

# Strengthening Fiscal Contracts Through Digital Town Halls in Freetown, Sierra Leone

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# 1 Introduction

While fiscal capacity is central for economic growth and political stability ([Besley and Persson 2011](#)), many governments around the world struggle to effectively raise revenue through taxation. One influential argument about the historical development of fiscal capacity is that political leaders can induce voluntary tax compliance by expanding democratic institutions ([North and Weingast 1989](#)).

In this project, we generate evidence evaluate this theory in contemporary democracies by studying the expansion of a participatory budgeting program in Freetown, Sierra Leone and evaluating its impacts on tax compliance and attitudes towards government. Specifically, we work with the Freetown City Council (FCC) to organize 58 digital participatory budgeting Town Halls (DTH) in 30 out of 48 wards of Freetown. The research is situated in the context of a city-wide property tax reform that increased the FCC's property tax potential revenue five-fold and collected revenue three-fold. The DTHs take the form of moderated WhatsApp group chats to which up to 40 resident property owners from the same city ward with confirmed WhatsApp usage are invited. Their task is to deliberate over what services are needed most in their ward, to exchange views over priorities with their political representatives, and to eventually decide over how the DTH budget of 15 million leones ( $\approx$  USD 1,500) should be invested. The selected service is then implemented in the ward in which DTH participants are resident.

To identify causal effects of the DTHs, we use a matched-pair design to randomize half of 3,618 property owners into treatment. In addition to being invited to join a DTH, treated units receive a notification call from an FCC representative informing them that the selected project has been completed. We observe property-level tax compliance behavior—our primary outcome of interest—through access to FCC administrative records. To nail down attitudinal mechanisms driving this effect, we collect three rounds of survey data: (i) before the DTH, (ii) after the DTH and before the implementation of the selected service, and (iii) after implementation of the selected service.

Contrary to our expectations, we do not find that the digital town hall intervention, on average, increases tax compliance. The point estimate on the effect in 2022 is -0.55 percentage points and is not distinguishable from zero. This null effect is particularly striking given that we do find that (i) the DTHs effectively create opportunities for participants to communicate preferences to government officials and (ii) the intervention increases treated property owners' satisfaction with City Council service provision and improves perceptions of government responsiveness. However, the average null effect on compliance behavior masks substantial variation in the treatment effect conditional on partisan affiliation and baseline attitudes towards expanding taxation. For self-reported copartisans of the Mayor (which make up 24.3% of the sample), we find that the treatment increases tax compliance in 2022 by 6.1 percentage points, a statistically significant increase of 27.9% over the group's baseline compliance rate. Probing further, we find that this positive effect amongst copartisans is buried by a substantial *negative* treatment effect in a small subset of the sample that is both ideologically opposed to taxation and non co-partisans of the Mayor. Finally, we find that the intervention increases property owners approval of elected officials (i.e., the Mayor and Councilors) and improves perceptions of the efficiency, transparency, and corruption of the the Freetown City Council. These results indicate that the intervention shapes attitudes towards government and political representatives in a way consistent with future improvements in fiscal capacity.

# 2 Intervention and Treatment Description

This research takes place in cooperation with the Freetown City Council (FCC) in a context of a city-wide property tax reform two of us helped lead. The reform served to broaden the tax base—less than 50% of the approximately 120,000 properties had been registered previously in the property cadastre—and to make the tax burden more equitable through the introduction of a more nuanced,

consistent and transparent property valuation scheme. The mayor publicly announced that DTHs would be held starting in January of 2021. In her messaging, she emphasized that these DTHs are key to secure citizen participation. She stressed that she intends to institutionalize the THs and that future THs will be assigned 20% of the property tax revenue raised in a given ward (see the Freetown City Council’s second year Transform Freetown [report](#), pg. 26)

The digital town halls were part of a broader intervention that contained three components: (i) digital town halls, (ii) service delivery, (iii) notification calls about delivered services. Table 1 summarizes the intervention components received by members of the treatment and control groups. Note that we manipulate participation in the digital town halls and reception of a service delivery notification call across groups, holding constant the delivery of services. This implies that the estimand in our primary analysis is the effect of participating in a digital town hall plus having received a notification call, conditional on services being delivered.

Intervention Component	Treatment Group	Control Group
Digital Town Hall	X	
Service Delivery	X	X
Notification calls	X	

Table 1: Intervention components

In the sections 2.1.2, 2.2, and 2.3 we describe each of these intervention components in turn. But before doing so, in section 2.1.1, we position our study of digital town halls within a broader literature on participatory processes.

## 2.1 Digital Town Halls

### 2.1.1 Motivation

Non-digital Town Halls have become a prominent facilitator of citizen-representative interactions since the late 1980s ([Sheely 2015](#), p.252f.). Such deliberative settings have been shown to:

- improve development outcomes ([Gonçalves 2014](#)) (but see [Mansuri and Rao 2013](#))
- increase vote shares of participating parties ([López-Moctezuma et al. 2022](#))
- decrease clientelism ([Fujiwara and Wantchekon 2013](#))
- decrease occurrences of violent events ([Collier and Vicente 2014](#))
- increase the political efficacy of participants ([Boulianne 2019](#))
- allow citizens to become more informed ([Esterling et al. 2011](#))
- allow for updating of policy preferences ([Barabas 2004](#); [Farrar et al. 2010](#); [Luskin et al. 2014](#); [Sandefur et al. 2020](#))

Therefore, it is unsurprising that it recently has been argued that the “creation of deliberative spaces where citizens and political elites participate in meaningful conversations with real policy consequences is central to strengthen the quality of weak democracies” ([López-Moctezuma et al. 2022](#), p.73). Yet, there remains much that we do not know about the impacts of such participatory processes, and about different ways of organizing them. Against that background, we make two central contributions.

First, we focus on the underexplored question of how participatory processes impact tax compliance, and the mechanisms through which those impacts occur. A handful of existing studies have argued that participatory processes can lead to increased tax compliance ([Sjoberg et al. 2019](#); [Touchton et al. 2019](#); [Torgler 2005](#)). A weakness of this literature is that it focuses on attitudes toward taxation,

rather than tax compliance behavior, or that evidence is generated with observational designs (for example, comparing compliance across jurisdictions that varied in their adoption of participatory processes). Even though fiscal contract approaches fundamentally rest on the idea that participatory institutions will induce tax compliance, we currently lack field experimental evidence linking access to participatory institutions to individual-level, administrative compliance data. This study will thus be the first to provide a robust and disaggregated investigation of the impact of participatory processes on tax compliance.

Second, few studies have examined the potential of *digital* Town Halls to enhance political accountability (for reviews of this literature, see [Kies 2010; Friess and Eilders 2015](#)). As digitization is expected to be a defining trend for developing countries in this century, policy makers increasingly have to decide whether to offer participatory processes online. As we argue, even if face-to-face interactions are possible (which cannot be taken for granted, as COVID-19 has forcefully shown the world), digital town halls may offer considerable advantages vis-à-vis their offline analogue. In Appendix A we lay out potential advantages and disadvantages of *digital* town halls.

### 2.1.2 Digital Town Halls in practice

In this study, DTHs take the form of WhatsApp group chats. Participants were assigned to one of 58 chat groups, where the number of participants in each chat ranged from 17 to 37 (the median chat group size was 24). All participants in a given chat group owned property in a same ward. The overarching goal of the DTH is for the group to deliberate and decide over how a budget of 15 million leones (about USD 1,500) should be spent in their ward. The budget allocated to the TH does not come from FCC tax revenue given (1) the severity of the budget constraint the FCC faces and (2) that the expected increase in property tax revenue will be accrued after the DTHs have taken place. For these reasons, the funds to be decided over are taken from the project's research budget. However, this is not communicated to the DTH audience, allowing the Mayor and (FCC) political representatives to fully claim credit for the participatory budgeting opportunity, which further ensured buy-in to enable our research.

We designed the DTHs with the goal of enabling both (direct) citizen-citizen and (indirect) citizen-representative interactions. This is reflected in the DTH's four distinct phases: (i) horizontal deliberation, (ii) preference articulation and aggregation, (iii) vertical interaction, and (iv) decision making over services. Videos from political representatives were shared with DTH participants in two ways: videos were posted directly in the WhatsApp group and were available via a Qualtrics link, also posted in chat groups. DTH facilitators requested that participants only use the chat between 7am and 10pm daily, so as to ensure that a facilitator can be present at all times. Participants are free to choose the form in which they would like to participate (text/ voice/ video messages), but were asked to contribute in Krio or English. Please refer to Appendix D for the timeline. We completed a pilot DTH in one ward before scaling the DTHs up to our 30 study wards.

Property owners were only eligible for the study if they were verified WhatsApp users (see section 5.1 for full sampling eligibility criteria); 1,616 of 1,809 treatment respondents provided informed consent to join their DTH and we verified 1,457 as actually joining. The DTH commenced after introductory videos by both the mayor and the ward councilor, where both representatives explained the DTH process and goals. Additionally, DTH facilitators introduced themselves to participants (both in the group chat and in one-to-one conversations with participants).<sup>1</sup>

#### Phase 1: Horizontal Deliberation (January 2021)

In the first phase of "horizontal deliberation," participants discuss which services they would like to see improved in their ward. This phase is purely horizontal because participants are told that

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<sup>1</sup>The research team hired a local team to act as facilitators, supervised and managed by project RAs.

representatives will not be involved at this stage and will not learn about what was discussed. The facilitators begin the conversation by sharing a menu of preferred services taken from a citywide survey we conducted earlier. Participants are then asked which services, within the budget allocated, they would like to see added to the menu that will constitute the choice set for the eventual DTH vote. Overall, this phase serves to offer a “safe discussion space” for citizens that approximates the conditions under which deliberation is thought to work (i.e., the relative equality of citizens exchanging reasoned views on a topic of shared interest, framed to suggest sociotropic concerns—“which service would improve well-being in your ward the most?”).

#### **Phase 2: Preference Articulation and Aggregation (January 2021)**

The second phase, “preference articulation and aggregation”, is the first in which participant statements will be shared with political representatives. Participants are told that this will take the form of an unbiased and anonymized aggregation of their views—performed by the study team—that is presented to both the mayor and the respective ward councilor. While the discussion is still focused on preferred service delivery, participants now articulate preferences towards their representatives.

#### **Phase 3: Vertical Interaction (February 2021)**

In the third phase, “vertical interaction,” the councilors respond in separate videos to the comments made by DTH participants. These response videos—one per councilor—allow the representatives to acknowledge the input received and to position themselves to the demands made.<sup>2</sup> This includes highlighting their preferred services, justifications for their service preferences and explaining past and future delivery goals. The representatives also revealed a list of service projects—pre-determined by the study team—that participants vote over in the next phase. Participants are then invited to discuss the reactions received from their representatives. We opted for this mediated interaction between citizens and representatives to (i) avoid elite-domination of the TH process and (ii) make realistic time-demands on representatives.

#### **Phase 4: Decision Making (February 2021)**

The fourth phase, “decision making,” consists of the final vote over how the DTH budget should be spent. This vote could be cast anonymously through a Qualtrics survey. We additionally gave participants the option to inform moderators of their vote in bilateral conversations. The choice set is given by a menu of services (see figure ??—the list provided in phase 1 plus additional items recommended in this first phase that were deemed feasible and within budget by the study team).

The whole budget is dedicated to the service selected by majority rule after aggregating votes to the ward level. The mayor announced the winning project through individualized group messages to each ward. After the announcement, we halted the WhatsApp groups after thanking participants for their contributions. We explained that chats would be used one more time in the future to announce that delivery of the service has concluded. Regarding determining the site of implementation, we explained that we would choose a site in the respective ward at which delivery can be accomplished within budget (as determined by the local implementing partners we cooperated with). When there are multiple such sites, we choose the one which promised the highest utility (because it was most central, closer to higher population density areas, or because of the relative improvement towards the existing local public good in that place).

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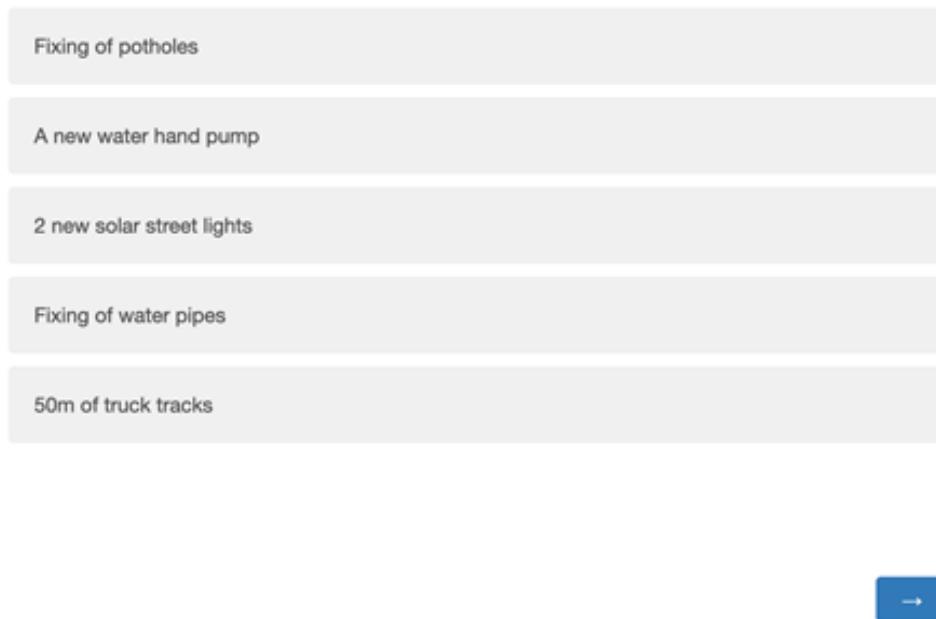
<sup>2</sup>Where there were two DTHs in a ward, the councilor prepared a video that addressed concerns raised in both DTHs.

Figure 1: Menu of services

Q1.

Which project would you like to be implemented in your ward?

Each project is worth 15 million leones.



### 2.1.3 Experiences and participation in the DTH

Of a total of 1,616 treated respondents who consented to be invited to DTH, we confirmed that 1,457 actually joined (90.2%). Those who joined the DTH report active participation. Only 5% of respondent said they never accessed the group and another 5% said they accessed the DTH group only once. The modal response was that they accessed the groups “daily” (54%) and 89.6% of respondents said they accessed the group at least once a week (84.3% said more than once per week). 68% of respondents in the DTH voted for their preferred service delivery and 63% (921 different property owners) posted at least one message (see tables 11 and 12 in Appendix).<sup>3</sup>

Respondents overwhelmingly reported they believed that FCC organized the DTH (89%), implemented services (96%), and funded the services (84%).<sup>4</sup> Of the respondents who said the FCC funded the project, 87% thought it was funded through taxes (either from inside or outside the ward), 6% from government transfer, 4% from development partners, and 3% from foreign aid.

<sup>3</sup>Note that 25 people who did not join the DTH also voted, because we reached out to treated participants bilaterally. The statistic regarding messages includes all forms of messages, such as text and audio. The median participant sent out two messages and the mean number of messages sent by participants is just under four. The median number of messages posted per DTH was 70, about evenly split across text and voice messages.

<sup>4</sup>See table 13 in the appendix. We asked participants which actors they believed were responsible for organizing, implementing, and funding the DTHs. For these questions, respondents were allowed to name multiple actors they thought might be involved. The next most frequently named actor involved for each activity is as follows: organizing the DTH was “researchers” (12%); for service implementation, central government (4.5%); as for funding, 11% of respondents thought that projects were at least partially funded by private citizens, either inside or outsider their ward and 11% thought that the projects were funded by central government.

Respondents report that the DTH were useful and safe spaces for exchanging views with representatives and community members. On average, participating respondents agreed that the DTHs allowed them to “let my political representatives know about my views” (3.94/5) and “better understand views from fellow members of my community” (4.04/5). In addition, respondents on average agreed that “participants felt comfortable to make their views known even when their views differed from those of other participants” (3.82/5). However, respondents had middling feelings when asked (i) if the Town Hall budget was sufficient to improve the delivery of the selected service in a meaningful way” (2.86/5) and (ii) if the menu of services was “comprehensive” (3.33/5) (see table 14 in the Appendix).

## 2.2 Service Delivery

Each participating ward received a service project—essentially a local public good both treated and control units in that ward could profit from.<sup>5</sup> Implementation was initially scheduled to start in May 2021, after completion of our midline survey, but was delayed due to negotiations with the delivery firm as well as the underestimated complexity of identifying appropriate delivery sites. Construction began in most wards in October 2021, with the notable exception of one ward (Tengbeh Town) where the FCC needed to provide additional assurances over liability to the delivery company. By the end of 2021 all projects were completed, except the project in Tengbeh Town, which was completed in February of 2022.

Despite multiple rounds of assessment visits to potential delivery sites—in which project team members were accompanied by an engineer from a construction firm—there was uncertainty in some wards over whether the selected projects could effectively be delivered there. Specifically, we were not able to fix water pipes in wards that selected this service. Of the 19 wards that voted to fix water pipes, we built street taps in 11 of them. In the remaining 8 wards, water street taps were deemed infeasible; in these cases we opted to provide a 5000L Milla Tank instead. This was an item participants did not have the option to directly vote for in the DTHs, but one that reflected the participants’ preference for improved water provision in affected wards. In addition, one ward voted to “fix pot holes”, but implementation proved difficult. Instead, this ward received 50 meters of truck tracks. Table 2 summarizes the votes received for each project, the number of projects that won the vote across wards, and the projects that were eventually implemented.

Participants report they are satisfied with the selected services—service satisfaction is 4.6 and 4.2 at midline and endline, respectively, on a 5-point Likert scale. Most participants got the project they voted for, or at least one fairly similar to what they voted for. Of people who voted, for 51.8% received exactly the project they voted for. Even if a respondent did not get exactly the project they voted for, the selected project addressed a similar issue. For example, hand pumps and fixing water pipes both improve water services.<sup>6</sup> Considered this way, 75% of people got the project they wanted, or one close to it.

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<sup>5</sup>Pictures of implemented projects can be found in Appendix C.

<sup>6</sup>Or if a respondent voted for 50meters of tire tracks, a project that fixes pot holes still address the issue of road repair.

	Projects for vote					Replacement Projects	
	Water		Road repair		Solar	Water	
	Fix pipes	Hand pump	Truck tracks	Potholes	Street lights	Tank	Street tap
Votes	429	313	138	51	83	NA	NA
Won	19	9	2	1	0	NA	NA
Built	0	9	3	0	0	8	11

*Note:* The top row (“Votes”) describes the number of votes of each project. The middle row (“Won”) shows how those votes translate to number of projects won for each project type. The project “fixing of water pipes” was found to be too difficult to implement—wards that voted for this project received a different water related project: either a 5000 liter tank in the community (“Milla Tank”) or a street tap. One ward voted to “fix pot holes”, but implementation proved difficult. Instead, this ward received 50 meters of truck tracks.

Table 2: Project votes, winning projects, implemented projects

Question	Satisfaction [0-5]
Satisfaction with selected service (midline)	4.56
Satisfaction with selected service (endline)	4.24

Table 3: Self-reported satisfaction with selected service

### 2.3 Service Delivery Notification Calls

While our endline survey was conducted after all selected services were successfully delivered, we found it plausible that not all participants would be aware of the completed service project. Further, we worried that our inability to observe respondents’ knowledge of project implementation would complicate the interpretation of our findings. For example, to what extent should a null (or perverse) effect be attributed to respondents’ (mistaken) belief that services selected in the DTH had not been implemented? To address this, we made notification calls on behalf of the FCC to all treated units, informing participants the project chosen in the DTH had been successfully implemented. Note that by making these notification call to treated units but not control, we build the notifications calls into our treatment.<sup>7</sup> We successfully reached approximately 70% of treated units to inform them of the implemented services. These calls started in mid-November and were staggered across wards so that they started once service delivery was completed in that ward. The endline survey similarly was staggered and commenced after notification calls were completed, but never earlier than one week after delivery completion.

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<sup>7</sup>Therefore, the treatment effect includes the heightened awareness of treated units regarding the implementation of the service.

### 3 Theoretical Model and Hypotheses

Our primary hypothesis predicts that the intervention increases participants' tax compliance.<sup>8</sup>

**H1:** Intervention increases property tax compliance in 2022.

#### 3.1 Conceptual framework

We hypothesize that the intervention increases tax compliance by strengthening the fiscal contract between property owners and the Freetown City Council.<sup>9</sup>

In our conceptualization, a fiscal contract is a set of terms that specifies the obligations between a citizen (in our case, property owner) and a governing authority (in our context, the Freetown City Council). In particular, the fiscal contract specifies (i) the tax rate that is to be paid by a given property owner and (ii) a set of services to be delivered by government.<sup>10</sup> Figure 2 lays out a simple model of this fiscal contract and highlights the role of each actor in executing the contract. First, while citizens may participate in the process of defining the terms of the contract, it is ultimately the government that sets these terms. Second, while government delivers the services, it is ultimately property owners who evaluate the received services against the terms of the contract. The model has three moving parts in the model: (i) citizens' role in setting terms (which we refer to as "input"), (ii) the delivery of services ("output"), and (iii) citizens' payment of taxes.

It is important to emphasize that our framework focuses on the aspects of tax compliance behavior that are voluntary (or "quasi-voluntary" (Levi 1988)). We use contractual language to highlight perceived and subjectively felt moral or civic obligations, rather than *legal* obligations. In any context we can think of (including our own), paying taxes is a legal obligation and enforcement measures are an important driver of compliance behavior. Therefore, while enforcement is likely to be a key driver of compliance in our context, it is not the target of our intervention, and therefore lies outside our conceptual framework.

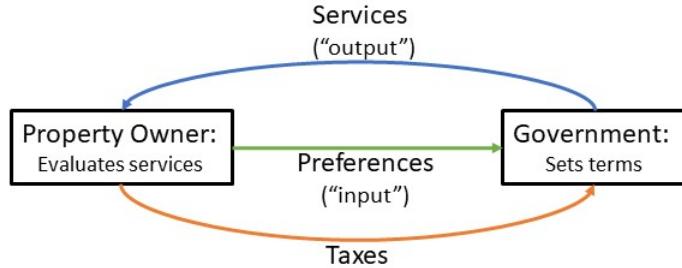
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<sup>8</sup>In the pre-analysis plan, we also specify secondary hypotheses related to tax morale outcomes. We do not report on those outcomes in this version of the paper.

<sup>9</sup>Note that we do not present this conceptual framework in the PAP and the organization of hypotheses presented here differs slightly from what is registered in the pre-analysis plan. In the PAP, we lay out four mechanism channels through which the intervention might impact compliance: (i) political efficacy, (ii) willingness to expand fiscal exchange, (iii) fairness / equity, (iv) enforcement. Discussion during analysis sharpened our thinking about how the intervention might impact the fiscal contract and we updated our conceptual model accordingly. The political efficacy and fiscal exchange families from the PAP map on to the "input" and "output" components of the fiscal contract model presented here, with one exception. We present the indicator "FCC responsiveness" as part of the "output" component of the fiscal exchange model, despite it previously being part of the political efficacy family. Property owners' perceptions of how the FCC responds to their demands is not a measure of the input citizens have in the policy process, but captures well how government meets agreed upon policy. In a future version of this document, all changes deviations from the PAP will be clearly documented in the appendix. For the moment, we refer interested readers to the pre-analysis plan.

<sup>10</sup>In this sense, the fiscal contract is individualized, with separate contracts connecting thousands of property owners across the city to the Freetown City Council.

Figure 2: The Fiscal Contract



In our model, the intervention impacts property owners’ compliance through two channels. First, all else equal, property owners are more likely to pay taxes when they play a greater role in setting the terms of the contract, which in the case of our intervention means deciding which services the government should provide. This impacts compliance behavior because it implies greater overlap between the services specified in the terms of the contract and a given property owner’s ideal set of services. Second, property owners are more likely to pay taxes when the government better delivers the agreed upon services.

Taken together, these two factors imply that citizens are more likely to pay taxes when they get more of the services they want. This conceptualization of the fiscal contract combines the “fiscal exchange” logic typical in the tax compliance literature (e.g. [Bodea and LeBas 2016](#); [Timmons 2005](#)) with insights from historical political economy research that link citizens’ input in policy-making to their willingness to supply the government with revenue ([North and Weingast 1989](#)).<sup>11</sup>

### 3.2 Theory of change: mechanism hypotheses

As described in section 2, the intervention contains two major components: (i) the Digital Town Hall (DTH) and (ii) service delivery. The DTH component aims at increasing compliance by opening up space for treated property owners to participate in the political process, communicate their preferences regarding services with political leaders, and effect policy change. If the DTH affords property owners these opportunities we should find that treated respondents perceive they have more opportunities to communicate their policy preferences to government. In addition, treated property owners may also feel they are empowered to engage in political action more broadly.

**H2a:** Treatment increases perceived opportunities for voicing opinions to FCC

**H2b:** Treatment increases perceived ability to participate in politics

The service delivery component of the intervention ensures that services selected in the DTH are delivered. Because demands voiced in the DTH were met, we should find that treated property owners believe that the FCC is more responsive to their demands (relative to the control group). Because the delivered services “match” the (majority) preferences voiced in the DTH group, we should also find that treated property owners are more satisfied with FCC service provision in general.<sup>12</sup> Further, following from our expectation that perceptions towards service delivery improve, we expect that property owners’ become more willing to pay additional taxes for better services.

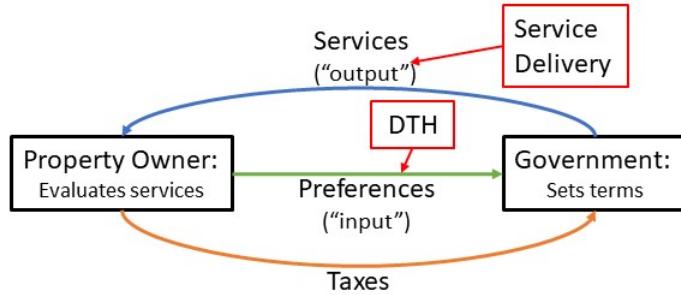
<sup>11</sup>In their discussion of the constitutional changes brought on by the Glorious Revolution in England, North and Weingast note, “in exchange for the greater say in government, parliamentary interests agreed to put the government on a sound financial footing, that is, they agreed to provide sufficient tax revenue” (pg. 817).

<sup>12</sup>Importantly, note that this aspect of the intervention does not increase the aggregate level of services received by the treatment group, as the control group receives this same set of services.

- H3a:** Treatment increases perceived FCC responsiveness  
**H3b:** Treatment increases satisfaction with FCC service provision  
**H3c:** Treatment increases willingness to pay more taxes for better services

Figure 3 summarizes our prediction about *how* these two components of the intervention affect compliance behavior.

Figure 3: Impact of intervention on fiscal contract



Given the comprehensive nature of our intervention, it is possible that treatment impacts compliance outside of the mechanisms outlined in our conceptual model. We measure outcomes associated with two alternative mechanisms: (i) perceptions of the fairness and equity of the tax system (“fairness and equity”) and (ii) the level of enforcement (“enforcement”).

- H4:** Treatment increases perceptions of fairness and equity in the tax system.  
**H5:** Treatment increases perception that non-compliance is punished.

## 4 Measurement

For our measure of tax compliance, we rely on FCC administration data, which allows us to observe individual level tax compliance behavior for the universe of property owners in Freetown. Our measure of tax compliance is a dummy variable equal to 1 if a property owner makes any tax payment in 2022. In 2021, the compliance rate in the control group was 25%.

For our measures intermediate mechanisms outcomes and secondary outcomes, we rely on three rounds of survey data collected (i) prior to treatment assignment, (ii) post-treatment, but before the implementation of the selected service, and (iii) after implementation of the selected service.<sup>13</sup> Table 4 displays the number of completed surveys in each survey round. Survey measure summary statistics for the control group at baseline, midline, and endline can be found in Appendix B. Table 5 provides additional information about indicators (i.e., survey measures) and maps indicator onto hypotheses outlined in section 3.

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<sup>13</sup>We provide financial incentives—packages of mobile data—for midline and endline survey takers to minimize attrition.

Survey round	Completed surveys	%
Baseline	3618	100 %
Midline	3304	91.3 %
Endline	2872	79.4 %

Table 4: Number of surveys per round

H	Indicator Name	Variables Description
H1	Tax compliance	A dummy variable equal to 1 if the property owner paid any tax in 2022, as of November 16. This information is taken from FCC administrative records.
H2a	Opportunities for voice	Perceived opportunities for “citizens like you” to voice opinions about Freetown City Council operations. Measured on a four-point Likert scale.
H2b	Participation efficacy	Perceived ability to participate in a political group. Measured on a five-point Likert scale.
H3a	FCC responsiveness	Perceived responsiveness of Freetown City Council to citizens’ demands. Measured on a five-point Likert scale.
H3b	Service satisfaction	How satisfied is the respondent with the Freetown City Council’s provision of services? Measured on a five-point Likert scale.
H3c	Attitude towards fiscal exchange	A survey question that asks respondents if they agree with the statement that they would be willing to pay additional taxes to receive improved services. Measured on a five-point Likert scale.
H4	Tax system fairness	Agreement with the Freetown City Council’s claim that the new property tax system is more fair. Measured on a three-point Likert scale.
H4	Others’ compliance	Estimated number of 10 closest neighbors receiving a tax bill that will pay.
H5	Punishment likelihood	Perceived likelihood that a non-compliant property owner will face legal consequences, assuming the Freetown City Council knows this person has not paid. Measured on a five-point Likert scale.

Table 5: Description of outcome / mechanism variables

## 5 Sampling, Treatment Assignment, Balance

### 5.1 Study Population and Sampling

To construct our sample frame we draw on FCC administrative records of the universe of taxable properties in Freetown, which contains a set of property characteristics and property owner contact information. To be eligible to participate in the Digital Town Hall a property owner must (i) own a

property in one of the 30 study wards and (ii) have WhatsApp on their phone. For property owners that own multiple properties, we coded them as being eligible for the DTH in the ward that contains their highest value property (i.e., highest tax fee).<sup>14</sup> We used owner contact information in FCC’s administrative records to call 15,977 property owners in our study wards. We refer to this set of property owners as the “call list”. From the call list we were able to confirm 4,860 property owners that had WhatsApp on one of their phones; these property owner were eligible to be selected into the Digital Town Hall intervention.

The set of 15,977 property owners on the call list is *not* a random sample of property owners from the 30 study wards. First, (most) property owners on the call list own properties of above median value. As a response to COVID-19, the FCC intended to waive property tax for 2020 on properties of below median value. As our intervention was originally scheduled for early 2020, it was necessary to target the DTH intervention at property owners who owned properties above the median property value. Politics related to the tax reform caused us to delay the DTH intervention until early 2021. However, during the calling process we unintentionally verified 450 property owners who own a property below the median value. We included these property owners in our sample. Second, in a previous version of our research design, we planned to allocate treatment status using a two-stage randomization procedure, to mitigate and estimate geographic spillover (as in [Sinclair et al. 2012](#)). Under that research design, properties were divided into geographic clusters using a grid overlay and properties within five meters of the edge of a grid cell were ineligible for the study. We constructed the call list with this research design in mind, thereby removing properties within five meters of the grid cell edge.

We were able to complete baseline surveys with 3859 of the 4860 verified property owners (79.4%). To mitigate spillover, we drew a restricted sample from this set of property owners such that each property is at least 15 meters from the closest study property. The restricted sampling leaves us with a final sample of 3619. Figure 18 in Appendix E displays the distribution of the distance from each property to the closest property in the sample.

## 5.2 Treatment Assignment and balance

We assign treatment status using a matched-pair design, leveraging baseline data to match similar observations into groups of two. We create 1809 pairs and then assign one observation in each matched-pair to treatment and the other to control (Appendix F describes the matching procedure). In each matched pair, one unit is assigned to treatment and one to control. We implement this randomization in R using the *block\_ra* function in the *randomizr* package. Across this range of variables, differences in means between treatment and control group are small (see balance table in Appendix G)

Figure 4 visualizes treatment assignment across Freetown.

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<sup>14</sup>This prevents the same property owner from being assigned to the DTH in multiple wards or being assigned to both treatment and control conditions. We made multiple property owners eligible for the DTH in the study wards where their highest value property was located as we reasoned that they were more likely to be resident of these properties and more likely to be involved in the administering of these properties (and therefore more likely to be directly involved in the decision to pay property tax). Note that there are only a handful of DTH participants who own multiple properties and are in the DTH of their second highest value property. In these instances, the ward in which they have a higher value property is not a study ward.

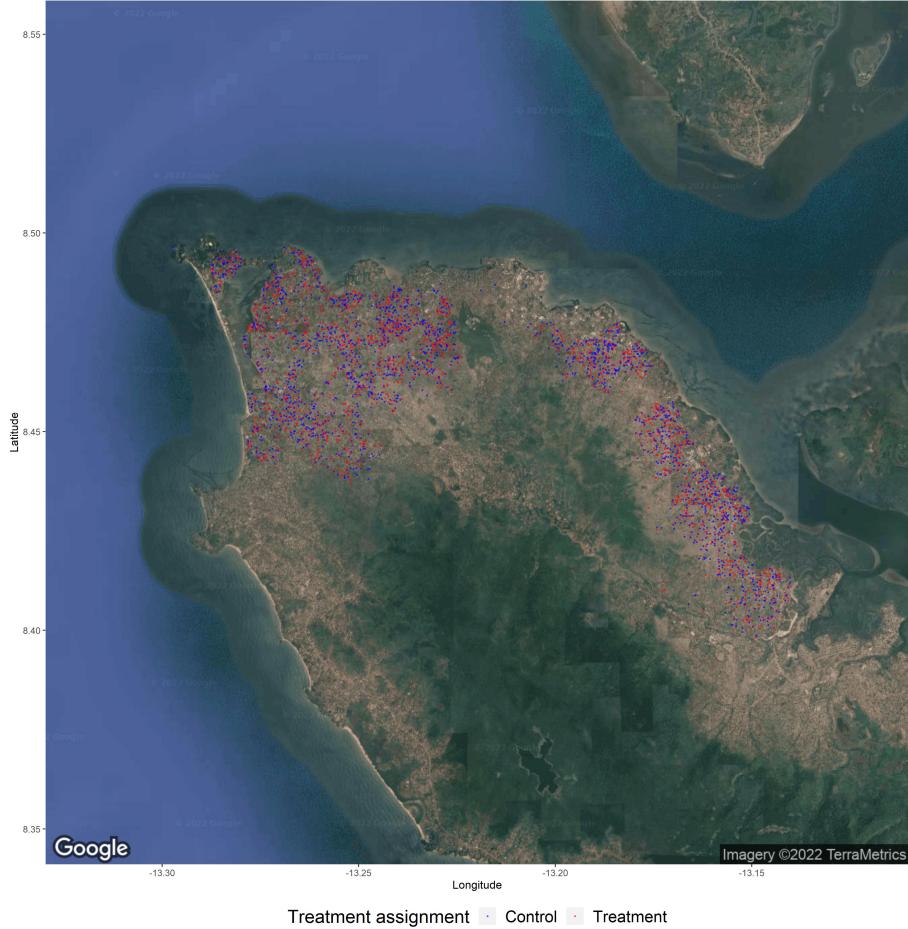


Figure 4: Digital Town Hall treatment assignment in Freetown (red = treatment)

## 6 Results

The results section proceeds in several parts. First, in section 6.1, we describe our estimation strategy and our approach to inference. Second, in section 6.2, we report the effects of the intervention on mediating attitudinal outcomes. Third, in section 6.3, we report treatment effects on our main outcome of interest, tax compliance. In section 6.4, we unpack average treatment effects on compliance and consider variation in treatment effect. Finally, in section 6.5, we present treatment effects on attitudes towards politicians and government.

### 6.1 Estimation and inference

The nature of our intervention allows for one-sided noncompliance and indeed not all property owners who were invited to join the DTH actually joined it. Of the 1809 property owners assigned to treatment, 1459 (80.7%) joined WhatsApp groups of the DTH.<sup>15</sup> While Intent-to-Treat (ITT) estimators provide unbiased estimates of being assigned to treatment, the presence of one-sided non-compliance means that our ITT estimate will underestimate the effect of *participating* in the DTH.

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<sup>15</sup>In section ?? we noted that 1,637 of 1,809 respondents who were invited to join the DTH consented to join it. However, 159 respondents who consented to join the DTH never joined the WhatsApp chat group.

To estimate the effect of a property owner joining the town hall—rather than being assigned to treatment—we use an instrumental variable regression framework to estimate Local Average Treatment Effects (LATEs). In this set-up, joining the DTH is conceptualized as the endogenous treatment and our invitation to property owners to join the DTH is conceptualized as the instrument (or encouragement). This estimator captures the local ATE among the set of people who comply with treatment, which in this case refers to property owners who are invited to join the DTH and consent to join the DTH.<sup>16</sup> We report estimates with heteroskedasticity-robust standard errors (HC2). As randomization occurs at the level of the observation (property owner), we do not cluster standard errors.

## 6.2 Effects on mediating outcomes

Figure 5 captures the impact of participating in the DTH on the mediating outcomes outlined in section 3. We present treatment effects estimated both before and after service delivery, using midline (triangle) and endline (circle) survey data, respectively.

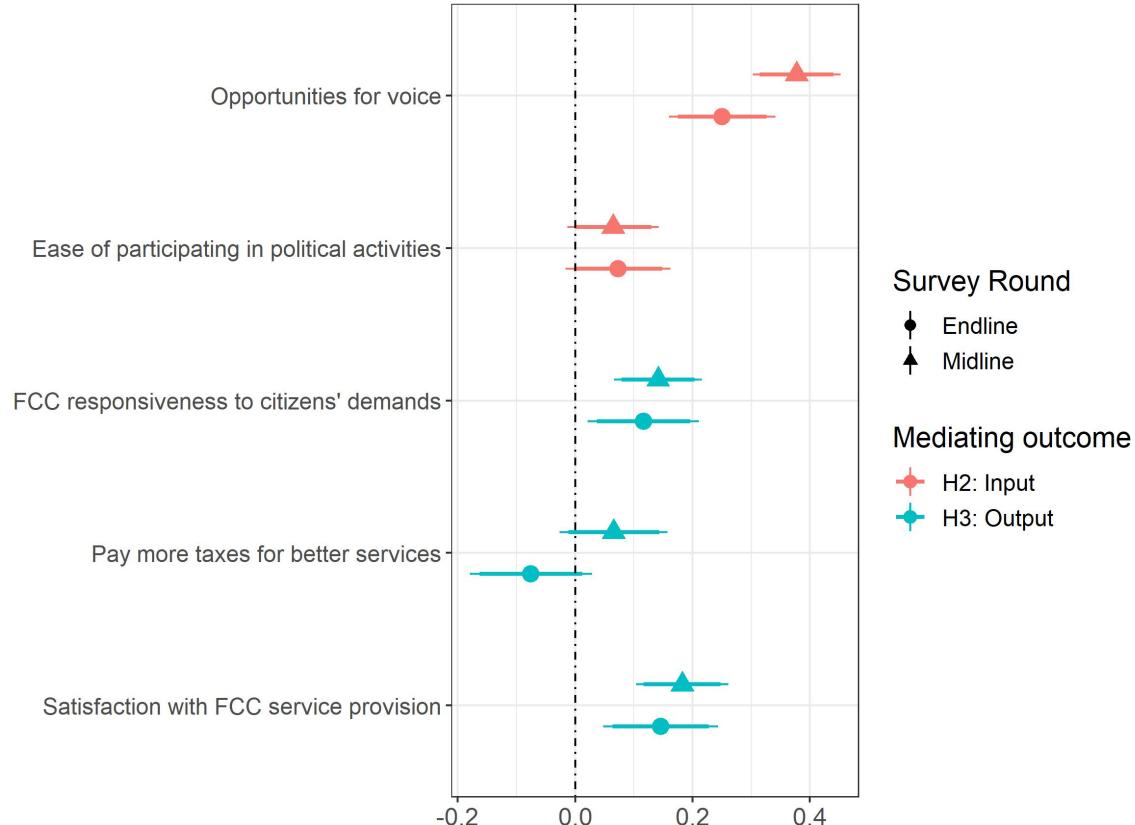
In **hypothesis 2**, we predicted that treatment would increase respondents' perceptions (a) that they have opportunities to voice their opinions about government matters to government officials and (b) that it is easy to directly engage in political activities. We refer to these outcomes collectively as “input” mediators, as they capture the DTH’s effect on expanding property owners’ input in government affairs. In figure 5, we find strong support that the treatment increases our measures of input mediators (red).

In **hypothesis 3**, we predicted that treatment would increase respondents’ (a) perceptions of FCC responsiveness, (b) satisfaction with FCC service provision, and (c) willingness to pay more taxes for better services. We refer to these outcomes collectively as “output” mediators, as they capture the impacts of the service delivery output of the government. Figure 5 captures the impact of the treatment on output mediators (blue). We find strong support for sub-hypotheses “a” and “b”, as the treatment increases these indicators at midline and the effect persists in the endline survey. However, treated respondents are not more willing to say that they would pay *more* taxes for better services (sub-hypothesis “c”).

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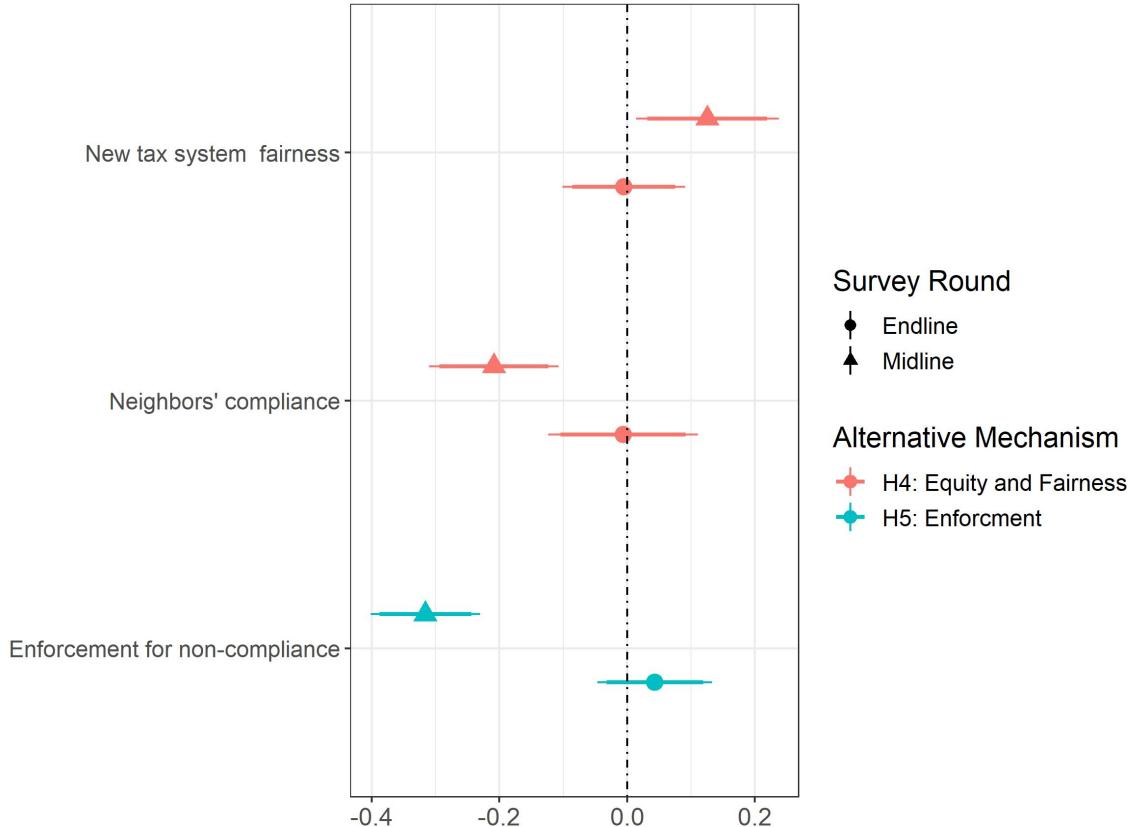
<sup>16</sup>We note, however, that our LATE estimates may be upwards biased due to a potential exclusion restriction violation, which stems from notification calls going to all treated units, not just treated units that joined the DTH. We do not address this potential bias in this version of the paper, but we believe biases are likely to be negligible.

Figure 5: Effects on mediating outcomes (LATEs)



While our intervention was designed to target property owner participation and service delivery, it is possible that the intervention drives compliance through other mechanisms. However, we find no lasting effects on outcomes that would suggest that the intervention will drive compliance behavior through the alternative mechanisms of either fairness and equity (H4) or enforcement (H5). At midline, we see contradictory results for the fairness and equity mechanism. Before services are delivered treatment respondents believe (i) that the tax system is more fair and (ii) that their neighbors are less likely to pay, compared to respondents in the control condition. However, after services are delivered, these results both vanish to zero. With respect to enforcement, at midline we see strong evidence that the treatment group believes they are *less* likely to be punished if they don't pay property tax, relative to control. However, by the time services have been delivered, this difference in beliefs about enforcement disappears.

Figure 6: Effects on alternative mediating outcomes (LATEs)



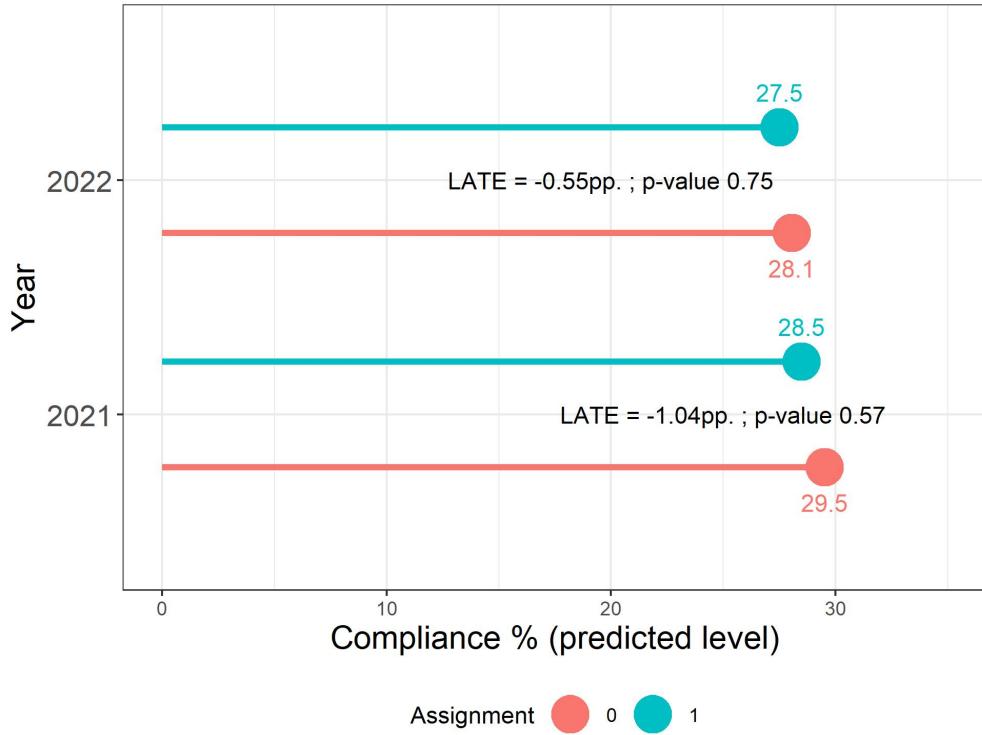
### 6.3 Effects on Tax Compliance

We now turn to the effect of participating in the Digital Town Hall intervention on our main outcome of interest: tax compliance behavior for FY2022. In figure 7, group compliance rates are presented on the x-axis, and the y-axis records compliance behavior in the fiscal year of 2022 (top) and 2021 (bottom). When interpreting treatment effects recall that, in 2021, the DTH started at the beginning of the tax season and the tax deadline came before any services were delivered. By contrast, the 2022 tax season comes after all of the services selected in the DTH are implemented. In that sense, only 2022 provides a test of the full treatment of participation + service delivery and is our pre-registered primary outcome of interest.

Focusing first on 2022, the red dot represents the control group, which has a group average compliance rate of 27.5%. The blue dot displays a compliance rate in the treatment group of 28.1%.<sup>17</sup> This implies that the point estimate on the treatment effect is negative 0.55 percentage points, an effect that is statistically indistinguishable from zero with a  $p$ -value of 0.75. In 2021, the point estimate on the treatment effect is again negative (-0.04 percentage points) and statistically indistinguishable from zero ( $p$ -value = 0.57).

<sup>17</sup>Given that we include covariate adjustments, these are predicted compliance rate, rather than raw group means. Note that results are unchanged when we estimate effects without covariate adjustment, or with different sets of control variables.

Figure 7: Treatment effects on tax compliance (LATEs)



## 6.4 Unpacking null effects: partisanship and ideology

The null average treatment effects on compliance presented in figure 7 mask important treatment effect heterogeneity. We now explore that variation.

Recall that in the conceptual framework we outlined in section 3, we predict the intervention increases compliance because treated property owners are (i) afforded expanded opportunities to set the terms of the fiscal contract and (ii) made aware of the government's increased success in meeting those terms. A necessary assumption of this logic is that property owners are open to the prospect of exchanging tax dollars for services. If property owners have little interest in exchanging taxes for services, the additional input opportunities and signals of government responsiveness brought on by the treatment are likely to have little impact on compliance behavior.

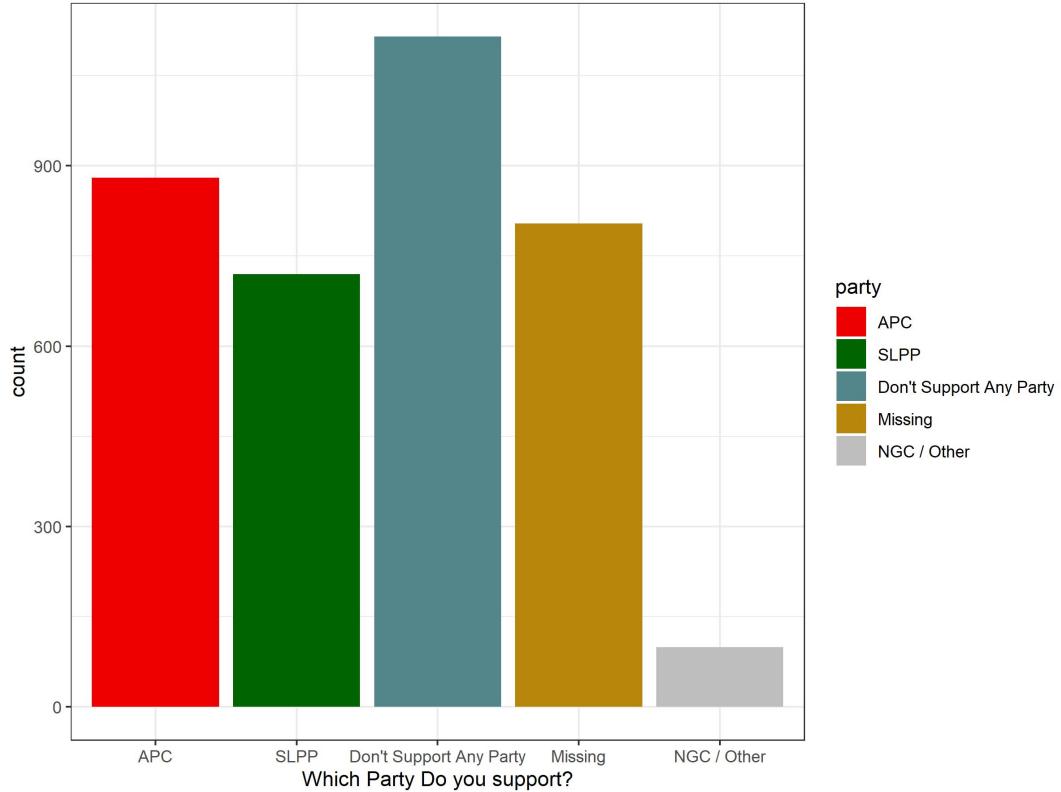
In this section, we explore two dimensions that may shape property owners' willingness to trade taxes for services with the Freetown City Council: partisanship and ideology. In section 6.4.1, we show that treatment effects vary significantly conditional on partisan affiliation. In particular, we find treatment effects are large and positive for co-partisans of the incumbent government at Freetown City Council (APC, the All People's Congress). Co-partisans may be especially receptive to attempts to build the fiscal contract for several reasons. For example, co-partisans may see themselves as the likely target of future government projects. Alternatively, co-partisans may perceive the importance of this exchange for the incumbent party's political future (e.g., re-election prospects). In section 6.5, we show that for a small minority (14%) of property owners oppose the idea of expanding taxation for better services—a preference about taxation akin to a small government ideology—treatments effects are negative. In section 6.4.3, we combine the insights from the two preceding sub-sections and consider partisanship and ideology together. This analysis reveals that negative treatment effects are concentrated in the

small sub population of respondents who are both ideologically opposed to exchange and non co-partisans of the incumbent Mayor.

#### 6.4.1 Compliance effects by partisanship

In our baseline survey, we asked respondents which political party (if any) they “personally support and feel close to”. Figure 8 displays the breakdown of self-reported partisan support. Just under half of all respondents reported they had a partisan leaning (47.7%), with 24.3% and 19.9% declaring themselves for the APC (the incumbent party at FCC) and SLPP, respectively.<sup>18</sup> The modal respondent claimed they did not support any party (30.1%) and an additional 22.2% of respondents opted not to answer this question and are labeled as “missing” in figure 8.

Figure 8: Partisan support (baseline)



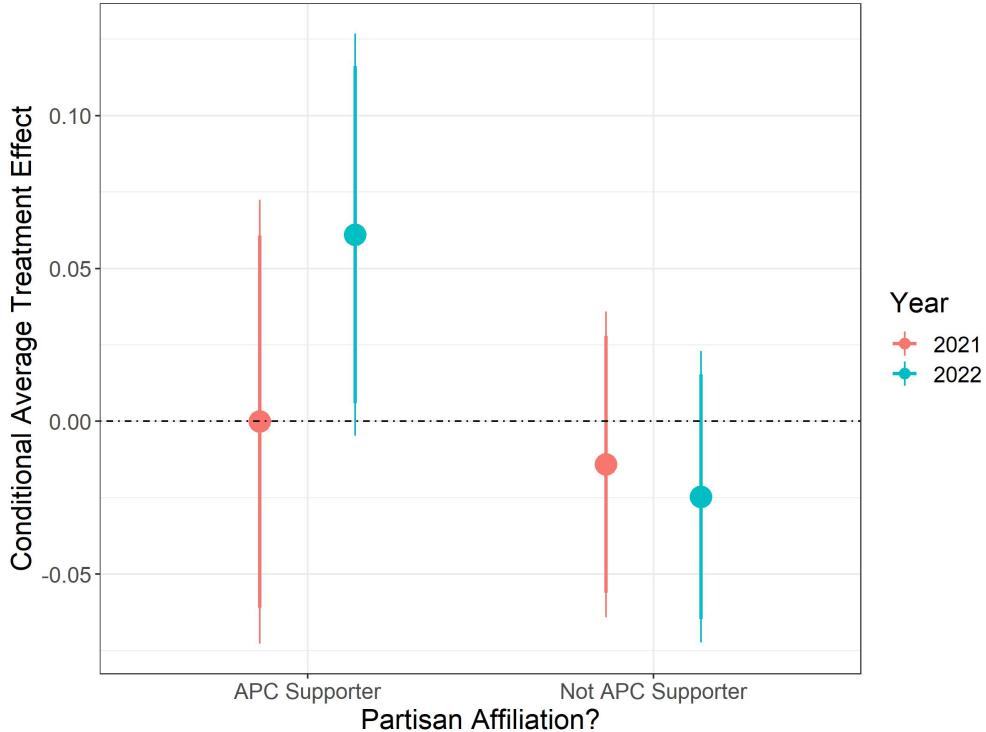
In figure 9, we break out treatment effects by partisan affiliation. For 2022 (blue), treatment effects differ significantly conditional on partisan affiliation. For co-partisans of the Mayor (i.e., APC supporters) the treatment increases compliance by 6.1 percentage points, which is a substantial 27.9% increase over the group’s control compliance rate of 21.9%. This effect is statistically distinguishable from zero ( $t\text{-statistic} = 1.73$ ). In contrast, we find no such effects for non copartisans of the Mayor (i.e., respondents who do not declare themselves APC supporters). Point estimates for this group are below zero (-2.6 percentage points), though not statistically distinguishable from zero ( $t\text{-statistic} = -1.25$ ). Finally, the difference in the treatment effects between the two groups is significantly different ( $t\text{-statistic} = 2.12$ )— the treatment effect on compliance is larger for co-partisans than it is for

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<sup>18</sup>Less than 3% of all respondents declared themselves for a party other than APC or SLPP, with the majority of third party partisans going for NGC.

non co-partisans.<sup>19</sup> For 2021, we see little difference in the treatment effects conditional on partisan affiliation.

Figure 9: Treatment effects by partisan affiliation



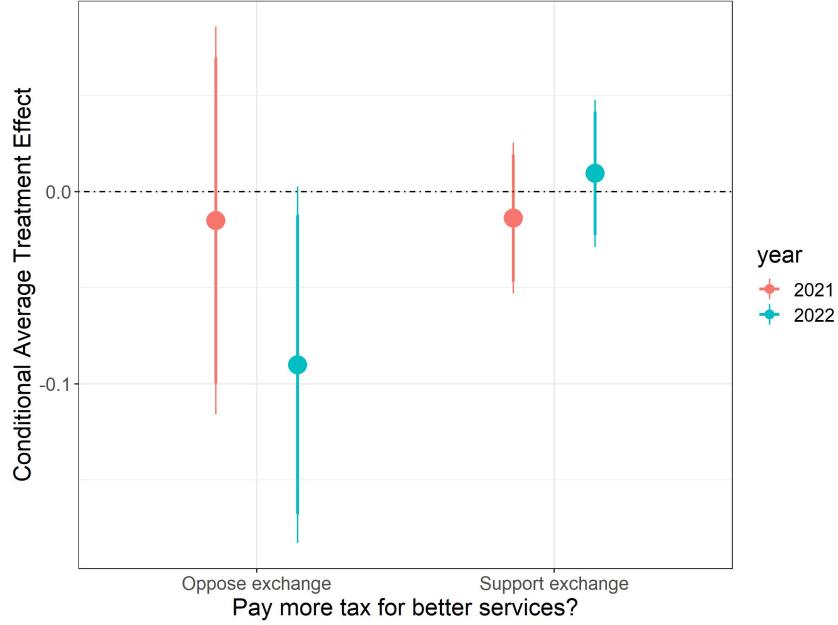
#### 6.4.2 Effects by attitudes towards taxation

A minority of property owners in our sample opposed the idea of exchanging tax dollars for services. Specifically, 14% of respondents either “strongly disagreed” (7.1%) or “somewhat disagreed” (6.9%) with the following statement: *I would be willing to pay additional taxes in order to receive improved services*. Figure 10 demonstrates that these negative attitudes towards taxation strongly shape treatment effects on compliance in 2022. For the 14% of property owners who oppose greater exchange of tax dollars for services, the treatment *lowers* the compliance rate by 9 percentage points (*p*-value = .056). This effect size represents a 29% drop from the baseline compliance rate in this group of 32.1%. In contrast, a large majority (82.1%) of property owners in our sample express a willingness to exchange taxes for services, reporting that they either “strongly agree” (57.4%) or “somewhat agree” (25%) with the above statement; and additional 4% reported they were “in the middle”. For this group that supports exchange, estimated treatment effects are positive (1 percentage point), though not statistically significant (*t*-statistic = .48).<sup>20</sup> The difference in the estimated treatment effects for property owners that support exchange and property owners who do not is statistically significant (*t*-statistic = 1.95).

<sup>19</sup>In the results shown here, all those people who self-report being affiliated with the APC are coded as “Co-partisan”, while all other respondents are coded as “not co-partisan”. Results are unchanged if we drop respondents who don’t answer the question.

<sup>20</sup>In this analysis, we include the “in the middle” group with supporters. Results are substantively are unchanged if we drop this group.

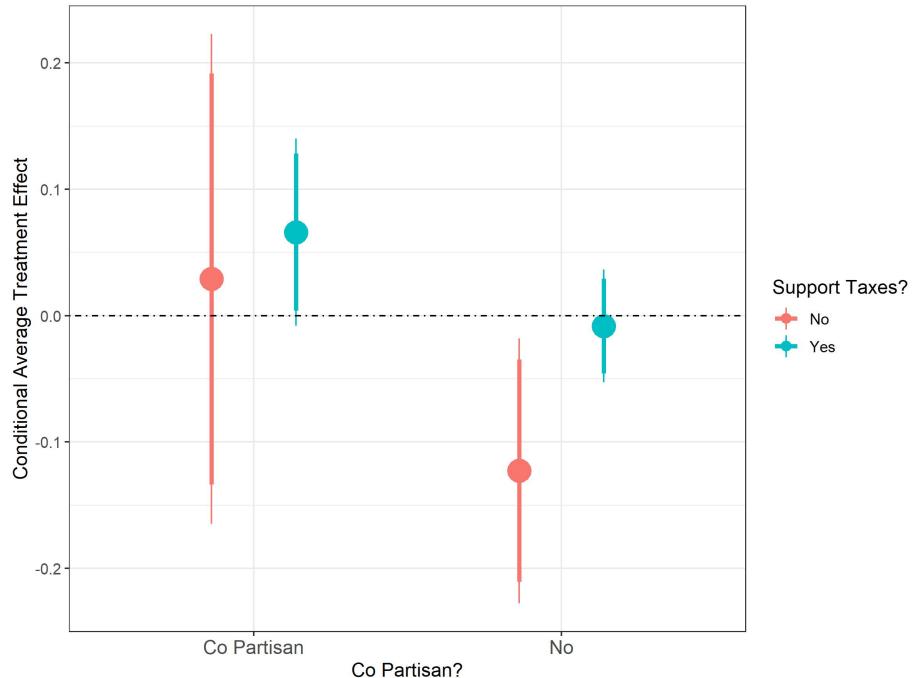
Figure 10: Treatment effects by attitudes towards taxation



#### 6.4.3 Compliance effects by partisanship and attitudes towards taxation

In figure 11 we put both these heterogeneous treatment effects together, focusing on tax compliance in 2022. Figure 11 makes clear that the *negative* effects of the treatment are located in a specific subgroup: non-copartisans who oppose the idea of expanded taxation for better services. In section 6.4.1, we saw that treatment effects are positive for co-partisans—this effect holds irrespective of initial attitudes towards taxation. For non-copartisans who support exchange, treatment effect are indistinguishable from zero.

Figure 11: Effects by partisanship & tax attitudes: 2022 compliance



## 6.5 Effects on attitudes towards politicians and government

Finally, we turn to the impact of intervention on broader attitudes towards political representatives and perceptions of government. Tax compliance behavior and the fiscal contract more generally may evolve over the long term. However, the treatment may impact attitudes that facilitate this long-term transformations. Specifically, positive shifts in attitudes towards government may facilitate a virtuous cycle of improvements by: (i) increasing future compliance, and (ii) enabling broader tax reform.

Figure 12 displays the impact of the treatment on approval ratings of local government officials. We see clear, positive treatment effects, persistent across baseline and endline.

Figure 13 reports the effects of treatment on perceptions of the Freetown City Council. Before services are delivered, we see positive, but insignificant increases in perceptions of FCC transparency and efficiency, but statistically significant *decreases* in perceptions of corruption (top panel). However, after services are delivered (bottom panel), we see clear positive treatment effects in perceptions of FCC transparency, efficiency and corruption (significant at the 10% level).

Figure 12: Effect on approval of political representative

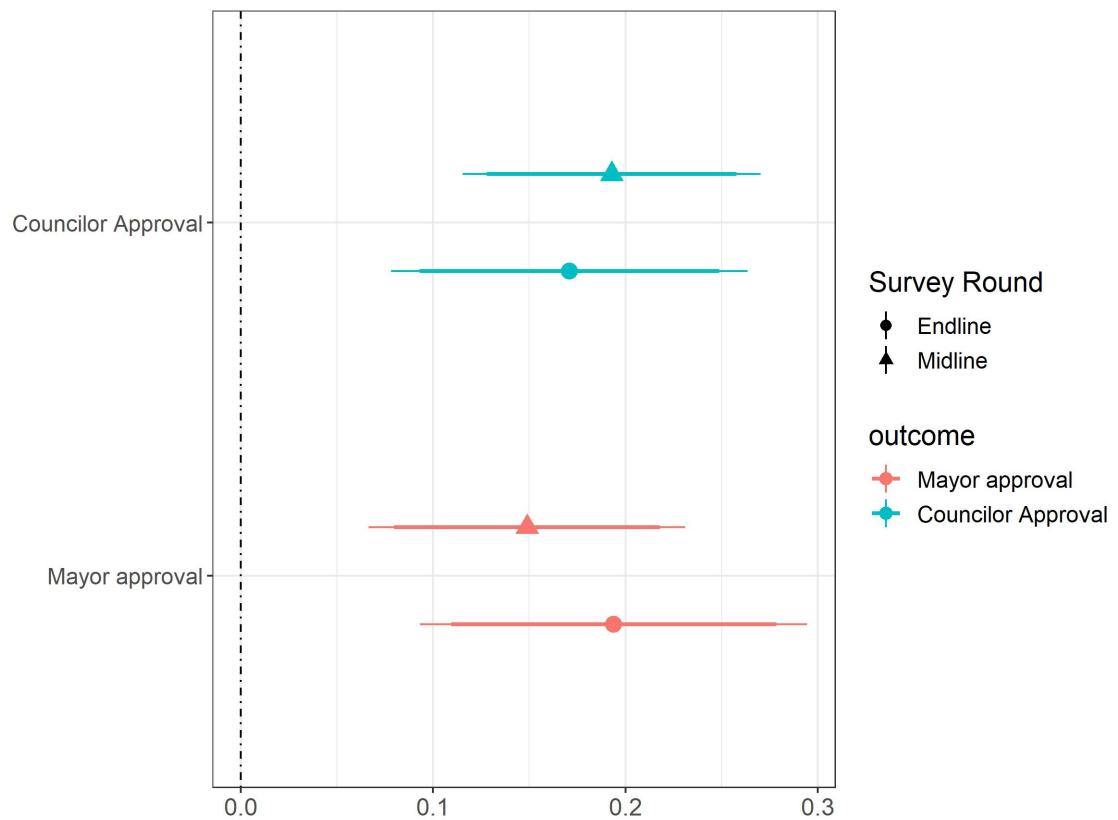
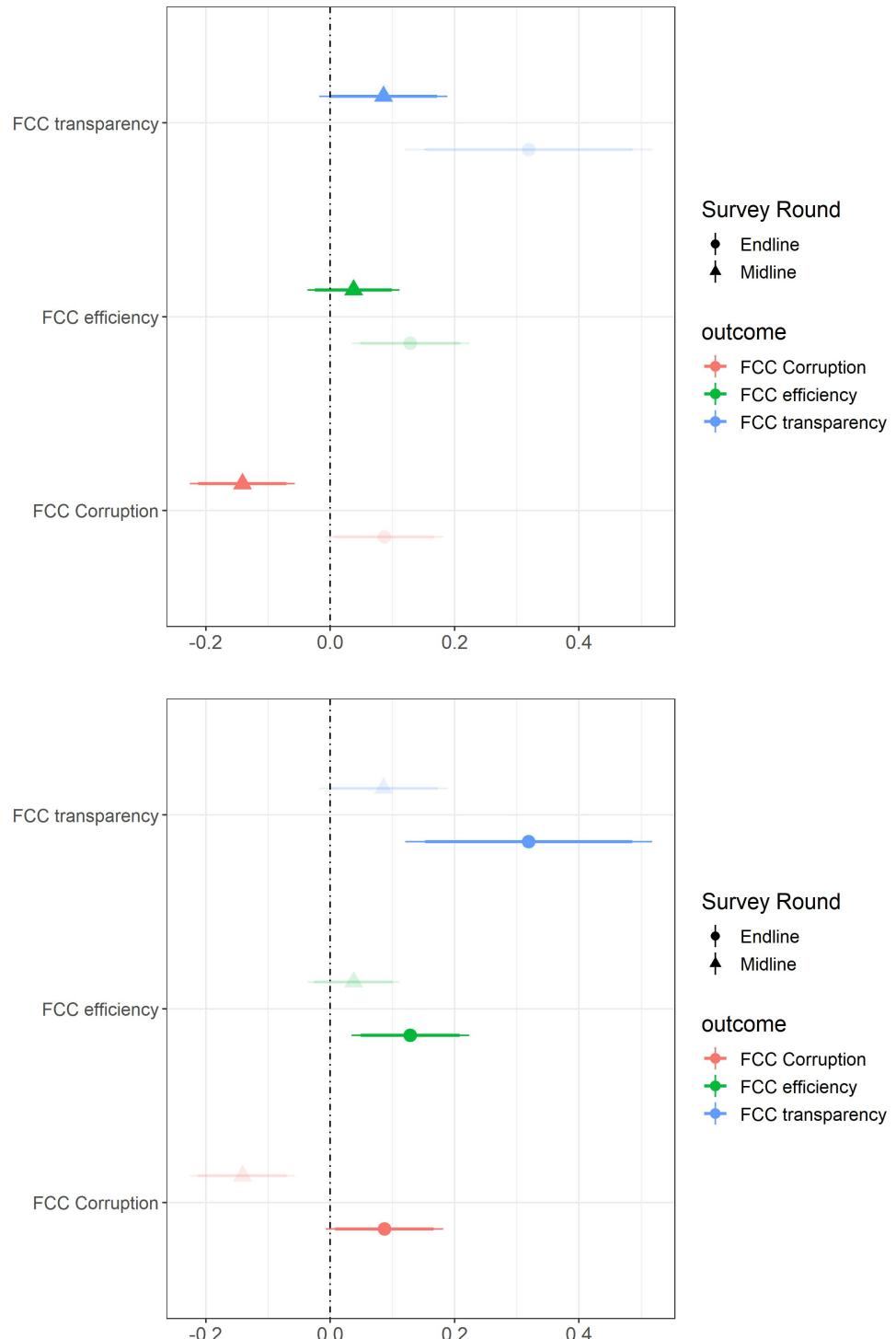


Figure 13: Effects on perceptions of government



## **7 Discussion**

In preparation.

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# Appendices

## A Digital Town Halls: Pros and Cons

To begin with, participation can be less costly: If access to WhatsApp already exists, participants only need to invest a modest amount of time and mobile data to enter the DTH. Whereas offline THs enable participation only for a short and fixed time period, DTHs can be accessed for weeks and whenever it is convenient for participants. This flexibility reduces the oft significant opportunity costs of participation (Casey 2018). Intuitively, transportation costs—traditionally a barrier to participation especially in rural settings (Sexton 2017, p.35)—are not incurred. Remarkable improvements in internet activity in developing countries—31 % of Sierra Leoneans in 2018 own a phone with internet access (Afrobarometer 2018)—have led to an explosion in social media usage (21.5% of Sierra Leonean report obtaining news through Facebook or Twitter at least “a few times a week” (Afrobarometer 2018). As our study population is property owners in the capital city, we expect these numbers to be even higher in our setting. In our model of mediated interaction through WhatsApp, participation is less costly for political representatives too: All that is required of them is to read a summary of participant contributions and to respond in a limited number of video and voice messages.

Second, perhaps counter-intuitively, we argue that DTHs hold more deliberative promise: In the Habermasian ideal type of deliberative democracy, participants engage in potentially endless communicative action (an exchange of reasoned arguments) as equals until the best argument prevails (Habermas 1975). In offline THs, attendants regularly find themselves unable to make their views known in front of representatives as time constraints only allow for a limited number of contributions. Statements, especially from members of marginalized groups, are often interrupted by other participants (Parthasarathy et al. 2019). In contrast, DTHs allow all participants to make their views known without running the risk of interference by others. Importantly, DTHs alleviate the constraint of limited attention spans on successful argumentative reasoning: While it is easy to forget what a participant argued a few minutes ago in an offline TH, participants in WhatsApp can just scroll back. Whereas immediate reactions are required offline to ensure that the conversation stays on topic, DTHs enable participants to first reflect on their statement—in theory for multiple days—before posting it. Therefore, the longer time frame in a DTH should increase the argumentative quality of contributions and facilitate perspective taking (as the need for immediate reactions in offline DTHs precludes taking the time to reflect on where someone else’s argument is coming from). Finally, we can avoid face-to-face interactions which in group settings under time constraints lend themselves to emotionalized exchanges (more cues are visible—e.g., body language and facial expressions—which make it harder to focus on the merits of the argument alone). Third, DTHs can alleviate one dimension of the well-known gap in political participation by targeting the relatively young who usually are less likely to participate in conventional forms of political engagement. Yet, it is to be expected that DTHs—just like their offline analogue—display additional participation biases (higher ability and willingness to participate among those able to afford smart phones and internet usage, the more educated and literate, those with higher political efficacy (on self-selection in offline TH participation, see Boulianne 2019; Neblo et al. 2010).

However, there are also potential relative disadvantages to the DTH format: The relative anonymity decreases the (reputational) cost of disruptive behavior as participants can choose how much identifying information they provide through their WhatsApp profile. Furthermore, moderating chats can be costly, constrained by the functionalities provided by WhatsApp (messages can only be deleted by who wrote them) and, if done poorly, runs the risk of altering the conversation. The absence of face-to-face interactions can lead to questioning that one is actually talking to ones’ representatives and fellow community members. Fortunately, this is less of a concern here as political representatives have prominently associated themselves with the DTH intervention in public. One may argue that

voice- and text-based communication is less rich when other cues cannot be observed (e.g., the eyes as an indicator of the sincerity of the speaker). The mediated interaction between participants and representatives relies on trust in the intermediary that is aggregating the information. Perhaps most crucially, while DTHs reduce participation costs for many, those lacking internet/ WhatsApp access cannot participate. Finally, the brevity of text messages may not be conducive to the articulate elaboration of arguments ([Jaidka et al. 2019](#)). However, there are no length limitations in WhatsApp and participants have the option to record voice and video messages as well. Through our endline survey and by capturing all DTH conversations, we can measure many of the aforementioned potential disadvantages how prevalent they were.

## B Outcome Summary Statistics

	Mean	SD	Min	Q25	Q50	Q75	Max	N	Missing
Unconditional tax morale	3.77	1.55	1	2	5	5	5	1797	12
Service conditional tax morale	1.96	0.96	1	1	2	3	3	1805	4
Fiscal exchange willingess	4.19	1.22	1	4	5	5	5	1805	4
Satisfaction with FCC service provision	3.64	1.17	1	3	4	4	5	1790	19
Opportunities for voice	2.12	1.00	1	1	2	3	4	1719	90
Political efficacy	1.76	1.14	1	1	1	2	5	1794	15
FCC responsiveness	3.17	1.18	1	2	4	4	5	1712	97
Tax system fairness	2.12	0.79	1	1	2	3	3	1112	697
Neighbors' compliance	5.13	2.41	0	3	5	7	10	1138	671
Percieved probability of punishment	4.06	1.11	1	4	4	5	5	1788	21

Table 6: Summary statistic for outcome variables at baseline (control group)

	Mean	SD	Min	Q25	Q50	Q75	Max	N	Missing
Unconditional tax morale	3.94	1.53	1	2	5	5	5	1645	164
Service conditional tax morale	1.72	0.93	1	1	1	3	3	1647	162
Fiscal exchange willingess	4.00	1.25	1	4	4	5	5	1648	161
Satisfaction with FCC service provision	3.61	1.06	1	3	4	4	5	1648	161
Opportunities for voice	2.33	0.92	1	2	2	3	4	1636	173
Political efficacy	1.62	1.02	1	1	1	2	5	1646	163
FCC responsiveness	3.36	1.06	1	2	4	4	5	1623	186
Tax system fairness	2.15	0.69	1	2	2	3	3	1147	662
Neighbors' compliance	5.97	2.29	0	5	6	8	10	1498	311
Percieved probability of punishment	4.24	0.98	1	4	5	5	5	1648	161

Table 7: Summary statistic for outcome variables at Midline (control group)

	Mean	SD	Min	Q25	Q50	Q75	Max	N	Missing
Unconditional tax morale	4.36	1.30	1	5	5.00	5	5	1397	412
Service conditional tax morale	2.52	1.56	1	1	2.00	4	5	1402	407
Fiscal exchange willingess	4.03	1.29	1	4	4.67	5	5	1402	407
Satisfaction with FCC service provision	3.47	1.21	1	2	4.00	4	5	1400	409
Opportunities for voice	2.16	0.92	1	1	2.00	3	4	1392	417
Political efficacy	1.63	1.02	1	1	1.00	2	5	1395	414
FCC responsiveness	3.31	1.13	1	2	4.00	4	5	1380	429
Tax system fairness	2.38	0.78	1	2	3.00	3	3	1394	415
Neighbors' compliance	5.92	2.45	0	4	6.00	8	10	1210	599
Percieved probability of punishment	4.14	1.04	1	4	4.00	5	5	1395	414

Table 8: Summary statistic for outcome variables at Endline (control group)

## C Project Pictures



Figure 14: Project implemented in Ward 418.



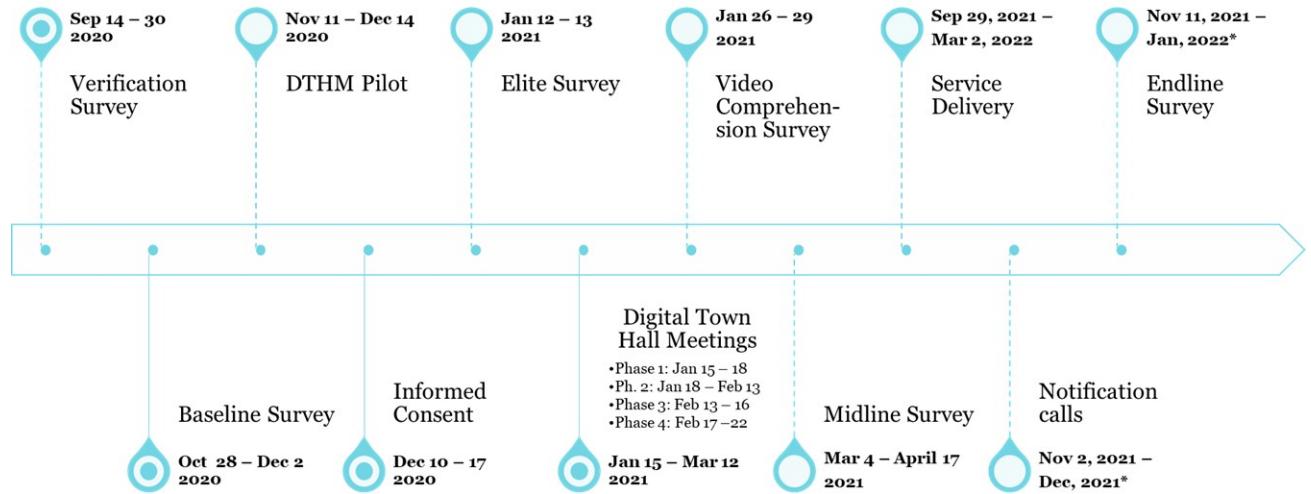
Figure 15: Project implemented in Ward 442.



Figure 16: Project implemented in Ward 444.

## D Timeline

Figure 17: Timeline



\*Note that notification calls and endline surveys in one ward, Tengbeh Town, were delayed by two months due to contractual issues with the construction firm.

## E Distance to Closest Study Property

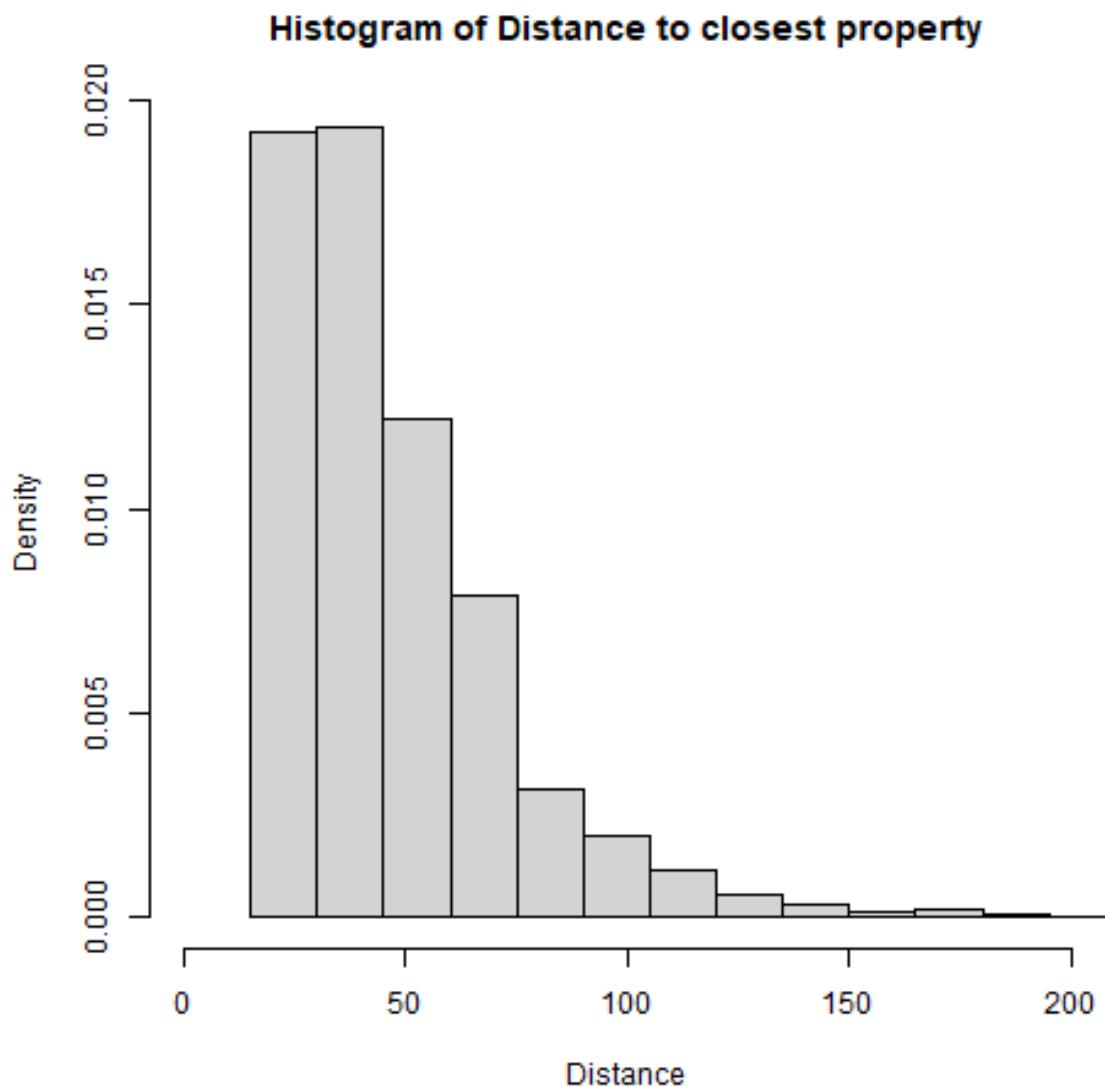


Figure 18: Histogram of minimum distance (in meters) between study properties

## F Matching

We match property owners using the following covariates:

- Unconditional tax morale
- Service conditional tax morale
- Perceived probability of punishment for non-compliance
- Satisfaction with FCC service provision
- Tax reform awareness and support
- RDN received in 2019 or 2020
- Opportunities to voice opinion about FCC governance
- Willingness to believe member of opposing party
- Mayor approval
- FCC councilor approval
- Gender
- FCC responsiveness
- Age
- Property value
- Education

We generate matched-pairs using the *blockTools* package in R. We use the Optimal Greedy (“opt-Greedy”) matching algorithm to find best matches along mahalanobis distance. In this matching process we weight certain variables higher than others, in line with our expectations that certain variables are a stronger predictor of our outcomes of interest. We place the greatest weight on our measure of unconditional tax morale—we expect this to be the strongest predictor to tax compliance, in line with the common use of this variable as proxy for tax compliance behavior. We place equal weight on another set of six measures from our baseline survey. Three of these measures are important factors in the literature on tax compliance: (i) service conditional tax morale, (ii) perceived likelihood of punishment for non-compliance, and (iii) satisfaction with FCC service provision. We also place equal weight on the (iv) gender of the property owner, (v) their awareness and support of the property tax reform,<sup>21</sup> and (vi) the number of these five variables that were imputed.<sup>22</sup>

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<sup>21</sup>We create a three level ordinal variable based on two survey items. A first group consists of respondents who have heard of the reform and strongly/somewhat support it; a second group consists of respondents who (a) have heard of the reform and feel neutral towards it and (b) have not heard of the reform; a third group consists of respondents who have heard of the reform and somewhat/strongly oppose it.

<sup>22</sup>This avoids matching observations with missing values on these key variables to observations that have non-missing values close to the mean.

<b>Variable name</b>	<b>Weights</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>	<b>n imputed</b>
Unconditional tax morale	1.10	3.77	1.55	1.00	5.00	25
Service conditional tax morale	1.00	1.96	0.96	1.00	3.00	11
Perceived probability of punishment	1.00	4.06	1.11	1.00	5.00	52
Satisfaction with FCC service provision	1.00	3.64	1.17	1.00	5.00	35
Gender (female = 1)	1.00	0.31	0.46	0.00	1.00	0
Reform awareness / support	1.00	2.38	0.67	1.00	3.00	19
RDN delivered 2019 or 2020	0.90	0.83	0.38	0.00	1.00	0
Opportunities for voice	0.10	2.13	0.99	1.00	4.00	174
Mayor approval	0.10	4.23	0.89	1.00	5.00	79
Councilor approval	0.10	2.73	1.22	1.00	5.00	122
FCC responsiveness	0.10	3.17	1.19	1.00	5.00	199
Believe opposition member	0.10	3.00	1.55	0.00	5.00	132
Age	0.09	51.77	12.93	20.00	100.00	11
Property tax value (USD)	0.09	60.25	87.45	2.88	1281.85	0
Education [0-2]	0.09	1.31	0.62	0.00	2.00	259

Table 9: Summary statistics of matching variables

Table 9 presents descriptive statistics and match weights for our matching variables. If a respondent refused to answer a question or said they “did not know” we imputed the value as the unconditional mean of the variable.<sup>23</sup> The last column displays the number of observations that were imputed for matching. Note that in general, the number of imputed responses is low.

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<sup>23</sup>Following suggestions of: <https://egap.org/resource/10-things-to-know-about-missing-data/>

## G Balance Table

Table 10 presents balance statistics for outcome variables (at baseline), matching variables, and several property-level characteristics.<sup>24</sup>

Variable name	Mean (Z0)	Mean (Z1)	SD (Z0)	N (Z0)	N (Z1)	Raw dif	Std. dif
Fiscal exchange willingness	4.19	4.18	1.22	1805	1804	0.01	0.008
Political efficacy	1.76	1.74	1.14	1794	1793	0.02	0.018
Tax system fairness	2.12	2.11	0.79	1112	1129	0.01	0.013
Neighbors' compliance	5.13	5.07	2.41	1138	1105	0.06	0.025
Unconditional tax morale	3.77	3.78	1.55	1797	1799	-0.01	-0.006
Service conditional tax morale	1.96	1.96	0.96	1805	1803	0.00	0.000
Perceived probability of punishment	4.06	4.06	1.11	1788	1781	0.00	0.000
Satisfaction with FCC service provision	3.64	3.64	1.17	1790	1796	0.00	0.000
Opportunities for voice	2.12	2.13	1.00	1719	1736	-0.01	-0.010
Mayor approval	4.23	4.22	0.89	1770	1774	0.01	0.011
Councilor approval	2.73	2.74	1.22	1751	1751	-0.01	-0.008
FCC responsiveness	3.17	3.17	1.18	1712	1719	0.00	0.000
Gender (female = 1)	0.31	0.30	0.46	1809	1809	0.01	0.022
Age	51.65	51.88	13.00	1803	1804	-0.23	-0.018
Reform awareness / support	2.38	2.37	0.67	1794	1806	0.01	0.015
Property tax value (USD)	60.12	60.38	86.49	1809	1809	-0.26	-0.003
Believe opposition member	3.02	2.99	1.55	1749	1744	0.03	0.019
Received RDN 2019 or 2020	0.83	0.83	0.38	1809	1809	0.00	0.000
Education [0-2]	1.30	1.32	0.62	1685	1694	-0.02	-0.032
Tax compliance 2020	0.07	0.07	0.25	1809	1806	0.00	0.000
Number of properties with tax liability 2021	1.93	1.89	1.48	1809	1806	0.04	0.027
Property on pave road	0.27	0.25	0.44	1809	1806	0.02	0.045
Property has water	0.47	0.47	0.50	1809	1806	0.00	0.000
Property has drainage	0.36	0.36	0.48	1809	1806	0.00	0.000

Table 10: Balance table

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<sup>24</sup>The last column of Table 10 standardizes the difference relative to the standard deviation of the control group.

## H Participation and experience in DTH

Participation frequency	percent
Never	0.050
Once	0.053
Once per week	0.053
Two or three times per week	0.227
Four to six times per week	0.080
Daily	0.536

*Note:*

Self-reported frequency of accessing the DTH group. Amongst respondents who we confirmed as joining the group.

Table 11: DTH participation

Item	Percent / Value
Voted for service [percent]	0.68
Sent any message in DTH [percent]	0.63
Median messages sent	2.00
Mean messages sent	3.84

Table 12: Voting and messaging behavior

activity	Perceived responsible actor				
	fcc	gov	researchers	citizens	other
organized	0.893	0.019	0.126	0.002	0.014
implement	0.961	0.045	0.018	0.017	0.006
fund	0.842	0.106	0.023	0.115	0.056

*Note:*

This table reports participants perceptions of which actor(s) organized, implemented, and funded the DTHs. Participants were allowed to name multiple actors. Data from mid-line survey.

Table 13: Organization, Implementation, Funding

Question	Agree [0-5]
DTH gave space to voice views to political representatives	3.94
DTH facilitated better understanding of community members views	4.04
Budget (LE15 Million) sufficient to meaningful improve selected service	2.86
Participants comfortable making views known	3.82
Menu of services reflected services community wanted improved, given budget	3.33
Selected service will be delivered in the near future	3.58
Vote was fair and gave every participant the same influence	3.83

*Note:* We asked respondents seven questions about their experience in the DTH. We asked questions in both positive and negative forms, so as to limit confirmation bias in the average response. Questions in the table are presented in the positive form.

Table 14: DTH experience

Figure 19: Number of messages by DTH

