Popular Support, Violence, and Territorial Control in Civil War*

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Abstract

I study civilians' cooperation with an armed group in an irregular war. In the model, civilians differ in their valuation of siding with the armed group and make cooperation decisions without knowing others' motivations or cooperation choices. I find that a superior military force is not sufficient to bring high cooperation and that full cooperation can only be attained if military power is complemented by expectations of punishment for helping the enemy. The model challenges the idea that random violence aimed at punishing enemy cooperators is used when selectivity is difficult to implement, and it shows that indiscriminate reprisals induce lower levels of cooperation, even when enemy cooperators are less likely to be punished with selective methods. Finally, I find that communities that have a highly centralized process of decision making are expected to give their support to only one group of combatants and to be exposed to less violence.

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Attaining civilians' cooperation is perhaps the most important objective for those fighting irregular wars. Tragically, violence directed towards civilians is a commonly used strategy to achieve that objective. Sir Henry Gurney, British High Commissioner in Malaya in 1948, crudely describes the link between violence and cooperation in a letter to the Colonial Secretary days after the Batang Kali massacre: "[The Chinese] are as you know notoriously inclined to lean towards whichever side frightens them more and at the moment this seems to be the government" (in Stubbs, 1989, 75).[1] Similar assertions found in numerous historical records reflect a strong belief held by some combatants in the usefulness of civilians' victimization. Yet, we know little about the conditions under which violence induces civilians to help an aggressor. How do the timing and types of violence used against civilians affect the amount of information they share? What role does expected territorial control play in shaping civilians' cooperation decisions? Does the political organization of communities in conflict areas affect their exposure to violence? This paper explores these questions using a formal framework with a focus on civilians' agency in a limited information environment.

The potential tactical gains of civilians' victimization depend critically on the civilians' responses to the attacks. Yet, civilians are often portrayed in our theories of violence as passive actors who can do little to avoid victimization (Barter, 2014). The lack of interest in civilians' agency is surprising given the large body of work written by practitioners that highlights the importance of noncombatants' choices (e.g. Mao, 1937; Galula, 1964; Thompson, 1966). Addressing this point, this paper studies civilian-combatant interactions with a model that considers each civilian as a strategic actor. The focus on individual civilian agency contrasts with the approach taken by previous work in which civilians are either non-strategic, or are modeled as a unitary actor (Mason, 1996; Berman, Shapiro and Felter, 2011; Zhukov, 2013, 2015). Relaxing the unitary-actor assumption is consistent with the observed heterogeneity of civilians' responses to similar conditions in the field (Condra and Shapiro, 2012; Lyall, Blair and Imai, 2013; Barter, 2014). Moreover, it allows us to examine civilians' coordination problems that determine overall exposure to violence. These coordination problems arise as each civilian has different motivations to help a particular armed group and, at the same time, the aggregate choices of civilians influence overall risks faced by their community.

A second important aspect of irregular conflicts that the model takes into account is the uncertainty about civilians' actions and motivations faced by combatants and other civilians. The doubt and unpredictability that civilians experience is captured by the words of the major of Nebaj, Guatemala in 1976,

> It was difficult to clarify who was who. Many things were said but not verified. There were personal reprisals, political reprisals, of every type, and really it was not known who was who (in Stoll, 1993, 75).

This general sense of distrust is prevalent among the population as loyalties change quickly and people are careful to conceal them to avoid any harm. Denunciations increase confusion and unpredictability as the denouncers' identities and the specific information given is generally kept secret.

Combatants are also forced to operate under uncertainty. While some civilians provide useful information, those who support the group's enemy often engage in deception. Others may even take the opportunity to settle private disputes by denouncing personal enemies. The model accounts for some key aspects of the described limited information environment: civilians act without knowing others' cooperation choices, or what personal benefits others obtain when they take sides, and the armed group executes military operations based on information whose quality is not observed at the time it is provided.

The model yields five results. I find that a superior military force is not sufficient to achieve full civilian cooperation and that maximum cooperation can be attained only if this superiority comes with expectations of certain punishment for helping the enemy. A second finding is that selective post-control retaliations bring higher cooperation than randomly applied punishments and that this holds even when the enemy cooperators are less likely to be punished under selectivity than under random reprisals. I also find that communities that have a highly centralized process of decision making are expected to give their support to only one of the warring factions and to experience less violence. The fourth result tells us that forcing civilians to reveal any information—rather than allowing them to provide it voluntarily—generally increases the amount of valuable information that an armed group attains. Finally, I show that when civilian cooperation does not critically impact short-term military outcomes, civilians will cooperate less with a group that demands assistance, which generates more violence as a response.

The model's results give a theoretical basis to several empirical regularities. The model accounts for the forced displacement of civilians by an armed group in areas where its support is low (Steele, 2011; Balcells and Steele, 2012), the lower levels of violence experienced by communities with respected local leaders (Kaplan, 2012), the greater victimization in places where groups do not rely on popular support to operate (Weinstein, 2007; Wood, 2013; Salehyan, Siroky and Wood, 2014), and the persistence of violent extraction of information from civilians even when it generates faulty information (Rejali, 2007; Conrad and Moore, 2010). The results also highlight the importance of considering the interaction between the timing of the execution of violence and the extent of territorial control when explaining the relative incidence of random and selective violence. In particular, the model shows that post-control random violence aimed at punishing civilians who fail to provide information is always self-defeating, but that rational actors could use it before control has been established, especially when cooperation is expected to be low. The findings thus challenge the claim that indiscriminate violence should be observed when the cost of selectivity is high and where the ability of groups to protect their cooperators is low (Kalyvas, 2006).

This paper is part of a growing formal literature on civil war. Previous work has studied the economic determinants of rebellion (Besley and Persson, 2008; Fearon, 2008), the choice of tactics by rebel groups (Bueno de Mesquita, 2013), and armed groups' recruitment (Grossman, 1991; Gates, 2002; Beber and Blattman, 2011). This paper, however, is more closely related to work that studies non-combatants' support of armed groups in conflict environments. Berman, Shapiro and Felter (2011), Eynde (2011), Zhukov (2013), and Zhukov (2015) model three way contests between rebels, government forces, and civilians who can assist one of the combatants. This paper's contribution is to account for differences in individual civilians' actions and motivations by relaxing the civilians-as-unitary-actor assumption in an incomplete information setting. This allows us to study the coordination problems that affect overall levels of popular support and exposure to violence under assumptions that are consistent with descriptive accounts of these conflicts.

The question of how armed groups attain territorial control has also been studied formally by Siqueira and Sekeris (2012), but unlike this paper, the authors focus on how non-coercive tactics and actions that reflect the ability of combatants to govern induce civilian cooperation. Finally, Kalyvas (2006) presents a game of denunciations in which civilians provide information to an armed group, taking as given its level of territorial control. This paper builds on Kalyvas's seminal contribution and expands his analysis in three areas. First, the model studies civilian cooperation when the personal motivations and actions of other civilians are not known. Second, it endogenizes territorial control, as civilian cooperation has an effect on the ability of an armed group to defeat its enemy, and third, it studies cooperation in environments in which communities differ on their degrees of political centralization, and on how their support influences military outcomes.

A Simple Model

Consider a village, the control of which is disputed by two armed groups. One of them arrives at the village and demands cooperation from the civilians. To fix ideas, I will call this group the *counterinsurgents* and their enemies the *rebels*. This is without loss of generality, as the model captures the interactions between any group that attempts to consolidate territorial control and civilians.

There are $N > 2$ civilians and each of them has information that can help the counterinsurgents to secure control. Once the counterinsurgents demand the information, the civilians simultaneously and independently choose whether to provide it or to give false or militarily useless leads.[2] Cooperating with the counterinsurgents by providing them truthful information will be denoted by c and lying by $-c$.

At the time of the counterinsurgents' arrival, all civilians have one unit of utility that represents personal safety. If civilian i gives false information to the counterinsurgents, a term b_i is added to her utility. The term b_i captures any benefit derived from deceiving the counterinsurgents. This can be a material or emotional gain derived from denouncing a personal enemy—another civilian—as a rebel, or the psychological benefit associated with helping the rebels when there is some ideological affinity with their cause. The benefit b_i is private information so no civilian knows how strong others' incentives are to lie. All of them know, however, that the benefits are randomly distributed in $[0, 1]$ according to a smooth increasing and convex cumulative density function F.[3] The assumptions on F ensure that all civilians have a positive probability of having a benefit of lying that can be very small, intermediate or large, but not larger than the value associated with being safe. This is consistent with accounts that emphasize how civilians' desire to limit damage generally prevails over ideals or material benefits (e.g. Leites and Wolf, 1970; Migdal, 1974).

Once cooperation choices are made, the counterinsurgents carry out military operations based on the information that was given to them. I assume that a larger number of civilians lying to the counterinsurgents puts all civilians at risk of being harmed during these operations. In the model this is captured by having the personal safety utility of every civilian multiplied by the fraction $\frac{n^c}{N}$, where n^c is the number of cooperators.

Some examples illustrate why all civilians can be affected when some of them deceive the counterinsurgents. If civilians do not reveal the identities or location of rebels but rather, point the finger at other villagers, this inflicts damage not only on the accused ones, but also on the original denouncers given the possibility of reprisals from the victims' relatives or friends. Receiving low quality information also increases soldiers' frustration, which leads to general abuses of the population. More generally, giving false information to the counterinsurgents lowers the precision of their attacks, which increases the civilians' risks of becoming victims during the operations. If everyone cooperates, counterinsurgents' operations are precisely targeted at the rebels and all civilians are safe from harm; if fewer than N cooperate, their personal safety utility falls to $\frac{n^c}{N}$.

The probability that the counterinsurgents take control of the village after they carry out their operations is $1 - \beta(1 - \frac{n^c}{N})$, where β in $[0, 1]$ parameterizes the rebels' relative military strength.[4] Note that full civilian cooperation can offset the effects of a strong rebel group's military force on the probability of attaining control. This is consistent with the literature that emphasizes how civilians' support is much more important in shaping military outcomes than raw military power in irregular conflicts (e.g. Mao, 1937; Galula, 1964; Thompson, 1966).[5]

Finally, the group that takes control tries to punish those civilians who helped its enemy. The losers' cooperators however, might be able to avoid the punishments with some probability. In particular, if the rebels gain control, a civilian who cooperated with the counterinsurgents is punished with probability $1 - \delta^r$ and she is not with probability δ^r. Similarly, if the counterinsurgents take control, those civilians who gave them false information become the victims of their retaliations with probability $1 - \delta^c$ and remain safe with probability δ^c. Civilians who helped the winners are not at risk of being punished. When a civilian is punished, she loses her remaining personal safety utility. Figure 1 summarizes the sequence of events.

[Figure 1 about here]

Expectations of long term control are directly tied to the probabilities of finding enemy cooperators $1 - \delta^r$ and $1 - \delta^c$. If villagers know that control will be firmly maintained, it is more likely that the group that wins will identify and punish past enemy informants. Under this interpretation, the model separates expectations of short-term and long-term control. From the villagers' perspective, their actions partially determine short-term military outcomes, but they take as given the ability of the group that takes control over the village to remain there later on.

Table 1 gives a civilian's payoffs conditional on which group takes control and on the number of other civilians giving useful information to the counterinsurgents, n^c_{-i}. The bottom row gives the payoffs of a civilian who lies to the counterinsurgents. In this case, the harm caused by the false leads reduces the civilian's initial utility to $\frac{n^c_{-i}}{N}$. If the counterinsurgents take control, they search for those who gave them false information leaving the civilian unharmed with probability δ^c or punishing her with probability $1 - \delta^c$. Since the civilian chose not to cooperate with the counterinsurgents, the term b_i is added to her utility whether or not she is punished. The expected payoff of not cooperating when the counterinsurgents take control is then $\frac{n^c_{-i}}{N}\delta^c + b_i$. If the rebels win, on the other hand, the civilian does not have any risk of losing her personal safety utility and also gains the private benefit b_i, which leaves an expected payoff of $\frac{n^c_{-i}}{N} + b_i$. A similar logic applies to the first row of the table.

[Table 1 about here]

In the model, a group that gains territorial control can protect its informants from enemy retaliations, which is captured by the fact that the winners' cooperators are not punished. This gives an incentive for civilians to act in favor of the group that is receiving more cooperation from others. The way counterinsurgents' military operations affect civilians also pushes them to coordinate on helping the counterinsurgents, as this reduces the risks of collateral damage associated with ill-informed operations. The next section shows under what conditions the incentives to coordinate support for the counterinsurgents outweigh the private benefits of lying.

The equilibrium concept that I use to solve this simultaneous game of incomplete information is Bayesian Nash Equilibrium. I concentrate on symmetric strategies represented by the function $s : [0, 1] \to \{c, -c\}$. The function s gives an action for a given private value of providing false information b_i. That is, all civilians that have a value of lying to the counterinsurgents of b will take the same action $s(b)$ in equilibrium.

Results

A civilian cooperates with the counterinsurgents if her expected utility from doing so is greater than or equal to the utility she gets if she chooses to provide false information. The following expressions give us both of those utilities.

$$\begin{aligned} U_i(c) &= E\left[\frac{n^c_{-i}+1}{N}\left(\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\delta^r + 1 - \beta\left(1-\frac{n^c_{-i}+1}{N}\right)\right)\right], \\ U_i(-c) &= E\left[\frac{n^c_{-i}}{N}\left(\beta\left(1-\frac{n^c_{-i}}{N}\right) + \left(1-\beta\left(1-\frac{n^c_{-i}}{N}\right)\right)\delta^c\right)\right] + b_i. \end{aligned} \tag{1}$$

In the expressions above, expectations are taken over the distribution of the number of civilians providing useful information other than i. Given that in equilibrium others cooperate according to s, a civilian i expects the probability of anyone else cooperating with the counterinsurgents to be $p \equiv \int_0^1 I_c(s(b))f(b)db$, where the function I_c takes the value of one when evaluated at c and zero otherwise and f is the density function of the private benefits of lying. In this way, n^c_{-i} has a binomial distribution with parameters $(N-1, p)$. After rearranging some of the terms in (1), we can deduce that a civilian i provides useful information to the counterinsurgents if and only if

$$\Psi(p) \equiv E\left[\frac{n^c_{-i}}{N}\left(\beta\left(1-\frac{n^c_{-i}}{N}\right)(\delta^r-1)+\left(1-\beta\left(1-\frac{n^c_{-i}}{N}\right)\right)(1-\delta^c)\right)\right] \\ + E\left[\frac{n^c_{-i}}{N}\frac{\beta}{N}(1-\delta^r)\right] + E\left[\frac{1}{N}\left(\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\delta^r + 1 - \beta\left(1-\frac{n^c_{-i}+1}{N}\right)\right)\right] \geq b_i. \tag{2}$$

The expression on the left hand side of this inequality, $\Psi(p)$, is the expected gain in the likelihood of being unharmed that cooperating with the counterinsurgents brings for a given probability of others' cooperation.

We can learn how the expectation of others' cooperation affects the individual incentives to side with the counterinsurgents by studying the components of Ψ. The first term in Ψ (from left to right) is the expected gain in utility of cooperating with the counterinsurgents if i's choice did not directly affect which group takes control or the damage caused by the counterinsurgents' operations.[6] In what follows, I will call this term *the indirect utility of cooperation*. The second term is the gain in utility derived from increasing the chances of the counterinsurgents winning. The last term is the gain in utility that comes from increasing the precision of counterinsurgents' operations.

Both the utility derived by increasing the counterinsurgents' probability of winning and the one derived by increasing the precision of their attacks are non-decreasing in the number of cooperators. To see this, consider the second term in (2) first. If i cooperates with the counterinsurgents, this makes them more likely to win, in which case i is relieved from the fear of being punished by the rebels. That relief is captured by the term $\frac{\beta}{N}(1-\delta^r)$. She cannot enjoy all that additional utility, however, if there is high collateral damage caused by other civilians' lies, which explains why the term is multiplied by $\frac{n^c_{-i}}{N}$. As for the third term in (2), by siding with the counterinsurgents, the civilian has reduced the collateral damage done by the counterinsurgents by the fraction $\frac{1}{N}$ that multiplies the expected utility after the initial counterinsurgency operations have concluded. This utility is increasing in others' cooperation, as such cooperation reduces the civilian's chances of being punished by the rebels.

The next result shows that for most parameter combinations, the indirect utility of cooperation is a quadratic function of p. All proofs are in the appendix.

Lemma 1. *If rebels have some military power ($\beta > 0$) and if there is a risk of being punished in post-control reprisals ($\delta^c + \delta^r < 2$), the civilians' indirect utility of cooperation with the counterinsurgents is a quadratic U-shaped function of the cooperation probability p. Moreover, the minimum of this function is reached at $p_{min} = \frac{\beta(2-\delta^c-\delta^r)\left(1-\frac{1}{N}\right)-(1-\delta^c)}{2\beta(2-\delta^c-\delta^r)\left(1-\frac{2}{N}\right)}$.*

If rebels are effective at punishing counterinsurgents' cooperators and are militarily powerful (β and $1-\delta^r$ are high enough to make $p_{\min} > 0$), there will be a range of beliefs, $[0, p_{\min}]$, in which more expected cooperation to the counterinsurgents *reduces* the desire of a given civilian to help this group. The logic for this is simple. For those low expected levels of cooperation, the rebels will be the more likely winners. Moreover, as other villagers help the counterinsurgents, the risks of being harmed by the collateral damage of the counterinsurgents' operations are lower. These two factors make lying to the counterinsurgents a more attractive choice as p grows. In contrast, when $p > p_{\min}$ civilians perceive that there is enough information being given to the counterinsurgents to make them prevail and, therefore, they will want to cooperate with this group as well.

As indicated by (2), s must be a threshold strategy and the ex-ante probability of any civilian cooperating is the probability of that civilian having a private benefit b_i being less than or equal to $\Psi(p)$. Therefore, the equilibrium probability of cooperation with the counterinsurgents satisfies

$$F(\Psi(p)) = p. \tag{3}$$

The next result shows that there is in fact a fixed point of $F \circ \Psi$, in $(0, 1]$.

Proposition 1. *The following statements characterize equilibria in the cooperation model.*

1. *There is a symmetric Bayesian equilibrium in which the ex-ante probability of cooperation with the counterinsurgents is strictly positive.*

2. *If the rebels have some military power ($\beta > 0$), or if there is no risk for civilians of facing post-control reprisals ($\delta^r + \delta^c = 2$), the equilibrium is unique.*

3. *If the rebels are completely dominated militarily ($\beta = 0$) and counterinsurgents always punish those who lied to them ($\delta^c = 0$), there is an equilibrium with complete cooperation. Moreover, both of those conditions are necessary for an equilibrium with complete cooperation.*

The result shows that there are no circumstances under which all civilians choose to lie to the counterinsurgents. If all civilians lie to the counterinsurgents, the risk of being harmed by the counterinsurgents' operations is so high that a civilian with a small private value of lying would prefer to reduce that risk by cooperating.[7]

The second statement tells us that for the substantively interesting cases in which the rebels have some ability to militarily confront the counterinsurgents, the equilibrium is unique. The same is true when regardless of which group takes control, civilians are not punished for their previous actions. In this case, which side takes control becomes irrelevant and civilians would only care about reducing the collateral damage of the counterinsurgents' operations. By cooperating, each civilian reduces risk by exactly $\frac{1}{N}$ and then the unique ex-ante equilibrium probability of cooperation would be $F(\frac{1}{N})$.

The last statement of the proposition indicates that, even when the rebels' forces represent no military threat to the counterinsurgents, civilian cooperation with the counterinsurgents will not be guaranteed. Similarly, it is not sufficient for civilians to know that they will be punished with certainty after lying to the counterinsurgents to induce their cooperation. If there is even a small chance that the rebels would control the village in the absence of civilians' help, that would be enough to deter cooperation for those who have a strong interest in deceiving the counterinsurgents.

While counterinsurgents having a vastly superior military does not guarantee that all civilians will help the counterinsurgents, the next proposition shows, intuitively, that more powerful rebels generally deter cooperation with their enemy. Similarly, there will be less cooperation with the counterinsurgents if civilians perceive that the counterinsurgents are increasingly unable to identify who lied to them.

Proposition 2. *The ex-ante probability of cooperating with the counterinsurgents in equilibrium is:*

1. *Weakly decreasing in the rebels' relative military power, β,*
2. *Weakly decreasing in the probability of avoiding counterinsurgents' post-control reprisals, δ^c,*
3. *Weakly increasing in the probability of avoiding rebels' post-control reprisals, δ^r.*

This result and statement 3 in Proposition 1 highlight the importance of expectations of long-term control and military power and how they complement each other to induce cooperation. In this type of conflict, it is crucial for an armed group to convince civilians that their side is more militarily powerful *and* that they will retain control over the area. The role of expectations has been emphasized many times by counterinsurgent practitioners. Oliver Lyttelton, British Colonial Secretary in 1951, for example, notes, "You cannot win the war without the help of the population, and you cannot get the support of the population without at least beginning to win the war." This demands, he continues, that a war be "waged with two instruments, propaganda and armed forces" (in Nagl, 2005, 76). In terms of the model, the counterinsurgents should increase their relative military capabilities as much as possible in the area of operations (lowering β) and simultaneously, they need to make civilians believe that they will find out who cooperated with the enemy, possibly, by creating expectations of long-term control (lowering δ^c).

Changes in the size of the population also affects cooperation choices. When both groups cannot punish their enemy's informants, we saw that the probability of cooperating with the counterinsurgents was $F(\frac{1}{N})$, which is decreasing in the size of the population. In a populated area, the effect of one civilian cooperating on reducing the risks associated with ill-informed operations is small. Because of this, the option of deceiving the counterinsurgents becomes more attractive. A similar logic can also be applied to situations in which civilians have some chance of being punished after helping the group that loses control. In a large village, the actions of one civilian have a small effect on the levels of violence brought about by false denunciations and also on the outcome of the military contest, which suggest that the negative relationship between population size and cooperation will be maintained more generally. Figure 2 shows that this is the case. The figure plots the equilibrium probabilities of cooperation with the counterinsurgents as a function of the rebels' relative military power and population size. For these simulations I have assumed that the private benefits of lying are uniformly distributed. We see that regardless of the rebels' relative military strength, or whether rebels' cooperators are highly likely to be punished by the counterinsurgents, the probability of cooperation decreases in the size of the population.

The figure also shows the complementarity between military power and expectations of control that was discussed earlier. As the rebels become weaker, there tends to be more cooperation with the counterinsurgents, but such an increase is only significant when civilians expect to be punished for lying to the counterinsurgents. For a fixed village size, we see that the slope of cooperation as a function of β is steeper when rebels' cooperators expect to be punished (left panel of Figure 2). When they do not, changes in relative military power make almost no difference on the levels of cooperation.

[Figure 2 about here]

These comparative statics can help us understand patterns of displacement in conflict-afflicted regions. In particular, when an armed group attempts to gain control of an area, but expects low levels of cooperation, it could induce displacement, as doing so increases the cooperation of those who stay. If this is the case, we should see that in places where an incoming group is militarily weak and where civilians' expectations of being punished for lying to them are low, the armed group will exert pressure on the population to leave.

Recent findings in the literature are consistent with those expectations. In a case study in the municipality of Apartadó, Colombia, Steele finds that in neighborhoods where an insurgent-associated political party, the Patriotic Union, had higher vote shares in 1991, more people were forced to leave their homes in the following years (Steele, 2011). Through interviews, the author presents evidence of a concerted effort by right-wing paramilitaries to force displacement where the Patriotic Union performed better in previous elections. The events occurred when the United Self Defence Forces of Colombia (the paramilitaries) started an expansion in the municipality, which had been, until then, a stronghold of the main left insurgent groups. In those areas the left-wing rebels were militarily more powerful and there were no strong expectations of long term control by the incoming paramilitaries. Both of these are conditions where the model predicts cooperation with the paramilitaries would be low, which makes it more convenient for them to forcibly reduce the size of the population.

Clearly, the previous mechanism complements one in which an armed group forces civilians to relocate to prevent them from offering protection and assistance to its enemy. What the model shows is that even in the absence of direct assistance to any armed group by civilians, it is still beneficial for an incoming group to induce displacement where expected cooperation is low. The model in Zhukov (2015) also shows that resettlement is more likely when a group disputing control is not dominant. As the model does here, his paper highlights how civilians might lack incentives to cooperate with a group that is not able to accurately apply selective punishments. The key distinction is the underlying mechanism: in this model, reducing population size ameliorates the coordination problem that inhibits cooperation with a weak incoming group.

The coordination problem of civilians is a product of how individual decisions affect aggregate risks faced by the community. When some civilians lie to the counterinsurgents aiming to gain a private benefit, they are eliminating the outcome in which no one in the village is harmed. When more people live in the village, civilians perceive that their actions are less important in determining conflict outcomes, which in turn, makes lying to the counterinsurgents more attractive. This suggests that if there is only one agent in charge of deciding the level of cooperation with the counterinsurgents, she would choose complete cooperation. The next result confirms this intuition.

Proposition 3. *The centralized cooperation decision involves all civilians cooperating with the counterinsurgents.*

This optimal benchmark gives us an idea of how communities that have greater centralization of political decisions choose whether to give their support to an incoming armed group. In light of this interpretation, the result tells us that when civilians follow a leader who decides on the group's conflict participation, we should observe consistent support for one of the armed actors.[8] Moreover, the overall levels of violence that they experience should be lower, as consistent support for one group increases the group's chances of taking control with less collateral damage and eliminates the need to exert ex-post reprisals.

Centralized local power has been recognized as an effective counterinsurgency tool and has indeed been promoted by armies fighting irregular forces. In Afghanistan, for example, U.S. special operation forces have directly sought the empowerment of village elders as part of the Village Stability Operations program (Connet and Cassidy, 2011). In districts like Chora, in the southern province of Uruzgan, the elders responded by directly helping the U.S. in the recruitment process of local forces for the Afghan Police (Green, 2014). Empowering local leaders in Afghanistan was inspired by the positive experiences in Iraq during the Anbar Awakening with the role that Sheiks (community leaders) played in helping the allied forces reduce violence.

More systematic evidence of how local power centralization can reduce violence in irregular war environments is given by Kaplan (2012). Using data from Colombia, the author finds that a higher frequency of shamans' visits in a municipality is associated with a significant reduction in its homicide rate. The interpretation of these findings given by Kaplan emphasizes the role played by shamans and local leaders in maintaining social cohesion, and how their authority is used to encourage members to avoid being involved in cycles of denunciations (Kaplan, 2012, 7). That interpretation is clearly consistent with the mechanism highlighted by the model, in which a benevolent leader internalizes the negative spill-overs from false denunciations.

Variations

The baseline model makes the assumption that retaliations for failing to provide information only affect those who helped the group that lost control. It also assumes that civilians are not allowed to remain silent when the counterinsurgents arrive in the village, and that military outcomes depend on civilians' cooperation. In what follows, I relax these assumptions. As will be seen, the counterinsurgents' behavior implied by the assumptions of the baseline model maximizes civilians' truthful information sharing.

Indiscriminate Punishments

In the baseline model all post-control punishments are *selective* in the sense that those who do not cooperate with the group that loses territorial control are never at risk of being harmed. However, armed groups have been hypothesized to engage in indiscriminate punishments when information is scarce or, more generally, when the cost of selectivity is high (Kalyvas, 2006, 147). After slightly modifying the model's baseline setup, I examine this claim. In particular, I study the levels of cooperation achieved under random punishments when selectivity is hard to implement, and when the random punishments have a higher chance of inflicting harm on those who previously gave false information than selective ones. I also investigate whether the choice between random or selective violence of the rebels affects the counterinsurgents' own choice of type of violence.

I will use the term *indiscriminate violence* to denote a situation in which a group punishes those who cooperated with its enemy *and* those who did not with some positive probability. This probability is denoted by $1 - \widetilde{\delta}^c$ for the counterinsurgents and by $1 - \widetilde{\delta}^r$ for the rebels. Selective violence is, as before, captured by the probability of punishing exclusively enemy cooperators of each group ($1 - \delta^c$ and $1 - \delta^r$).

The next result shows that the use of selective violence by the counterinsurgents dominates the use of indiscriminate violence.

Proposition 4. *For any type of violence used by the rebels (selective or indiscriminate) and for all probabilities of civilians facing post-control reprisals ($1-\delta^c$, $1-\delta^r$, $1-\widetilde{\delta}^c$, and $1-\widetilde{\delta}^r$), the probability of cooperating with the counterinsurgents when they use selective violence is* *greater than or equal to the one that is attained when they use indiscriminate violence.*

If civilians think that the counterinsurgents would put effort into finding and punishing only those that gave them false information, cooperation would follow. What happens then when counterinsurgents do not have enough human or capital resources to successfully implement post-control selective violence? As part of the proof of Proposition 4, I show that when using indiscriminate violence, the probability of cooperation increases with $\widetilde{\delta}^c$. This indicates that the best counterinsurgents can do when they cannot employ selective punishments is to commit to not punish anyone at all.

According to Kalyvas, when counterinsurgents' resources are low, when selectivity is costly and hard to implement, and when the rebels cannot protect the people who lied to the counterinsurgents, we should see that counterinsurgents will be more likely to use indiscriminate violence (Kalyvas, 2006, 147, 165-168). The conditions stated by Kalyvas can be captured by the model if we choose a low β and a high δ^c. In such a scenario, rebels are less likely to take control over the village so those who lied to the counterinsurgents cannot be protected by the rebels. Also, the counterinsurgents would find it very hard to find those who lied to them.[9] In the extreme case when β is zero and δ^c is one, the probability of civilian cooperation under selective violence is $F(\frac{1}{N})$. In contrast, if the counterinsurgents choose random violence applied at a positive rate $1-\widetilde{\delta}^c$, they would obtain a smaller probability of cooperation, $F(\frac{\widetilde{\delta}^c}{N})$. Under these circumstances, counterinsurgents that want to maximize cooperation would never choose indiscriminate violence.[10] Even if the rebels cannot win and if the counterinsurgents cannot find their enemies' cooperators because doing so is too costly or difficult, turning to indiscriminate violence is self-defeating. This is because random punishments tend to equalize the costs and benefits of choosing to help either side, while selective violence increases the costs of failing to cooperate.

In Downes (2007), other factors that affect the use of indiscriminate violence are also mentioned. According to Downes, indiscriminate violence is effective when applied to a small population that is concentrated in a small geographical area. Under these circumstances, the author argues, the armed group can kill or imprison most civilians, eliminating any source of potential rebel support. While the model shows that for all population sizes selective violence attains a cooperation that is as high as the one obtained with indiscriminate violence, the model suggests one way in which population size and indiscriminate violence are directly linked. As noted earlier, smaller populations are preferred by the counterinsurgents in the model because all the benefits of cooperating with them are decreasing in population size, while the private benefit of lying is independent of this variable. This is consistent with recent studies that identify violence against groups as a driver of displacement (Steele, 2009, 2011). In these cases, punishments that indiscriminately target a group of civilians that share some trait (indiscriminately within the group) and that induce their displacement, can be used whenever such civilians are not expected to cooperate. Doing so reduces the size of the civilian group, increasing the cooperation of those who stay.

Voluntary Provision of Information

In this version of the model civilians can choose not to give any information to the counterinsurgents once they arrive in the village. I assume that those who remain silent do not affect the precision of the counterinsurgents' operations or the chances of any group taking control. Because of this, they will not be punished by any group that takes control over the village. In this way, remaining silent is convenient, as it eliminates the risk of being punished by post-control reprisals. However, the opportunity costs of taking this choice can be high. A civilian who chooses to remain silent does not receive the private benefit of lying, or reduce the harm caused by the counterinsurgents' operations. All other aspects of the model remain as in the baseline setting.

The expected utility of remaining silent then is

$$U_i(o) = E\left[\frac{n^c_{-i}}{N}\right].$$

The expected value is taken over the distribution of the number of civilians that cooperate with the counterinsurgents and the number of those that remain neutral other than i, n^o_{-i}. These numbers and the number of other civilians that give false information to the counterinsurgents follow a multinomial distribution with parameters $(p, p^o, 1-p-p^o, N-1)$.

Allowing civilians to remain silent will not increase the amount of cooperation that counterinsurgents receive as the next result shows.

Proposition 5. *If civilians are allowed to remain silent, the highest probability of cooperation that can be achieved in any equilibrium is the same as the one obtained when civilians are forced to reveal information.*

An implication of the result is that counterinsurgents will not refrain from forcing civilians to speak when they suspect they have something to say. They will do so knowing that some civilians will lie. By forcing civilians to provide information, counterinsurgents ensure that the amount of useful leads they receive is maximized. This gives one additional mechanism that accounts for violence in the form of interrogational torture. Although it has been long recognized in the literature that torture generates faulty information (e.g. Rumney, 2006; Rejali, 2007), it is less clear whether the amount of useful information that it provides (as part of the total) is less than what would be obtained when prisoners are not forced to answer their interrogators' questions.

It is important to note that the model is only focusing on a situation in which the victimizer is exclusively interested in maximizing useful information. When paramilitary groups or non-democratic governments are fighting insurgencies, concerns about whether their pre-control violence harms innocent civilians might not play much of a role in the decision to carry out these operations. The model's assumptions seem consistent with these situations. On the other hand, in cases in which civilians' welfare has weight in the utility function of those seeking cooperation, it is clear that forcing civilians to provide information may no longer be optimal as the informational gains are offset by the civilians' suffering.[11]

Exogenous Military Outcomes

The baseline model assumes that civilian support determines military outcomes. Although this is consistent with what is reported by a large counterinsurgency literature, military strength might not be sensitive to changes in popular backing in all cases. Groups like the Rally for Congolese Democracy mainly rely on outside resources (from Rwanda and Uganda) to carry out operations, which make their military effectiveness less dependent on the cooperation of civilians (Wood, 2013, 4). Others, like the United Self Defense Forces of Colombia, are sometimes assisted by former and active members of the armed forces (González, 2007; Valencia, 2007). This reduces their dependence on civilian support. Even in these cases, armed groups demand food, shelter, money, supplies, and similar logistical assistance from civilians. Relative to information about the enemy, this logistical support could have less of an effect on short-term military outcomes. To capture such environments, we can examine cooperation choices when popular support does not determine military outcomes, but where the incoming group still exerts pressure in the population to provide assistance to its troops. The payoffs associated with cooperating or not in this new environment are:

$$\begin{aligned} U_i(c) &= E\left[\frac{n^c_{-i}+1}{N}\left(\beta\delta^r + 1 - \beta\right)\right], \\ U_i(-c) &= E\left[\frac{n^c_{-i}}{N}\left(\beta + (1-\beta)\delta^c\right)\right] + b_i. \end{aligned} \tag{4}$$

These payoffs still reflect the risks that the population faces when soldiers become frustrated after receiving low levels of cooperation. Here non-cooperation can represent lying about real capabilities of support, civilians shirking their duties, or concealing materials, food, or money. Just as in the original game, if everyone cooperates, no civilian is hurt. If some decide to deny assistance to the incoming group, all civilians are affected by the reaction of the troops as they are not able to clearly identify individual non-cooperators. Also, notice that military outcomes are completely determined by the exogenous parameter β. The following proposition shows that cooperation in this scenario is not higher than the cooperation attained in the baseline model.

Proposition 6. *The probability of cooperation with the counterinsurgents when civilians' choices do not influence military outcomes is less than or equal to the one obtained when civilians' choices do determine these outcomes.*

Others have shown how paramilitary forces or those armed groups that do not rely on popular support impose particularly high levels of violence on civilians (Weinstein, 2007; Wood, 2013; Salehyan, Siroky and Wood, 2014). The explanations put forward to account for this pattern are often based on the lack of incentives for restraint that the soldiers have when civilian support can be substituted. If their military success is not undermined by civilians' victimization, indiscipline and abuse will not be monitored and punished by higher ranking combatants. The previous result accounts for the same pattern, but offers an alternative mechanism: when military outcomes are not affected by popular support, civilians provide less assistance to the group, which brings more violence as a response. While previous explanations are based on a "supply side" account of violence in which abuse towards civilians is independent of their actions, the model offers one in which greater violence comes as a reaction to the low cooperation brought about by civilians' coordination problems.

Concluding Remarks

This is the first model of civilian-combatant interactions that focuses on the individuals' decisions to provide cooperation to a potential aggressor in a limited information environment. The formal study of the micro-dynamics of irregular conflicts is growing, but so far attention has been almost exclusively directed at the internal organization of rebel groups and their tactics. The importance of civilians in these types of conflicts demands an examination of how they act under the conditions of uncertainty and high stakes of irregular wars.

The model's results highlight the complementary nature of short and medium-term expectations of territorial control when civilians are deciding on whether to support an armed group. To entice cooperation, an armed group with strong military forces still needs to make civilians believe that it will be able to punish enemy cooperators. It is unlikely that such beliefs can be formed if the group that takes territorial control of a disputed area does not stay there for long.

Counterinsurgent forces that have to rely mainly on voluntary cooperation or that are part of a temporary occupation army with a fixed deadline to leave the area of operations appear to have a serious disadvantage when trying to obtain information from civilians. It is worth mentioning, however, that the model does not explore how non-coercive methods affect civilians' cooperation choices or the potential effects of current violence on future cooperation decisions. A modelling exercise that accounts for dynamic considerations like revenge, and that explicitly captures the decision between violent and non-violent tactics could enhance our understanding of the strategic use of violence.

Future work should also continue to study the conditions under which indiscriminate violence is used by an armed actor that seeks to maximize information sharing by civilians. We saw that there are reasons to believe that there is a complementarity between the use of pre-control indiscriminate violence and threats of post-control selective violence. In the model, forcing civilians to speak when they are suspected of having information or to induce displacement using indiscriminate violence are not inconsistent with efforts to increase cooperation.

Similarly, indiscriminate violence could be used whenever an armed group expects low cooperation from civilians because enemy combatants live among the population. In these cases, indiscriminate attacks that inflict harm on some of the enemy combatants who hide among the civilians could be perceived to be more cost-effective than relying on civilians' information. It is important to emphasize that indiscriminate violence should occur before it has been decided which group takes territorial control. The model indicates that post-control indiscriminate violence, on the other hand, is self-defeating.

Tables and Figures

Table 1: Ex-ante Civilians' Payoffs

Action	Counterinsurgents win	Counterinsurgents lose
c	$\frac{n^c_{-i}+1}{N}$	$\frac{n^c_{-i}+1}{N}\delta^r$
$-c$	$\frac{n^c_{-i}}{N}\delta^c + b_i$	$\frac{n^c_{-i}}{N} + b_i$

Figure 1: Timeline

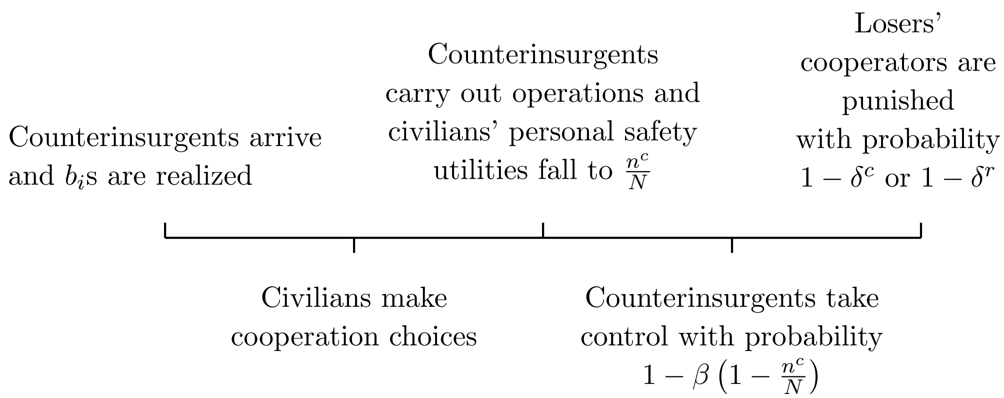
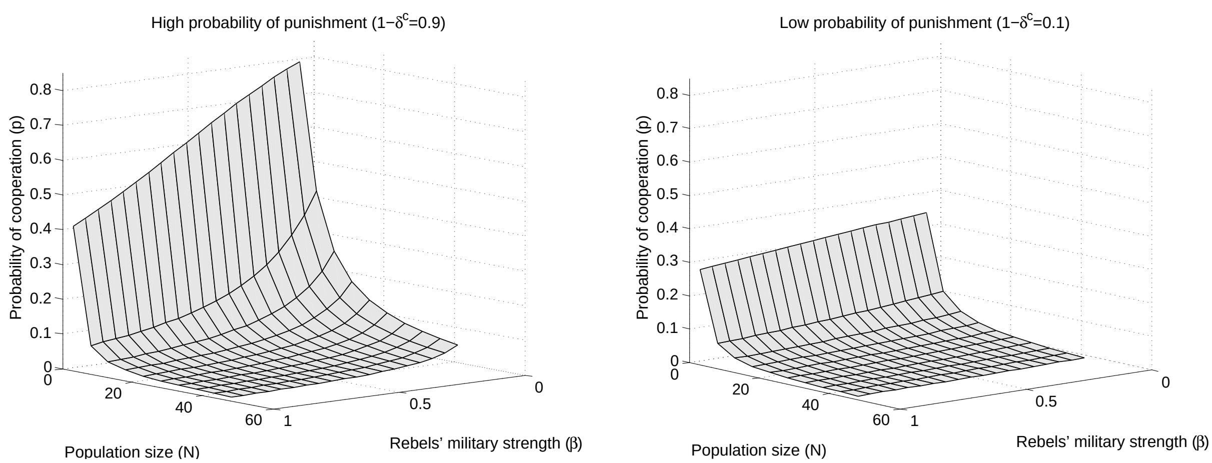


Figure 2: Probability of Cooperating with Counterinsurgents: Comparative Statics



Proofs

Proof of Lemma 1. Using the fact that $E[n^c_{-i}] = (N-1)p$ and $E[(n^c_{-i})^2] = (N-1)p(1-p) + (N-1)^2p^2$, the indirect utility of cooperation becomes

$$\left(1-\frac{1}{N}\right)\left(p^2(2-\delta^c-\delta^r)\beta\left(1-\frac{2}{N}\right)+p\left((1-\delta^c)-\beta(2-\delta^c-\delta^r)\left(1-\frac{1}{N}\right)\right)\right).$$

Since $\beta > 0$ and $\delta^c + \delta^r < 2$, this expression reaches a minimum at $p_{\min}$. □

Proof of Proposition 1. Note that with a finite population

$$\Psi(0) = \frac{1}{N}\left(1-\beta(1-\delta^r)\left(1-\frac{1}{N}\right)\right) > 0,$$

which implies that $F(\Psi(0))$ is positive. Also, since

$$\Psi(1) = (1-\delta^c)\left(1-\frac{1}{N}\right)\left(1-\frac{\beta}{N}\right)+\frac{1}{N} \leq 1, \tag{5}$$

$F(\Psi(1)) \leq 1$. Given that F is convex, it is continuous, and by continuity of $F \circ \Psi$, there is at least one fixed point of $F \circ \Psi$ in $(0, 1]$.

Next, I show the second statement of the proposition. Using (5), note that if $\beta > 0$, then $F(\Psi(1)) < 1$. If $\delta^r + \delta^c < 2$, by Lemma 1 and by the fact that the second and third terms in the left hand side of inequality (2) are linear in p, Ψ is quadratic in p and has a global minimum. Since F is convex, $F \circ \Psi$ is strictly convex. Moreover, Ψ and $F \circ \Psi$ reach their global minimums at the same point, $p'_{\min}$. If $p'_{\min} < 0$, $F \circ \Psi$ is monotonically increasing with no inflection points in [0,1], so there is only one point where $F \circ \Psi$ and the identity function intersect. If $p'_{\min} > 0$ and $F(\Psi(p'_{\min})) > p'_{\min}$, $F \circ \Psi$ and the identity function cannot intersect in $[0, p'_{\min}]$ but they do at one point in $(p'_{\min}, 1]$. If $p'_{min} > 0$ and $F(\Psi(p'_{\min})) \leq p'_{\min}$, $F \circ \Psi$ is monotonically decreasing in $[0, p'_{\min}]$ and, therefore, $F \circ \Psi$ and the identity function intersect at one point in $[0, p'_{\min}]$. By the convexity of $F \circ \Psi$, there cannot be any other intersection between those two functions in $(p'_{\min}, 1]$. If $\delta^r + \delta^c = 2$, $F \circ \Psi$ is constant and equal to $F(\frac{1}{N})$ and so, the unique equilibrium probability is $F(\frac{1}{N})$.

Finally, If δ^c and β are 0, using (2) we get $\Psi(p) = p\left(1 - \frac{1}{N}\right) + \frac{1}{N}$. Expression (3) is satisfied with $p = 1$. If in equilibrium $p = 1$, this implies $F(\Psi(1)) = 1$ and, given that $F^{-1}(1) = 1$, then $(1 - \delta^c)\left(1 - \frac{\beta}{N}\right) = 1$. Since both δ^c and β are in $[0, 1]$, they both have to be zero. □

Proof of Proposition 2. Applying the Implicit Function theorem,

$$\frac{dp}{dx} = -\frac{F'(\Psi(p))\frac{\partial \Psi(p)}{\partial x}}{F'(\Psi(p))\frac{\partial \Psi(p)}{\partial p} - 1}.$$

For non-zero β and δ^c I use the fact that $F \circ \Psi$ is convex and that $F(\Psi(1)) < 1$ to show that

$$\frac{\partial F(\Psi(p))}{\partial p} \leq \frac{F(\Psi(1)) - F(\Psi(p))}{1 - p} = \frac{F(\Psi(1)) - p}{1 - p} < 1.$$

This shows that $\frac{dp}{dx}$ and $\frac{\partial \Psi(p)}{\partial x}$ have the same sign.

To prove the first statement of the proposition note that

$$\begin{aligned}
\frac{\partial \Psi(p)}{\partial \beta} &= \left(p(1-\delta^c)\left(p\left(1-\frac{2}{N}\right) - \left(1-\frac{1}{N}\right)\right) + (1-\delta^r)\left(p^2\left(1-\frac{2}{N}\right) - p\left(1-\frac{1}{N}\right) + \frac{2p-1}{N}\right)\right)\left(1-\frac{1}{N}\right) \\
&< \left(p(1-\delta^c)\left(p\left(1-\frac{2}{N}\right) - \left(1-\frac{1}{N}\right)\right) + (1-\delta^r)\left(p^2\left(1-\frac{2}{N}\right) - p\left(1-\frac{1}{N}\right) + \frac{p}{N}\right)\right)\left(1-\frac{1}{N}\right) \\
&= \left(p(1-\delta^c)\left(p\left(1-\frac{2}{N}\right) - \left(1-\frac{1}{N}\right)\right) + p(1-\delta^r)\left(1-\frac{2}{N}\right)(p-1)\right)\left(1-\frac{1}{N}\right) \\
&< 0.
\end{aligned}$$

As for the second statement, note that

$$\frac{\partial\Psi(p)}{\partial\delta^r} = \beta\left(1-\frac{1}{N}\right)\left(p\left(1-\frac{3}{N}\right)-p^2\left(1-\frac{2}{N}\right)+\frac{1}{N}\right) > 0,$$

and

$$\frac{\partial\Psi(p)}{\partial\delta^c} = -p\left(1-\frac{1}{N}\right)\left(p\left(1-\frac{2}{N}\right)+1-\beta\left(1-\frac{1}{N}\right)\right) < 0.$$

If β and δ^c are zero, the only exogenous variable that affects the equilibrium probability of cooperation is N. □

Proof of Proposition 3. The objective function of an aggregate welfare maximizer is:

$$\sum_{i\in C}\frac{n^c}{N}\left(\beta\left(1-\frac{n^c}{N}\right)\delta^r+1-\beta\left(1-\frac{n^c}{N}\right)\right)+\sum_{i\in -C}\left(\frac{n^c}{N}\left(\beta\left(1-\frac{n^c}{N}\right)+\left(1-\beta\left(1-\frac{n^c}{N}\right)\right)\delta^c\right)+E[b_i]\right),$$

where C and $-C$ denote the set of individuals who cooperate with the counterinsurgents and the set who do not, respectively. This expression can be rewritten as

$$\frac{n^{c2}}{N}\left(\beta\left(1-\frac{n^c}{N}\right)\delta^r+1-\beta\left(1-\frac{n^c}{N}\right)\right)+\frac{(N-n^c)n^c}{N}\left(\beta\left(1-\frac{n^c}{N}\right)+\left(1-\beta\left(1-\frac{n^c}{N}\right)\right)\delta^c\right)$$
$$+(N-n^c)E[b_i].$$

Since the terms in the parentheses of the first line in this expression are linear combinations of numbers between 0 and 1, the previous expression must be less than or equal to

$$n^c+(N-n^c)E[b_i]. \tag{6}$$

The objective function evaluated at $n^c = N$ is N, which, given that $E[b_i] \leq 1$, is the maximum of expression (6). Also, since expression (6) is less than N for all $n^c \neq N$, the unique maximizer of the objective function is N. □

Proof of Proposition 4. If rebels are applying indiscriminate violence with an associated probability of $1-\widetilde{\delta}^r$ and the counterinsurgents are also using indiscriminate violence with an associated probability of $1-\widetilde{\delta}^c$, the new expected payoffs of revealing information to the counterinsurgents and of lying are

$$U_i(c) = E\left[\frac{n^c_{-i}+1}{N}\left(\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\widetilde{\delta}^r + \left(1-\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\right)\widetilde{\delta}^c\right)\right],$$
$$U_i(-c) = E\left[\frac{n^c_{-i}}{N}\left(\beta\left(1-\frac{n^c_{-i}}{N}\right)\widetilde{\delta}^r + \left(1-\beta\left(1-\frac{n^c_{-i}}{N}\right)\right)\widetilde{\delta}^c\right)\right] + b_i.$$

Then, civilian i gives truthful information to the counterinsurgents if and only if

$$\widetilde{\Psi}_1(p) \equiv \frac{\widetilde{\delta}^c}{N} - \frac{\beta}{N}(\widetilde{\delta}^c - \widetilde{\delta}^r)\left(1-\frac{1}{N}\right)(1-2p) \geq b_i.$$

Following similar arguments used in the proof of Proposition 1, it can be shown that $F(\widetilde{\Psi}_1(1)) < 1$ and $F(\widetilde{\Psi}_1(0)) \geq 0$, which imply that $F(\widetilde{\Psi}_1(p)) = p$ can only be satisfied by one probability.

Now, if the rebels use indiscriminate violence while the counterinsurgents use selective violence with an associated probability of punishment of $1-\delta^c$ the expected payoffs are

$$U_i(c) = E\left[\frac{n^c_{-i}+1}{N}\left(\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\widetilde{\delta}^r + \left(1-\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\right)\right)\right],$$
$$U_i(-c) = E\left[\frac{n^c_{-i}}{N}\left(\beta\left(1-\frac{n^c_{-i}}{N}\right)\widetilde{\delta}^r + \left(1-\beta\left(1-\frac{n^c_{-i}}{N}\right)\right)\delta^c\right)\right] + b_i.$$

Civilian i cooperates with the counterinsurgents if and only if

$$\widetilde{\Psi}_2(p) \equiv p^2\beta(1-\delta^c)\left(1-\frac{1}{N}\right)\left(1-\frac{2}{N}\right)+p\left(1-\frac{1}{N}\right)\left((1-\delta^c)\left(1-\beta\left(1-\frac{1}{N}\right)\right)+\frac{2\beta}{N}(1-\widetilde{\delta}^r)\right)$$
$$+\frac{1}{N}\left(1-\beta(1-\widetilde{\delta}^r)\left(1-\frac{1}{N}\right)\right)\geq b_i.$$

Following the proof of Proposition 1, it can be shown that there is at least one probability of cooperation that solves $F(\widetilde{\Psi}_2(p)) = p$.

Note that

$$\widetilde{\Psi}_2(p)-\widetilde{\Psi}_1(p)\mid_{\widetilde{\delta}^c=1} = p^2\beta(1-\delta^c)\left(1-\frac{1}{N}\right)\left(1-\frac{2}{N}\right)+p\left(1-\frac{1}{N}\right)\left((1-\delta^c)\left(1-\beta\left(1-\frac{1}{N}\right)\right)\right)\geq 0.$$

This shows that the largest probability of cooperation obtained in any equilibrium when counterinsurgents use selective violence is as high as the one obtained when they do not punish anyone and when the rebels use indiscriminate violence. Since $\frac{\partial\widetilde{\Psi}_1(p)}{\partial\widetilde{\delta}^c} > 0$, this shows that for all δ^c, $\widetilde{\delta}^c$ and $\widetilde{\delta}^r$, cooperation under selective violence is at least as high as cooperation under indiscriminate violence when rebels use indiscriminate violence as well.

Following the same steps above, it can be shown that $\Psi(p)\mid_{\delta^c=1} - \widetilde{\Psi}_3(p)\mid_{\widetilde{\delta}^c=1} = 0$, where $\widetilde{\Psi}_3(p)$ is the expected gain of cooperating with the counterinsurgents when the rebels use selective violence and the counterinsurgents use random violence. Since, as part of the proof of Proposition 2 we saw that $\frac{\partial\Psi(p)}{\partial\delta^c} \leq 0$ and since $\frac{\partial\widetilde{\Psi}_3(p)}{\partial\widetilde{\delta}^c} > 0$, the proposition is proven. □

Proof of Proposition 5. First, note that there cannot be an equilibrium in which some civilians remain silent and no one cooperates. If that was the case, civilians who stay silent—who have a payoff of 0—would have an incentive to deviate to cooperating which has a strictly positive payoff of

$$\frac{1}{N}\left(\beta\left(1-\frac{1}{N}\right)\delta^r+1-\beta\left(1-\frac{1}{N}\right)\right).$$

An equilibrium in which there are people who stay silent must therefore satisfy

$$E\left[\frac{n^c_{-i}}{N}\right]=E\left[\frac{n^c_{-i}+1}{N}\left(\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\delta^r+1-\beta\left(1-\frac{n^c_{-i}+1}{N}\right)\right)\right].$$

and

$$F(\Psi(p^c))=p^c+p^o.$$

Using the last expression and the convexity of $F\circ\Psi$, we can see that

$$\frac{dp^c}{dp^o}=\frac{1}{F'(\Psi(p^c))\frac{\partial\Psi(p^c)}{\partial p^c}-1}<0.$$

This shows that the maximum p^c that can be achieved in any equilibrium of this form is strictly less than the one achieved if p^o is zero. □

Proof of Proposition 6.

Civilian i would provide assistance to the counterinsurgents if and only if

$$\overline{\Psi}(p)\equiv p\left(1-\frac{1}{N}\right)((1-\delta^c)-(2-\delta^c-\delta^r)\beta)+\frac{1}{N}(1-\beta(1-\delta^r))\geq b_i.$$

After rearranging the terms and computing the expectations in (2), it can be seen that

$$\begin{aligned}\Psi(p)=&p^2\left(\left(1-\frac{1}{N}\right)\left(1-\frac{2}{N}\right)\beta(2-\delta^c-\delta^r)\right)+p\left(1-\frac{1}{N}\right)\left((1-\delta^c)-(2-\delta^c-\delta^r)\beta\left(1-\frac{1}{N}\right)+2\beta\frac{1-\delta^r}{N}\right)\\&+\frac{1}{N}\left(1-\beta(1-\delta^r)\left(1-\frac{1}{N}\right)\right)\geq\overline{\Psi}(p).\end{aligned}$$

Moreover, $F(\overline{\Psi}(p))=p$ has at least one solution, as $F(\overline{\Psi}(0))\geq 0$, $F(\overline{\Psi}(1))\leq 1$. I conclude that the highest probability of cooperation in equilibrium when military outcomes are not affected by civilian support is less than or equal to the probability of cooperation in the baseline model. □

Notes

[1]On December 12, 1948, British soldiers killed 24 Chinese villagers as part of counterinsurgency operations in the context of the conflict knows as the "Malayan Emergency" (Stubbs, 1989, 74).

[2]I will later explore the case where they are allowed to remain silent.

[3]All the results of the model hold in a more symmetric setting in which the support of F covers negative values as well (i.e. some civilians, who are ideologically aligned with the incoming group, would pay additional costs when deceiving it). Intuitively, the assumption about F having support on $[0, 1]$ is consistent with a situation in which the incoming group is trying to gain information in a place where civilians are not predisposed to give it. Also, convexity of F is an assumption taken to facilitate the exposition but that is not critical to the results. See the online appendix for a condition that ensures that all the results of the baseline model are maintained with non-convex cumulative distribution functions.

[4]We can also interpret β as the probability of the rebels winning control over the area if there were no civilians living in it.

[5]Later, I explore cooperation choices when civilians' actions do not affect military outcomes.

[6]The action of i still affects both the precision of military operations and which side prevails through p in equilibrium.

[7]It can be verified that in a setting in which military operations of the incoming group do not harm civilians, there could be a zero-cooperation equilibrium. However, allowing for collateral damage created by operations of the incoming group seems more realistic. Later, I discuss how other results change when there is no collateral damage created by the incoming group's operations.

[8]In this version of the model, cooperation is given to the counterinsurgents. It can be

shown that for most parameter combinations in a setting with no collateral damage, the welfare maximizer will side with the group that is militarily stronger, giving it complete support.

[9]The costs associated with each form of punishment are not directly modeled. Here, I assume that if the same resources are spent on both types of violence, the number of enemy cooperators punished under selective and random violence would be lower for the most expensive option.

[10]Kalyvas does note that random violence is generally counterproductive and that actors that use it could modify their tactics (Kalyvas, 2006, p. 169). However, what the model says is that under the conditions proposed in his theory of indiscriminate violence, and without the need to invoke dynamic considerations like revenge, rational actors who seek to punish defectors should not use it.

[11]Revenge and high costs associated with ill informed operations might also be important factors that could offset the short term benefits of forceful information extraction.

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