Corruption, Investments and Contributions to Public Goods: Experimental Evidence from Rural Liberia

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Abstract: We analyse how corruption affects incentives to invest in private goods and contribute to public goods. We measure corruption of community leaders in a sample of Liberian communities by keeping track of a flow of project inputs, and use this information to explain variation in investment behavior of villagers using artefactual field experiments. Our main results are that corruption (i) undermines incentives for voluntary contributions to local public goods and (ii) reduces private investments of individuals subject to informal taxation by the chief in real life. Corruption crowds out investment incentives especially in ethnically heterogeneous communities.

Keywords: Corruption, leadership, field experiments

JEL Codes: C9, K42, O12, O17, Z13.

1. Introduction

Corruption, or the misuse of public office for private gains, is an overarching concern in many countries—especially developing ones. It has been estimated that worldwide bribery involves some $1 trillion per year, or 3% of global income (Rose-Ackerman 2004). Corruption is often considered as symptomatic for deeper-seated problems of weak governance—one of the key factors responsible for underdevelopment in large parts of the world, such as Africa. While the macro literature – typically based on subjective assessments of corruption – is rather ambiguous about the growth impact of corruption (e.g. Mauro 1995), analyses at the firm and household level generally support the view that corruption is bad for development.

Our understanding of the causes and effects of corruption is rapidly improving. While earlier analysts emphasized the importance of persistent factors such as the overall level of development, religious traditions, political regimes or the design of legal systems (e.g., La Porta et al. 1999, Treisman 2000), recent work suggests levels of corruption are also determined by more transient variables—possibly amenable to intervention by policy makers. Using clever identification strategies, including randomised controlled trials, economists have scrutinised the causal effect of factors such as community-based monitoring (Olken 2007, Bjorkman and Svensson 2009), electoral accountability (Ferraz and Finan 2011), external audits (Olken 2007), and the interaction between wages and auditing intensity (Di Tella and Schargrodsky 2003) on the incidence and extent of corruption.

We have also obtained a clearer perspective on the consequences of corruption. Early analyses debated whether it merely "greased the wheels" of a rigid bureaucracy, or involved genuine costs to society due to distortions. A consensus has emerged that corruption involves real costs, and that corrupt bureaucrats and politicians occasionally raise bureaucratic hurdles to extract greater payments—creating "endogenous red tape" (Bertrand et al. 2007).

Corruption may adversely affect (foreign) investment, especially when it is an unpredictable process (Wei 1997, 2000, Campos 1999, Egger and Winner 2006). Moreover, insofar as it impedes the supply of public services such as education and health care (Reinikka and Svensson 2004, Bjorkman and Svensson 2009), corruption may adversely affect growth via reduced levels of human capital.

Corruption may also have equity implications. While high-profile cases of politicians stealing hundreds of millions of dollars attract attention (Dowden 2010), corruption usually has more subtle effects. For example, Reinikka and Svensson (2004) document how actual transfers in Uganda are regressive in the sense that schools in better-off communities are able to obtain a larger share of their entitlements than other schools. Olken (2006) demonstrates how corruption raises the costs of redistribution of rice to poor Indonesian households, even to the extent that the welfare benefits from redistribution may be completely eroded. This threatens the viability of such schemes on which the poor may critically depend.

Some analysts argue that corruption can be viewed as a tax,[1] highlighting it also invokes standard distortionary effects. At the margin, private agents should provide lower levels of input if there exists a wedge between actual and privately appropriable levels of output. Svensson (2005, p.37) writes "*when profits or potential profits are taken away from firms through corruption, entrepreneurs choose not to start firms or to expand less rapidly*." Bates (1981) provides evidence supporting this view, showing that many African farmers opt for subsistence farming to avoid corruption in input and output markets. Corruption may invite the propping up of inefficient firms and steer away the allocation of talent and resources from their most productive use (Murphy et al. 1991). Svensson (2003) demonstrates firms are

[1] The "corruption is a tax" perspective is arguably too optimistic as it overlooks that corruption does not generate revenues for the state (potentially available for the provision of public goods) and ignores that corruption creates uncertainty and raises transaction costs due to a lack of enforceability and a perceived need for secrecy (e.g., Shleifer and Vishny 1993). Bribing also implies an inherent asymmetry. Corruption may discourage risky investments as investors bear the full costs of negative profits (unlike with taxation, losses cannot be deducted from past bribes, see Bardhan 1997).

inclined to produce with relatively inefficient "fly-by-night" technologies if they expect they will have to bargain over bribes in the future (as the implied reversibility of such technologies enhances their bargaining position). In other words, the shadow of corruption affects the choice of inputs, and may invite sub-optimally low levels of investment. This is the main theme analysed in this paper.

We analyse corruption and private incentives in 44 communities in rural Liberia using a novel dataset at the community and household level that we collected ourselves. The main objective of this paper is twofold. First, we study the impact of corruption on private incentives to invest in local public goods and private goods. Our first result is that a corrupt community leader significantly erodes incentives to contribute to local public goods. Our second result is conditional on the social status of our respondents, and is derived from anthropological evidence (see section 2). Corruption undermines incentives for private investments by individuals subject to "informal taxation" by the chief in real life (e.g., older women—see below), but does not affect private investments for respondents not used to the chief's grabbing hand in their pockets. Third, we explore heterogeneity in terms of the communities' responses to being governed by a stealing leader. That is, we analyse which factors accentuate or attenuate the impact of corruption on private incentives to invest.

One innovation of our study is our direct approach to gauging corruption. The empirical macro literature on corruption relies heavily on subjective assessments.[2] At the micro level a wider range of corruption indicators is used. Some studies compare formal entitlements and received transfers as reported at the end of the public service chain (e.g., Reinikka and Svensson 2004, Olken 2006, Bjorkman and Svensson 2009). Di Tella and Schargrodsky (2003) compare the prices paid for basic homogenous inputs like ethyl alcohol

[2] Three corruption indicators are used in cross-country analyses of corruption: an index published by the International Country Risk Guide (ICRG), the corruption Perception Index by Transparency International, and the Control of Corruption index by the World Bank.

in different hospitals. Olken (2009) compares the declared costs of road construction and the actual costs as estimated by a team of engineers. However, we are not aware of any study that attempts to quantify corruption using *objective* measurements. We obtain such an objective measure by participating in a development project that involved the provision of agricultural inputs to a random sample of communities in Liberia. Detailed tracking of this flow of inputs enabled us to identify the community leaders appropriating project inputs for private purposes.[3] We find nearly half the leaders in our sample stole either seed or agricultural tools. This is the key explanatory variable in our models explaining investment behavior of villagers. These investments are measured in two conventional artefactual field experiments (see below).

We believe our results speak to three literatures. First, and obviously, they extend the literature on the consequences of corruption by providing detailed evidence of the adverse incentive effects of being governed by a thieving chief. Second, our results contribute to the rapidly growing literature on leadership. A macro literature suggests that individual characteristics of leaders matter for economic growth (Jones and Olken 2005, Besley et al. 2011). The importance of leadership in shaping aggregate behavior is recognized and analyzed in the domains of psychology (e.g., De Cremer and van Knippenberg 2002), political science (Ahlquist and Levi 2011) and experimental economics (van der Heijden et al. 2009). In the context of rural development in Africa, various studies have focused on bad leadership and "elite capture" in community-driven development projects (e.g., Platteau 2004).[4] A common finding of the leadership literature is that fair treatment by the leader motivates individuals to engage in group-oriented behavior, and facilitates cooperation in social

[3] We believe direct measurement of corruption may be preferable over data based on reported receipts by intended recipients. Such reporting data have the potential disadvantage that they are not always obtained in a fashion that is incentive compatible—respondents have an incentive to underreport when asked about goods received, in order to qualify for additional transfers. Our own field work in West Africa suggests this is not uncommon. Reporting data used by Reinikka and Svensson (2004) were collected for purposes of the recipients themselves, and so do not suffer from this potential drawback.

[4] See Fritzen (2007) and Khwaja (2009) on leadership and project design in Indonesia and Pakistan, respectively.

dilemma situations. Third, our results speak to the literature on ethnic fractionalisation, which according to our results is an important cause of inter-community heterogeneity (for a summary of the fractionalisation literature, refer to Alesina and La Ferrara 2005). We find that the attenuating impact of corruption on incentives for public goods provision is most pronounced in ethnically diverse communities.[5]

The paper is organised as follows. In section 2 we provide background information on life in rural Liberia, and discuss two types of corruption by local chiefs. We also introduce our three field experiments and data, and outline our identification strategy. Section 3 contains our main regression results and robustness analysis. Section 4 concludes.

2. Data and empirical strategy

2.1 The context

The experiments were conducted in cooperation with an international NGO aiming to alleviate poverty in rural Liberia. As part of the project, 44 rural communities (townships) in Montserrado and Margibi counties were randomly selected to receive an agricultural development project. These counties are located close to the capital city Monrovia, and are characterized by poor infrastructure and livelihood conditions. The main livelihood activities are small-scale agriculture and rubber tapping. As part of the intervention, participating communities received a fixed amount of inputs, consisting of vegetable seeds, rice and small hand tools.[6]

Rural communities are governed by a town chief, who is nominated by elders, "elected" by community members, and finally approved by the government. Not everybody

[5] Our results complement those of Glennerster et al. (2010), who find that ethnic diversity has no impact on local public goods provision in rural communities in Sierra Leone. We also report that ethnic diversity *per se* does not matter, but find the effect may be conditional—the negative influence of corruption on investment is significantly larger in ethnically heterogeneous communities (see below).

[6] The set of small hand tools included 4 cutlasses, 2 shovels, 4 regular hoes, 2 files, 2 watering cans and 5 scratching hoes.

is sufficiently "civilized" to qualify as a potential chief in the hierarchical and class-based society of northwest Liberia, and leaders tend to come from an upper stratum of society (Richards et al. 2005). Class-based and inter-generational patterns of exploitation and marginalization characterize rural life in Liberia (and arguably were a force shaping the most recent episodes of violence). Exploitation is embodied in informal institutions governing local justice and access to land and women (marriage rules). In this context, Richards et al. (2005) refer to a "*crisis of local confidence in state institutions*" invited by "*authoritarianism and extractive rent-seeking behaviour*" (p.31).

Chiefs are local "big men" and have multiple means at their disposal to extract surplus from their environment. First, chiefs control and allocate communal resources. This includes communal land, but also state resources channelled down from Monrovia, and revenues from local enterprises (such as communal plantations). Second, chiefs may pursue their private interests by extracting surplus from their underlings directly. We distinguish between two common types of surplus extraction from villagers—one of which is potentially relevant for our artefactual field experiment, and one of which is arguably not. Consider the former first, which is simply the levying of informal taxes. Such tax revenues are at the discretion of the town chief and may, for example, be used to feed workers on communal plantations (the revenues of which will be controlled by the chief). Anthropological evidence suggests that particularly older women are susceptible to such grabbing. They have become independent from their husbands, and benefit from opportunities arising due to their status as parent of marriageable children (Bledsoe 1976).[7] We speculate that, as a result of their experience with informal taxation, the investment behavior of older women will be affected by corruption of the chief.

[7] For example, the loss of a daughter at marriage for is compensated by bridewealth (material wealth) or brideservice (long-term labor commitment from the son-in-law). Analogously, when a son gets married, his mother will try to keep her daughter-in-law close to help her with domestic and farming chores (Bledsoe, 1976).

The second type of surplus extraction is more exotic, and involves manipulated court cases, resulting in forced and gratis labor on the land of "big men" (e.g. Richards et al. 2005). Importantly, this does not involve the chief's grabbing hand reaching for one's assets, hence exposure to this type of extraction may not affect choices in the investment game. Woman damage accusations are a well-documented case in point. Writing about the Kpelle, the largest ethnic group in our sample, Bledsoe argues that "*the most important way in which elders lure and hold on to young men is by the careful accumulation and deployment of young women*." This involves a manipulative honey trap element as big men … "*use rights in young women not only to reproduce and to gain labour for supporting their immediate families, but also to lure young men into ties of debt and obligation*" (Bledsoe 1980, p.55). Such labor mobilization via the judicial system—serfdom by another name—is common in rural Liberia and Sierra Leone. Approximately one third of the court cases in Eastern Sierra Leone concern woman damage, affecting especially young men (Mokuwa et al. 2011).[8] The reason is simply that most young men lack cash (Bledsoe 1976), and are immune to informal taxation of the above type.

Summarizing, town chiefs can be corrupt in two ways: (*i*) use communal resources for own benefit (to the detriment of all villagers), and (*ii*) appropriate private property of specific community members. In what follows we analyse whether the shadow of corruption influences investment behavior of villagers, affecting the development potential of the community. We hypothesize that a grabbing chief attenuates the propensity to contribute to local public goods. More speculatively, we also hypothesize that corruption erodes incentives for private investments by cash-owning individuals who are regularly exposed to the chief's grabbing hand in their daily life (older women).

[8] See also Bledsoe (1976) who argues that Kpelle men with many wives loan their sexual and domestic services to wifeless men in exchange for labor and political favors.

To gauge the impact of corruption on private incentives to invest in public and private goods we carried out three different field experiments: two *artefactual field experiments* (AFEs) to elicit (social) preferences among our sample of community members, and one *natural field experiment* (NFE) to measure corruption among our sample of leaders.[9] We also collected household and community-level survey data. AFE and survey data were collected in November and December of 2010, using a random subsample of 20-30 household heads per community. Care was taken to ensure that all participants understood the AFEs before commencing the games (through careful instruction and trial runs).

2.2 The three field experiments

Our first AFE aimed to measure the individual's proclivity to make an uncertain investment for private gains. For this purpose we played a simple lottery game, with positive expected profits. All participants were invited to a public space, where the experimenter explained the experiment. Each household head then received an endowment of 70 Liberian Dollar (L$). L$70 equals approximately US$1, or the one-day wage for unskilled labor in rural areas—a salient incentive. Participants could invest (part of) their endowment in a risky, but potentially profitable project. With a success probability of 50%, this project paid out four times the amount invested (so that, with a probability of 50%, the participant would lose its investment). Each participant made her investment decision in private, and afterwards was presented a bag containing two cards—one marked and the other one unmarked. Upon drawing the marked card, the participant had "won" and received four times the amount invested. In what follows we refer to the amount invested in the risk game as a "private investment."

[9] Refer to Harrison and List 2004 for details regarding the AFE and NFE terminology.

Our second AFE aimed to measure investment in a public good. We played a standard public goods game (PG) where each participant received five tokens per round,[10] each worth L$10. People were randomly and anonymously matched with three other community members, and were informed that the game would be played five rounds (with group composition changing after every round). One of the rounds was randomly selected for payment. In each round, participants decided how many tokens to invest in the public good ('the pot'), and how much to keep for themselves. After the round, the number of tokens in the pot was doubled and equally distributed among the four participants. As is well-known, the Nash equilibrium for all individuals is to invest nothing, and the social optimum is to invest the full endowment. In what follows we refer to contributions to the pot as a "public investment."

Next, we discuss the natural field experiment, or the tool we used to gauge corruption. One key difference between an AFE and NFE is that participants in the latter type of experiment are unaware of the fact that their behavior is scrutinized (Harrison and List 2004). Hence, the internal validity of NFEs is not compromised by socially desirable responses.[11] Due to logistical difficulties we were unable to transport and distribute all project inputs to 44 communities on a single day. Hence we transported inputs on one day, and asked community leaders to store them for a period of three days in a safe place. Leaders were also informed that on the third day a project worker would make a public inventory of the inputs, after which they would be distributed to the participants. However, and unknown to community

[10] In fact, to keep the setting as familiar as possible, we replaced the tokens with pebbles.

[11] The analyst faces a trade-off when designing her experiment. While "informed consent" of participants is clearly desirable, it is obvious that one cannot measure malfeasance with consent. The simple fact that behavior is scrutinized affects behavior (see List 2006 for an example of differences in behavior of the same sports cards traders in an AFE and NFE context). The scrutiny effect is likely much greater when measuring corruption. Therefore we believe measuring corruption is among the "prime candidates for relaxation of informed consent" – – informing participants about the experiment would come at minimal benefits, and huge costs (see List 2008, p. 672). Obviously, to attenuate ethical concerns and avoid social tensions, we made sure that village leaders and villagers remained uninformed about the NFE ex-post (they did not hear about the NFE at all, and never received any information about experimental outcomes).

leader and villagers, we had measured these inputs prior to transport. The difference between quantities transported and quantities available for distribution are our measure of corruption.

2.3 Data

Table 1 summarizes our experimental and survey data. Panel A lists the experimental data. First, the corruption indicators obtained via the NFE are dummy variables taking a value of 1 if certain items were stolen (rice, vegetable seeds or corn, tools, or any of these categories). The major staple crop in Liberia is rice, and this crop has a special position in Liberian culture (e.g., Sawyer 2008). Stealing rice is considered more offensive than stealing other items, hence we expected less theft of rice to occur than theft of, say, vegetable seeds. This was confirmed by our data. In only 18% of the communities rice was stolen, compared to 37% in which vegetables were stolen. The low level of variation in our '*missing rice*' variable (combined with the small sample size) complicates the identification of effects. In our preferred specifications we therefore focus on the theft of vegetables and corn ('*missing veg*'). We also use the aggregate theft variable ('*missing any*') capturing the theft of vegetables, rice or agricultural tools. Almost half the community leaders stole something during the three days they stored the inputs; the other half did not.

Panel A also summarizes the play in the AFEs. On average, villagers shared 1.5 stones in the fifth round – our measure for contributions to the public good ('*public investment*'). All results that follow are robust to choosing another round, or using an aggregate measure of average play over the rounds. In the investment game, villagers invested on average L$26, or 37% of the endowment ('*private investment*'). The data reveal considerable variation across communities—variation that we will seek to explain later.

<< Insert Table 1 about here >>

Panel B summarizes the household controls. About half of the sample is male, and the average age of the head of household is 42. Some 30% of the households was attacked during the civil war that ravaged Liberia between 1989 and 2003, but variation across communities is quite large—ranging from 9 to 65% attacked households per community. The average share of inter-household family members in the group is about 35%.[12]

Community controls are provided in Panel C. Communities are small, with an average community size of only 45 households. A main road connects half of the communities to the outside world, while the other communities cannot be reached by car during the rainy season. The Herfindahl indices measure ethnic and religious diversity (so that 0 indicates maximum homogeneity with all villagers belonging to the same group, and greater values signify larger degrees of diversity). The communities in our sample are rather homogenous, as evident from the low Herfindahl indices for ethnicity and religion (0.10 and 0.11, respectively). About 71 percent of our sample communities have been visited by NGOs in the past. This high percentage is unsurprising given the destructive nature of the civil war, inviting high levels of post-war reconstruction efforts. In half of the communities, community members have been recruited during the Liberian war. Local markets are rare; only 9% of the communities in our sample has one. Villagers from other communities have to travel to trade—sometimes considerable distances—so we treat the market dummy as a rough proxy for market integration. The number of acres used for (rubber) plantation varies considerably across villages from 0-1500 with a mean of 174 acres per village. There are relatively few young men in the village, and some 73% of the people has been displaced during the war.

[12] The family share is measured as "density" in social network analysis; participants were asked to specify their relationship with all others in our sample of respondents, and we aggregated these data.

Finally, Panel D summarizes key characteristics of the village leader (term in office, ethnic identity, land, and education) that we will use to identify exogenous variation in corruption in an instrumental variables approach outlined below.

2.4 Empirical strategy

To motivate our analysis we first compare mean private and public investments in corrupt and not-corrupt communities. Results are displayed in Table 2. Both private and public investments are significantly lower in communities headed by a corrupt chief. In what follows we investigate these correlations in more detail in a multivariate regression framework.

<<Insert Table 2 about here>>

Our identification strategy is simple, and consists of only two components. First, we run OLS and interval regression models to explain investments (in public or private goods) by our corruption indicator, and vectors of community and household controls. We estimate two models: (*i*) at the community level, explaining average investment behavior, and (*ii*) at the household level, explaining household-level investment choices:

$$Investment_j = \alpha + \gamma_k + \beta_1 Stealing_j + \beta_2 Comm_j + \varepsilon_j, \quad \text{or} \tag{1}$$

$$Investment_{ij} = \alpha + \gamma_k + \beta_1 Stealing_j + \beta_2 Comm_j + \beta_3 X_{ij} + \varepsilon_{ij}, \tag{2}$$

where subscript i indexes household i=1,…,1074 and subscript j indexes community j=1,…,44. In many specifications we also use interaction terms ($Stealing_j \times Comm_j$) to explore whether the impact of corruption is heterogeneous—varying across selected community characteristics. In all models we use province fixed effects (γ_k, k=1,2,3) to capture

unobservable factors that might vary at this higher level of organization. Throughout we cluster standard errors at the community level.

Equation (1) may suffer from endogeneity bias. In particular, our estimate of β_1 may be biased due to reverse causality (if leaders steal more or less in communities where villagers tend to invest more in public or private goods) or omitted variables (unobserved factors driving both corruption and investments—think of cultural factors or average income in the community). For this reason, we resort to an instrumental variables model and seek to identify exogenous variation in corruption levels across our set of communities. We use chief characteristics (see below) as instruments, and estimate a system of two equations:

$$Investment_{ij} = \alpha + \gamma_k + \beta_1 Stealing^*_j + \beta_2 Comm_j + \beta_3 X_{ij} + \varepsilon_{ij}, \text{ and} \quad (3)$$

$$Stealing^*_j = \theta + \psi_k + \varphi_1 Comm_j + \varphi_2 X_{ij} + \varphi_3 Chief_j + \varepsilon_j. \quad (4)$$

In (3), *Stealing** is predicted with chief characteristics (captured by the vector of excluded instruments, $Chief_j$). Good instruments satisfy two requirements: (i) they should be relevant (i.e. correlated with the endogenous regressors), and (ii) they should not violate the exclusion restriction (i.e., not be correlated with the error term in 3). We believe town chief characteristics are likely to meet these requirements, and will return to this below.

3. Empirical results

3.1 Correlations between corruption and investment behavior

We first focus on aggregate results at the community level, and report OLS results in Table 3. In columns (1-4) we explain voluntary contributions to the public good, and in columns (5-8) we explain investments in the private risk game. In column (1) the regressor of interest is whether or not vegetable seed was stolen by the chief. In spite of the small sample

size, our corruption indicator is significant at the 5% and, not surprisingly, enters with a negative sign. Villagers living in a community with a thieving chief, on average, contribute 0.42 tokens less to the common pot, or 28% of the mean contribution in this game. A rather similar result is obtained when we use the broader theft dummy in column 2, which captures missing rice, seeds, or tools (compared to the mean, average contributions fall by 21%).

<< Insert Tables 3 and 4 about here >>

In columns (3-4) we explore whether there is systematic inter-community heterogeneity by adding two interaction variables (results using alternative interaction terms are not informative, and available on request). The interaction term in column (3) is based on accessibility, and allows us to analyse whether the association between corruption and behavior varies with remoteness (e.g. Khwaja 2009, Olken, 2006). However, this interaction term does not enter significantly. Another candidate to explain inter-community differences in investment choices is the degree of ethnic fractionalization. While the level of ethnic diversity never enters significantly in any model, the interaction between corruption and fractionalisation enters significantly. The adverse association between a corrupt leader and voluntary contributions to the public good becomes more pronounced in more ethnically diverse communities, and corruption does not matter in homogenous communities.

This result suggests an "efficacy mechanism" may be at work. Habyarimana et al. (2007) ascribe higher levels of public goods provision in ethnic homogeneous communities to particular attributes shared by co-ethnics. These attributes (e.g. common experience, shared norms) facilitate the ease of communication, and enhance the ability of co-ethnics to collaborate. For example, they could facilitate coordination on a joint response to overcome the common challenge of a corrupt chief. Alternatively, the result could be evidence of a strategy-selection mechanism: co-ethnics may share a common norm that cooperation will be

reciprocated and shirking will be punished; a norm that could become more salient when formal rules are weak—in communities with a corrupt chief.[13] The finding that ethnic fractionalisation matters in the domain of corruption is reminiscent of results reported by Bjorkman and Svensson (2010), who find that fractionalization adversely affects collective action for improved service provision.[14]

Various other factors are correlated with average contributions in the public goods game. For example, contributions increase as the number of family members in the sample of respondents goes up (even if respondents are unsure about the identity of individuals with whom they are matched in specific rounds of the experiments). Communities that experienced recruitment by rebel factions in the war display lower contributions, which suggests intra-community tensions and lack of trust. The same may apply to the share of young men in the community. The presence of a local market correlates with lower contributions to the public good.

The results for investments in the private risk game are qualitatively different. First, no control variable enters significantly, which is not surprising given that these are community-level controls, and we are explaining an individual decision that lacks a clear community dimension. Second, and more importantly, the evidence for the corruption variables is much weaker than before. While our corruption indicators enter significantly in two specifications (albeit only at the 10% level), they do not in the remaining models. The finding that corrupt leadership is more robustly associated with low contributions to the public good than with private investments is consistent with the anthropological evidence discussed in section 2. If only a sub-sample of the respondents of the respondents has experienced

[13] Habyarimana et al., (2007) find support for such a so-called "strategy selection mechanism" in their study.
[14] However, note that the results are not the same. Bjorkman and Svensson (2010) focus on explaining missing transfers, which is a measure of corruption. Instead, we find that *given a certain level of corruption*, the impact of corruption on investment choices varies with the level of ethnic homogeneity. In our data, the level of ethnic fractionalization does not affect the level of corruption (see Table 5, below).

informal taxation by the chief, then this social group's behavioral response may be obscured when we consider aggregate data.

In Table 4 we therefore analyse the same issue, but now use *individual* decisions in the field experiments as the dependent variable. We include a vector of household controls (Table 1, panel B), but to economize on space we now do not report regression results for our control variables (details available on request). The results in columns (1-4), explaining contributions to the public good, are consistent with the community-level results in Table 3: corrupt chiefs are correlated with lower contributions, and this correlation is especially important in ethnically diverse communities. Similarly, the average response to corruption in the investment experiment is not consistently significant (columns 5-8). However, restricting the sample to women over 35 years old—a prime group for informal taxation by the chief—results in a large, negative and statistically significant coefficient (column 9). Older women "bring their life-time experience to the lab" and contribute less when they are governed by a corrupt chief.

3.2 Instrumental variables: Causal effect of corruption

While the correlations in Tables 3 and 4 are informative, it would be premature to interpret them as causal relationships as they might be driven by reverse causality or omitted variables. For that reason, we seek to identify exogenous variation in corruption, and consider various characteristics of the chief as possible instruments. These characteristics should explain whether or not chiefs engage in stealing, yet should not have any effect on villagers' behavior other than via the postulated governance channel. As potential excluded instruments we consider his term in office and ethnic identity.

Regression results are reported in Table 5: 1st stage regression results are displayed in column (1), and matching 2nd stage outcomes in column (5). Column (1) explains theft of

vegetables. Leaders that are longer in office are less likely to steal, whereas leaders that belong to the communities' dominant ethnic tribe are more likely to steal. Corruption thus predicted enters significantly in the model explaining voluntary contributions to the public good. The magnitude of the coefficients is similar as before. We have also estimated models using the broad indicator of corruption '*missing any*' and obtained similar results (results available on request). The impact of being governed by a corrupt chief is that average contributions to the public good go down by some 32-35% (depending on the corruption indicator chosen). The test statistics are no cause for alarm, but the partial F values of the 1st stage regressions are low (see below for a discussion on an alternative set of instruments).

<< Insert Table 5 about here >>

Column (6) presents the 2nd stage results of the model where we instrument for corruption as well as the interaction of corruption and ethnic diversity. Matching 1st stage results are reported in columns (2-3). Similar results emerge as before—the adverse effects of corrupt leadership are more pronounced as the degree of ethnic diversity increases.

Next, we use the IV set-up to analyze how corruption affects private investments. Aggregate results are reported in columns (7-8), and generally confirm the insights obtained earlier. The corruption indicator enters with a negative sign, as does the interaction term, but these coefficients are borderline significant at best (again: similar results are obtained using the broad corruption index). Column (9) displays results for our subsample of older women (1st stage results in column 4). For this subsample we again find a significant, negative effect of stealing on investment.

As a robustness test we experimented with other instruments, including land "controlled" by the chief and his level of education (in years). Education levels are negatively

correlated with corruption, and land ownership increases the likelihood of stealing.[15] These instruments work well for the public investment models; raising partial F-statistics (all > 5), and the overall model significance of the first stage improves (F-statistics >10 for all models). Regression coefficients are the same as in Table 5.[16]

4. Discussion and conclusions

In recent years, bad governance has been identified as a leading factor of slow growth and underdevelopment. A micro-oriented corruption literature is now emerging, to complement the more established macro literature based on cross-country comparisons and subjective corruption indicators. Our main contributions fit in this micro literature, and are twofold. First, corrupt leadership attenuates individual investment incentives, and the strength of this effect varies across investment opportunities. Reflecting the reach of chiefs in rural Liberia, we find that corruption strongly undermines incentives to provide local public goods (creating goods or services amenable to confiscation by the leader), and has a weak effect on aggregate investments in private goods. However, once we zoom in on the subsample of cash-owning community members regularly exposed to grabbing behavior of the chief, we again find strong and significant effects. Insofar as asset accumulation or local public goods provision matter for generating growth, our data suggest that corruption could depress local development via lowered investments.

[15] Note that the macro literature has established that more highly educated leaders boost economic performance, but has been silent on the channel linking education to growth (Besley et al. 2011). The negative correlation between education and stealing could shed light on this matter, and suggests that corruption (one specific dimension of governance quality) could be the linking pin between an educated leader and economic growth. A more educated chief translates into less corruption, which in turn enhances investments in public goods by citizens.

[16] However, this set of instruments proved problematic for the private investment models. Our overidentification test rejects the null of valid instruments ($p>0.05$), hence we do not report results here (but details are available on request).

Second, the social context matters. Ethnically fragmented communities are more susceptible to the adverse effects of corrupt leadership than ethnically homogenous ones. It is not evident why this result materializes. Following Habyarimana et al. (2007), we speculate that so-called efficacy and (or) strategy selection mechanisms could play a role—enabling ethnically homogenous communities to coordinate on informal arrangements that substitute for weak formal rules. If so, trust and shared norms among co-ethnics imply that the erosive impact of a thieving chief is less poisonous for community life. Exploring why ethnically fragmented societies are more sensitive to corruption than ethnically homogenous ones is an important topic for future research.

Why do people invest less when their leader is corrupt? Our data do not allow us to test for the channel linking theft to reduced investments, but at least two candidate explanations leap to mind. First, corruption might work like a distortive tax. While there is no "taxation" in the experiment, such an effect might work via internalization—people are used to the fact that the chief has a finger in the allocation of (communal) resources, and bring their life-time experience into the lab. But another sort of effect might be at play as well. Fehr and Falk (1999) write that when subordinates are treated with respect, they respond with loyalty and greater productivity. Insofar as we can equate the incidence of corruption with a lack of respect, the loyalty channel could also explain the behavioral patterns in our data. Additional research will be necessary to untangle the mechanism. Arguably, combinations of natural and artefactual field experiments, as advanced in this study, are a logical avenue to push this research agenda further.

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Table 1: Summary statistics

Variable	N	Mean	SD	Min	Max
A1: Experimental results – Stealing					
Missing rice (d)	44	0.182	0.390	0	1
Missing vegetables & corn (d)	44	0.364	0.487	0	1
Missing tools (d)	44	0.068	0.255	0	1
Missing any (d)	44	0.477	0.505	0	1
A2: Experimental results – Private investment decisions					
Public investment	1079	1.491	1.488	0	5
Private investment	1075	25.674	18.027	0	70
Public investment (public good game, *village mean*)	44	1.495	0.505	0.409	2.762
Private investment (risk game, *village mean*)	44	25.707	8.451	9	43.077
B: Household controls					
Male (d)	1072	0.493	0.500	0	1
Age	1028	42.694	15.059	11	94
Number of tapping knives per household (d)	1074	0.268	0.443	0	1
Household attack during war (d)	1003	0.304	0.460	0	1
Average number of attacks per household *(village mean)*	44	0.3	0.124	0.091	0.654
Share of family in the community	1075	0.347	0.279	0	1
Average share of family in the community *(village mean)*	44	0.348	0.140	0.117	0.726
C: Community controls					
NGO (d)	44	0.705	0.461	0	1
Rebel recruitment during war (d)	44	0.5	0.506	0	1
Main road (d)	44	0.5	0.506	0	1
Market (d)	44	0.091	0.291	0	1
Plantation owned by village (acres)	44	179.273	284.370	0	1500
Share of young men (12-25 years)	44	1.683	0.901	1	4
% of people displaced during war	44	0.731	0.132	0.364	1
Ethnic heterogeneity (Herfindahl index)	44	0.110	0.160	0	0.943
Religious heterogeneity (Herfindahl index)	44	0.098	0.123	0	0.498
D: Chief characteristics					
Years in office	44	5.705	6.504	0	32
Chief belongs to communities ‘dominant tribe (d)	44	0.795	0.408	0	1
Years of education chief	44	4.864	4.402	0	12
Chief owns land (d)	44	36.852	158.617	0	1000

(d) = dummy

Table 2: t-test private and public investments in stealing and non-stealing communities

Investment	Non corrupt villages (missing any = 0)	Corrupt villages (missing any = 1)	Difference
Public investment	1.593 (0.058)	1.329 (0.712)	0.264 (0.093)***
Private investment	26.677 (18.608)	24.010 (0.841)	2.667 (1.133)**

Table 3: Investment decisions, community level

	(1) Public investment *OLS*	(2) Public investment *OLS*	(3) Public investment *OLS*	(4) Public investment *OLS*	(5) Private investment *OLS*	(6) Private investment *OLS*	(7) Private investment *OLS*	(8) Private investment *OLS*
Missing veg.	-0.423**		-0.846*	-0.225	-1.664		-8.354*	-1.885
	(0.155)		(0.469)	(0.206)	(2.947)		(4.772)	(3.710)
Missing any		-0.318**				-5.849*		
		(0.155)				(3.340)		
Missing veg. × road			0.546				8.620	
			(0.513)				(6.203)	
Missing veg. × ethnic div.				-2.019*				2.246
				(1.168)				(22.78)
HH attacked	0.390	0.207	0.217	0.350	-6.613	-11.16	-9.333	-6.569
	(0.551)	(0.593)	(0.602)	(0.548)	(15.33)	(15.05)	(15.34)	(15.54)
Family share	0.946**	0.841*	0.961**	0.775*	10.23	6.103	10.46	10.42
	(0.419)	(0.469)	(0.440)	(0.399)	(7.761)	(8.639)	(7.762)	(7.647)
NGO	0.0399	0.0379	0.0794	0.0605	-4.012	-3.881	-3.388	-4.035
	(0.148)	(0.155)	(0.142)	(0.154)	(3.326)	(3.038)	(3.325)	(3.348)
Recruitment	-0.243*	-0.235+	-0.280*	-0.295*	-0.380	-0.337	-0.978	-0.321
	(0.138)	(0.147)	(0.148)	(0.147)	(2.442)	(2.341)	(2.492)	(2.659)
Main road	0.415*	0.401*	0.104	0.343+	4.697+	4.027	-0.224	4.777+
	(0.212)	(0.206)	(0.388)	(0.221)	(3.016)	(2.766)	(4.726)	(3.093)
Market	-0.516**	-0.523**	-0.455**	-0.512**	3.191	1.684	4.143	3.187
	(0.206)	(0.208)	(0.188)	(0.206)	(3.818)	(3.735)	(4.165)	(3.857)
Plantation	-0.000394	-0.000455	-0.000395	-0.000381	0.0000626	-0.00152	0.0000428	0.0000477
	(0.000327)	(0.000344)	(0.000333)	(0.000338)	(0.00352)	(0.00339)	(0.00360)	(0.00359)
Young men share	-0.263***	-0.250***	-0.260***	-0.240***	1.703	1.740	1.740	1.679
	(0.0801)	(0.0883)	(0.0758)	(0.0773)	(1.681)	(1.534)	(1.661)	(1.690)
Ethnic diversity	-0.257	-0.284	-0.181	-0.0116	-1.540	-4.560	-0.332	-1.813
	(0.496)	(0.517)	(0.485)	(0.402)	(8.252)	(8.366)	(8.125)	(8.288)
Religious diversity	1.101+	0.942	1.355*	1.341*	11.35	13.14	15.38	11.09
	(0.653)	(0.678)	(0.684)	(0.706)	(12.77)	(11.29)	(13.61)	(13.61)
Displaced	0.797	0.665	0.588	0.889+	22.03*	24.05+	18.72	21.93+
	(0.601)	(0.647)	(0.653)	(0.551)	(12.91)	(14.41)	(12.97)	(13.42)
Constant	1.469***	1.607***	1.884**	1.485***	9.871	14.52	16.42	9.853
	(0.499)	(0.501)	(0.755)	(0.505)	(10.37)	(10.95)	(11.66)	(10.54)
Province FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	44	44	44	44	44	44	44	44
R^2	0.557	0.517	0.586	0.598	0.378	0.457	0.403	0.378
F	4.36	3.15	4.54	7.01	2.91	3.55	2.71	3.27

Robust standard errors in parentheses
*+ p < 0.15, * p < 0.10, ** p < 0.05, *** p < 0.01*

Table 4: Investment decisions, individual level -- linear model

	(1) Public investment *Intreg*	(2) Public investment *Intreg*	(3) Public investment *Intreg*	(4) Public investment *Intreg*	(5) Private investment *OLS*	(6) Private investment *OLS*	(7) Private investment *OLS*	(8) Private investment *OLS*	(9) Private investment *OLS* *Women >35*
Missing veg.	-0.522***		-0.608***	-0.296	-3.420		-5.358*	-2.405	-8.461***
	(0.143)		(0.179)	(0.208)	(2.569)		(3.134)	(3.038)	(3.023)
Missing any		-0.401***				-5.532**			
		(0.122)				(2.688)			
Missing veg. × road			0.217				5.082		
			(0.263)				(4.492)		
Missing veg. × ethnic diversity				-2.149**				-10.15	
				(1.077)				(17.42)	
Constant	1.098**	1.328***	1.120**	1.057**	2.217	5.430	3.103	2.253	9.169
	(0.520)	(0.487)	(0.504)	(0.492)	(9.174)	(9.566)	(9.041)	(9.053)	(10.92)
lnsigma _cons	0.366***	0.369***	0.365***	0.363***					
	(0.0264)	(0.0254)	(0.0268)	(0.0258)					
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Community controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	992	992	992	992	476	476	476	476	292
R^2	0.063	0.058	0.064	0.069	0.159	0.171	0.162	0.159	0.161
F	4.04	3.56	4.18	8.11	6.96	7.40	7.37	6.91	5.41

Clustered standard errors in parentheses
*+ p < 0.15, * p < 0.10, ** p < 0.05, *** p < 0.01*

Table 5: Investment decisions – IV model (first & second stage)

	(1) **Missing veg.** *First stage*	(2) **Missing veg.** *First stage*	(3) **Missing veg.× ethnic diversity** *First stage*	(4) **Missing veg.** *First stage* *Women >35*	(5) **Public investment** *Second stage*	(6) **Public investment** *Second stage*	(7) **Private investment** *Second stage*	(8) **Private investment** *Second stage*	(9) **Private investment** *Second stage* *Women >35*
Missing veg.					-0.612**	-0.0245	-5.908	0.211	-19.11*
					(0.300)	(0.383)	(7.458)	(9.330)	(10.27)
Missing veg. × ethnic diversity						-3.180**		-36.80+	
						(1.389)		(24.56)	
Chief instruments									
Years in office	-0.0173*	-0.00210	0.00213**	-0.0140+					
	(0.00894)	(0.0149)	(0.000958)	(0.00859)					
Kpelle tribe	0.380***	0.258+	0.00108	0.292**					
	(0.140)	(0.165)	(0.0185)	(0.132)					
Years in office × ethnic diversity		-0.124+	-0.0383***						
		(0.0791)	(0.00745)						
Kpelle tribe × ethnic diversity		1.186*	0.677***						
		(0.654)	(0.101)						
Constant	-0.107	-0.156	-0.0188	-0.180	1.115**	1.026**	4.074	3.150	8.918
	(0.450)	(0.447)	(0.0486)	(0.429)	(0.514)	(0.483)	(9.505)	(9.321)	(11.38)
HH controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Comm. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	987	987	987	292	987	987	985	985	292
R^2	0.450	0.487	0.745	0.506	0.062	0.065	0.116	0.117	0.116
F	5.53	6.68	7.78	10.99	3.56	23.46	8.27	9.67	5.01
Partial F	4.57	3.44	13.71	3.00	.	.	.	.	.
Hansen-J P-val.	.	.	.	.	0.965	0.606	0.604	0.967	0.74
K-P p-value	.	.	.	.	0.007	0.085	0.007	0.084	0.000

Clustered standard errors in parentheses
*+ p < 0.15, * p < 0.10, ** p < 0.05, *** p < 0.01*