0.031)	(0.031)	(0.031)	(0.031)
Contributed $\times$ Co-Villager	0.045	0.053	0.044	0.050
	(0.042)	(0.041)	(0.042)	(0.041)
Expected Size of Group Fund			-0.0062	-0.0087*
			(0.0038)	(0.0038)
Village Fixed Effects		yes		yes
Observations (Decisions)	2364	2364	2357	2357
Clusters (Individuals)	1182	1182	1179	1179

Standard errors in parentheses (clustering by individual). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 3: Contributed resources are embezzled at a lower rate than windfall resources.** The table reports coefficients from OLS regressions. All specifications also control for order effects.

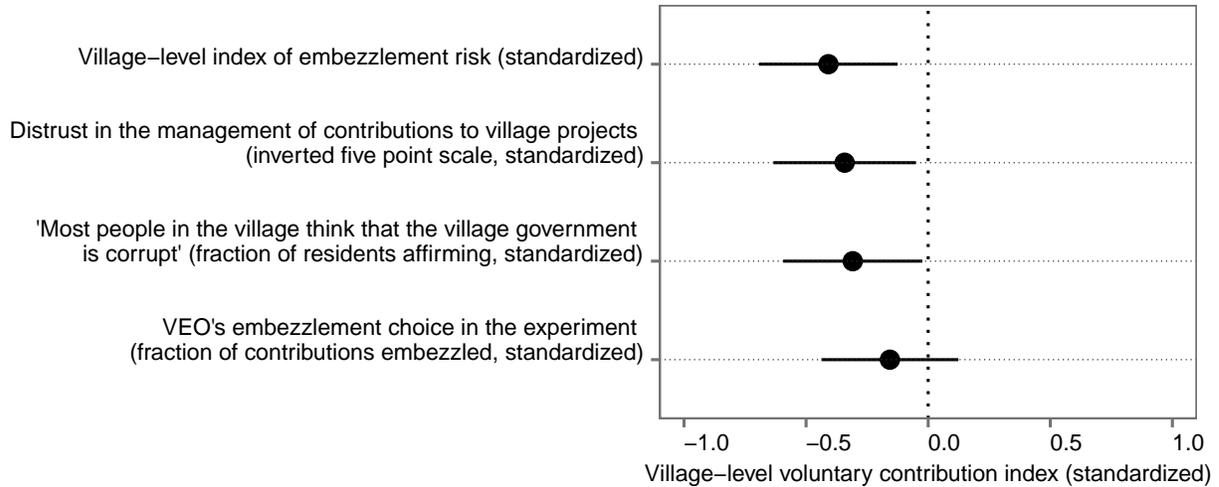
However, reciprocity cannot be the only cause of voluntary moderation in embezzlement, considering that most study participants also refrain from maximal embezzlement in the windfall condition, albeit to a lesser extent than in the voluntary contribution condition. Plausible alternative sources of moderation include altruism, inequity aversion, as well as a social or cultural norm not to be overly greedy in appropriating funds that belong to the group as a whole. In either case, the evidence suggests that individuals can reasonably trust that the embezzlement of voluntary contributions will be limited to such an extent that contributing to the group fund remains collectively rational.

## 6 Moderation in Embezzlement Increases Voluntary Contributions

### Observational comparisons

Local norms of moderation in embezzlement could play an important role in explaining why individuals refrain from maximal embezzlement. Between villages, average embezzlement proposals in the co-villager condition vary significantly ( $p = 0.00002$ , one-way ANOVA), ranging from 22 to 58 percent of the group fund. This suggests that not all villages are equal in terms of how much embezzlement can be expected. Instead, in some villages individuals have a preference to refrain from embezzlement to a greater extent than in other villages. This can most plausibly be understood as variation in social norms.

If voluntary contribution preferences are sensitive to the extent of embezzlement that can be expected and villages differ with regard to their local norms as to how much embezzlement is deemed appropriate, we should expect that villages where people exercise greater moderation in embezzlement exhibit greater levels of voluntary cooperation. Indeed, data on embezzlement and cooperation in natural settings confirm that moderation in embezzlement positively correlates with voluntary cooperation. Figure 5 analyzes the statistical relationship between a village-level index of voluntary cooperation (previously introduced in Figure 2) and an index of local embezzlement risk, representing the first principal component among three alternative metrics of local embezzlement risk: (1) village residents' self-reported trust that their contributions to village projects are managed well, (2) the proportion of residents affirming that "most people in the village think that the village government is corrupt", and (3) the VEO's embezzlement behavior in the decision exercise. The more embezzlement can be expected in a village, the more difficult it is to mobilize local contributions.



**Figure 5: Lower embezzlement risk in a village is associated with greater contributions to village projects.** The figure shows coefficient estimates and 95 percent confidence intervals from separate OLS regressions of the village-level voluntary contribution index (see Figure 2) on the respective indicator of embezzlement risk and district fixed effects.

As such, the correlation between local embezzlement risk and contribution behavior does not reveal the direction of causality. In an ideal experiment, an omnipotent researcher would exogenously manipulate local embezzlement norms in the villages *without simultaneously influencing contribution norms*, and then proceed to evaluate the impact of embezzlement norms on contribution preferences. In practical and ethical respects, such an ideal experiment is inconceivable. Therefore, the best available approach is to rule out as many confounding mechanisms as possible in a carefully designed observational comparison.

### Heterogeneous treatment effects by village-level embezzlement risk

The behavioral experiments offer a crucial advantage in interpreting the observational relationship between local embezzlement risk and contribution preferences: They shed light on the counterfactual situation in which embezzlement is impossible. By isolating variation in contribution preferences that is causally attributable to the possibility of embezzlement, conditioning on contribution preferences in the no-embezzlement condition eliminates unobservable confounders that

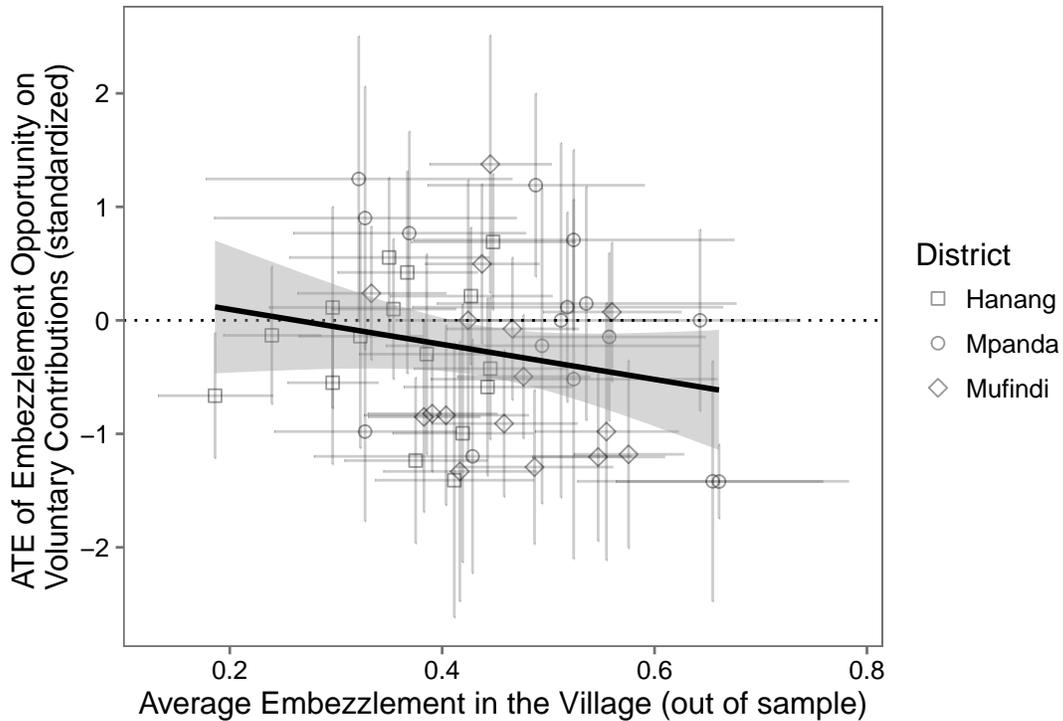
jointly cause variation in embezzlement risk and contribution preferences. At the village level, such unobservable joint causes of local embezzlement risk and contribution preferences might include a culture of generosity, social homogeneity, social cohesion and collective action capacity, as well as collective past experiences. If the correlation between local embezzlement risk and contribution preferences is driven by a direct causal relationship, we should expect heterogeneous treatment effects in the first experiment, depending on how much embezzlement can be expected in a village. Greater voluntary moderation in embezzlement in a village should translate into a lower sensitivity of voluntary contributions to the possibility that the contributions can be embezzled.

In analyzing heterogeneous treatment effects at the village level, it is important to separate the effect of collective, village-level norms or expectations from individual-level confounders. At the individual level, contribution preferences in the first stage of the decision exercise and embezzlement preferences in the second stage of the decision exercise are highly correlated ( $\rho = -0.42$ , see also Appendix A.6). However, this correlation could be a consequence of personality traits, personal beliefs or spontaneous sentiments that simultaneously influence contribution and embezzlement preferences, but have nothing to do with village-level norms of moderation in embezzlement. Individual-level confounders can be eliminated by relying on out-of-sample comparisons. If contribution and embezzlement preferences are correlated across different, independent samples from a village, the correlation must be due to village-level processes, rather than individual-level confounders, especially since the field team took great care to prevent spillover effects between different individuals in a villages, strictly guarded the confidentiality of individual decisions and minimized the risk of prior communication between study participants.

Finally, it is important to rule out reverse causality, i.e. the possibility that embezzlement risk is lower, *because* people in a village are more willing to contribute under the risk of embezzlement. Reverse causality could arise because of reciprocity, or because a lower sensitivity of contributions to the possibility of embezzlement might result in a greater perceived size of the group fund. Both concerns can be eliminated at once, by measuring village-level embezzlement risk via the embezzlement proposals of those study participants who were assigned to the windfall condition. In the windfall condition, the size of the group fund is exogenous, and reciprocity is impossible by

design. This ensures that neither reciprocity, nor expectations about the size of the group fund can confound the analysis.

Figure 6 visualizes the village-level relationship between embezzlement risk and contribution preferences, using embezzlement in the windfall condition as an out-of-sample measure of village-level embezzlement risk. The data confirm that greater moderation in embezzlement at the village level is associated with a lower sensitivity of contribution preferences to the possibility of embezzlement.



**Figure 6: Across villages, greater embezzlement risk is associated with a more negative difference in contributions between the embezzlement and no-embezzlement conditions.** The horizontal axis shows mean embezzlement in the windfall condition (+/- 1 SE) as an out-of-sample estimate of village-level embezzlement risk. On the vertical axis are standardized treatment effect estimates by village (+/- 1 SE).

## Ruling out risk preferences as a confounding variable

Conditioning on contribution preferences in the no-embezzlement condition controls for a wide range of unobservable confounders that might jointly influence contribution preferences and embezzlement risk in a village. However, risk tolerance is a potential confounder that could simultaneously moderate the impact of embezzlement risk on contribution preferences, while also shaping contribution preferences even in the no-embezzlement condition. Individuals who are more risk seeking might be more willing to contribute in a free riding dilemma. At the same time, they may be less sensitive to the possibility that their contributions are embezzled. If individuals' risk preferences are, for any reason, influenced by village characteristics that are endogenous to local norms of moderation in embezzlement, they could confound even out-of-sample comparisons between local embezzlement risk and contribution preferences.

To address this omitted variable problem, study participants' risk preferences were recorded prior to the experiment, via a lottery choice game that was carried out on a random subsample of study participants in every village. Study participants were given a choice between eleven different lotteries with the same expected payoff of 1000 TZS. That way, a pre-treatment measure of risk preferences was obtained.

Table 4 presents coefficient estimates for a model that also controls for individual risk preferences and district fixed effects

$$y_{iv}^C = \beta_0 + \beta_1 \bar{x}_v^{C,W} + \beta_2 \bar{z}_v^C + \beta_3 p_{iv} + r'_{iv} \omega + \delta_d + \epsilon_{iv}$$

where  $y_{iv}^C$  is the contribution of individual  $i$  in village  $v$  in the co-villager/embezzlement condition,  $\bar{x}_v^{C,W}$  is the average fraction of windfall resources embezzled in village  $v$  (in the co-villager condition),  $\bar{z}_v^C$  is the average contribution in village  $v$  in the co-villager/no-embezzlement condition,  $p_{iv}$  is the individual-level baseline measure of risk seeking behavior,  $r'_{iv}$  is a vector of treatment order indicators,  $\delta_d$  are district effects and the errors are correlated within villages.

As evident in Table 4, if lower embezzlement can be expected in a village, contributions under

the possibility of embezzlement are greater, controlling for village-level heterogeneity in free riding (via average contributions in the no-embezzlement condition), individual risk preferences, and heterogeneity between districts. This is consistent with the hypothesis that village residents' voluntary contributions under the possibility of embezzlement are partly driven by collective trust that embezzlement will be limited and that others will continue to contribute. Such collective trust could originate from village-level norms of moderation in embezzlement and tolerance for moderate embezzlement.

<i>DV: Voluntary Contributions in the Embezzlement Condition</i>			
	(1)	(2)	(3)
<i>OLS coefficients</i>			
Avg. Embezzlement of Windfall Resources (Co-Villagers)	-.39*** (.078)	-.40*** (.10)	-.54*** (.11)
Avg. Contributions in the No-Embezzlement Condition (Co-Villagers)	.38* (.15)	.53** (.17)	.21 (.18)
Baseline Risk Preference		-.037 (.040)	-.039 (.039)
District Fixed Effects			yes
Observations (Individuals)	560	302	302
Clusters (Villages)	48	48	48

Standard errors in parentheses, clustered by village.

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 4: Greater embezzlement risk is associated with lower voluntary contributions**, conditional on voluntary contributions in the no-embezzlement condition and risk tolerance. Risk preferences were recorded at baseline for a random subsample of study participants. All specifications also control for carry-over effects from prior decisions.

### Social proximity effects

An analysis of social proximity effects – via the cross-cutting co-villager/stranger manipulation – makes it possible to further scrutinize the impact of local norms of moderation in embezzlement. If

embezzlement risk varies due to local norms in a village, we should expect that lower embezzlement risk is associated with a more positive co-villager bias in contributions, if contributions can be embezzled. The reason is that lower embezzlement risk in a village relative to other villages implies a lower embezzlement risk in the co-villager condition relative to the stranger condition, because embezzlement choices in the stranger condition are made by residents of other villages who are not influenced by the same set of local norms.

Holding everything else equal, we might even expect a negative village-level relationship between co-villager bias in embezzlement decisions and co-villager bias in contributions, if the contributions can be embezzled, because co-villager bias in embezzlement decisions contributes to lowering the embezzlement risk in the co-villager condition relative to the stranger condition.

To evaluate these relationships, coefficients for the following models are reported in Table 5:

$$y_{iv}^C = \beta_0 + \beta_1 y_{iv}^S + \beta_2 (\bar{z}_v^C - \bar{z}_v^S) + \beta_3 \bar{x}_v^C + r'_{iv} \omega + \epsilon_{iv} \quad (1)$$

$$y_{iv}^C = \gamma_0 + \gamma_1 y_{iv}^S + \gamma_2 (\bar{z}_v^C - \bar{z}_v^S) + \gamma_3 (\bar{x}_v^C - \bar{x}_v^S) + \gamma_4 \bar{x}_v^S + r'_{iv} \omega + \epsilon_{iv} \quad (2)$$

The data are restricted to the subsample of study participants who were assigned to the embezzlement condition.  $y_{iv}^C$  is the contribution of individual  $i$  in village  $v$  in the co-villager condition,  $y_{iv}^S$  is the contribution in the stranger condition,  $(\bar{z}_v^C - \bar{z}_v^S)$  is the estimated co-villager bias in village  $v$  among study participants in the no-embezzlement condition,  $\bar{x}_v^C$  is the estimated mean embezzlement in the co-villager/windfall condition, and  $r_{iv}$  is a vector of treatment order indicators.

Since a negative correlation between village-level embezzlement risk and co-villager bias in contributions could potentially be caused by variation in altruism towards co-villagers, models (1) and (2) control for co-villager bias in the no-embezzlement condition, evaluated in the subsample of village residents that were assigned to the no-embezzlement condition. Furthermore, like in the preceding analyses, the independent variable of interest is average embezzlement in the windfall condition, since it is independent of the expected size of the group fund and therefore captures variation in village-level norms with regard to embezzlement more directly. Thus, if variation in contribution preferences under the risk of embezzlement is caused by village-level norms of moderation in

embezzlement, we should expect  $\beta_3, \gamma_3$  and  $\gamma_4$  to be negative.

In line with expectations, lower embezzlement risk in a village and greater co-villager bias in embezzlement decisions are both associated with greater co-villager bias in contributions, if embezzlement is possible (Table 5). Since the model controls for co-villager bias in contributions in the no-embezzlement condition, the most plausible interpretation is that the possibility of embezzlement induces additional variation in co-villager bias, which is due to local norms of moderation in embezzlement. In villages where local residents are more likely to refrain from maximal embezzlement, either because of a generalized norm to do so, or because of in-group solidarity, study participants are more willing to contribute in the co-villager setting relative to the stranger setting, if their contributions can be misappropriated.

<i>DV: Voluntary Contribution in the Co-Villager Condition</i>		
	(1)	(2)
<i>OLS coefficients</i>		
Voluntary Contribution (Stranger Condition)	0.47*** (0.042)	0.47*** (0.042)
Avg. Co-Villager Bias in Contributions (No-Embezzlement Condition)	0.0046 (0.15)	-0.024 (0.16)
<b>Avg. Fraction Embezzled (Co-Villager/Windfall Condition)</b>	<b>-0.30*** (0.073)</b>	
<b>Avg. Co-Villager Bias in Embezzlement (Windfall Condition)</b>		<b>-0.23* (0.11)</b>
Avg. Fraction Embezzled (Stranger/Windfall Condition)		-0.33*** (0.077)
District Fixed Effects	yes	yes
Observations (Individuals)	561	561
Clusters (Villages)	48	48
Adj. R <sup>2</sup>	0.29	0.29

Standard errors in parentheses (clustering by village). \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

**Table 5: Moderation in embezzlement and co-villager bias in contributions.** Between villages, greater moderation in embezzlement (measured out-of-sample) is associated with greater co-villager bias in contributions, conditional on co-villager bias in contributions the no-embezzlement condition (Col-

umn 1). Furthermore, co-villager bias in embezzlement choices (estimated out-of-sample) is inversely correlated with co-villager bias in contributions, conditional on embezzlement in the stranger condition and co-villager bias in contributions in the no-embezzlement condition (Column 2).

## 7 Discussion and Implications

This paper has pointed out a seeming paradox in informal taxation, which is a major source of financing for local-level public goods in low-income countries (Olken and Singhal, 2011): Citizens make hard-to-enforce contributions, even though their contributions can easily be captured or embezzled by local authorities. Local revenue mobilization therefore suffers not only from a free riding dilemma, but also from agency problems that create substantial uncertainty with regard to the collective returns to cooperation. This paper has contrasted two hypotheses that could explain why citizens voluntarily cooperate in free riding dilemmas, even if their contributions can potentially be embezzled. The null hypothesis was that citizens' contribution preferences are inelastic to the risk of embezzlement, for example because they contribute unconditionally, out of a sense of duty, or out of altruism. The alternative hypothesis was that voluntary contribution behavior is sensitive to embezzlement risk, but that a collective expectation of voluntary moderation in embezzlement, combined with a certain tolerance for moderate embezzlement, motivate citizens to contribute nevertheless.

The evidence from behavioral experiments with residents of 48 villages in Tanzania is consistent with the latter hypothesis. The first experiment confirmed that village residents in Tanzania voluntarily contribute to a public good, even if their contributions can be embezzled by an individual in their midst, who cannot be held accountable for it. While the possibility of embezzlement decreased voluntary contributions in groups of co-villagers, it did not cause contributions to break down.

Voluntary restraint in embezzlement was found to be consistent with individuals' behavioral dispositions. Most study participants refrained from maximal embezzlement, even though they had no instrumental reason for doing so. This could in part be explained by reciprocity. Funds that origi-

nated from voluntary contributions by group members were embezzled at lower rates than windfalls provided by the experimenter. However, even beyond reciprocity, it appears that local norms of moderation, which vary across villages, prompt individuals to refrain from maximal embezzlement. Finally, an analysis of heterogeneous treatment effects across villages suggested that contribution preferences are more sensitive to the *extent* of embezzlement that can be expected in a village than to the mere *possibility* of embezzlement. Exploiting variation in embezzlement behavior across different villages, out-of-sample comparisons demonstrated that greater moderation in embezzlement in a village is associated with a lower sensitivity of voluntary contributions to the possibility of embezzlement. It was shown that this correlation is not due to heterogeneity in free riding risk or risk preferences across villages. It is also not simply a consequence of generalized trust in the villages, which should equally affect cooperation in the absence of embezzlement risk. Instead, it appears that local norms of moderation in embezzlement are instrumental in shaping individuals' willingness to cooperate in free riding dilemmas, if their contributions can be embezzled. This interpretation was solidified via experimental estimates of social proximity effects. In comparisons between co-villager and stranger groups, lower embezzlement risk in a village relative to other villages is associated with greater cooperation in co-villager groups relative to stranger groups, controlling for co-villager bias in the no-embezzlement condition. Finally, greater co-villager bias in embezzlement choices was also associated with greater co-villager bias in contribution preferences. Each of these results are consistent with the idea that local norms of moderation facilitate voluntary contributions under the possibility of embezzlement, by engendering collective trust that embezzlement will be limited and others will continue to contribute.

Taken together, the results highlight three behavioral mechanisms that can facilitate cooperation in situations where free riding and agency dilemmas coincide: reciprocity, collective trust, and a certain tolerance for limited free riding and embezzlement. Reciprocity towards voluntary contributors decreases the risk that contributions are embezzled for private gain. Collective trust that embezzlement will be limited prevents free riding dilemmas from escalating if contributions can be embezzled. Tolerance for limited embezzlement is necessary for that. If citizens were not individually willing to tolerate moderate embezzlement, there would be no basis for collective trust that

cooperation will take place. Yet, as the study has shown, unconditional cooperation alone cannot explain the extent to which village residents contribute voluntarily. They must additionally have reason to trust that embezzlement will be limited.

The findings have important implications for our understanding of how informal taxation can be sustained, if a lack of enforcement capacity coincides with a lack of accountability of local authorities. They suggest that imperfect accountability of local leaders might not by itself be an obstacle to voluntary cooperation, as long as citizens have reasons to expect that rent extraction will be limited. While theories of predatory rule have emphasized the incentives of self-interested leaders to create conditions under which citizens comply quasi-voluntarily (Levi, 1988; Olson, 1993), they rest on the assumption that local leaders can mount a latent threat of coercion. This study has focused on voluntary contribution behavior in the absence of strong, centralized enforcement capacity. It has suggested that cooperation which is based on collective trust, reciprocity and moderation is consistent with individuals' social preferences and may present an alternative explanation for the puzzle of voluntary tax compliance under the risk of embezzlement.

The findings also complement prior research on community self-governance, which has emphasized the fundamental role of social preferences, both for the uncoordinated, decentralized enforcement of cooperation (Ostrom et al., 1992; Fehr and Gächter, 2000; Fehr et al., 2002), as well as for the emergence and persistence of informal social norms and institutions through which cooperation can be sustained over time (Ostrom, 1990). In some instances, the literature on self-governance has emphasized the *vulnerability* of systems of self-governance to the risk of corruption and embezzlement, for example in Ostrom (2005). However, it has stopped short of investigating the conditions under which individuals cooperate voluntarily *despite* the presence of agency problems and moral hazard. By examining the sensitivity of voluntary contribution preferences to the risk of embezzlement in a context where corruption is widespread, but citizens nevertheless make hard-to-enforce contributions to local public goods, this paper has laid the groundwork for closing this gap. Future extensions of this work will focus on the mechanisms through which cooperation is sustained in repeated interaction.

From a policy perspective, the findings of this paper speak to the debate on whether local public goods in low-income countries should be funded through locally mobilized revenue or through fiscal transfers. Critics of local revenue mobilization often point to the concern that local authorities lack the capacity to enforce contributions (Fjeldstad, 2001). Arguments in favor of local revenue mobilization tend to focus on the argument that local taxation increases accountability pressures on local leaders (Moore, 2008; Paler, 2013; Martin, 2014). By highlighting behavioral mechanisms through which voluntary cooperation can emerge even if contributions cannot formally be enforced and are vulnerable to being embezzled, this paper suggests that a lack of formal enforcement and accountability structures need not be considered an unsurmountable obstacle to local revenue mobilization. The paper further demonstrated that voluntarily contributed resources are embezzled at lower rates than windfall resources, which implies that locally contributed resources might be less vulnerable to embezzlement than external fiscal transfers, purely by virtue of reciprocity. These results provide an alternative (and complementary) argument in favor of local revenue mobilization, in addition to the accountability argument.

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