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Civilians and the Strategic Use of Information during Conflict in Resource-Rich Territory[§]

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April 3, 2013

Abstract

[§]Jason Lyall and Jacob Shapiro provided theoretical and logistical advice at numerous crucial points. We thank Chike Egbulefu and Mariam Fagbemi for outstanding field management in Port Harcourt and project management in Lagos respectively, to Clinton Okpawhor and Charles Uche for assistance with the Pidgin translation, and to the excellent field teams based on Benin City and Port Harcourt. Several activists in the Niger Delta provided crucial assistance in developing the database of militant camps active in 2007 and 2008, and we thank Jo Croft and Stakeholder Democracy Network for their assistance in obtaining the government database of oil spills. Thanks to John Campbell, Evan Lieberman, Rebecca Littman, Jason Lyall, Betsy Levy Paluck, Jacob Shapiro, Abbey Steele, Alexandra Scacco, and the TAPGAH working group for comments on the questionnaire and experimental design. Barbara Zlotnik provided outstanding administrative support. The survey was fielded by TNS-RMS Nigeria in March 2013 following training of the field team by the authors. Two pilot studies were conducted in a urban-rural representative stratified random sample of the four study states in May 2012, and in a random sample of riverine oil communities in February 2013. Focus groups and open-ended interviews were conducted in Port Harcourt and the “Land of Liquid Gold” in May 2012, and in several rural communities affected by militancy in Bayelsa State and Rivers State in December 2012 and January 2013. Financial support for the survey from the International Growth Centre (Grant RA-2010-12-013) and the Princeton University Bobst Center for Peace and Justice is gratefully acknowledged. This research was approved by the Princeton University Institutional Review Board under Protocol #5358.

Are civilians strategic actors in civil conflict, or do they simply take direction from armed groups? In this paper, we explore the question of what, if any, role civilians play during conflict by examining the most likely case for a key civilian role, in civil conflicts in territory rich in natural resources. Why do civilians in resource-rich conflicts cooperate with armed groups in these conflicts? In this study, we explore these questions using original survey data that explores both the attitudes of civilians toward armed groups, but also the information held by civilians and their ability to transmit it to militants. We explore the attitudes and behaviors of civilians, and what role civilians can play and why they might choose to cooperate with militants during conflict.

Scholars have long recognized that difficult terrain such as dense forest or swamps make insurgency easier, because of the informational advantages of locals in navigating the area (cf. Fearon and Laitin, 2003). Our study area, the Niger Delta region of Nigeria, a labyrinthine network of small creeks among a dense mangrove forest, is just such an environment, in which aid in the form of riverine navigation and shelter is critical to combatants, both rebel and state. The popular understanding of the civil war in the Niger Delta oil production region in Nigeria focuses on the grievances of Delta residents against the Nigerian state and the international oil and gas companies, the level of corruption in state governments that receive large shares of the oil wealth, and long standing political disenfranchisement at the federal level.

Civilians, in collaboration with rebel groups with the capacity to produce violence, generate that capacity to obstruct. In the recent conflict in the Delta region, the umbrella militant group MEND is claimed to have had a membership of between 5,000 and 10,000 at its height. This is very few to cover an area roughly the size of Ireland. Rather than collecting intelligence on the locations of oil production and the activities of oil firms directly, the groups can rely on the broad network of civilians living in communities that often abut oil installations or through which oil pipelines flow directly.

We will show in this paper that civilians in the Niger Delta hold substantial information about the oil industry's activities, about navigation in the difficult mangrove swamp terrain of the region, and about the movements of the combatants. We then examine how civilians can share that information with armed groups, by examining the extent of social network overlap between militants

and civilians. We show that there is substantial interaction between communities near militant camps and the operations of militant financiers (oil theft organizations), and that nearly a fifth of respondents are estimated to personally know a militant, either a friend or family member. We show in related research (Blair and Imai n.d.) that civilians do provide information to the militant groups currently operating in the region. Almost 20% of respondents to a survey of a stratified random sample of communities in the region are estimated to have given information.

1 A role for civilians in civil war

With the exception of a small number of relatively recent studies, the question of why civilians collaborate with armed groups in civil war remains under studied. Given this and the measurement issues inherent in identifying collaboration or cooperation behaviors in civilian populations during wartime, scholars of comparative politics are left with little evidence with which to develop inductive theories. One approach has been to develop a nearly tautological view of the relationship between support for groups and the extent of collaboration. For example, Beath, Christia and Enikolopov (2011) see supportive attitudes and behaviors as tautologically connected in a study on the effects on civilian attitudes and security outcomes of an aid program in Afghanistan: “In the context in which the information constraint is binding, an increased support for the government and greater willingness to share information would affect violence close to the village, since information regarding the insurgency is likely to be localized” (pg. 19). Similarly, Crost and Johnston (2010) write that “successful development projects may increase the population’s support for the government, making individuals more willing to supply the government with intelligence on insurgents’ plans and whereabouts” (pg. 1). Berman, Shapiro and Felter (2011) suggest that “some noncombatants know what insurgents are doing” and that information they may have, such as “the identity of insurgents, a planned ambush, the location of an improvised explosive device. . . , or that of a weapons cache,” is useful to some kinds of counterinsurgency forces (pg. 773).

This tautological view of the causes of civilian collaboration has received some criticism, and two recent studies propose a strategic logic for civilians. In the most direct test of the strategic view of civilian use of information, Douglass (2012) argues that civilians share or do not share information

in order to reduce the total amount of violence they experience. Civilians are seen to “face a choice between withholding information and suffering random targeting or providing some information and risking retaliation by the other side” (pg. 4). Civilians can provide information to enable selective violence (low noncombatant casualties), obviating the need for indiscriminate campaigns. Condra and Shapiro (2012) argue that civilians strategically provide and withhold information to “punish” (“reward”) combatants for bad (good) treatment, and that in particular, civilians can choose whether or not to share information to counterinsurgents that “facilitates raids, arrests, and targeted security operations which reduce insurgents’ ability to produce violence” (pg. 4). They find suggestive evidence that local political circumstance may constrain the ability of civilians to exercise these choices.¹ Lyall (2009) argues that this logic may even extend to campaigns of indiscriminate violence by the state: “If local populations come to blame insurgents, not the incumbent, for the state’s repressive acts, then an insurgency may be forced to curb, if not abandon, its current tactics and strategy to avoid provoking further counter-mobilization” (pg. 337). This may cause civilians to provide information to the state in response to *state* violence. Balcells (2011) offers an additional strategic calculus, suggesting that civilians are more likely to support targeted direct violence in their locality when the local balance of power is closely contested. Civilians prefer violence only if it might tip the balance in their favor, and will provide information and material support to combatants only in that circumstance. Finally, Shapiro and Weidmann (2012) find suggestive evidence that increasing the ability of civilians to report information to counter-insurgency forces, in this case through expanding cell phone networks, may diminish the ability of insurgents to succeed. Kalyvas and Kocher (2007) cautions each of these analysts to consider the coercive power of rebels on nonparticipants, that is, on non-recruits. The risks to not providing information are often tremendous.

Theory and evidence on collaboration with combatants during wartime focuses on three types: information sharing, which will be the subject of this study; material aid; and provision of willing recruits. I will address each in turn. For Kalyvas (2006) and Berman, Shapiro and Felter (2011), counterinsurgency forces depend on information from civilians, and insurgents strategically avoid

¹The authors find that insurgent violence is a function of past civilian victimization by either side only in ethnically heterogeneous districts and dense urban ones.

using violence against civilians to encourage them to withhold that information from counterinsurgents. In a related argument, Lyall (2010) finds that coethnics are more effective counterinsurgents, in part because they are better able to identify insurgents among the population and issue credible threats against them. Shapiro and Weidmann (2012) find that increasing cell phone reception decreases insurgent violence by increasing the flow of information from civilians to counterinsurgents. Condra and Shapiro (2012), similarly, find that civilians “punish” insurgents for high levels of violence, since the “insurgents’ ability to conduct attacks is limited by the degree to which the civilian population supplies valuable information to counter-insurgents.”

Information sharing is risky and thus costly, but providing material aid in the form of navigational aid, shelter, or cash is observable by third parties and in some cases may be even more risky. “Those who supplied tortillas, information, and other aid to the guerillas took mortal risks and yet stood to gain no more than those who eschewed these risks, were the government forces to be defeated or a favorable peace secured,” writes Wood (2003) of supporters of the FMLN in El Salvador.

Substantial recent work engages the question of why (and which) individuals decide to join rebel movements and participate directly in civil war. In a now classic statement, Weinstein (2007) finds that whether “material resources to finance warfare can be easily mobilized without civilian consent,” (pg. 7) determines the types of individuals that join movements and the types of organizations that emerge. In particular, it may be more difficult to attract high ability recruits in resource-rich environments. Humphreys and Weinstein (2008) test these hypotheses more systematically with survey data from recruits into several rebel movements in Sierra Leone, and find that poor, uneducated, politically alienated citizens who were plied with material incentives are most likely to be recruited — forcibly or voluntarily — into a rebel and a counter-rebel movement. Beber and Blattman (2013) argue that some rebel leaders recruit children as soldiers because they are “easier to intimidate, indoctrinate and misinform than adults.”

Combatants wish to extract resources, information, or recruits from civilian populations, and the extent that they need to shapes how combatants and civilian populations regard each other. There are two main findings in this literature. The first strand studies the causes of rebels choosing

strategies that victimize civilians or aim to minimize harm (indiscriminate versus discriminate violence), and the second the consequences of those strategies for civilian support of combatants. Humphreys and Weinstein (2006) finds that rebel groups that rely on material incentives for cadre recruitment are more likely to exploit civilians. Several recent studies examine the effects of violence on the ability of combatants to retain support among the population. Blair et al. (2013) argue that civilian victimization substantially diminishes support for the perpetrator, leading to dramatic differences in affect between the poor, who are the primary victims, and middle class Pakistanis. Lyall, Blair and Imai (Forthcoming) show that victimization by combatants substantially diminishes affect towards the side responsible, but that this is conditional on the identities of the combatant and civilian.

In these resource-rich conflicts, civilians hold substantial information about the movements and activities of resource management firms that may be useful to combatants trying to interrupt those activities in order to increase their bargaining power in the state. Rebels may be cognizant of the reductions in popular support caused by victimization, which the theories reviewed here suggest might lead to reduced cooperation and thus less information sharing. We have suggested earlier in this dissertation that in resource-rich conflicts, the rates of victimization are relatively low and that indeed most aggression is against oil company infrastructure and their foreign staffs and often this is away from populated areas. The nature of the low-level conflicts in resource-rich regions, therefore, may in fact be a product of the need to extract information from civilians.

There are two primary implications of this theory for civilian behavior. First, civilians must hold valuable information for waging civil war in a resource-rich region. Several kinds of information may be useful to combatants: information about the combatants and their activities, local navigational knowledge, and intelligence about the locations of resource extraction and the activities of extraction firms. In this paper, this conjecture is taken to data from the survey of civilians in the Niger Delta, and the amount and type of information held by civilians is estimated. To our knowledge, this is the first survey evidence about the types of information held by civilians in civil war. Extant work focuses on distal impacts of assumed information held by civilians, rather than directly examining whether and how often the information in fact exists.

This project, secondly, tests the key implication of the theory presented in a preceding chapter: that civilians in resource-rich regions cooperate with rebel groups by providing actionable information about the resources, combat, or local terrain. It is this cooperation between civilian and rebel that grants groups in resource-rich regions bargaining power with the state to insist upon retaining the revenues from resources extracted locally. This portion of the research is presented in Blair and Imai (n.d.).

In summary, the analysis of this paper will present evidence on three subjects: the attitudes of civilians toward armed groups; the combat-relevant information civilians hold; and the social embeddedness of civilians and members of armed groups, meaning the extent it is possible for civilians to share that information. We will conclude with thoughts on the relationship between support for the groups and these cooperative behaviors. Attitudes and cooperation behaviors of civilians will be considered for militants in the Niger Delta during the height of the crisis between 2007 and 2008, and with the oil theft industry that provided the bulk of funding for these groups.

2 Militancy and Oil Theft in the Niger Delta

2.1 Militant camps in the Niger Delta, 2007–2009

The major militant forces that remained in operation by the resurgence of the conflict in 2007, some such as the Niger Delta People’s Volunteer Force and some the unnamed private forces of an individual, were organized into major camps populated by a dozen or more fighters in addition to their commanders as well as satellite camps of smaller size scattered in strategically important areas. The major camps were the source of most major attacks and operations against state forces and oil installations, whereas the satellite camps largely served as additional information gathering hubs.

Approximately 50 major camps operated during the period of the second crisis between 2007 and the amnesty agreement in 2009. For this project, a database of the major camps was constructed, and meant to include all of these camps, based on documentary sources and numerous conversations with key activists in Port Harcourt. The database is presented in Appendix A. A full account of

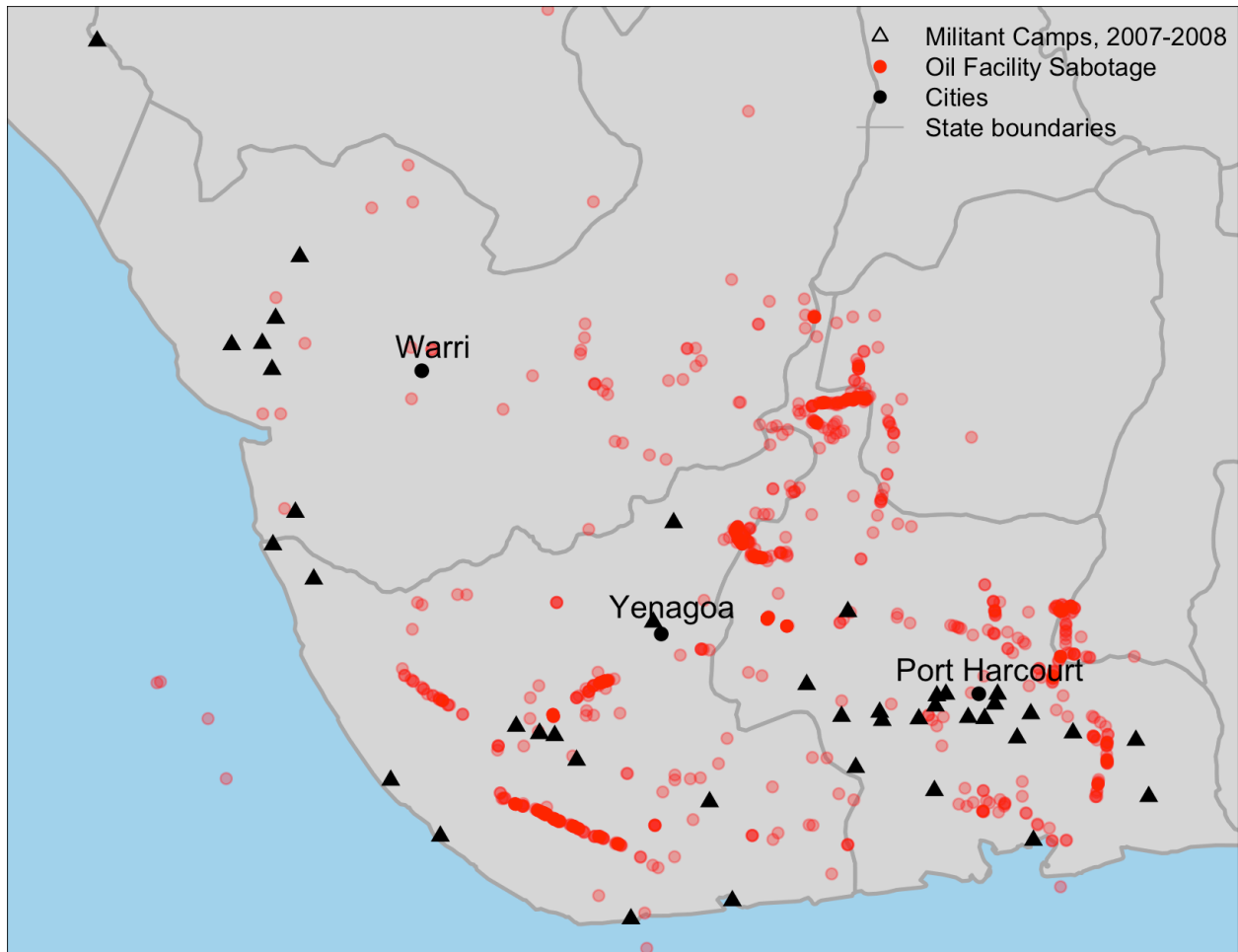


Figure 1: Militant Camps Active from 2007–09 (black triangles) and Sabotage at Oil Facilities from 2011–12 (red circles) in the Niger Delta region. Militant camps identified from a database collected in collaboration with activists in Port Harcourt Nigeria of major camps active from 2007 until the amnesty agreement in late 2009. Sabotage identified from the confidential oil spills database held by the Ministry of Petroleum Resources Hydrocarbon Pollution Restoration Project based on reports from oil companies on oil spills, including their date, location, and cause. Spills identified as caused by third party activities are depicted.

the satellite camps, which were more ephemeral than the major operations, was beyond the scope of this project. However, given the relatively small geography of the Niger Delta region and the spatial concentration of the major camps, it is clear that the modal experience of communities interacting with militants would have come from the major camps documented in this paper.

2.2 The oil bunkering industry in Nigeria, 2011–2013

The major source of funding for the militants in the conflict in the Niger Delta from the 1990s to the present is the oil theft industry, known in Nigeria as “oil bunkering.” This multi-billion dollar

industry continues today, and in this paper we explore civilians' role in oil bunkering. Due to recall issues, it is difficult to differentiate armed group activities and oil theft activities during the crisis between 2007 and 2008, so we focus instead on the present day.

The oil bunkering industry today consists of several layers. There are two major profit sources and the industry is organized into two production chains around them: bulk crude oil sale to foreign firms and states, and the production of motor spirits and other refined products for sale in Nigeria. The first stage in each part of the industry is the siphoning of crude oil from the oil pipelines, wells, transfer stations, and jetties of licensed oil firms. For the international oil trade sector, this crude is then loaded onto barges in the creeks of the Niger Delta and then taken out beyond Nigerian national waters and transferred onto unmarked oil tankers for shipment overseas. Often the bills of lading are changed so that the oil appears to have been shipped legally from Nigeria or elsewhere. For domestic production, the siphoned crude is transferred to a network of local refiners, which form the largest part of the oil bunkering labor force. Refining crude oil into motor oil, kerosene, and other products is not a technically difficult process: it involves heating the crude to certain temperatures (local refinery workers are called "cooks"). As such, there are hundreds of small refineries across the Niger Delta employing less than 10 employees that take siphoned crude, refine it, and transfer it for sale either in the same state in the Niger Delta or via trucks to other parts of Nigeria.

Oil theft from pipelines and other oil company facilities is often a more difficult technical process, however. Oil can be stolen from active pipelines ("hot" siphoning) or from temporarily inactive pipelines ("cold") disabled by theft industry workers for the purpose. Hot siphoning is technically difficult, and likely requires the assistance of current or former technical employees of the oil companies. Cold siphoning requires sabotaging the facility or pipeline so that the oil company shuts off the flow of oil temporarily to repair the damage, and in the meantime the oil theft workers drill a hole and divert some of the oil to their own apparatuses. It is not known how many oil siphoning operations there are, but some are on a grand scale and divert huge volumes of oil onto jetties in the creeks that are then sent to the international market. Some are smaller operations.

In this paper, we explore the social embeddedness of oil bunkerers (both those who “cook” or refine oil, and those who “collect” or siphon oil) by sampling communities near where sabotage activities took place — where oil collectors may have intentionally stopped oil flow to add their own flow diversion. These areas were identified using classified government data collected by the Hydrocarbon Pollution Restoration Project of the Nigeria Department of Petroleum Resources, the regulatory agency of the oil industry. After damaging oil spills in Ogoniland in the Niger Delta in the early 2000s and litigation against Shell’s Nigeria affiliate for the damage, the government instituted mandatory spill reporting. In those spill reports, which are not made public, the companies report the cause of the spill, such as mechanical malfunction, operator error, or “third party” interference. This last category, which is used to identify potential bunkering spots, is meant to indicate places where the oil company believes sabotage activities took place to cause the spill.

3 Survey Design

In this paper, we present evidence from a 3,000-person survey in the Niger Delta conducted in March 2013 in areas surrounding militant camps operating in 2007–2009 and currently affected by oil theft activities. In this section, we describe the sampling procedure and the measurement strategies used to estimate the three key quantities of the paper — the proportion of respondents with knowledge about oil extraction, the proportion who know a militant, and the proportion who share combat- or oil-relevant information to militants.

To test the implications of the theory described above, we conducted a survey of residents of a stratified random sample of communities in the Niger Delta in southern Nigeria. In addition to eliciting the types of information about oil production and the activities of combatants from respondents, the survey aims to identify the proportion of respondents who know combatants, and then who provide that information to combatants. In all survey research, a key challenge is eliciting truthful beliefs. In this context, that challenge is dramatically heightened by the fact that responding truthfully about providing information to combatants in the conflict in the Niger Delta may put respondents in physical danger from the militant groups who may see positive responses as traitorous and from the state which may view them as admissions of criminal culpability.

To address these issues, we employ two types of survey experiments designed to indirectly question respondents about providing information, and use statistical techniques we developed with collaborators (Blair and Imai, 2012; Blair, Imai and Lyall, 2012) to recover efficiently the proportion of respondents who provided information. The survey employs the first survey questions designed to elicit truthful responses indirectly to questions about the social embeddedness of civilians and armed group members, and on collaboration with those groups.

3.1 Sampling

The sample of respondents was chosen through multi-stage random sampling. Communities were randomly sampled from the set of two types of communities: those near militant camps operating from 2007 to 2009, and those near oil spills caused by sabotage (the potential oil bunkering communities).² The data used to identify each type of community was described in Section 2. 100 communities were chosen from each subset. Within each of the 200 sample communities, households were selected through a random walk pattern, and respondents were randomly selected using a Kish grid. Men aged 16 and 17, who are potential oil bunkering workers, were included the sample³, but only women 18 and above were included.

3.2 Estimating Support for Militants: The Double List Experiment Design

How can we measure civilian attitudes toward militant groups in post-conflict environments? In the Niger Delta, though fighting ended in 2009 with the signing of an amnesty agreement between top militant commanders and then-Nigerian President Yar'Adua, militants remain in communities in varying states of demobilization.⁴ Asking, in public, questions about sensitive attitudes such as *support* for militants during their campaign of violence in 2007 and 2008 is a challenge. Responses may be affected by social desirability bias — respondents may want to communicate attitudes that

²Communities in the bunkering sample frame were included if they were one of the ten communities closest to an oil spill event attributed to third party interference, and those in the militant camp sample frame if they were one of the ten communities closest to a former militant camp.

³A special minor consent form was enumerated to boys and their parents, but there were no other differences in the survey protocol for these respondents.

⁴Though the amnesty agreement required an exchange of arms for salaries, it is alleged that few weapons were actually turned in and that many combatants retain their arms and the possibility of re-mobilizing.

conform to those of the enumerator or those standing nearby — or they may be censored for fear of revealing negative attitudes to eavesdropping militants.

To address these issues, we employ a *list experiment* designed to elicit truthful responses to such sensitive questions. In particular, we use a double list experiment to most efficiently recover these truthful responses. List experiments obscure truthful responses to protect the respondent's privacy through aggregation: the sensitive item is included in a list of other items and the respondent is asked to respond with the number of groups they hold a certain attitude toward. The double list experiment does this twice: the sensitive item is added to two different lists of items, which gives us more information about the sensitive item.

There are two treatment groups, and for all respondents two questions are read. First, in group 1 a question with a list of control items — the items that partially obscure the response to the sensitive item — are asked, and second the second list with different control items plus the sensitive item. The same is read to group 2 with the lists flipped. The full script is reproduced below.

Treatment group 1 script

I'm going to read you a list with the names of different groups and individuals on it. After I read the entire list, I'd like you to tell me how many of these groups and individuals you broadly support, meaning that you generally agree with the goals and policies of the group or individual. Please don't tell me which ones you generally agree with; only tell me how many of these groups or individuals you broadly support.

The Nigerian National Petroleum Company
The Nigerian labor congress
The local youth group
The local vigilante group

How many, if any, of these individuals and groups do you support? __

Treatment group 2 script

I'm going to read you a list with the names of different groups and individuals on it. After I read the entire list, I'd like you to tell me how many of these groups and individuals you broadly support, meaning that you generally agree with the goals and policies of the group or individual. Please don't tell me which ones you generally agree with; only tell me how many of these groups or individuals you broadly support.

The Action Congress Party
Traditional rulers
Youth Corpers
The People's Democratic Party

How many, if any, of these individuals and groups do you support? __

Now I'm going to read you one more list of different groups and individuals on it. Again, I'd like you to tell me how many of these individuals and groups that you broadly support.

The Action Congress Party
Traditional rulers
Youth Corpers
The People's Democratic Party
Militants before amnesty

How many, if any, of these individuals and groups do you support? __

Now I'm going to read you one more list of different groups and individuals on it. Again, I'd like you to tell me how many of these individuals and groups that you broadly support.

The Nigerian National Petroleum Company
The Nigerian labor congress
The local youth group
The local vigilante group
Militants before amnesty

How many, if any, of these individuals and groups do you support? __

We estimate the proportion of respondents who say that they support “militants before amnesty” by subtracting the mean response to the control item list (the first question read) from the second question in the other group. We repeat this exercise for the second group and then average these two estimates. We repeat this exercise for “oil bunkerers and local oil refiners.” In the following section, we will develop a formal statistical framework for analyzing data from the double list experiment, which will allow us to more efficiently recover this proportion.

3.3 Estimating the Social Embeddedness of Militants in Rural Communities: The Randomized Response Design

To estimate the degree of social connection between civilians and militants — which will bound the extent to which information can be transmitted between the two groups — we face the same type of concerns regarding self-reported responses to sensitive issues. To address this in this second context, we use the randomized response design which allows us to ask direct questions but obscure the true response using true random variation.

The randomized response technique, in which a sensitive question is combined via a randomization privately implemented by the respondent with noise independent of the response, was introduced in Warner (1965) and later to political science in Gingerich (2010). There are several general variants, depending on the type of noise introduced — either the answer to an unrelated non-sensitive survey item (Greenberg, Abul-Ela and Horvitz, 1969) or random noise.

The variant used in this study was chosen for its simplicity of implementation and explanation to the respondent. This technique, as with all methods for eliciting truthful responses to sensitive items, requires that respondents understand how their privacy is being protected — or at least believe it is. The sensitive item is combined with random noise introduced by a single roll of a six-sided dice carried out outside the view of the enumerator. The item is best explained by the instructions read to the respondent, back-translated to English, with instructions to the enumerator in capital letters:

For this question, I want you to answer "yes" or "no." But I want you to consider the number of your dice throw. If 1 shows on the dice, tell me "no." If 6 shows, tell me "yes." But if any other number, like 2 or 3 or 4 or 5 shows, tell me your own opinion about the question that I will ask you after you throw the dice.

[TURN AWAY FROM THE RESPONDENT] Now throw you the dice so that I cannot see what comes out. Please do not forget the number that comes out. [WAIT TO TURN AROUND UNTIL RESPONDENT SAYS YES TO:] Have you thrown the dice? Have you picked it up?

Now let me ask you the question. During the crisis in 2007 and 2008, did you know any militants, whether they were your family member, your friend, or whether they were someone you talked to at least once a week. Remember, take note of the number from the dice when you answer.

- Yes 1
- No 2
- Refused [DO NOT READ] 99

In this way, the distribution of responses is a mix of the respondents' opinions for two thirds of the sample, when the dice throw is 2, 3, 4, or 5; and one sixth "yes," when the dice throw is 6; and one sixth "no," when the dice throw is 1. In the next section, we present a formal statistical framework for analyzing data from this type of randomized response question.

4 Statistical Analysis of the Survey Experiments

4.1 Double List Experiments

4.2 Setup

We begin with a random sample of $i = 1, \dots, N$ individuals who are randomly divided into two groups identified by $T_i^a \in \{0, 1\}$, and equivalently $T_i^b = 1 - T_i^a$, where a and b identify the two sets of J control items, with the size of each group N_0 and N_1 , respectively.

We administer two questions to each random sample, one soliciting a count of one of the two sets of J control items and the second soliciting a count of the other set of J control items plus the sensitive item. In the first treatment group, we first ask the set of J control items from list b , recorded as $Y_i^b(T_i^b = 0)$, and then the full list of $J + 1$ items from list a , $Y_i^a(T_i^a = 1)$. In the second treatment group we first ask the set of J control items from list a , $Y_i^a(T_i^a = 0)$ and the full list of $J + 1$ items from list b , $Y_i^b(T_i^b = 1)$. The sensitive item is the same in each group.

We can generalize the assumptions proposed for the single list experiment by Blair and Imai (2012) to the double list case as follows. The first assumption is that the responses to the control items do not change depending on whether they are asked as part of the short list (J) or the list with the sensitive item ($J + 1$). This is the *no design effect assumption*, which we write as,

Assumption 1 (No Design Effect). *For each $i = 1, \dots, N$, and for each $k = a, b$, we assume*

$$\sum_{j=1}^J Z_{ij}^k(T_i^k = 0) = \sum_{j=1}^J Z_{ij}^k(T_i^k = 1) \quad \text{or equivalently} \quad Y_i^k(T_i^k = 1) = Y_i^k(T_i^k = 0) + Z_{i,J+1}^k(T_i^k = 1).$$

Secondly, we assume that respondents give truthful answers for the sensitive item, whether it is asked as part of list a or b . We call this the *no liars assumption* and write it as follows,

Assumption 2 (No Liars). *For each $i = 1, \dots, N$, we assume*

$$Z_{i,J+1}^a(T_i^a = 1) = Z_{i,J+1}^b(T_i^b = 1) = Z_{i,J+1}^*$$

where $Z_{i,J+1}^*$ represents a truthful answer to the sensitive item.

Note that this also requires, by assumption, that the sensitive items asked in the two lists are identical. Though this could be relaxed by simply assuming that $Z_{i,J+1}^k(T_i^k = 1) = Z_{i,J+1}^{*,k}$ for each

list, there would be no advantage to the double list over two separate list experiments for those two sensitive items separately.

The two assumptions also require, by assumption, that responses to the sensitive item do not vary depending upon the control list presented before them.

4.3 Identification

Considering the two lists separately, we can identify the (unobserved) individual-level response to the sensitive item simply from Assumptions 1 and 2 for each list $k = a, b$,

$$Y_i^k(T_i^k = 1) - Y_i^k(T_i^k = 0) = Z_{i,J+1}^* \quad (1)$$

From the random sampling of the groups identified by T_i^k , we can justify the difference-in-means estimator for each list, defined as follows,

$$\tau_k = \frac{1}{N_{1\{k=a\}}} \sum_{i=1}^N T_i^k Y_i^k - \frac{1}{N_{1-1\{k=a\}}} \sum_{i=1}^N (1 - T_i^k) Y_i^k \quad (2)$$

To leverage the double list design, we can simply take the mean of the two estimates,

$$\tau = \frac{\tau_a + \tau_b}{2} \quad (3)$$

$$= \frac{1}{2} \left\{ \left(\frac{1}{N_1} \sum_{i=1}^N T_i^a Y_i^a - \frac{1}{N_0} \sum_{i=1}^N (1 - T_i^a) Y_i^a \right) + \left(\frac{1}{N_0} \sum_{i=1}^N T_i^b Y_i^b - \frac{1}{N_1} \sum_{i=1}^N (1 - T_i^b) Y_i^b \right) \right\} \quad (4)$$

4.4 Randomized Response Design with Dice

With the same type of setup for the list experiment, we wish to estimate the proportion of respondents answering “yes” to the sensitive question about the social embeddedness of militant groups, but we only observe the response in addition to random noise introduced by the dice. We are interested in $Pr(Y_i = y \mid X_i = x, T_i = 1)$, the response Y_i given some covariates X_i and an indicator for the dice throw T_i which is equal to 1 if the dice throw represents truthful response (in this case dice throws of 2, 3, 4, or 5) and equal to 0 otherwise, if the respondent is meant to respond based on the dice throw alone.

Let $f(y; x, \delta) = \Pr(Y_i = y \mid X_i = x, T_i = 1)$. Then the observed likelihood is,

$$L_{\text{obs}} = \prod_{i=1}^N [\Pr(T_i = 1) f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i} + \Pr(T_i = 0) 0.5] \quad (5)$$

$$= \prod_{i=1}^N \left[\frac{2}{3} \cdot f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i} + \frac{1}{6} \right] \quad (6)$$

$$\log L_{\text{obs}} = \sum_{i=1}^N \log \left[\frac{2}{3} \cdot f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i} + \frac{1}{6} \right] \quad (7)$$

See Appendix B for a derivation of an expectation-maximization algorithm to estimate this, considering the treatment indicator (the dice throw) missing data. We estimate the function $f(y; x, \delta)$ and calculate the proportion of respondents who say “yes” to the sensitive item.

5 Analysis

In this section, we present evidence to estimate the knowledge held by civilians in resource-rich conflicts, the extent to which they are socially connected to militants, and civilian support for the groups. We find that civilians in the oil-rich Niger Delta possess substantial information about militant groups, including actionable intelligence such as the movements of the counterinsurgency Joint Task Force and oil company activities in oil production facilities near their communities. We find, moreover, that the social networks in these communities are deeply entwined with the social networks of militants — many civilians, in fact, know a militant themselves. Finally, we show that militants and their financiers are not universally loved but that nearly a quarter of respondents are estimated to support the goals of each group.

5.1 Knowledge

First, we present evidence that Niger Delta civilians hold substantial, relevant information about oil production in their communities, navigation in the difficult terrain in rural areas, and about the movements of the combatants. A small, but not insignificant, proportion of respondents in both urban and rural areas are directly connected to the oil industry: 12% reported that a member of their household currently had a job with an oil company or one of its contractors, and a further

11% reported that a household member held such a job in the past. These were relatively evenly divided between respondents from rural, oil-producing areas and those from urban areas. Moreover, the oil companies either made direct payments or build development projects like wells, schools, or roads in respondents' communities in the past: 22% reported that their households had received a cash payment other than income for a job, and 55% reported that a project had been built in their community (with most projects built in rural oil-producing communities).

Three types of information civilians could hold in a resource-rich region are queried: information about oil production and the oil firms, information about the local environment that could be useful to rebels, and information about the movements of other combatants. Respondents to the survey report substantial knowledge of the oil production process near their communities. Nearly 85% of civilians in oil-producing communities reported that there were oil wells, pipelines, or other oil company facilities in their communities. Slightly over half of respondents reporting oil facilities in their communities said they walked past the facilities within the preceding month (52%). Respondents were then asked whether oil companies were pumping oil in their communities, and 52% responded affirmatively. To probe further how much contact these civilians have with oil production, the survey asks about contact with oil spills. 52% reported contact with oil in the water or on land near water near where they live in the last year, and of those who did 62% reported seeing a spill within just the last month.

Scholars of civil war have long noted that insurgents hold substantial advantages with respect to the state when they operate in difficult terrain, such as dense forests or mountainous terrain (Fearon and Laitin, 2003). It is easier to evade government forces, in part because insurgents have access to local knowledge about the terrain and how to navigate it whereas state military forces often do not. The Niger Delta is just such an environment, characterized by dense mangrove swamps and intertwined shallow creeks. The survey probed the ability of civilians to navigate in the creeks with two questions. 49% reported being able to navigate a boat in creeks in the respondent's community and 80% reported being able to navigate nearby forests.⁵

⁵The questions in English read, *Are you yourself able to navigate a boat in the creeks near where you live, meaning you are able to get around in the creeks, even if you can't drive the boat yourself?* and *If you were to get lost in the forest near where you live, would you be able to find your way back home?*

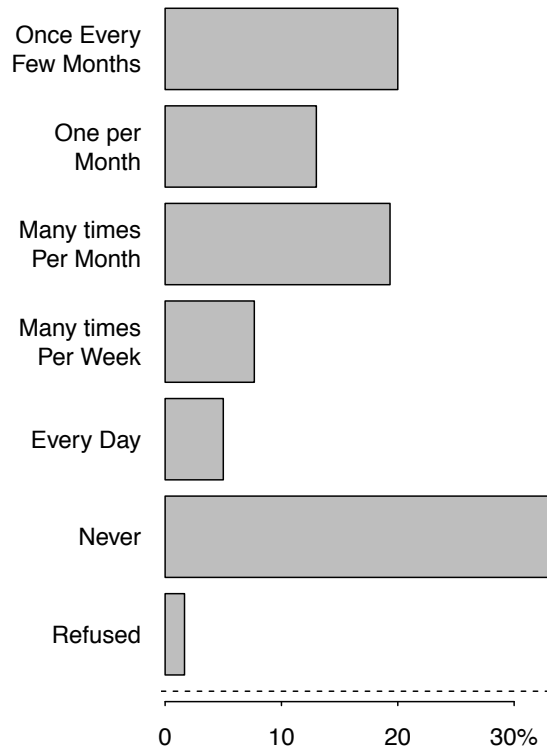


Figure 2: Large Majority of Respondents Frequently Encountered Militants During the Crisis. Two thirds of respondents reported encountering militants once every few months or more, and nearly 20% reported encountering them “many times in a month.”

Respondents also reported contact with rebel groups and the joint task force in their communities, suggesting substantial knowledge of the movements of the combatants. 23% reported encountering militant groups at least within the last month. Of greater interest to the rebel groups, of course, is that 59% reported encountering state security forces at least within the last month. Given the low intensity of the conflict during this period, a surprisingly large number of respondents in these communities reported attacks on oil facilities or oil works in their community (13%).

Together, this evidence suggests that civilians in the oil-rich Niger Delta region hold substantial relevant information that could be usefully shared with rebel groups that are active in the region, both in terms of helping rebels avoid detection by state security forces through navigational aid or monitoring the state’s troops or in terms of information about the conduct of oil extraction, which these groups often aim to disrupt.

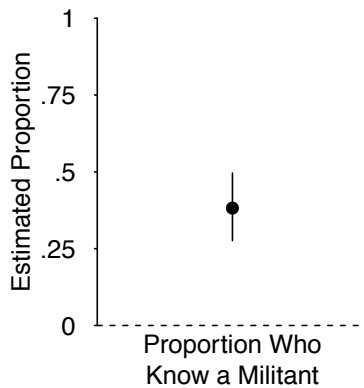


Figure 3: Nearly 40% of Respondents Are Estimated to Know a Militant in 2007 and 2008. Using the randomized response design presented in Section 3.3, 38.12% of respondents are estimated to know any militants, whether they were are a family member, a friend, or if the respondent and a militant spoke at least once a week. Estimate and 95% confidence interval calculated using quasi-Bayesian approximation.

5.2 Social embeddedness

To assess whether civilians are sufficiently socially connected to militants in the Niger Delta to be in a position to provide information to them relevant to the conflict, we first ask direct questions of an impersonal nature about their contacts with militant. We then ask using the randomized response method for asking sensitive subjects whether respondents personally know a militant.

A large majority of respondents frequently encountered militants, such that at least they see them or would be in a position to pass information. We ask how frequently civilians encounter militants during the period of the violent crisis in 2007 and 2008. Figure ?? presents the distribution of responses to the question. Though a third of respondents had never encountered militants, among those that had, nearly half encountered militants “many times per month.”

To directly test whether civilians were in a position to pass information to militants, we asked using the randomized response design whether civilians know militants personally, as in a family member, a friend, or someone they talk to at least once in a week. Nearly 40% of respondents are estimated to have responded that they knew a militant in the period between 2007 and 2008. Figure ?? presents the estimated proportion who knew a militant and its 95% confidence interval. A substantial proportion of residents in the Niger Delta proximate to militant communities personally knew a militant during the crisis, presenting the possibility that they could tip them off with

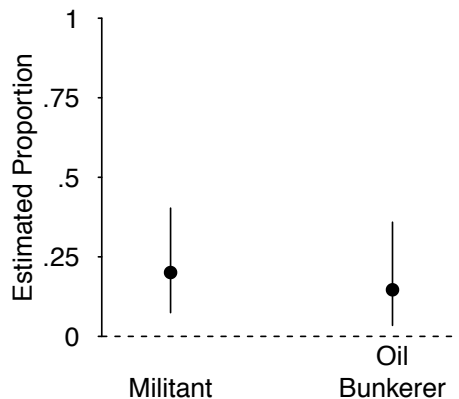


Figure 4: 20% of Respondents Estimated to Support Militants and 15% Support the Oil Theft Industry. Using the double list experiment design presented in Section 3.2, we estimate that nearly a fifth of respondents support militants and oil “bunkerers” from the oil theft industry. Estimates for the double list experiment were calculated by averaging the two estimates for each list experiment and 95% confidence intervals for the combined estimate were calculated using quasi-Bayesian approximation.

combat-relevant information.

5.3 Civilian attitudes

What do civilians think of armed groups and their affiliates? We estimate that though support is low, nearly a quarter of respondents in communities near militant camps and oil theft operations support militants and oil theft workers. Using the double list experiment methodology presented earlier, we estimate that 23% of respondents “generally agree with the goals and policies” of militant groups operating in 2007 and 2008, while 15% support the oil theft industry that funded those militants. In Figure 4, we present the list experiment estimates of attitudes toward each group with 95% confidence intervals estimated using non-parametric bootstrapping.

6 Discussion

In this paper, we examined the relationship between civilians and members of armed groups in combat. By focusing on a resource-rich environment, the oil-related conflict in the Niger Delta region of Nigeria, we examined a potentially high-information environment in which dispersed populations could potentially aid rebels by collecting and providing information on oil company

activities to aid oil theft operations that fund armed activities. We demonstrated that civilians do in fact hold substantial combat-relevant information. The paper then explored whether civilians were in a position to share that information by considering how and how often civilians encounter militants. Instead of focusing on dichotomous measures favored in earlier survey research, we explored *how* civilians encounter militants and whether those means could lead to information sharing. In related work, we show that militants frequently obtain information from civilians, and that 20% of civilians regularly shared information during the violent crisis between 2007 and 2008.

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Appendix

A Niger Delta 2007–2008 Militant Camps Database

Leader	Camp Location	LGA	State
Ebi Albert aka Commander Eze	A fishing settlement near Odioma	Brass	Bayelsa
Gibson Kala aka Prince Igodo	Igbabeleleu	Brass	Bayelsa
Ken Neweigha aka Daddy Ken	Odi	Kolokuma/Opuokuma	Bayelsa
Commander Woki Godwill Ibralafu aka Kitikata	Obioku waterways	Nembe	Bayelsa
Victor Ben aka Boyloaf	Agge	Southern Ijaw	Bayelsa
Commander Jackson aka The Young Shall Grow	Azuzuama	Southern Ijaw	Bayelsa
Victor Ben aka Boyloaf	Ezetu	Southern Ijaw	Bayelsa
Commander Adonna	Furupa	Southern Ijaw	Bayelsa
Victor Ben aka Boyloaf	Gbekeregbene	Southern Ijaw	Bayelsa
Timi Ukparasia Owe aka General Africa	Ikeberi 1	Southern Ijaw	Bayelsa
Timi Ukparasia Owe aka General Africa	Ikeberi 2	Southern Ijaw	Bayelsa
General Reuben Wilson, fondly called Pastor	Koluama	Southern Ijaw	Bayelsa
Gibson Kala aka Prince Igodo	Okiegbene/Ebrighbene axis	Southern Ijaw	Bayelsa
Gibson Kala aka Prince Igodo	Okiegbene/Ebrighbene axis	Southern Ijaw	Bayelsa
Joshua Mackiver	Olugbobiri	Southern Ijaw	Bayelsa
Paul Eris aka General Ogbunboss	Peremabiri in the Boma clan	Southern Ijaw	Bayelsa
General John Togo	Ayakoroma	Burutu	Delta
General Ezekiel Akpasibewei	Egbema	Egbema	Delta
Government Ekpemopolo aka Tompolo	Near Okerenkoko and Oporoza	Warri South West	Delta
Government Ekpemopolo aka Tompolo	Okerenkoko	Warri South West	Delta
Government Ekpemopolo aka Tompolo	Oporoza	Warri South West	Delta
Government Ekpemopolo aka Tompolo	Ubefan	Warri South West	Delta
High Chief Bibopre Ajube aka Shoot at Sight	Arogbo Ijaw area	Ese Odo	Ondo
Soboma George	Abonemma	Akuku-Toru	Rivers
Farah Dagogo Ipallibo	Krakrama	Akuku-Toru	Rivers
George Adumu	Ajakajak	Andoni	Rivers
Alhaji Asari Dokubo	Russia, a fishing settlement	Asari Toru	Rivers
John Agilo and others	Bonny Island	Bonny	Rivers
Farah Dagogo Ipallibo	Bakana	Degema	Rivers
Soboma Jackris aka Egberi-Papa	Bakana	Degema	Rivers
General Alali	Bille, in the Cowthorn Channel	Degema	Rivers
Soboma Jackris aka Egberi-Papa	Buguma	Degema	Rivers
Farah Dagogo Ipallibo	Bukuma	Degema	Rivers
Farah Dagogo Ipallibo	Degema area	Degema	Rivers
Prince Glad aka Prince Igodo	Tombia	Degema	Rivers
Farah Dagogo Ipallibo	Tombia	Degema	Rivers
Alhaji Asari Dokubo	Tombia	Degema	Rivers
Alhaji Asari Dokubo	Ogbakiri	Emuoha	Rivers
General Cairo	Ogbakiri	Emuoha	Rivers
Tokuebe-Oba	Ogbakiri	Emuoha	Rivers
Commander Reason Agala	Rumuekpe	Emuoha	Rivers
Solomon Ndigenen aka Osama bin laden	Yeghe	Gokana	Rivers
Tom Ateke	Ogu	Ogu/Bolo	Rivers
Tom Ateke	Alakiri	Okrika	Rivers
Tom Ateke	Isaka	Okrika	Rivers
Tom Ateke	Okochiri	Okrika	Rivers
Sunny Opuembe	Okrika town	Okrika	Rivers
Sunny Opuembe	Amadi-Ama	Port-Harcourt	Rivers
Soboma George	Marine base	Port-Harcourt	Rivers
Government Ekpemopolo aka Tompolo	Iroko Camp 1	Warri South West	Rivers
Government Ekpemopolo aka Tompolo	Iroko Camp 2	Warri South West	Rivers

B EM Algorithm for the Randomized Response Design

In this section, we derive the expectation-maximization algorithm to estimate multivariate models for the randomized response design presented in Section 3.3. To do so, we first define the complete likelihood if the missing data, T_i were observed:

$$L_{\text{com}} = \prod_{i=1}^N \{f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i}\}^{T_i} 0.5^{1-T_i} \quad (8)$$

$$l_{\text{com}} = \sum_{i=1}^N \log \{f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i}\}^{T_i} 0.5^{1-T_i} \quad (9)$$

$$= \sum_{i=1}^N T_i Y_i \log f(y; x, \delta) + T_i (1 - Y_i) \log(1 - f(y; x, \delta)) + (1 - T_i) \log 0.5 \quad (10)$$

The E-step is the conditional expectation of the missing data, T_i ,

$$w_i = \mathbb{E}(T_i \mid X_i = x, Y_i = y) \quad (11)$$

$$= \frac{\Pr(T_i = 1 \mid X_i = x) \Pr(Y_i = y \mid X_i = x, T_i = 1)}{\Pr(Y_i = y \mid X_i = x)} \quad (12)$$

$$= \frac{\Pr(T_i = 1) \Pr(Y_i = y \mid X_i = x, T_i = 1)}{\Pr(T_i = 1) \Pr(Y_i = y \mid X_i = x, T_i = 1) + \Pr(T_i = 0) \Pr(Y_i = y \mid X_i = x, T_i = 0)} \quad (13)$$

$$= \frac{\frac{2}{3} \Pr(Y_i = y \mid X_i = x, T_i = 1)}{\frac{2}{3} \Pr(Y_i = y \mid X_i = x, T_i = 1) + \frac{1}{6}} \quad (14)$$

$$= \frac{\frac{2}{3} f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i}}{\frac{2}{3} f(y; x, \delta)^{Y_i} (1 - f(y; x, \delta))^{1-Y_i} + \frac{1}{6}} \quad (15)$$

where (6) follows from Bayes' rule, (8) from the law of total probability and random assignment of T_i , and (9) based on the fixed assignment probability of T_i and the uniform probability distribution of Y_i in the control group.

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