THE TAXMAN COMETH:
PATHWAYS OUT OF A LOW-CAPACITY TRAP IN THE D.R. CONGO

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Abstract

How might fragile states escape a low-capacity trap in which citizens pay little tax and the government has insufficient revenue to increase enforcement or provide public goods? We argue that governments can escape such traps by regularizing tax collection. When citizens observe taxes being collected in a systematic, non-arbitrary manner, they are likely to update positively about the performance of the government, increasing their intrinsic motivation to comply. We test this idea in the first door-to-door property tax collection campaign in Kananga, D.R. Congo, which raised compliance from near zero to 10.3%. Linking pre-campaign surveys with administrative tax data, we document a strong relationship between citizens' prior perceptions of government performance and property tax payment. Then, exploiting the campaign's random roll-out, we find that systematic tax collection caused citizens to update positively about government performance. Together, these results are consistent with a virtuous cycle of perceived government performance and fiscal capacity.

1 Introduction

Collecting taxes — the 'hallmark of the state' (Scott, 2017) — is crucial for the provision of public goods (Kaldor, 1963; Besley and Persson, 2013) and is associated with more inclusive and accountable governance.[1] But many developing countries, especially those with weak or fragile states, collect less than 10% of their GDP in taxes, compared to more than 40% in many rich countries.

Moreover, many such countries appear caught in a low-capacity trap. To raise more tax revenue, canonical works suggest that governments should invest in enforcement (Allingham and Sandmo, 1972) and should cultivate tax morale so that citizens might pay due to a sense of fiscal reciprocity (taxes for public goods) and intrinsic motivation.[2] However, both tax enforcement and public goods provision typically require bulky investments and a threshold level of state capacity that some countries lack. Increasing tax payment through enforcement, for instance, requires tax authorities to have the human capital and informational capacity to detect non-compliance through audits — no easy feat in cash economies with large informal sectors. Similarly, increasing citizens' sense of fiscal reciprocity by building public infrastructure requires governments to cover fixed costs of acquiring the necessary machinery, supplies, and engineering capabilities.

In this paper, we argue that revenue-maximizing governments may be able to escape such a low-capacity trap by appealing to citizens' intrinsic motivation to pay by regularizing tax collection. When citizens observe state agents raising revenue systematically from a broad, if not universal, base in society, they are more likely to view taxation as fair and the government as acting in the common interest. Citizens may then be more intrinsically motivated to help fund a government they view as higher-performing. Importantly, unlike policies to promote enforcement-based tax compliance (e.g., audits) or reciprocity-based compliance (e.g., road building), it requires minimal state capacity to regularize tax collection.

Moreover, if the government uses the new revenue it receives from such reforms to

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[1]See North and Weingast (1989) and Tilly (1985) for the seminal historical accounts, Ross (2004) and Prichard (2015) for cross-country evidence, Paler (2013) and Martin (2014) for lab-in-the-field evidence, Weigel (2020) for field-experimental evidence, and Gadenne (2017) and Martinez (2019) for evidence on spending from tax revenue relative to other revenue sources.

[2]See Levi (1989) for the seminal account of 'quasi-voluntary compliance,' Luttmer and Singhal (2014) for a review of literature on tax morale more generally, and Besley (2019) for a model of the evolution of civic culture over time and the multiple equilibria that are possible.

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progressively increase the perceived performance of the tax authorities — e.g., by hiring more professional tax collectors, or adopting technologies to regularize collection further — it may be able to again expand the set of quasi-voluntary compliers in future periods. These dynamics illustrate the first step in a potential virtuous cycle and a path out of the low-capacity trap noted above. That said, increases in tax compliance from expanding citizens' intrinsic motivation alone are unlikely to raise sufficient revenue to fund a modern state. But they may be sufficient to generate the initial revenue that low-capacity states lack before implementing costlier policies to expand enforcement- and reciprocity-based compliance.

We test these ideas in the context of Kananga, D.R. Congo, a setting with low baseline tax compliance and highly arbitrary and idiosyncratic tax collection. We study the provincial government's first systematic property tax collection campaign. Collectors went door to door registering properties and soliciting the property tax — a major regularization of tax collection.

Crucially, the government randomized the rollout of the tax campaign on the neighborhood level to enable estimation of its impact on revenues. In control neighborhoods, citizens were simply reminded that they were expected to pay the property tax at the tax ministry. The campaign raised compliance from 0.1% in control areas to 10.3% in treatment areas, and property tax revenues increased to 5% of the provincial budget, on par with local governments in more prosperous African countries.[3] Although a 10 percentage-point increase is large compared to similar tax interventions in developing countries (Khan et al., 2015; Jibao and Prichard, 2015; Martin et al., 2021), it is striking that almost 90% of property owners avoided paying despite receiving in-person visits from collectors.[4]

We investigate what motivated compliers to pay by exploiting pre-campaign household surveys, linked with administrative tax data. The characteristics used as moderators are not random, of course. But estimating heterogeneous effects of a tax campaign that arrives exogenously in treatment but not control mitigates many endogeneity con-

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[3]For example, property taxes account for 14% of local government revenue in Ghana, 10% in the Gambia, 6% in Sierra Leone, and less than 1% in Cameroon and Liberia (Fjeldstad et al., 2017). Moreover, these figures include property tax revenues from from the national capitals and "first cities" of countries, whereas Kananga is only a provincial capital and the fourth largest city in D.R. Congo.

[4]In fact, property tax compliance is similar in most low-income countries, ranging from 7% in Haiti (Krause, 2020) to 7.7% in Liberia (Okunogbe, 2019), 12% in Senegal (Cogneau et al., 2020), and 25% in Ghana (Dzansi et al., 2020).

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cerns because it captures differential responsiveness to treatment among households of a characteristic, netting out correlations between the characteristic and tax payment in control. Property owners with above-median beliefs about the performance of the provincial government were 4.4 percentage points more likely to pay. As a comparison, owners with above-median beliefs about the probability of enforcement were 3.2 percentage points more likely to pay (though this difference is only marginally statistically significant). We also find mixed evidence about the importance of fiscal reciprocity in citizens' payment decisions. That views of government performance are a key determinant of tax compliance is consistent with our argument and with scholarship on why people obey the law more generally (Levi, 1998; Tyler, 2006).

Given this evidence that compliers in this first citywide tax campaign often held higher priors about government performance, we turn to the second stage in the argument to examine how the tax campaign as a whole impacted citizen perceptions of its performance at endline. If collectors engaged in arbitrary taxation, or abused their responsibilities on other margins, then the campaign could undermine views of the government and shrink the pool of future quasi-voluntary compliers. On the other hand, regularized tax collection could potentially boost perceived government performance in this low-capacity setting and lead to greater tax compliance in the future.

Leveraging its random assignment on the neighborhood level, we find that the tax campaign raised average perceptions of the government's performance as well as citizens' expectations that the government would use taxpayer money on public goods and other 'good uses.' Importantly, these patterns do not appear to reflect taxpayers engaging in ex-post justification of their decision to pay because the treatment effect exists also when restricting to a sample of non-compliers. By contrast, the campaign does not appear to have altered beliefs about enforcement capacity. The combination of (*i*) higher payment among citizens who ex ante held more positive views of government performance, and (*ii*) average improvements in ex post perceptions of its performance caused by the tax campaign is suggestive of the first step in a virtuous cycle leading out of the low-capacity trap. The key idea is that some share of the citizens who updated their beliefs about government performance after the tax campaign will have sufficiently high beliefs in the next period such that they, too, will pay taxes due to their newly acquired intrinsic motivation.

In a final and more exploratory section of the paper, we examine mechanisms

through which the tax campaign increased perceived government performance.[5] We chiefly study variation associated with the tax collectors — randomly assigned on the neighborhood level — who worked on the campaign to reach three main conclusions. First, tax collectors themselves are an importance source of perceived government performance, and governments may be able to invest in training or hiring more professional collectors to expand intrinsic motivation further. Second, tax collectors are most capable of increasing perceived performance when randomly assigned to work close to their home neighborhoods, consistent with observed higher trust levels among local officials in the decentralization literature (Faguet, 2012; Bardhan, 2002). Third, households that happened to witness collectors' tablets and receipt printers — technologies used during the campaign — were much more likely to update positively about government performance. Governments may thus be able to increase intrinsic motivation to pay taxes by adopting technologies that further systematize collection and increase the perceived integrity of state agents.

This paper contributes to the literature by developing and testing the argument that regularizing tax collection can raise citizens' intrinsic motivation to pay taxes and offer an initial pathway out of a low-capacity trap. While a long line of scholarship has emphasized the importance of tax morale in the expansion of fiscal capacity (e.g., Levi, 1989; Besley, 2019), we are unaware of past work exploring in detail the traps that can prevent low-capacity states from expanding enforcement- or reciprocity-based tax compliance — and the role that intrinsic motivation tied to perceptions of government performance can play in such settings. Moreover, in the growing literature on tax compliance in developing countries, past work on tax morale has tended to focus more on fiscal reciprocity[6] — taxes for public services — while we emphasize intrinsic

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[5]We did not pre-register these analyses, so the results should be taken as suggestive only.

[6]In fact, much of the economics literature focuses on enforcement and third-party reporting (e.g., Pomeranz, 2015; Naritomi, 2019; Jensen, 2019), tax administration (Khan et al., 2015, 2019; Basri et al., 2019; Balan et al., 2021), and tax design (Best et al., 2015; Brockmeyer et al., 2020). The main approach to comparing enforcement- v. tax morale-based compliance has been comparing the impacts of randomized messages about public goods or civic duty embedded in tax bills or other notices from tax authorities (see Slemrod (2019) for a recent review). As we discuss in Section 2.1, this approach leaves much to be desired, since it is not obvious why citizens would update their priors about the productive capacity of the state—informed by a lifetime of observation—because of a message from the tax authority, especially in developing countries with low literacy rates. More promisingly, three ongoing studies explore whether providing public goods increases tax compliance (Krause, 2020; Khan et al., 2021; Prichard, 2021). The political science literature on tax compliance similarly focuses on fiscal reciprocity and political bargaining between payers and the government (Prichard, 2015; Bodea and LeBas, 2016; Moore et al., 2018; Martin et al., 2021; Gottlieb et al., 2021). Across all of these

motivation stemming from positive views of government performance. The main exception is Dwenger et al. (2016) who compare extrinsic and intrinsic motivation with a church tax in Germany for which there is zero formal enforcement. Our paper by contrast examines whether incipient states can cultivate intrinsic motivation to escape a low-capacity trap. Finally, we study a rare empirical setting in which tax collection was randomly assigned, enabling us to analyze the causal effect of regularized collection on citizens' beliefs about the government. Although a key limitation of the empirical analysis is our inability to consider longer-term effects over multiple rounds of randomly assigned tax collection, we can nonetheless make progress in testing the observable implications of our argument thanks to rich pre- and post-treatment survey data.[7]

2   The Argument: Escaping low-capacity traps by expanding intrinsic motivation to pay taxes

To build our argument, we first examine possible motivations for tax compliance, and the citizen beliefs they depend on.[8] Second, we discuss conditions under which low-capacity traps can emerge. Third, we introduce how indirect effects of tax collection on citizens' beliefs could constitute virtuous cycles in which non-coercive and systematic tax collection increases citizens' perceptions of government performance and thus expands the set of intrinsically motivated tax compliers.

2.1   Why people pay taxes

Enforcement-based compliance

In most models of tax compliance, citizens trade off the cost of compliance with the expected cost of evasion (Allingham and Sandmo, 1972). They choose to pay if the tax liability is less than the expected probability of sanctions multiplied by the fine

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approaches, however, there is much less work on intrinsic motivation, as Luttmer and Singhal (2014) note in their review of the literature.

[7]The paper also makes a smaller contribution to a growing literature about social proximity and bureaucrat performance (Xu et al., 2018; Chu et al., 2020). Past work finds that bureaucrats tend to exhibit favoritism, or greater leniency, when working in their home regions (Xu et al., 2018; Chu et al., 2020); it emphasizes negative overall (national-level) consequences of such behavior. In this setting, collectors working near their home neighborhoods collected more revenue and appeared better able to stimulate a sense of government legitimacy.

[8]Section A1.3 contains a more formal investigation of the motivations behind tax compliance.

for non-compliance. Perceived enforcement risk varies on the individual level, which therefore generates heterogeneity in tax compliance. If individuals' beliefs about the probability of enforcement are sufficiently high — such that they are to the right of the threshold indifference point between the costs of compliance and evasion — then they will pay taxes. Otherwise, they will evade.

In middle- and high-income countries, there is strong empirical support for the importance of such pecuniary or *enforcement-based* motivations to pay taxes and the use of enforcement — especially third-party reporting — to achieve near-perfect compliance (Slemrod, 2019). A landmark study of random tax audits found almost zero income tax evasion among employed workers — whose income declarations are subject to third-party reports by employers — compared to evasion on 15% of income among the self-employed (Kleven et al., 2011). A cottage industry of tax letter experiments, in which tax authorities randomly include enforcement messages in their communications to taxpayers, reinforces the importance of pecuniary motivations and the use of enforcement by governments seeking to increase compliance.[9] If people can evade taxes, they will try, the conventional wisdom goes, and so governments should aspire to perfect coverage of third-party reporting to aid enforcement.

Reciprocity-based and intrinsically motivated compliance

In addition to pecuniary motivations, citizens may pay taxes due to non-pecuniary motivations or tax morale (Luttmer and Singhal, 2014). Scholars have tended to differentiate between two main sources of non-pecuniary tax morale. First, citizens might pay taxes due to *reciprocity-based compliance* if they expect to benefit from future public services in a kind of fiscal exchange (Levi, 1989; Fjeldstad and Semboja, 2001; Besley, 2019). These benefits might not be commensurate with taxes paid, i.e. the effective "price" of public goods might be high (Ross, 2004). But nonetheless citizens may expect to gain from the reciprocal quid-pro-quo exchange of taxes for public goods.[10] Second, citizens might have *intrinsic motivation* to pay taxes because they approve of the government and regard tax payment as a civic duty (Levi, 1989; Andreoni et al., 1998; Tyler, 2006).[11] We can think of this as a kind of "warm-glow" utility that

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[9] Mascagni (2018) and Slemrod (2019) survey this literature. Key papers include Blumenthal et al. (2001); Fellner et al. (2013); Pomeranz (2015); Dwenger et al. (2016), and Hallsworth et al. (2017).

[10] Levi (1989) discusses tax payment as a form of "reciprocal altruism," a deep-seated trait thought to be present in humans due to group-level selection (Gintis et al., 2003).

[11] Dwenger et al. (2016) discuss a related type of intrinsic motivation concerning payment of church taxes where there is no enforcement.

citizens feel when they pay taxes.[12]

The experimental tax letter literature reaches more tepid conclusions about nonpecuniary motivations (Slemrod, 2019). Morale messages — emphasizing duty to pay taxes, fiscal exchange, or comparisons with compliant peers — on tax letters are either ineffective or less effective than deterrence messages at increasing tax compliance, though there are some exceptions.[13] Yet, the correct inference from such null results may simply be that, individuals' beliefs about the government and its ability to transform tax revenues into socially valued public goods and services are based on a lifetime of experience and thus inelastic to messages from tax authorities, especially in settings with low literacy rates.

Moreover, economic historians and political scientists have long argued that nonpecuniary motivations to pay taxes are first order, especially in low-capacity settings. If history is a guide, the largest increases in tax compliance typically occur when states play a role of urgent public importance, such as protecting citizens from outside invasion. During wars or other national emergencies, people view the state as acting in the common interest and are willing to supply taxes.[14] During wars, for instance, citizens have consented to paying more tax, paying new taxes — notably progressive income taxation (Scheve and Stasavage, 2016) — and to greater fiscal centralization (Cantoni et al., 2019). Increased wartime tax compliance could not plausibly reflect changes in perceived enforcement but rather limns the importance of reciprocity and intrinsic motivation. Changes in political power, or regime, provide further evidence. The mid-century collapse of democracy in Argentina was followed by plunging direct tax receipts (Mitchell, 2006, p. 148). In the United States, tax compliance in partisan counties waxes and wanes in step with changing ideological alignment with the

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[12]A third potential non-pecuniary motivation to pay taxes is social norms. For instance, citizens might aim to signal their type to peers by paying taxes, or they could simply try to avoid feeling shame when admitting to peers that they did not pay taxes (Besley et al., 2015). In this paper, we focus on the first two sources of tax morale, given that social norms are likely to play a smaller role in settings where the state has only recently begun to collect formal taxes on a large scale.

[13]Some of the studies with null results for tax morale include Blumenthal et al. (2001); Fellner et al. (2013); Pomeranz (2015); and Meiselman (2018). Positive treatment effects have been reported in Norway (Bott et al., 2019) and Rwanda (Mascagni et al., 2017).

[14]Key references in the large literature on exogenous emergencies and the evolution of tax capacity and compliance include Schumpeter (1918); Tilly (1985); Steinmo (1993); Brownlee (1996); Daunton (2007); and Besley and Persson (2011). Scholars have also noted that international capital markets attenuate the relationship between external war and tax capacity building (Centeno, 2002; Queralt, 2019).

president (Cullen et al., 2018). These examples suggest that citizens are "contingent consenters," who comply with taxation, and other laws, when they view the state as acting in the public interest and administering laws in a just manner (Levi, 1989, 1998; Tyler, 2006).

Although the large shifts in tax compliance in wartime and during political changes reveal the importance of quasi-voluntary motivation, such scholarship cannot easily differentiate between different forms of quasi-voluntary motivation because the large shocks analyzed — wars, regime change, adoption of new constitutions, etc — likely jointly impact the value of public spending, social norms, and perceived government performance.[15] Micro-level work faces the challenge of overcoming selection by the government, which usually targets potential taxpayers non-randomly. In Section 5.2, we try to make progress on these issues by examining a tax campaign that arrived exogenously, and by linking administrative data on compliance with pre-campaign household surveys measuring different motives to pay taxes.

2.2 Virtuous cycles and the low-capacity trap

Perceived enforcement and quasi-voluntary motives are not fixed over time, but can endogenously change as government policies cause citizens to update their beliefs. Throughout this section, we follow Levi (1989) in assuming governments' objectives are to maximize revenue.[16]

In a world of reciprocity-based compliance, imagine a citizen who did not pay taxes in the past (time $t - 1$) because he held insufficiently high views of the public goods return on tax payment, i.e. his priors fell below a threshold indifference point (cf. Section A1.3). Now imagine that, in time t, this citizen observes a salient public project — e.g., road or school construction — such that his beliefs cross the threshold. In $t + 1$, he pays the tax. On a larger scale, the pool of tax compliers expands as people update about the quality of the fiscal deal offered by the government. Figure 1 expresses visually the share of citizens who pay taxes as a function of their tax morale at time t and $t + 1$. If the government then uses new tax revenues to provide even more public goods, then in $t + 2$, there may be still more tax compliers whose beliefs have crossed the threshold, further expanding revenue. This dynamic process

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[15]In some cases, perceived enforcement risk may be affected, too.

[16]This assumption can of course be questioned, especially with regard to whether elites have incentives to block tax reforms that could increase tax revenue. We discuss this possibility further in Section 2.3 drawing on Fairfield (2013) and Jibao and Prichard (2015).

constitutes a hypothetical virtuous cycle based on reciprocity. Analogous virtuous cycles could similarly be possible if citizens observe enforcement activities and update about the probability of sanctions — or, in the principal case we explore below, if citizens observe regularized tax collection and update about government performance.

**Figure 1:** Share of taxpayers as a function of tax morale
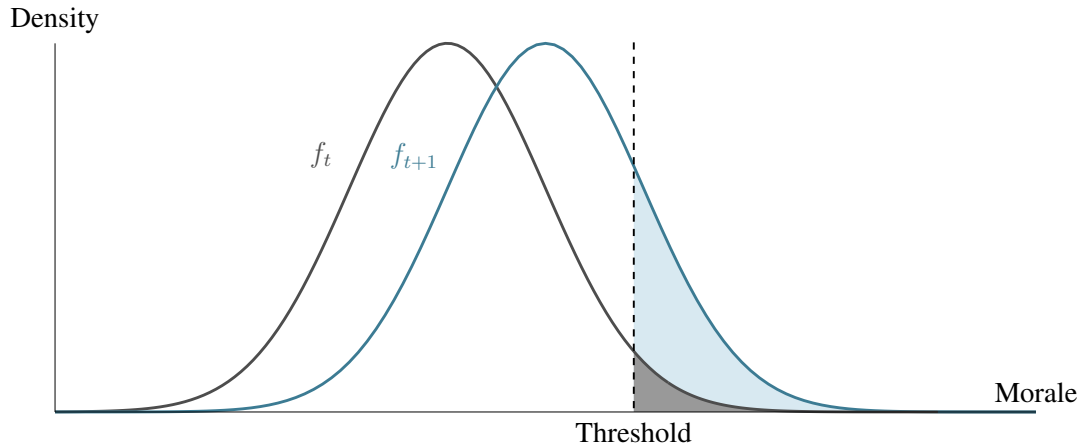
Notes: Curves f_t and f_{t+1} are hypothetical densities of tax morale across all citizens, at times t and $t+1$. The dotted line indicates the threshold level of tax morale (holding constant enforcement beliefs) for households to pay the tax. The shaded areas indicate the share of payers at time t and, after an average positive shock to tax morale, at $t+1$. Tax morale is meant generally and could encompass fiscal reciprocity or intrinsic motivation to pay.

However, the problem with virtuous cycles based on enforcement- and reciprocity-based tax compliance is that some governments may have too little capacity to initiate them in the first place. In particular, in the presence of fixed costs associated with enforcement interventions and large-scale public goods provision capable of raising citizens' beliefs past the threshold level and ushering in tax compliance, governments in low-capacity settings may be unable to kickstart such virtuous cycles. Governments in such settings may be caught in a *low-capacity trap.*

Concerning enforcement interventions, tax audits and threats to sanction non-compliant property owners must be both visible and credible to potential taxpayers. If auditors are exposed as unprofessional and easy to bribe or deceive, then public audits could backfire and cause citizens to view enforcement as less likely. Similarly, if pledges to pursue fines against the non-compliant are exposed as empty threats, such interventions could backfire as citizens update negatively, not positively, about

enforcement risk.[17] These examples highlight that to expand tax compliance through enforcement, the tax authority must exceed a certain level of resources, human capital, and bureaucratic competence.[18] In other words, unless a government can pay the fixed costs of training and staffing a professional tax auditor office as well as other legal machinery necessary to pursue and sanction the non-compliant, it is unlikely that marginal investments in enforcement will generate increases in citizen tax compliance.
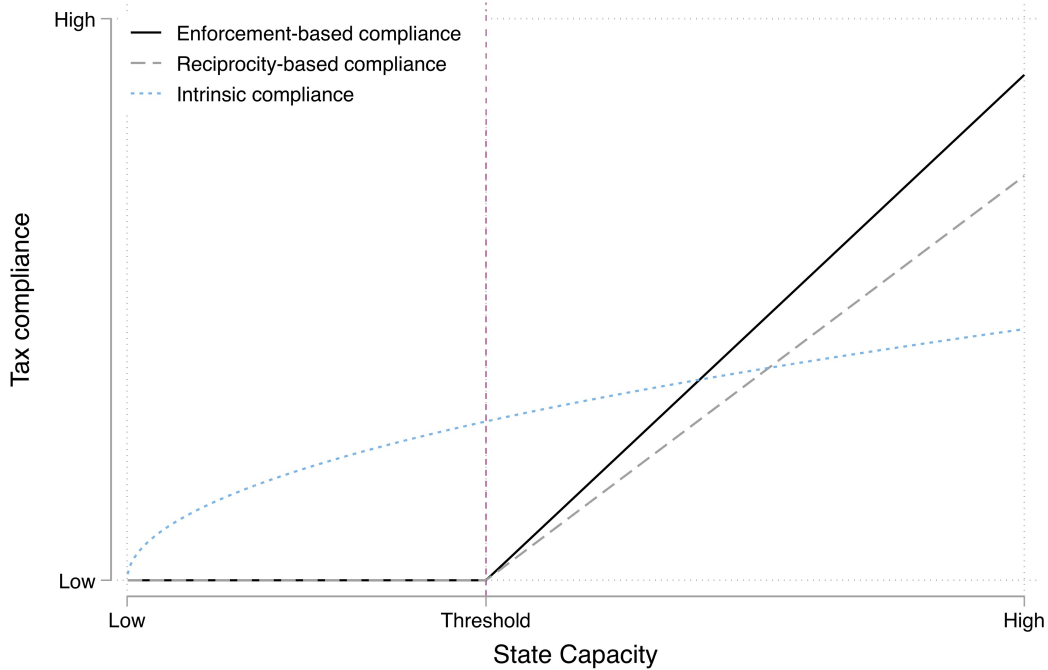
Figure 2: *Theorized relationship between state capacity and tax compliance.*

Large-scale public goods provision capable of increasing citizens' beliefs about the effective fiscal deal is also likely to require initial investments that may be out of reach for low-capacity governments. To build sealed roads, for instance, the government needs to make bulky purchases of machinery and to accumulate sufficient engineering know-how to implement construction projects. Such initial fixed costs imply that it may be difficult for a well-meaning but low-capacity government to transform marginal increases in tax revenue into new public infrastructure capable of progres-

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[17]Luttmer and Singhal (2014) discusses this theoretical possibility, and Krause (2020) provides some evidence that such backfiring may have occurred following an enforcement intervention in Haiti.

[18]Brewer (1990) underscores the high degree of human capital and the efficient bureaucratic structures required to enforce excise taxes, not to mention more complex tax instruments such as property or income taxes.

sively raising beliefs about the public goods return on tax payments. The inability of some governments to access virtuous cycles based on reciprocity (or enforcement) constitutes a low-capacity trap, as depicted visually by the black solid and grey dotted lines in Figure 2.

2.3   Increasing intrinsic motivation by regularizing tax collection

We argue that governments may be able to escape a low-capacity trap by reforming tax collection in ways that increase perceived government performance and give citizens greater intrinsic motivation to pay. Specifically, while taxation in low-capacity settings is often arbitrary, governments can regularize tax collection at low cost. If citizens observe state agents raising revenue systematically — from a broad, if not universal, base in society — they are more likely to view the government as implementing laws in a just manner and acting in the common interest. Citizens may then be more intrinsically motivated to help fund the government. Importantly, cultivating the intrinsic motivation of citizens is less susceptible to low-capacity constraints. While states will need also to activate enforcement- and reciprocity-based compliance to achieve high levels of revenue, cultivating intrinsic motivation by making tax collection less coercive and less arbitrary may offer a path out of the low-capacity trap.

The novelty of our argument is that rather than needing to implement publicly salient policies to promote enforcement-based tax compliance (e.g., audits) or reciprocity-based compliance (e.g., road building) — both of which likely require a state with a threshold level of capacity and revenue — we suggest that low-capacity governments can promote intrinsic motivation through low-cost reforms to regularize the collection of taxes. Crucial to this argument is that tax collection itself may have both direct and indirect effects on government revenues. The direct effect is the collection of revenues among citizens whose beliefs already exceed the threshold level and thus pay when a collector arrives at their doorstep. The indirect effect is how the method of collection impacts citizens' beliefs and thus the pool of potential future tax compliers.

Citizens' interactions with tax authorities could indirectly shape their compliance by changing their beliefs about enforcement, fiscal reciprocity, and government performance. In particular, citizen beliefs may be shaped by the degree of coercion involved in collection (Moore, 2008) and the perceived procedural fairness of collection (Levi, 1998; Tyler, 2006). Here we hold constant the degree of coercion/enforcement and fo-

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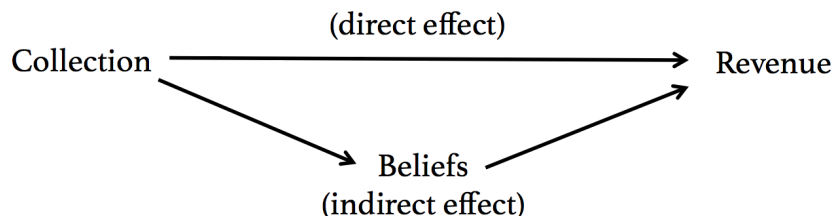
Figure 3: *Theorized direct and indirect effects of tax collection on tax compliance. The direct effect of tax collection reflects citizens who already hold sufficiently high beliefs to pay the tax. The indirect effect reflects how tax collection itself shapes citizens' beliefs about enforcement, fiscal reciprocity, and government performance, which in turn determine the pool of potential future tax compliers.*

cus on the second factor in the form of an inexpensive reform available to low-capacity governments: the *regularization of tax collection*. By this, we mean efforts to make tax collection more systematic and universal, in line with the tax code, rather than arbitrary, idiosyncratic, and with much is left to the discretion of individual tax collectors (as is the case in many low-capacity states (Young and Turner, 2013; Sanchez de la Sierra and Titeca, 2019)). Unlike enforcement or public goods capacity, regularization of tax collection does not require high levels of human capital or bulky investments ex ante. There are a range of marginal reforms available to tax authorities, such as requiring collectors to visit equally all legally liable taxpayers (as in a door-to-door campaign), providing clear information about tax liabilities to citizens, and simplifying tax instruments to reduce tax collector discretion. These and other administrative reforms to reduce the arbitrariness of collection and the discretion of collectors all constitute types of regularization.

Crucially, whether taxes are perceived to be levied systematically or arbitrarily is likely to affect the perceived performance of the government and thus the intrinsic motivation of the average taxpayer.[19] Scholars have emphasized the importance of government rules and procedures being transparent and applying equally to all persons as a first-order determinant in whether citizens comply with all types of law (Tyler, 2006). Levi (1998) similarly notes that taxpayers will only engage in quasi-voluntary tax compliance if they believe the government's tax rules and procedures are fair and reasonable. In particular, horizontal inequities in tax rates or enforcement across tax-

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[19]More generally, Scheve and Stasavage (2016) argue that fairness considerations are first-order factors in the evolution of the modern tax system.

payers are widely perceived as arbitrary and unfair, and are thus thought to discourage tax compliance (Smith, 1992; Auerbach and Hassett, 1999; Scheve and Stasavage, 2016; Best et al., 2020). For instance, the perceived arbitrariness of poll taxes in Tanzania is thought to explain low compliance and tax revolts (Kelsall, 2000; Fjeldstad and Therkildsen, 2008). Similarly, the arbitrary nature of local land taxes in China has been linked to the widespread resistance of such taxes (Bernstein and Lu, 2008).

In addition to its likely positive impact on intrinsic motivation, regularizing tax collection could also cause citizens to update about enforcement risk and the fiscal return to compliance (reciprocity). More systematic procedures and encounters with tax authorities would likely increase perceived enforcement risk for the average citizen — even if in fact audit probabilities and fine collection are held constant. Similarly, citizens might update that the state has more revenue thanks to more regularized collection and thus could be more capable of spending on public goods.

Importantly, regularizing tax collection could offer a way out of the low-capacity trap if governments reinvest new revenues in further efforts to boost intrinsic motivation. The government could use new tax revenues to further regularize collection by hiring more professional tax collectors, hiring managers, or investing in technologies that will limit collector discretion and ensure consistent application of the tax code. There will surely be an upper bound on how much revenue governments can raise by appealing only to intrinsic compliance (as indicated by the flattening of the intrinsic compliance curve in Figure 2). Once governments have sufficient state capacity, they will be better off investing in enforcement capacity and public goods project to help fuel pecuniary and reciprocity-based motivations to pay taxes. But until they reach that point, regularization of tax collection to increase intrinsic motivation to pay offers a potential path out of a low-capacity trap.

If regularization can increase revenue, why don't low-capacity states already do it? A likely answer is that elites have incentives to block such reform because they in fact face a lower effective tax burden in a non-regularized system that bends to the rich and powerful and because they have little need for the local services that property taxes and other local taxes fund (e.g., they have their own generators and 4x4 vehicles) (Fairfield, 2013; Jibao and Prichard, 2015). As with many reforms, the impetus for regularization may therefore be more likely to come during fiscal crises, when demand for tax revenue is particularly high, or following shifts in political power (Acemoglu and Robinson, 2019).

2.4 Hypotheses

Putting together the three steps in this argument — the three possible motivations for tax compliance, the existence of low-capacity traps in the evolution of enforcement- and reciprocity-based compliance, and the idea that regularization of tax collection could shape intrinsic motivation — leads to the following testable hypothesis.

H1: **Virtuous cycle of intrinsic motivation and fiscal capacity.**

1. *Households with stronger priors about the performance of the government will be more likely to pay taxes.*
2. *Regularization of collection will cause citizens to update positively about the performance of the government.*

For completeness, we also examine the following foil hypotheses regarding enforcement- and reciprocity-based compliance, respectively.

H2: **Virtuous cycle of enforcement-based compliance and fiscal capacity.**

1. *Households with stronger priors about the probability of enforcement will be more likely to pay taxes.*
2. *Regularization of collection will cause citizens to update positively about the probability of enforcement.*

H3: **Virtuous cycle of reciprocity-based compliance and fiscal capacity.**

1. *Households with stronger priors about the public service return on tax payments will be more likely to pay taxes.*
2. *Regularization of collection will cause citizens to update positively about the public service return on tax payments.*

Ultimately, these hypotheses concern the first step of a potential virtuous cycle: whether indirect effects of tax collection on beliefs could offer an initial path out of a low-capacity trap. Although we have discussed how governments could sustain virtuous cycles over time — by reinvesting new tax revenues in ways to raise citizens' beliefs and compliance further — testing these longer-run dynamics are beyond the scope of the empirical section of this paper.

3 Property tax collection in Kananga

This paper examines tax compliance in the first citizen property tax collection campaign in the city of Kananga (population 1 million), the provincial capital of Kasaï Central in the Democratic Republic of Congo.

Although before independence the Belgians planned to turn Kananga (then Lulu-abourg) into the colonial capital, the province was deliberately isolated under the rule of Mobutu Sese Seko, Laurent-Désiré Kabila, and Joseph Kabila because it had long been home to the opposition.[20] Additionally, 73% of Kananga's inhabitants are ethnically Luluwa, and there has never been a Luluwa president or prime minister in the DRC. Unlike other Kasaïen cities, such as Mbuji Mayi and Tshikapa, Kananga has not emerged as a center for the diamond trade, nor does it host other large productive enterprises. The city was founded as, and remains, *une ville administrative*, in which the provincial government is the largest employer. Known as the 'oasis of peace,' Kananga largely escaped the violence that seized the country during the First and Second Congo Wars.[21] Although the state has very low capacity in Kasai, this is not a setting in which large tracts of territory are under the de facto control of armed groups, like much of Eastern Congo. Kananga is more stable equilibrium. Nonetheless, a history of kleptocratic rulers has entrenched corruption and patron-client relations at the heart of the state and citizens' interactions with it (Young and Turner, 2013; Bratton and Van de Walle, 1994).

Perhaps not surprisingly, then, the formal tax capacity of the state is extremely low. For instance, the Provincial Government of Kasaï Central's annual tax receipts from 2010-2015 averaged $2 million per year, relative to the 6 million people in the province. Most of these receipts came from 'gatekeeper'-style taxes on trade and transport as well as various authorizations and fees paid by a small set of firms in the city center. Indeed, before the campaign we study, despite the universal legal obligation to pay taxes, tax collection was idiosyncratic, and the authorities targeted their efforts on certain subgroups, such as shopkeepers, market vendors, drivers, and merchants trying to move goods across borders. Tax liabilities often depended on 'arrangements' and connections; the rich and powerful were often fully exempt. When a shopkeeper paid the 'transport' of the tax collector, or a motorbike driver paid off a policeman, they were under no delusion that money would end up in the state coffers. Without these

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[20]Long-time opposition leader Etienne Tshisekedi hailed from Kasaï, along with many key players in the Union for Democracy and Social Progress (UDPS), the most prominent opposition party to Kabila's People's Party for Reconstruction and Democracy (PPRD). Tshisekedi's son became became president in January 2019.

[21]The exception was the Kamuina Nsapu insurgency, in 2017, when a dispute between the police and a customary authority in Kasai sparked an anti-Kabila movement with frequent fighting between the army and local militias. Most of the fighting ceased by May 2017, and the militia lay down their arms when Kabila stepped down from the presidency.

informal payments many state agents would lack money to live on, given the state's paltry formal revenue.[22]

This idiosyncratic and largely informal mode of financing the state forms the backdrop against which property tax collection was regularized in the 2016 campaign. The provincial government launched the campaign, the first citywide door-to-door collection effort in Kananga, to try to extend the tax net and raise revenue after a 40% decline in provincial revenues caused by a national decentralization policy.[23] Perhaps similar to the threat of war creating incentives for rulers to bureaucratize revenue extraction (Tilly, 1985), this exogenous fiscal shock appears to have provided the political will to try to reform and regularize the property tax collection apparatus, rather than continuing to rely on the informal and low-revenue status quo.

The property tax is a fixed fee of 2,000 Congolese Francs (CF), about $2 in 2016 exchange rates, for 90% of properties, and 6,600 CF for the remaining 10% of properties.[24] Although these amounts may seem small, 2,000 CF approximates the median household's daily income and represents roughly 0.32% of average house value in Kananga, which is not far from the rate in certain U.S. states. Every property owner in Kananga is by law supposed to pay the tax annually at the provincial tax ministry. Delinquent payers are legally subject to additional fines of 1.5 times the liability as well as the threat of further legal action. In practice, such sanctions are seldom enforced among the residential properties we study, though beliefs about the probability of enforcement varies considerably among average taxpayers, as we examine below.

3.1 Experimental design

The treatment is the door-to-door property tax collection campaign, randomized at the neighborhood level, in the city of Kananga. Control neighborhoods kept the status-quo

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[22]When the treasury ran out and he couldn't pay the vast Zairean civil service, former President Mobutu Sese Seko famously instructed the police and army "dèbrouillez-vous" ('live off the land'), tacitly condoning bribe taking as a substitute for the tardy payment of public-sector salaries. The official badge as a license to bribe remains ingrained in the norms of the civil service and citizens' expectations (Stearns, 2012).

[23]In 2015, the *découpage*, or administrative splitting, of Kasaï Occidental into two provinces meant that the provincial government in Kananga lost the diamond-rich area around Tshikapa, a major source of revenue. This *découpage* is widely viewed as part of President Joseph Kabila's strategy to create administrative holdups and postpone presidential elections, which he did for two years in a row (Englebert et al., 2018).

[24]Maintaining property valuation rolls requires a certain level of state capacity. Thus many developing country governments, especially at a local level, use similarly simplified property tax instruments (Franzsen and McCluskey, 2017).

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declarative system in which citizens were supposed to pay at the tax ministry, and only some small fraction of the delinquent received enforcement visits from tax authorities.[25] The randomization was stratified on blocks made of geographic units roughly coterminous with Kananga's quartiers combined with neighborhood-level population estimates.

Before the tax campaign, every fifth compound (in all neighborhoods of Kananga) received informational fliers. These fliers informed citizens about the property tax, how they should pay it, and that revenues from the tax would go toward promoting "the economic development of the province." The distribution of these tax fliers means that citizens were similarly informed about their legal responsibility to pay the property tax in treatment and control.

The 44 tax collectors working on the campaign were agents of the provincial tax ministry. In line with standard policy at the tax ministry, collectors received small performance-based compensation for their work on the campaign (18% of total tax deposits). Tax collectors were individually randomly assigned to neighborhoods in shifting groups of three. The timing of collectors' neighborhood assignments was also random.

Importantly, the campaign has strict procedures that amounted to a considerable regularization of what had previously been an ad hoc system of tax collection. In each neighborhood, collectors performed the following steps.

1. *Property registration.* Collectors first registered all property owners in the neighborhood. Because the government lacked a property valuation roll, the collectors essentially constructed one from scratch. During this first registration visit, collectors assigned a unique taxpayer ID to each compound, written on the house. They also reminded households about the tax rate and their responsibility to pay, making appointments with households for follow-up tax visits.

2. *Tax collection.* Then, collectors returned to households to solicit payment in-person and to collect the tax on the spot, issuing printed receipts using handheld tablets and receipt printers. Collectors left the receipt with the taxpayer, with a copy saved in the tablet's memory. When they returned to the tax ministry to deposit the money, their tablet data were downloaded to the tax database.

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[25]Control neighborhoods were slated to receive the campaign in 2017 — a phased rollout design — however, due to a violent insurgency in the province, the provincial government cancelled all property tax collection in 2017. The government resumed property tax collection in all neighborhoods in 2018.

The tax campaign thus represents a substantial regularization of property tax collection. Independent enumerators using GPS devices verified the property register, which achieved near total coverage in assigned neighborhoods — a testament to the systematic nature of assessment in this campaign.

4 Data, balance, and measurement

The analysis uses data from the following sources.

1. **Administrative tax data**. We have the universe of property tax payments in the government's property tax database, which we use to measure compliance.

2. **Baseline survey**. A team of independent enumerators administered a baseline survey to 2,384 randomly sampled households, including 1,238 property owners, before the launch of the tax campaign.[26] Enumerators randomly sampled houses by following a skip pattern while walking the streets in a neighborhood.

3. **Midline survey**. Enumerators administered a short midline survey throughout Kananga (N=32,866) to ask details about collectors' visits and tax payment.

4. **Endline survey**. Enumerators administered an endline survey after the tax campaign to two distinct samples.

    (a) *New random sample.* This is a random sample of 2,913 property owners, randomly sampled following the same procedure described above for the baseline survey. We use this survey to measure perceptions of enforcement and government performance after the tax campaign.

    (b) *Repeat baseline sample.* The enumerators also successfully tracked 642 baseline participants at endline. This is the sample in which we examine the determinants of compliance because we can observe tax payments in the administrative data and examine heterogeneity by baseline beliefs.

Attrition from baseline in the repeat baseline sample was high due to a conflict that occurred in Kananga in early 2017 during the administration of the endline survey, triggering considerable migration and population displacement. Kamuina Nsapu insurgents and the army engaged in a cycle of tit-for-tat violence in rural areas as well as the urban commune of Nganza. All neighborhoods (treatment and control) in Nganza were thus dropped before endline participants could be sampled.

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[26]The baseline sample was roughly half renters because initially the government had planned to include the rental tax as well as the property tax in the campaign. However, the rental tax was subsequently dropped from the campaign protocol, rendering those baseline surveys less relevant.

Table 1: Components of the 2016 property tax campaign and its evaluation

Activity	T	C	Actor	Timing	N	J
Tax campaign						
Property register	Yes	No	Collectors	Apr-Dec 2016	20,902	253
Tax solicitation	Yes	No	Collectors	Apr-Dec 2016	20,902	253
Evaluation						
Baseline survey	Yes	Yes	Enumerators	Mar-Apr 2016	2,363	427
Midline survey	Yes	Yes	Enumerators	Apr-Dec 2016	32,866	427
Endline survey	Yes	Yes	Enumerators	Jan-May 2017	2,913	356

Notes: T = treatment, C = control. N = number of observations, J = number of clusters (neighborhoods). The endline was only administered in 356 neighborhoods due to insecurity in the commune of Nganza, discussed in Section 4. All 71 neighborhoods from this commune (balanced across treatment and control) were dropped before respondents could be sampled and invited to participate

In the rest of the city, enumerators were able to survey households, but attrition was still 38%, as many people left the city or stayed with relatives in other neighborhoods. Although it is unlikely that conflict-induced attrition would be correlated with assignment to treatment in the tax campaign, Panel I of Table 2 examines the correlates of attrition formally. In addition no differential attrition in treatment, the table also shows that most individual-level variables do not correlate with attrition, even when interacted with treatment.[27] The key exception is age: younger respondents were considerably more likely to attrit. Although it is not obvious how age would introduce bias in the subsequent estimations, we control for age and age squared to be conservative.

Panel II of Table 2 then examines balance across the treatment and control group of these characteristics in the remaining, non-attriting sample in which our analysis is conducted. Unless the initial randomization were unlucky, then given the lack of endogenous attrition noted in Panel I, we expect to be balanced in the remaining sample. For completeness we confirm that, except for age, other key individual-level variables appear balanced across treatment and control.

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[27]Including these interactions is important given the heterogeneity analysis we conduct in the next sections.

Table 2: Attrition and balance

Variable	β_1	SE	β_2	SE	N	p
Panel I: Correlations with attrition						
Campaign	-0.023	0.031			1009	0.451
Female	0.001	0.034			1009	0.976
+ Treatment interaction	-0.016	0.048	0.026	0.056	1009	0.898
Age (high)	-0.145	0.034			1009	0.000
+ Treatment interaction	-0.096	0.044	-0.076	0.039	1009	0.000
Wealth (high)	0.010	0.030			1009	0.754
+ Treatment interaction	0.024	0.040	-0.023	0.043	1009	0.813
Income (high)	-0.042	0.031			1009	0.177
+ Treatment interaction	-0.027	0.039	-0.023	0.040	1009	0.355
Majority ethnic	0.009	0.036			1009	0.796
+ Treatment interaction	0.019	0.041	-0.016	0.034	1009	0.862
Unemployed	0.018	0.032			1009	0.570
+ Treatment interaction	0.041	0.050	-0.035	0.055	1009	0.707
Education (high)	-0.032	0.032			1009	0.310
+ Treatment interaction	-0.035	0.042	0.005	0.044	1009	0.595
Knows property tax	-0.031	0.067			1009	0.641
+ Treatment interaction	-0.029	0.107	-0.003	0.132	1009	0.895
Knows tax ministry	-0.014	0.029			1009	0.625
+ Treatment interaction	0.007	0.042	-0.034	0.047	1009	0.666
Enforcement risk (high)	-0.018	0.034			1009	0.596
+ Treatment interaction	0.029	0.043	-0.076	0.044	1009	0.202
Government legitimacy (high)	0.048	0.030			1009	0.109
+ Treatment interaction	0.068	0.040	-0.032	0.042	1009	0.201
Spending expectations (high)	0.039	0.029			1009	0.179
+ Treatment interaction	0.050	0.040	-0.018	0.049	1009	0.360
Panel II: Balance checks in non-attriting sample						
Female	0.027	0.043			629	0.524
Age (high)	0.167	0.040			629	0.000
Wealth (high)	0.007	0.045			629	0.880
Income (high)	0.032	0.042			629	0.455
Majority ethnic	-0.056	0.047			629	0.238
Unemployed	0.064	0.040			629	0.108
Education (high)	-0.031	0.040			629	0.430
Knows property tax	-0.050	0.076			629	0.508
Knows tax ministry	-0.015	0.038			629	0.699
Enforcement risk (high)	0.034	0.043			629	0.429
Government legitimacy (high)	0.024	0.041			629	0.564
Spending expectations (high)	-0.032	0.041			629	0.434

Notes: Panel I examines the correlations between the indicated variables and attrition from baseline to endline, conditional on stratum fixed effects. Panel I reports for each variable (*i*) results from a regression of an attrition indicator on the variable, then (*ii*) results from a regression that also includes the variable interacted with treatment and the treatment indicator. β_1 is always the coefficient on the variable indicator, and β_2, when relevant, is the coefficient on the interaction term. The p-value is that for β_1 in (*i*) and the result of an F-test testing both coefficients in (*ii*). Panel II then examines balance in the non-attriting sample used in the individual-level analysis by regressing a treatment indicator on each characteristic, conditional on stratum fixed effects. All variables are 1-0, either indicating a specific characteristic (e.g., "Female") or indicating the respondent is above the median value for the characteristic (e.g., "Age (high)").

4.1 Measurement of key variables

This section summarizes the primary dependent and independent variables examined in the subsequent analysis.

- *Paid property tax*: an indicator for households who paid the property tax in 2016. This variable equals 1 if (*i*) there is a match on tax ID number between household surveys and administrative data; (*ii*) there is a match on name *within neighborhood* between surveys and administrative data; or (*iii*) the household presents a valid printed receipt containing the name of the property owner. The latter two conditions help to measure tax compliance accurately — some tax IDs were erased in the rain, others were incorrectly entered by collectors — and to ensure symmetric measurement of outcomes across treatment groups.[28]

- *Enforcement risk*: a continuous variable increasing in the perceived probability of sanctions for households that did not comply with the property tax in 2016. Respondents reported whether they thought government sanctions would be 'very likely', 'likely', 'unlikely', or 'very unlikely' if a neighbor refuses to pay a property tax collector who comes to their house.[29] The exact same question was asked in the baseline and endline surveys. *Enforcement risk* is a standardized version of this variable, and *Enforcement risk (high)* is an indicator for individuals with above-median beliefs. Figure A3 shows the baseline distribution.

- *Government performance*: a continuous variable increasing in the perceived performance of the provincial government. The variable is constructed from respondents' responses to the survey question: "How would you evaluate the performance of the [provincial government / tax ministry] in Kananga?"[30] The question was posed separately for each institution, and responses were coded on a seven-point scale from 'excellent' to 'terrible.' The variable, *Government*

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[28]Because collectors assigned tax IDs in treatment only, condition (*i*) is never met in control. Fortunately, name-matching in control is simplified by the fact that there are only 214 records of non-campaign property-tax payments in 2016, most of which occurred before the campaign launch.

[29]The exact question text is: "Now, imagine that next week a tax collector comes and visits your neighbor, but he refuses to pay. In your opinion, what is the probability that the government will pursue and enforce the sanctions?"

[30]Measuring government performance is a challenge, and this question is by no means perfect. Based on focus group discussions about the word *nkuatshilu* (the exact translation of "performance" in Tshiluba), our sense is this question captures the conception of procedural performance — the administration of laws in a just manner — discussed in Levi (1998) and Tyler (2006).

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performance, is a standardized index of respondents' answers.[31] *Government performance (high)* indicates above-median values for this variable. Figure A2 shows the baseline distributions.

- *Spending expectations*: a continuous variable increasing in the perceived share of taxpayer money that will go to public services or other "good uses." We use this variable to measure the perceived fiscal exchange between taxes and public goods — the key belief sustaining reciprocity-based compliance. The survey question, in the baseline and endline surveys, asked respondents how much of $1,000 in tax revenue they thought would be spent well.[32] Participants responded with a dollar amount. *Spending expectations* is a standardized version of their response, and *Spending expectations (high)* is an indicator for above-median responses. Figure A4 shows the distribution of the baseline variable.

5 Results

We first examine the effect of the randomly assigned tax campaign on property tax compliance by estimating the following equation with OLS:

$$y_{ijk} = \beta_1 I_{ijk}^{Campaign} + \alpha_k + \mathbf{X}_{ijk}\mathbf{\Gamma} + \varepsilon_{ijk} \tag{1}$$

where i indexes individuals, j neighborhoods, and k the 33 strata used during randomization. All regressions include stratum fixed effects, α_k, and at times we show robustness by adding 'basic covariates' (age, age squared, gender) or 'socioeconomic covariates' (income, wealth, education) in $\mathbf{X}_{ijk}$. Standard errors are clustered at the neighborhood level (the level of random assignment).

Table 4 summarizes estimations of this equation to study the impact of the campaign on tax payment in the full midline survey dataset, while Table 5 examines the sample of baseline respondents tracked at endline. The campaign increases tax compliance from 0.1% in control neighborhoods to 10.3% across the universe of property owners (Table 4, Column 1) and by a similar amount in the baseline sample (Table 5, Column 1). This average increase in compliance masks considerable variation within and across

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[31]To construct this and all standardized indices in this paper, we standardize each component variable, sum over each component, and then standardize the resulting synthetic variable.

[32]The exact question text is: "Now I would like to ask you what you think the provincial government will do with the money it receives from this 2016 property tax campaign. Imagine that the provincial government of Kasaï Central receives $1,000 thanks to this campaign. How much of this money will be put to good use, for example providing public goods?"

neighborhoods, which we explore below.[33]

One might wonder how much of the treatment effect reflects the reduction in the transaction costs of compliance — i.e., the cost of going to the tax ministry — afforded by the campaign. If this were entirely a transaction cost story, compliance would have been considerably higher in control neighborhoods located close to the tax ministry, whereas it was near-zero everywhere (Table A5, Columns 1–2). Moreover, a transaction cost interpretation of the treatment effects would in fact predict *smaller* treatment effects closer to the tax ministry, where the reduction in transaction costs would have been smallest. But we observe the opposite, even when controlling for geographic stratum fixed effects: households that were closer, not farther, from the tax ministry were most likely to respond to treatment (Table A5, Columns 3–4).[34] Thus, although an important component of the campaign, the reduction in transaction costs alone cannot explain the variation in tax compliance observed during the campaign.

What then led the 10% of compliers to pay taxes when collectors arrived at their doorstep? We shed light on the determinants of compliance by (1) examining complier characteristics, (2) estimating heterogeneous treatment effects by neighborhood-level characteristics using the universe of taxpayers, and (3) estimating heterogeneous treatment effects by individual-level characteristics in the baseline survey sample.

5.1 Complier characteristics

Typically, it is difficult to characterize the population that complied with treatment — in our case, individuals who paid the tax because of the program but would not have paid absent the program — because the treated sample is a mix of compliers and always-takers whose type is unobserved. In this case, however, it is not unreasonable to assume away the existence of always-takers because the rate of tax compliance in control polygons is near zero.

Table 3 thus compares payers and non-payers across a range of socioeconomic characteristics as well as pre-treatment beliefs about the government. Columns 1-2 provide the mean of each characteristic for payers and non-payers in the treatment group, respectively. Columns 3-4 then provide the difference between payers and non-payers

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[33]Neighborhood-level variation is depicted in Figures A5 and A6. The intraclass correlation (ICC) for tax payment within treated neighborhoods is 0.077, compared to the ICC for household wealth (0.34), for example.

[34]This likely reflects the fact that the tax ministry is located in the city center, where the cost of living is higher and public infrastructure is better.

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in the treatment group and the standard error. Finally, to be conservative and to relax the assumption that there are no always-takers, Column 5 reports complier characteristic ratios (CCRs) in the spirit of Abadie's (2003) κ-weighting method (Abadie, 2003). Specifically, these are the ratio of the treatment effect on tax compliance for individuals of the characteristic to the overall treatment effect:

$$CCR = \frac{E(Y|T=1, X=x) - E(Y|T=0, X=x)}{E(Y|T=1) - E(Y|T=0)} \tag{2}$$

where Y is tax compliance, T indicates treatment status, and X is the characteristic of interest. In essence, these ratios tell us if tax compliers are more likely to have electricity, for example, than are average individuals in the sample.

Table 3: Complier characteristics

Characteristic	μ^{Payers}	$\mu^{Nonpayers}$	Difference	SE	CCR
	(1)	(2)	(3)	(4)	(5)
Female household head	0.111	0.333	-0.222***	0.072	0.359
Age (high)	0.578	0.526	0.052	0.079	1.087
Majority ethnicity	0.733	0.767	-0.034	0.067	0.961
Education (high)	0.578	0.366	0.212***	0.076	1.486
Income (high)	0.682	0.488	0.194**	0.079	1.314
Wealth (high)	0.600	0.493	0.107	0.079	1.189
Unemployed	0.289	0.355	-0.066	0.075	0.831
Enforcement risk (high)	0.556	0.420	0.136*	0.078	1.278
Government performance (high)	0.556	0.322	0.233***	0.075	1.597
Spending expectations (high)	0.400	0.331	0.069	0.075	1.183

Notes: This table reports characteristics of tax compliers. The first four columns examine only treatment neighborhoods. Columns 1-2 provide the mean of each characteristic for payers and non-payers, respectively. Columns 3-4 then provide the difference between payers and non-payers and the standard error. The fifth column provides the Complier Characteristic Ratio (CCR) in the spirit of Abadie (2003), i.e. the ratio of the treatment effect on tax compliance for individuals of each characteristic divided by the overall treatment effect. See p. 24 for further details about these ratios. All the characteristics are transformed into binary variables for this table. If a characteristic name has "high" in parentheses, this means that the variable indicates individuals above the median value for that characteristic. Details about the construction of the last three characteristics can be found on p. 21. Data: baseline survey sample matched with administrative data on tax compliance.

Table 3 reveals that households paying the property tax are more likely to have male household heads, more education, and more income. By contrast, tax compliers do not have higher wealth, as measured by characteristics of the property owner's house. They are also more likely to have held above-median baseline beliefs about the risk

of enforcement for non-compliance (significant at 10%) and about the performance of the government (significant at 1%). These initial comparisons motivate a deeper investigation into the pecuniary and non-pecuniary motivations behind tax payment.

5.2 Heterogeneous effects by baseline beliefs

To shed further light on why people chose to pay or evade, we examine heterogeneous responsiveness to treatment by individual characteristics collected in the baseline survey with the following equation:

$$y_{ijk} = \beta_1 I_{jk}^{Campaign} + \beta_2 I_{jk}^{Campaign} * Z_{ijk} + \beta_3 Z_{ijk} + \alpha_k + \mathbf{X}_{ijk}\mathbf{\Gamma} + \varepsilon_{ijk} \qquad (3)$$

where most notation is analogous to Equation 1, and Z_{ijk} is the baseline characteristic of interest, such as enforcement perceptions. Table 4 examines heterogeneity by characteristics at the neighborhood level (Z_{jk}), while Table 5 examines heterogeneity by characteristics at the individual level (Z_{ijk}). Here, β_2 is the coefficient of interest in examining how baseline characteristics affect responsiveness to treatment.

We examine different neighborhood- and individual-level moderators to test the role of pecuniary and nonpecuniary factors shaping compliance decisions. In Table 4, Columns 2-5 explore neighborhood characteristics calculated using data from the baseline survey. Table 5 then estimates heterogeneous treatment effects by household-level characteristics in the sample for which this is possible. To increase power, we examine binary moderators that indicate an observation is above the median value. The coefficient on the interaction term, then, estimates the additional impact of the tax campaign in neighborhoods (or households) above the median in the relevant characteristic.

These characteristics used as moderators are of course not random. That said, estimating heterogeneous effects of a randomly assigned tax campaign mitigates many endogeneity concerns because it nets out correlation between the characteristic and tax payment in control and thus picks up the differential responsiveness to treatment among households of a certain characteristic.

Enforcement risk

We begin with perceptions of the probability of enforcement given the prominent role of pecuniary motivations in the literature on tax compliance. The tables provide suggestive evidence that enforcement perceptions play a role in citizens' compliance decisions (H2), though the association is weaker than canonical models imply (Allingham

and Sandmo, 1972). When examining heterogeneity by neighborhood-level averages in baseline beliefs (Table 4, Column 2), the coefficient on the interaction term is a precise zero. Individual-level heterogeneity analysis (Table 5, Columns 3–4) return a positive coefficient, though not one that is statistically significant at conventional levels ($p = 0.126$). The magnitude of this coefficient is fairly stable in a horserace regression including all characteristics.

It is perhaps unsurprising that enforcement risk is not as strongly predictive of tax compliance as canonical models imply given that this was the first citizen tax campaign in setting of low state capacity. Although sanctions were rare in practice, 62% of endline respondents estimated that it was 'likely' or 'very likely' that those who refused paying the property tax would be punished (Figure A3). These results point to the fact that the threat of enforcement may be a necessary but not a sufficient condition for compliance — a point emphasized by Levi (1989) and the reason for the 'quasi' in quasi-voluntary compliance.

Government performance

We next examine intrinsic motivation tied to citizens' perceived performance of the government (H1). Examining heterogeneity in payment in the universe of property owners, we observe 2.9 percentage points higher compliance in neighborhoods with above-median average baseline views of the government, significant at the 10% level (Table 4, Column 3). In the horserace (Column 5), the magnitude of the coefficient on the interaction term, *Government performance X Campaign*, in fact increases, and it becomes statistically significant at the 5% level. These patterns are reinforced when examining individual-level heterogeneity in the baseline sample (Table 5). Property owners with above-median baseline views of the provincial government were over 10 percentage points more likely to pay (significant at the 1% level), conditional on basic and socioeconomic covariates and stratum fixed effects. These empirical patterns suggest that intrinsic motivation based on perceptions of government performance plays an important role when citizens are choosing whether or not to pay the tax.

If citizens had high intrinsic tax morale, then why weren't they paying before this tax campaign, and why weren't they paying in control neighborhoods? One likely explanation is that the utility citizens get from intrinsically motivated tax payments must exceed the transaction costs of compliance. Absent the program, this is almost never the case. But once transaction costs drop by sending tax collectors door to door,

Table 4: Heterogeneous effects of the tax campaign on payment by neighborhood-level moderators (midline sample)

	Paid Property Tax				
	(1)	(2)	(3)	(4)	(5)
Campaign	0.103***	0.103***	0.087***	0.108***	0.074***
	(0.007)	(0.011)	(0.010)	(0.011)	(0.015)
Enforcement risk X Campaign		0.000			-0.008
		(0.015)			(0.015)
Enforcement risk		0.007			0.008
		(0.008)			(0.007)
Government performance X Campaign			0.029*		0.032**
			(0.015)		(0.015)
Government performance			-0.009		-0.010
			(0.008)		(0.007)
Spending expectations X Campaign				-0.009	-0.021
				(0.016)	(0.015)
Spending expectations				0.006	0.006
				(0.008)	(0.007)
Stratum FE	Yes	Yes	Yes	Yes	Yes
R^2	0.054	0.055	0.055	0.054	0.059
Observations	27443	27443	27443	27443	27443
Control Mean	0.001	0.001	0.001	0.001	0.001

Notes: The dependent variable is always property tax payment, as discussed in Section 4. Column 1 summarizes the treatment effect of the tax campaign on property tax compliance. Columns 2-5 summarize estimations of Equation 3, on the neighborhood level. All moderators are drawn from baseline data, averaged at the neighborhood level. Variables are discussed in Section 4. Data: baseline survey matched with administrative data on tax compliance.

then some set of citizens who hold sufficiently high priors about the government's performance are tipped past the threshold and enter the tax net.

Fiscal reciprocity

Turning to fiscal reciprocity (H3) — tax compliance in exchange for public goods and services — we first examine heterogeneity by spending expectations over tax money received by the government. In both the neighborhood-level analysis (Table 4, Column 4), there is little evidence that expectations for public goods spending on public services and other 'good uses' is positively correlated with citizens' tax compliance. The coefficient on the interaction term is in fact negative in magnitude, though not statistically different from zero. In the individual-level analysis (Table 5, Columns 7-8), the interaction term has a positive coefficient, but it is not statistically significant.

Table 5: Heterogeneous effects of the tax campaign on payment by individual-level moderators (baseline sample)

	Paid Property Tax								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Campaign	0.112***	0.116***	0.092***	0.096***	0.080***	0.079***	0.104***	0.103***	0.051**
	(0.018)	(0.018)	(0.023)	(0.024)	(0.018)	(0.018)	(0.021)	(0.021)	(0.025)
Enforcement risk X Campaign			0.056	0.042					0.052
			(0.037)	(0.035)					(0.037)
Enforcement risk			-0.006	0.000					-0.003
			(0.011)	(0.012)					(0.011)
Government performance X Campaign					0.105***	0.102***			0.103***
					(0.039)	(0.039)			(0.038)
Government performance					-0.014	-0.009			-0.015
					(0.013)	(0.014)			(0.013)
Spending expectations X Campaign							0.032	0.032	0.023
							(0.039)	(0.038)	(0.039)
Spending expectations							-0.005	0.002	-0.004
							(0.011)	(0.011)	(0.011)
Basic Covariates	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socioeconomic Covariates	No	No	No	Yes	No	Yes	No	Yes	No
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.090	0.103	0.108	0.120	0.121	0.134	0.104	0.118	0.126
Observations	642	642	642	640	642	640	642	640	642
Outcome Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: The dependent variable is property tax payment, as discussed in Section 4. Columns 1-2 summarize the treatment effect of the tax campaign on property tax compliance within the sample of baseline respondents tracked by enumerators at endline. Columns 3-8 summarize estimations of Equation 3. All moderators are drawn from baseline surveys with respondents whose outcomes are confirmed in the administrative data at endline. Variables are discussed in Section 4. Table A4 shows alternative specifications with continuous moderators. Data: baseline survey matched with administrative data on tax compliance.

5.3 Effects of the campaign on endline beliefs

The previous section provided evidence that intrinsic motivation based on views of government performance is the strongest predictor of tax compliance in this setting. In this section, we consider treatment effects of assignment to the tax campaign on endline perceptions about the government. The analysis again exploits the random assignment of the campaign, estimating Equation 1, where now y_{ijk} is outcomes like endline enforcement perceptions or views of government performance. Table 6 summarizes these intent-to-treat estimations.

Consider first the effect of the campaign on perceived enforcement risk (H2), using a continuous variable measured analogously to that examined at baseline (and described on p. 21) and standardized to have mean zero and unit standard deviation. The tax campaign did not increase the extent to which citizens anticipate punishment if property owners refuse to pay the property tax (Table 6, Columns 1-2). Importantly, there is no evidence of 'backfiring' — citizens updating *negatively* about enforcement — among those assigned to regularized tax collection. Ultimately, given the lack of treatment effects on enforcement beliefs, we find little evidence of an enforcement-based virtuous cycle (H2) in this context.

To test for effects on perceived government performance (H1), we examine an the familiar standardized index but using endline data. On average, the tax campaign led to a 0.103 standard-deviation increase in views of the provincial government, conditional on covariates and stratum fixed effects (Table 6, Column 3). A natural question is whether this increase simply reflects taxpayers, who were more numerous in treatment, justifying their decision to pay by evaluating the government more positively ex post. To examine this possibility, we re-estimate Equation 1 and exclude taxpayers.[35] The coefficient decreases in magnitude to 0.088 but is still statistically significant at the 5% level. The campaign appears to have increased the perceived performance of the provincial government even among those who did not pay in the first year.

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[35]This analysis involves conditioning on an outcome and thus cannot be interpreted causally. But it provides suggestive evidence about whether the average causal effect operates through a tax payment channel.

Table 6: Treatment effects on endline beliefs about the provincial government

Dep. Var.	Enforcement Risk		Government Performance		Spending Expectations	
Sample:	All	Nonpayers	All	Nonpayers	All	Nonpayers
	(1)	(2)	(3)	(4)	(5)	(6)
Campaign	0.027	0.010	0.103**	0.088**	0.089*	0.093**
	(0.042)	(0.043)	(0.042)	(0.042)	(0.047)	(0.047)
Basic Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.033	0.033	0.030	0.031	0.038	0.039
Observations	3503	3271	3404	3225	3426	3246
Clusters	359	359	359	359	359	359
Outcome Mean	-0.009	-0.008	-0.059	-0.059	-0.060	-0.060

Notes: This table summarizes estimations of Equation 1, i.e. the causal effect of assignment to the tax campaign on the outcomes noted. The dependent variables come from the endline survey. They are measures of citizens' perceptions of enforcement, government performance, and expectations for future public good spending out of tax revenues, respectively. Detailed variable descriptions can be found in Section 4. Odd columns estimate treatment effects in the full sample, while even columns restrict to nonpayers as a robustness check. All regressions include age, age squared, and gender as covariates, as well as stratum fixed effects. Data: endline survey matched with administrative data on tax compliance.

Regarding fiscal reciprocity, the campaign improved citizens' expectations regarding how taxpayer money would be spent by the government (H3). In Column 5 of Table 6, we examine the same survey-based variable in which citizens estimate the share of $1,000 collected that will go toward public goods or other 'good uses.' The campaign caused a 0.089 standard deviation increase in this variable (significant at the 10% level).[36] Concretely, treated individuals estimated an additional $40 out of $1,000 collected in taxes would be spent well rather than being wasted or pocked illegally. When we re-estimate this comparison without taxpayers, the coefficient increases in magnitude and becomes significant at the 5% level. Ultimately, there is thus mixed evidence concerning H3. Although we observe citizens exposed to regularized tax collection updating about the public goods return on tax payments (Table 6), such beliefs were not themselves predictive of tax compliance (Tables 4 and 5), breaking the first link in a potential reciprocity-based virtuous cycle.

In sum, consistent with the discussion in Section 2.3, the regularization of tax collection in Kananga caused citizens to update positively about the perceived performance of the government and the public goods return to tax payments. The fact that (*i*) individuals with stronger baseline views of government performance were more likely to pay (Tables 4 and 5), and (*ii*) the tax campaign as a whole causes citizens to update positively about government performance indicates a possible virtuous cycle — consistent with H3. Assuming that some share of those positively updating about government performance at endline have crossed the threshold necessary for payment, discussed in Section 2.2, then in future rounds of collection the pool of intrinsically motivated compliers will have expanded. Put differently, the tax campaign had direct effects on revenue in the current period, and it may also have indirect effects on revenue in future periods by shaping citizens' beliefs about the government (cf. Figure 3).

5.4 The sources of positive updating

Although the reduced form impacts of regularizing tax collection on citizens' beliefs are of theoretical and policy interest, this section seeks to shed further light on the mechanisms behind such updating. We first address the concern that the results may

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[36]Although this variable is correlated with perceptions of government performance ($\rho = 0.32$), the magnitude remains at 0.080 SDs if performance is controlled for in the previous regression. This is a post-treatment 'bad control,' but it still provides suggestive evidence that spending expectations capture a different dimension of citizens' views of the government.

be affected by social desirability bias. We then examine whether tax collectors themselves mediate the treatment effect of regularization, before studying other idiosyncratic variation in the implementation of the campaign.

5.4.1 Social desirability bias

An important concern is whether the effects of the campaign on citizens' beliefs reflect respondents telling enumerators what they want to hear. To limit such social desirability (or experimenter demand) bias, all components of the study, such as sampling and survey instruments, were identical across treatment and control. Nonetheless, to test formally if respondents in treatment might have had more trust in or exposure to the research team, we estimate treatment effects on several endline survey-based proxies: (*i*) self-reported trust in foreign researchers, (*ii*) whether respondents remembered the name of the research team at the end of the survey, (*iii*) whether they participated in any past surveys conducted by the research team, (*iv*) whether they failed to give their phone number to the enumerator (suggestive of possible mistrust), and (*v*) whether they gave a wrong or disconnected number (also suggestive of mistrust). No systematic differences appear across treatment and control (Table A2). Although relying on admittedly imperfect measures, these results help assuage concerns that social desirability is driving the results.

5.4.2 Random assignment of tax collectors

First, we exploit the fact that tax collectors were randomly assigned to neighborhoods, allowing us to examine how individual collectors shaped both compliance and endline perceptions of the government while netting out neighborhood-level determinants of these outcome. Specifically, we estimate fixed effects for each randomly assigned collector on tax compliance and on beliefs about the government. Figure 4 shows correlations between collector fixed effects on tax compliance with (a) endline perceptions of government performance, and (b) endline enforcement perceptions, respectively. There is a positive and statistically significant correlation between collector fixed effects on compliance and perceived government performance (Panel A). Collectors who raised more revenue were also those who caused citizens to view government performance more positively. By contrast, there is not a significant correlation between fixed effects on compliance and enforcement perceptions, though the slope is weakly positive (Panel B). This pattern suggests that the tactics of the most productive tax collectors had less to do with threatening enforcement and more to do with project-

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ing government performance to citizens. It also raises the possibility that governments may be able to use new revenues to hire more professional tax collectors who similarly convey a sense of integrity and performance and help to expand intrinsic motivation to pay taxes further.

Panel A: Government Performance   Panel B: Enforcement Risk
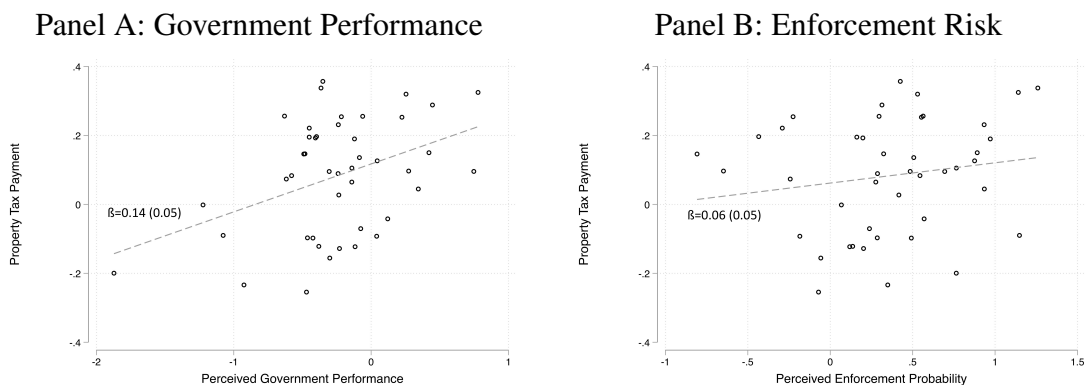
Figure 4: *Correlations between collector fixed effects — conditional on neighborhood fixed effects and household covariates — for property tax payment and (i) endline perceptions of government performance (Panel A), and (ii) endline perceptions of enforcement risk (Panel B), respectively. Collectors can have negative fixed effects on tax compliance if their marginal contribution to the three-person collector team reduced predicted compliance in assigned neighborhoods.*

What qualities of collectors cause citizens to update about government performance? In the growing literature on how bureaucrats impact political and economic outcomes, one crucial dimension is whether they are assigned to work in or outside of their home districts/neighborhoods. State officials are often more trusted in their home areas (Faguet, 2012; Bhavnani and Lee, 2018), though they may also have local enforcement capacity and stronger incentives to engage in corrupt behavior (Xu et al., 2018).

The random assignment of collectors generates exogenous variation in the distance between their homes and the neighborhoods in which they collected taxes, which we can use to investigate if collectors cause different effects when working close to home. We define the variable *Same quartier* to indicate instances where the collector is assigned to collect taxes in their home quartier. We then regress tax compliance on this variable, conditional on individual covariates, stratum fixed effects, and commune fixed effects.[37] We include commune fixed effects in this analysis to absorb other spa-

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[37]Communes are one administrative unit higher than quartiers in urban DRC.

tial determinants of compliance than are already picked up by stratum fixed effects.

Table 7 reveals that tax compliance is about 5.4 percentage points higher when collectors are working in their own quartiers (Column 1). To test the robustness of this finding, we define two alternate measures of "local" tax collectors: *Number collectors <500m* and *Any collector <500m*, which indicate instances where collectors are assigned to work within 500 meters of their homes. These variables are based on "crow flies" distances from each assigned collector's house to all assigned neighborhoods.[38] Examining these variables in the identical regression returns similar point estimates with similar magnitudes (Table 7, Columns 2-3), though they are not statistically significant at conventional levels ($p = 0.11$ and $p = 0.22$, respectively). Nonetheless, that the magnitude is nearly identical to that when using the coarser *Same quartier* measure reinforces the observation that collectors raise more revenue when assigned to work closer to their homes.

Were 'local' collectors more effective because they were perceived as higher performing? We re-estimate the same specifications with perceived government performance as the outcome variable. The coefficient on *Same quartier* is positive, but not significant. The coefficients on *Number collectors <500m* and *Any collector <500m*, on the other hand, are large and highly significant (Table 7, Columns 5-6). According to these estimates, the assignment of an additional tax collector whose home is less than 500 meters from a neighborhood is associated with a 0.196 standard-deviation increase in perceived government performance at endline. Importantly, assignment of local collectors does not appear to be associated with higher enforcement perceptions at endline (Table 7, Columns 7-9). This empirical pattern suggests that collectors are able to raise more revenue when assigned to work locally because they can generate a sense of local legitimacy and government performance among citizens, not because they threaten more effective enforcement.

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[38]A total of 1,584 observations in 17 neighborhoods are assigned to at least one collector living within 500 meters.

Table 7: Collectors randomly assigned to work near their own neighborhoods (treatment group only)

	Paid Property Tax			Government Performance			Enforcement Risk		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Same quartier	0.054**			0.046			-0.038		
	(0.026)			(0.075)			(0.081)		
Number collectors <500m		0.055			0.196***			0.054	
		(0.034)			(0.072)			(0.086)	
Any collector <500m			0.047			0.215**			0.050
			(0.038)			(0.084)			(0.103)
Basic Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2123	2123	2123	1991	1991	1991	2067	2067	2067
R^2	0.049	0.048	0.048	0.035	0.038	0.038	0.063	0.064	0.063
Outcome Mean	0.106	0.106	0.106	0.035	0.035	0.035	0.008	0.008	0.008

The dependent variable is verified property tax compliance (Columns 1-3), endline perceptions of government performance (Columns 4-6), and endline perceptions of enforcement risk (Columns 7-9). *Same quartier* is an indicator for collectors randomly assigned to work in a neighborhood in the quartier in which they live. *Number collectors <500m* is a count variable, ranging from 0 to 3, of the number of assigned tax collectors who live within 500 meters of the neighborhood in which they work. *Any collector <500m* is an indicator variable for neighborhoods in which at least one of the assigned collector lived within 500 meters. All regressions include age, age squared, gender, and stratum fixed effects. They also include commune fixed effects to net out broader regional differences in compliance and views of the government. Data: endline survey and administrative data on tax compliance.

Correlating collector characteristics and perceived government performance

To provide further evidence about the sources of positive updating about the government, we examine correlations between endline beliefs and characteristics of collectors' work during the campaign. Differences in collector-level outcomes are unlikely to reflect neighborhood characteristics because of the random assignment of collectors. While collectors' behavior was surely impacted by household characteristics, they typically possessed little information about households except from what they could observe from the street about the quality of the property. We therefore control for observable household characteristics throughout this analysis. Ultimately, however, the variation studied in this section is less clean than that studied in the previous section, and the results should be interpreted as correlational not causal.

We adopt a more inductive and exploratory approach in this section, examining the range of observable characteristics about collectors that we measured in the endline survey to see which, if any, appear positively associated with citizens' updating about government performance. First, we examine visits from tax collectors on the extensive and intensive margins. The property registration visit is fundamental to regularization and could convey professionalism and state-ness to citizens, who observe themselves becoming legible to the state through a taxpayer ID code in the neighborhood database. Second, receiving multiple visits from collectors could lead citizens to view the tax authorities as having greater capacity and higher performance. Similarly, the total amount of time spent by collectors, or the number of different collectors whom households witness, are salient dimensions of citizens' exposure to the tax campaign that could well shape views of the government. Finally, the use of new technologies during the tax campaign — the tablets and handheld printers used to issue receipts — are an important component of regularization that could signal government performance to citizens who were unlikely to have witnessed state agents facile with modern technologies.

To assess the importance of these factors, we regress endline perceptions of government performance on each variable, measured in the endline survey, controlling for individual covariates, household observables, and stratum fixed effects (Table 8). The strongest correlate of performance is whether households observed collectors using the tablet and/or printer (Column 6). The 30% of households that did had 0.178 standard deviations higher perceptions of the performance of the provincial government at endline. The only other factor that predicts compliance is being registered as a taxpayer,

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which has a positive coefficient though not one that is statistically different from zero.

To explore the robustness of the positive association between households observing collectors using campaign technologies and their perceptions of the government's performance, we first show that the point estimates are stable as we vary the covariates (Table A3, Columns 1-2). This association could simply reflect that taxpayers had more positive views of the government at baseline, and they were also more likely to observe the tablet and receipt printer. It is of course true that technologies were likely most salient when households paid. But collectors were supposed to always keep the tablet and receipt printer with them while working on the campaign. Indeed, 23% of non-payers in treatment also reported seeing collectors with the technologies. Importantly, if we restrict the sample to non-payers, the (conditional) correlation coefficient actually increases in magnitude (Table A3, Column 3).

The positive association between households observing collectors with the tablet and printer and their endline perceptions of government performance likely reflects the contrast with the arbitrary and non-transparent encounters with state agents that citizens had in this setting before the regularization of tax collection. When asked "To what extent do you think the use of tablets and portable printers helps the government monitor and sanction collectors who put state money in their own pockets?" 84% of endline participants thought it 'helps' or it 'helps very much.' The government shares citizens' conviction that technologies help lower bribes by creating a paper trail, an idea echoed in recent empirical literature (Pomeranz, 2015; Naritomi, 2019).

By contrast, observing the new technologies is more weakly correlated with updating about spending expectations (Columns 4–6) or enforcement risk (Columns 7–9). There is a statistically significant correlation between observing the collection technologies and perceived enforcement risk, though it is roughly half the size of that for government performance. When we exclude taxpayers, the estimate shrinks and falls below the threshold for statistical significance. Plotting these endline beliefs by observation of the technologies and payment status (Figure 5) renders vivid that non-payers who observe the technologies update strongly about government performance and considerably less so about enforcement. This combination of evidence suggests that the use of collection technologies helps explain why regularization raised perceived government performance in this setting.

Table 8: Endline perceptions of government performance and tax collector variation in treatment neighborhoods

| | Government Performance | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
Registered as taxpayer	0.052					
	(0.043)					
Visited by collectors		0.012				
		(0.045)				
Number of collector visits			0.003			
			(0.019)			
Time spent by collectors				0.000		
				(0.001)		
Number of different collectors					0.006	
					(0.018)	
Observed tablet/printer						0.178***
						(0.045)
Basic Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Socioeconomic Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.043	0.042	0.042	0.044	0.042	0.049
Observations	2005	2005	2005	1991	2002	2005
Clusters	214	214	214	214	214	214
Outcome Mean	0.041	0.041	0.041	0.041	0.041	0.041

The dependent variable is endline perceptions of government performance, measured as noted in Section 4. The table summarizes correlations within treatment neighborhoods between taxpayers interactions with tax collectors and perceptions of performance at endline. *Registered as taxpayer* is an indicator for households that were registered and assigned a tax ID. *Visited by collectors* is a dummy for households that reported receiving any collector visits, and *Number of collector visits* is a count of the number of reported visits. *Time spent by collectors* is households' estimate of the total time passed during all visits by all collectors. *Number of different collectors* is a count of the different collectors whom households reported seeing in house visits. *Observed tablet/printer* is whether the household reports having seen the tablet and/or receipt printer at any point during visits or at other points in the campaign. All regressions include controls for age, age squared, gender, education, income, and wealth, as well as stratum fixed effects. Data: endline survey.

Panel A: Government Performance   Panel B: Enforcement Risk
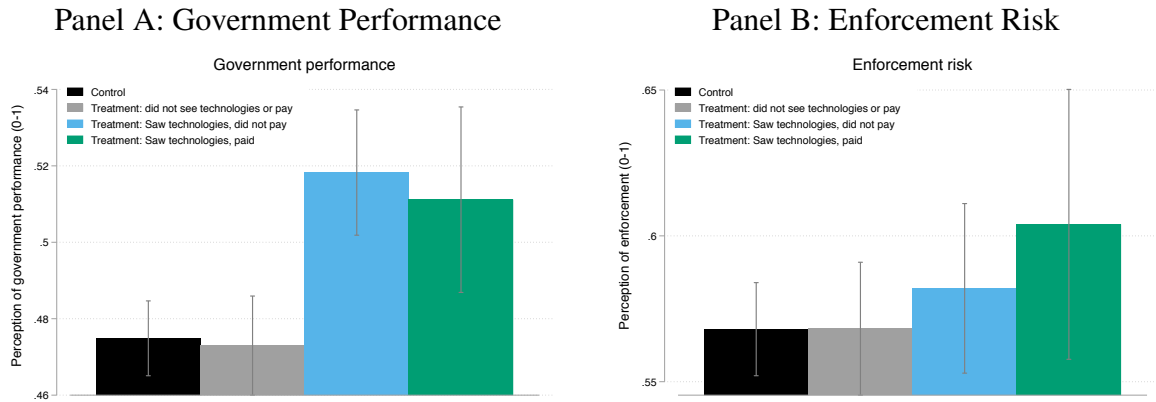
Figure 5: *Observation of technology and endline perceptions of (i) government performance (Panel A), and (ii) enforcement risk (Panel B).*

6 Conclusion

This paper argued that fragile states caught in a low-capacity trap may be able to increase intrinsic motivation to pay taxes by regularizing tax collection. It tested this argument in the context of a citywide property tax campaign in Kananga, in which tax collectors went door to door registering properties and soliciting tax payment — a major regularization of a previously arbitrary and idiosyncratic system. The results are consistent with a potential virtuous cycle of government performance and tax compliance: citizens with more favorable views of the government's performance at baseline were more likely to pay the property tax, and the tax campaign as a whole caused citizens to update their beliefs about the performance of the government. The increases in beliefs about government performance were in turn shaped by the assignment of local tax collectors and the use of tablets and handheld receipt printers during the campaign.

The paper carries policy implications for other low-capacity governments. In particular, these findings underscore the importance of regularizing tax collection to instill in citizens greater confidence that tax law is being administered in a neutral and just manner. Moreover, more suggestive findings point to the possibility of hiring professional tax collectors and training them with clear and uniform procedures as well as the use of mobile receipt printing technologies to create a paper trail and convey transparency and integrity to citizens. Governments with low enforcement capacity would do well to regularize tax collection to potentially stimulate a similar virtuous cycle in

perceived performance, intrinsic motivation, and fiscal capacity.

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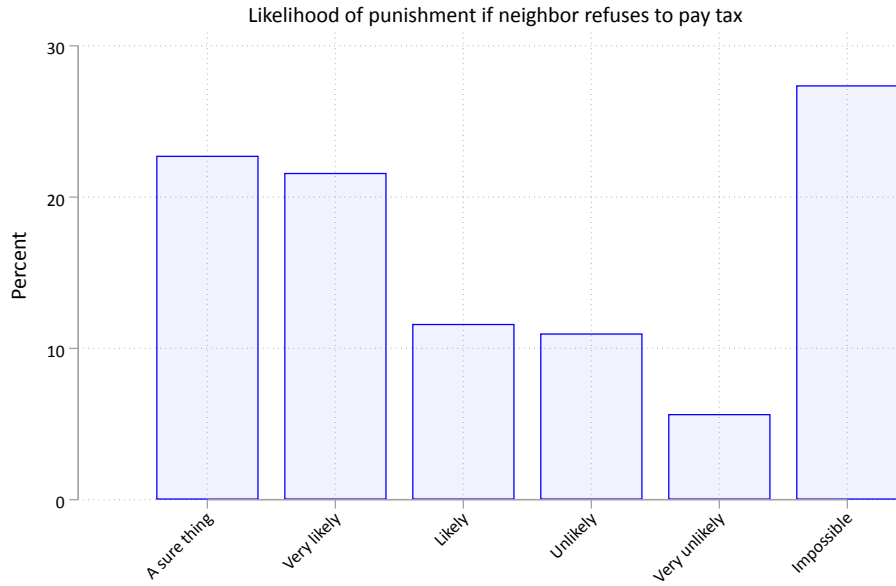
7   Appendix

A1.1   Baseline beliefs about the government

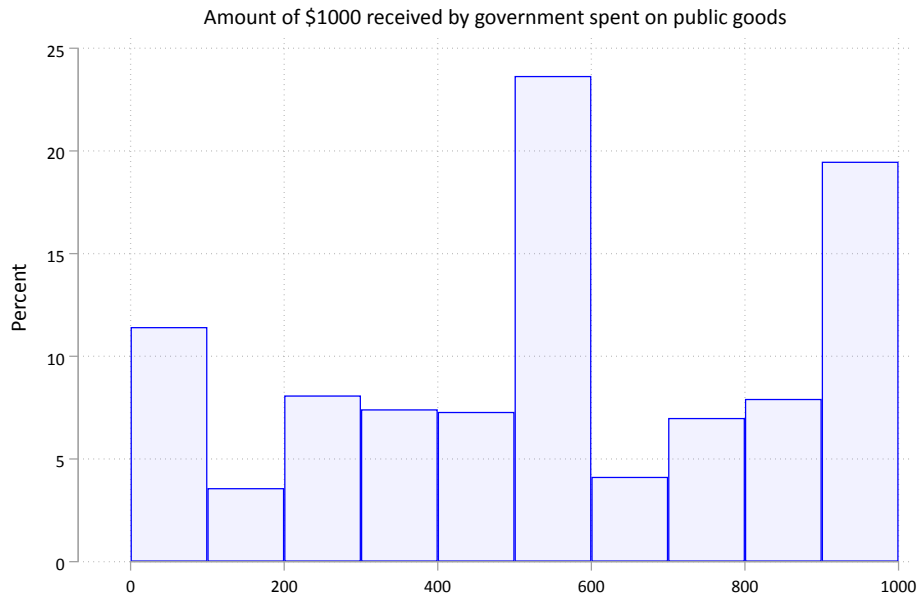### Performance of tax ministry and provincial government
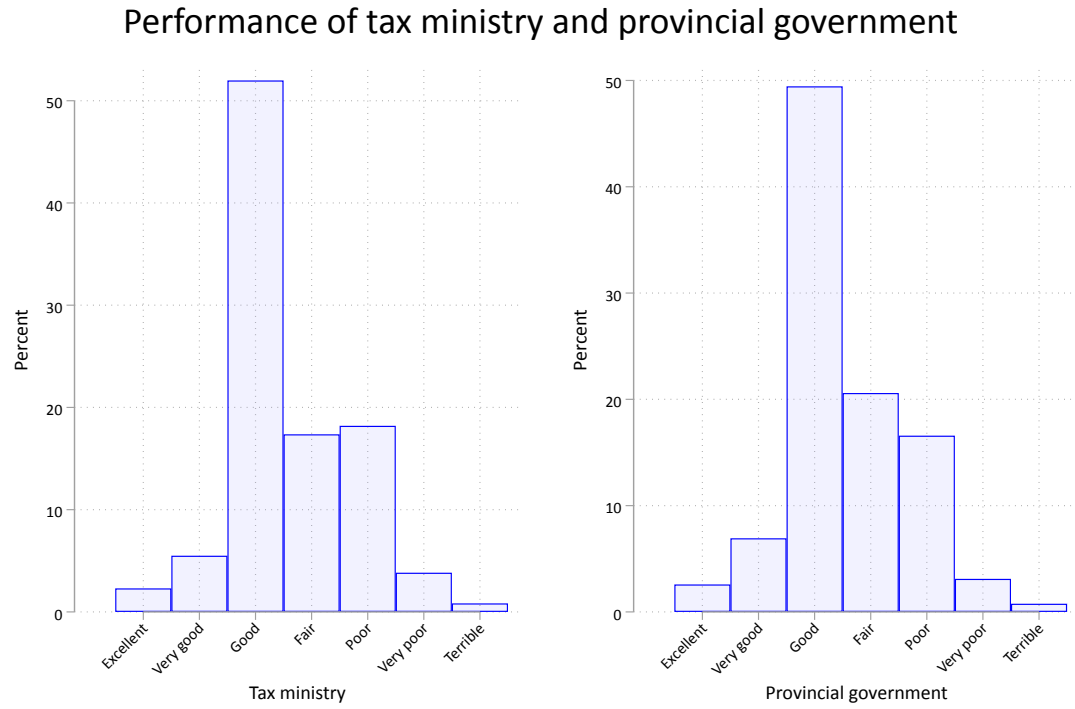
Figure A2: *Baseline perceived performance for tax ministry and provincial government.*

**Figure A3:** *Baseline views of enforcement risk for tax evaders.*

Figure A4: *Baseline spending expectations for how much of $1000 received by the provincial government will be spent on public goods and not be stolen or wasted.*

## A1.2 Additional Figures and Tables from Section 5

Table A2: Effects of the campaign on trust in and familiarity with the research team

|	Trusts researchers (1)	Knows researchers (2)	Past Participant (3)	No phone (4)	Fake phone (5)
Campaign	0.056	-0.037	0.021	0.022	-0.014
	(0.051)	(0.048)	(0.037)	(0.019)	(0.017)
Covariates	Yes	Yes	Yes	Yes	Yes
Stratum FE	Yes	Yes	Yes	Yes	Yes
R^2	0.036	0.121	0.016	0.123	0.038
Observations	2733	2913	2913	2913	2913
Clusters	356	356	356	356	356
Control Mean	-0.037	0.041	-0.020	0.176	0.077

Trusts researchers is a standardized measure of respondents' self-reported trust levels in foreign research organizations. *Knows researchers* indicates respondents who could identify the employer of the enumerator in the endline survey. *Past participant* indicates respondents who self-reported participation in past research activities conducted by our team in Kananga. *No phone* indicates that the respondent did not provide a phone number in the endline survey. *Fake phone* indicates that the respondent provided a bad or fake phone number. Data: endline survey.
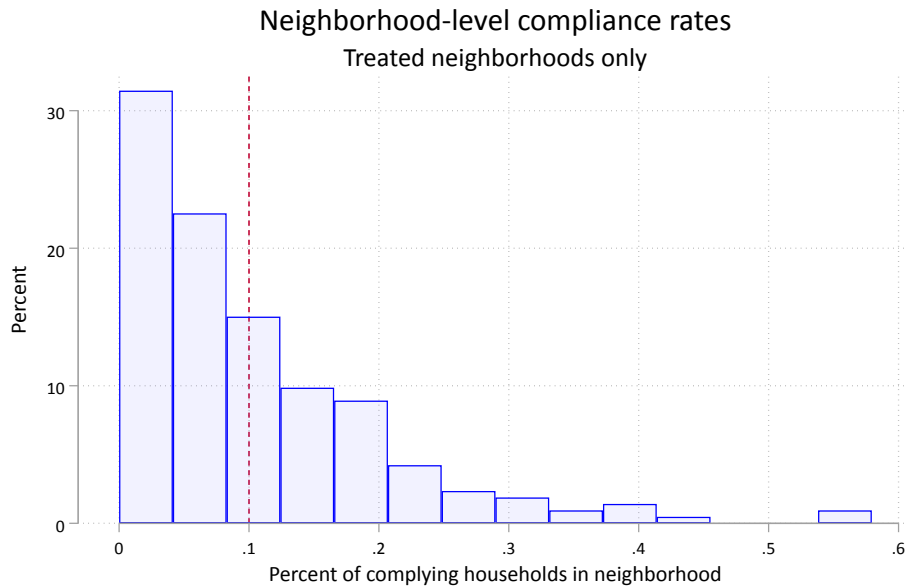
Figure A5: *Histogram of property tax compliance rates by neighborhood, excluding control neighborhoods.*
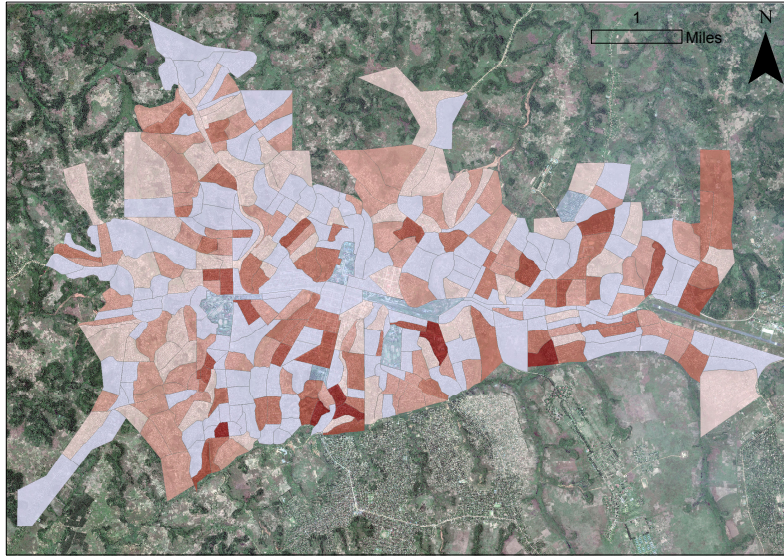
Figure A6: *Property tax compliance rates by neighborhood. Red neighborhoods received the tax program (treatment), with color intensity indicative of the proportion of payers. Blue neighborhoods are the control group.*
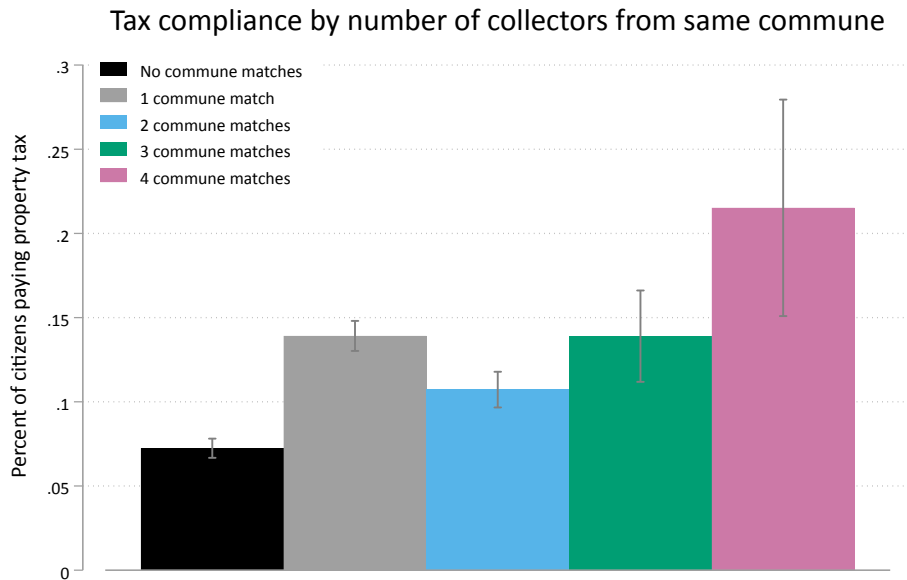
Figure A7: *Property tax compliance rates by number of collector-commune matches.*

Table A3: Endline beliefs and collectors' use of technology in treatment neighborhoods

Dependent variable:	Government Performance			Spending expectations			Enforcement Risk		
Sample:	All	All	Non-payers	All	All	Non-payers	All	All	Non-payers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Observed tablet/printer	0.163***	0.173***	0.180***	0.051	0.082	0.093	0.091**	0.095**	0.087
	(0.045)	(0.045)	(0.051)	(0.055)	(0.054)	(0.060)	(0.045)	(0.045)	(0.054)
Basic Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socioeconomic Covariates	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.035	0.042	0.046	0.040	0.077	0.078	0.059	0.062	0.065
Observations	1991	1988	1819	2004	2001	1831	2067	2065	1844
Clusters	212	212	212	212	212	212	212	212	212
Outcome Mean	0.035	0.035	0.022	0.033	0.033	0.039	0.008	0.008	-0.008

This table explores correlations between observation of new technologies and endline perceptions about the government within treatment neighborhoods only. The dependent variables are endline perceptions of government performance (Columns 1-3), expectations for future public good spending out of tax revenues (Columns 4-6), and the risk of sanctions for non compliance (Columns 7-9), respectively. *Observed tablet/printer* is whether the household reports having seen the tablet and/or receipt printer at any point during visits or at other points in the campaign. Detailed variable descriptions can be found in Section 4. All regressions include controls for age, age squared, gender, as well as stratum fixed effects. Some regressions include socioeconomic controls (education, income, and wealth) for robustness. The first two columns for each dependent variable are estimated in the full sample in treatment neighborhoods, while the third column restricts to non-payers. Data: endline survey.

Table A4: Heterogeneous effects of the tax campaign on payment by continuous individual-level moderators (baseline sample)

	Paid Property Tax								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Campaign	0.108***	0.111***	0.109***	0.107***	0.115***	0.112***	0.113***	0.110***	0.115***
	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Enforcement risk X Campaign			0.033*	0.027					0.030
			(0.019)	(0.018)					(0.019)
Enforcement risk			-0.001	0.001					-0.000
			(0.005)	(0.005)					(0.005)
Government performance X Campaign					0.040**	0.036**			0.038**
					(0.018)	(0.018)			(0.018)
Government performance					-0.010*	-0.006			-0.011*
					(0.006)	(0.006)			(0.006)
Spending expectations X Campaign							0.011	0.009	0.003
							(0.016)	(0.016)	(0.017)
Spending expectations							-0.000	0.004	0.002
							(0.005)	(0.006)	(0.006)
Basic Covariates	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socioeconomic Covariates	No	No	No	Yes	No	Yes	No	Yes	No
Stratum FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.076	0.089	0.098	0.109	0.099	0.113	0.090	0.104	0.107
Observations	629	629	629	627	629	627	622	621	622
Outcome Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

This table presents the results from Table 5 with continuous rather than binary moderators. The dependent variable is property tax payment, as discussed in Section 4. Columns 1-2 summarizes the treatment effect of the tax campaign on property tax compliance within the sample of baseline respondents tracked by enumerators at endline. Columns 3-8 summarize estimations of Equation 3. All moderators are drawn from baseline surveys with respondents whose outcomes are confirmed in the administrative data at endline. Variables are discussed in Section 4. Data: baseline survey matched with administrative data on tax compliance.

Table A5: Heterogeneous effects of the tax campaign on payment by distance from the tax ministry

	Paid Property Tax			
	(1)	(2)	(3)	(4)
Log Distance from Ministry	-0.001	-0.002	-0.001	-0.004
	(0.000)	(0.002)	(0.000)	(0.015)
Campaign			0.148***	0.145***
			(0.018)	(0.017)
Campaign X Distance			-0.042***	-0.039***
			(0.013)	(0.013)
Stratum FE	No	Yes	No	Yes
Observations	9827	9827	27596	27596
R^2	0.000	0.003	0.047	0.058
Control Mean	0.001	0.001	0.001	0.001

This table explores how transaction costs of tax compliance (proxied by distance to the tax ministry) impact the probability of property tax payment. The dependent variable is property tax payment, as discussed in Section 4. Columns 1-2 examine payment of the property tax in control neighborhoods as a function of distance. Columns 3-4 examine heterogeneous treatment effects by log distance to the tax ministry. Variables are discussed in Section 4. Data: midline survey matched with administrative data on tax compliance.

A1.3 Motivations for tax compliance

Pecuniary motivations

In the seminal public finance model of compliance, a citizen trades off the cost of compliance with the expected cost of evasion (Allingham and Sandmo, 1972). He chooses to pay the property tax τ, which is a fixed amount, if it is less than the expected probability of sanctions, p_i, multiplied by the fine for non-compliance, π, inclusive of the original cost of the tax.[39] Perceived enforcement risk varies on the individual level: $p_i \sim F$. Property owners will pay the tax if $\tau \leq p_i \pi$, or if

$$p_i \geq \tau/\pi \tag{4}$$

where all variation in compliance stems from individual heterogeneity in enforcement beliefs. Specifically, if individuals' beliefs lie to the right of the indifference point, $p^* = \tau/\pi$, then they will pay taxes, and otherwise they will evade.

This pecuniary framework may apply imperfectly in low-income countries where many households are liquidity constrained. Even if their beliefs about enforcement were sufficiently high to motivate payment, they would not be able to pay because they have no cash on hand. We can introduce liquidity constraints into the framework by assuming households have stochastic income $y_i \sim Bernoulli(q)$, such that they are either cash rich or cash poor. The probability of payment becomes:

$$Pr(p_i \geq p^* \ , \ y = 1) = q \left(1 - \int_0^{\tau/\pi} f(p)dp \right) \tag{5}$$

Nonpecuniary motivations

In addition to pecuniary motivations, citizens may derive nonpecuniary utility from paying taxes. Potential sources of nonpecuniary quasi-voluntary tax compliance are as follows. First, citizens might have intrinsic motivation to pay taxes because they view the government as advancing the common interest and tax payment as a civic duty (Levi, 1989; Tyler, 2006). We can think of this as a kind of "warm-glow" utility that citizens feel when they pay taxes.[40] Second, citizens might be motivated to pay taxes because they expect to benefit from future public services in a kind of reciprocal fiscal exchange (Fjeldstad and Semboja, 2001; Besley, 2019). Third, citizens might pay taxes because of social norms. For instance, citizens might aim to signal their type to peers by paying taxes, or they could simply try to avoid feeling shame when admitting to peers that they did not pay taxes (Besley et al., 2015). In this paper, we

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[39] Allingham and Sandmo (1972) include the probability of detection, which is trivial with the fixed fee property tax studied in this setting. There is no margin on which to hide taxable income, as in Allingham and Sandmo (1972). The uncertainty concerns whether the government will enforce sanctions against the non-compliant.

[40] For instance, Dwenger et al. (2016) model intrinsic motivation for a mandatory (yet unenforced) local church tax in this way, building on theories of charitable giving (Andreoni, 1989).

focus on the first two sources of tax morale, given that social norms are likely to play a smaller role in settings where the state has only recently begun to collect formal taxes on a large scale.

We can add such nonpecuniary motivations for tax payment into the framework with the term $\theta_i \sim G$, which is meant generally and could capture any of these aspects of tax morale that increase the utility citizens receive from paying taxes (but not from paying fines). When liquidity constraints do not bind, citizens pay taxes when $\theta_i \geq \tau - p_i \pi$.[41] For a given perception of the enforcement risk, $p = \bar{p}$, then citizens pay if their tax morale exceeds the indifference level $\theta^* = \tau - \bar{p}\pi$, and we can similarly write the probability of payment as:

$$Pr(\theta_i \geq \theta^* \, , \, y = 1 \mid p = \bar{p}) = q \left(1 - \int_{-\infty}^{\tau - \bar{p}\pi} f(\theta) d\theta \right) \qquad (6)$$

Dynamics

If we allow only pecuniary motivations, then citizens' compliance decisions can change over time if they observe the state enforcing (or failing to enforce) taxation among the non-compliant. Following Equation 4, assume that citizen i did not pay the tax in the past (time $t - 1$) because he held insufficiently high views of enforcement risk such that $p_{i,t-1} < p^*$. Now imagine that, in time t, citizen i observes state agents in their neighborhood auditing and pursuing sanctions against property owners. This signal may cause citizen i to view enforcement as more likely, such that now $p_{i,t} >= p^*$, and he pays the tax. On a larger scale, the pool of tax compliers expands because of a positive signal sent about the government's enforcement capacity. Moreover, if the increase in average tax compliance is sufficiently high in time t, then the tax authority may be capable of still greater enforcement in time $t + 1$, if it invests the new revenues in improving its enforcement capacity.[42] This could lead citizens to revise their beliefs about enforcement upward again, further expanding the pool of tax compliers. This dynamic process of investing in enforcement, updating citizens' beliefs about enforcement risk, and reinvesting new tax revenues in enforcement would constitute an enforcement-based virtuous cycle. Similar dynamics are possible in a world of reciprocity-based compliance or intrinsically motivated compliance, as described in detail in Section 2.2.

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[41]To apply the framework more closely to the experiment in Kananga, one could introduce a positive transaction cost of compliance — e.g., the shoe-leather cost of going to the tax ministry — that is realized only in the control group. Assignment to treatment then eliminates this transaction cost as well as affecting perceptions of enforcement and tax morale.

[42]For example, the government could hire new inspectors and increase the probability of audits.