Terrorism, Wealth, and Delegation

William Spaniel[*]

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Abstract

I develop a model in which a terrorist organization delegates tasks to recruits. The organization wants to assign sensitive tasks to the most reliable recruits but cannot perfectly identify commitment to the cause. In equilibrium, the organization interprets the desirability of a recruit's opportunities in the civilian sector as a credible signal. When the recruit has attractive options available, the organization infers his commitment and gives him a sensitive task; when it is low, the organization conservatively assigns him a non-sensitive task. I then extend the model to allow for a third-party to endogenously improve economic conditions among the civilian population. Despite raising the opportunity cost of terrorism, such subsidies can increase violence because they help the organization identify committed types.

Compared to other types of political violence producers, terrorists have considerable autonomy over day-to-day operations (Shapiro and Siegel 2007; Shapiro 2013). For individuals selected to commit attacks, frequent communication with other agents risks exposing the operation or the network. Although operatives may receive orders from their commanders, they have substantial control over how to carry out those tasks. Lazy or sloppy execution can break an organization's back.[1]

Similarly, terrorist organizations must fear defection. Whereas rebel groups can persist after losing a few comrades, a single defector can force the entire terrorist organization to restructure, change drop points, alter existing attack plans, and remain in stasis until the leaked information ceases to be useful.[2] Consequently, in searching for the ideal recruit, organizations need to find individuals who will not defect at the first bribe offered.

Generalizing, because terrorist organizations face monitoring issues (Chai 1993, 103), they have great incentive to separate reliable recruits from security risks. This is no simple task. Organizations may want to delegate tasks to ideologically extreme individuals. However, ideology is an inherently internal attribute, forcing organizations to instead select on observable characteristics. Consider forgone economic opportunities, for example. Only the most radical individuals would sacrifice a wealthy lifestyle to join a terrorist cause. In contrast, giving up a life of poverty sends little useful information to the organization. Scholars have noted that groups pay poverty wages (Bahney et al 2013), perhaps to discourage less motivated individuals from joining, but the literature has yet to fully address the ramifications of such a signaling mechanism.

To better understand the relationship between wealth and terrorism, I develop a model in which organizations delegate sensitive and non-sensitive tasks to recruits, while a third-party attempts to pacify citizens with economic aid. If individuals join the organization, they generally prefer sensitive tasks. In contrast, although the organization believes that commitment to the cause is not critical for non-sensitive tasks, it suffers if a recruit assigned a sensitive task exerts lackluster effort. Thus, the game

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[1] In 2013, Said Ali al-Shihri, a deputy leader of al Qaeda in the Arabian Peninsula, stopped using standard security measures for phone calls. Correspondingly, American intelligence began tracking him. A drone strike killed him later that year, creating further vulnerability in the organization's bureaucratic structure.

[2] Berman (2009, 14) argues that the devastating consequences of defection restrict the number of functioning terrorist groups to around 40 despite the relatively low economic barriers of entry.

hinges on the organization's ability to delegate effectively.

The model generates five key results. First, as anticipated, terrorist organizations can use a recruit's "wealth"—education, job prospects, social capital, and donations to the organization—as a signal. The organization prefers assigning the most ideologically extreme recruits to sensitive tasks, and those recruits enjoy performing those sensitive tasks more than comparatively less extreme members. As such, when the organization observes that a recruit has sacrificed enviable opportunities, it knows that the individual is extreme. And unlike other signals—such as espousing ideology or spending time with the organization—pretenders cannot mimic it. In contrast, poorer recruits may only join the organization for a lack of better alternatives. Consequently, wealthier recruits are more likely to receive sensitive tasks even if they are no more extreme than the population as a whole.

Second, the model indicates that wealthier recruits are more effective agents on average than their poorer compatriots, even though all members are equally skilled in the model I analyze. This follows from the first result. Wealthier individuals, conditional on joining the organization, are more extreme on average than their poorer compatriots. This higher level of extremism leads them to exert more effort and thus perform better.

Third, the model shows that we cannot make inferences about terrorist organizations' memberships based on the characteristics of attackers. With reliable data on terrorist organization membership at a minimum due to their secretive nature, researchers focus on those who commit attacks (Russell and Miller 1977; Krueger and Maleckova 2003; Berrebi 2007). Although these datasets help answer questions about variation *given* an attack, the model indicates that terrorist organizations strategically select their attackers. In turn, the average member may slant poor even though most attackers come from wealthy backgrounds.

Fourth, income inequality may or may not increase the frequency of attacks. The fact that increasing inequality could lead to more attacks might not seem controversial. Yet the influx of attacks does *not* come from the poorer segments of the population. Indeed, because the terrorist organization worries that poor recruits are not particularly motivated, it delegates non-sensitive tasks to those individuals. Instead, the additional effectiveness comes from the wealthier segment of the population, because the organization can safely give those recruits sensitive tasks. Nevertheless, extreme inequality can reduce attacks because sufficiently wealthy individuals choose to remain civilians.

This helps explain why large-scale empirical investigations cannot recover a relationship between inequality and terrorism (Gassebner and Luechinger 2011).

Finally, economic improvements across society can increase attacks as well. Although increasing the attractiveness of civilian life would seem to raise the opportunity cost of becoming a terrorist (Frey and Luechinger 2003; Blomberg, Hess, and Weerapana 2004; Baker and Hamilton 2006; Berman and Laitin 2008, 1964; Rosendorff and Sandler 2010), the delegation problem convolutes the overall effect: recruitment decreases monotonically with aid, but effectiveness may increase or decrease.[3] Further, empirical results showing that aid correlates with fewer attacks do not imply that donors should be more liberal with their subsidies. Rather, strategic donors endogenously select aid targets where the subsidy yields fruitful results and avoids the counterproductive circumstances. Despite empirical observations seemingly to the contrary (Burgoon 2006; Azam and Thelen 2008; Azam and Thelen 2010), more aid might only exacerbate existing problems.

From a theoretical perspective, my work is most similar to Shapiro and Siegel (2007) and Bueno de Mesquita (2005). Shapiro and Siegel develop a model with principal-agent problems. Whereas their research addresses oversight, my work analyzes a signaling mechanism that affects task assignment. This also differentiates my work from the broader literature on structuring contracts for political violence operatives (Gates 2002; Ferrero 2006; Arce and Siqueira 2013). Unobservability of effort is common across the literature, but my model emphasizes the observability of a recruit's outside option. Terrorist organizations can then use this information to improve the assignment decision without offering differential contracts. My work therefore comes from a signaling perspective. In this framework, unlike the contracts literature, terrorist organizations do not have to credibly commit to payments to receive the information. This is important because the shadow of the future for such organizations may be short, preventing reputation effects from making payments credible.

Meanwhile, Bueno de Mesquita develops a model of economic opportunity and terrorist activity. He finds that organizations seek wealthier recruits with access to vulnerable targets. A large literature provides empirical confirmation that wealthier terrorists are deadlier.[4] But whereas Bueno de Mesquita's mechanism emphasizes access and skill,

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[3]This result also matches non-monotonic results on GDP in general (Lai 2007; Freytag, Kruger, Meierrieks, and Schneider 2011).

[4]See Russell and Miller 1977; Krueger and Malechova 2003; Berrebi 2007; Benmelech, Berrebi, and

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my model demonstrates that the signaling and endogenous effort decisions produce a similar relationship.

Despite the similarity of the mechanisms, my signaling theory generates unique predictions of interest to scholars and policymakers alike. The connection between wealth and effectiveness is most prominent when terrorist organizations face greater information asymmetries, whereas the effect of competence remains static. Additionally, the signaling mechanism predicts a nonmontonic relationship between terrorism and both wealth and inequality; the skill mechanism remains neutral here. These effects indicate that aid provides the most benefit in middle-income areas.

Modeling Delegation

This paper explains how a third-party manipulation of wealth affects terrorism dynamics. First, however, we need a better understanding of the information problems those organizations face. I therefore develop that dilemma here; it later serves as the subgame following an economic inducement.

Players, Actions, and Timing. The baseline model features two players: an organization and a citizen. Broadly, the citizen first decides whether join the organization. If the citizen joins, the organization delegates him to a sensitive or a non-sensitive task. I conceptualize sensitive assignments as direct participation in or logistical support for violent actions that require great preparation, focus, or secrecy. Non-sensitive tasks have more rigorous direct oversight such as foot soldier duties, bureaucratic fields such as accounting (Shapiro 2013, 34-44), religious devotion, non-participatory civilian support, or charitable work like that of Hamas, Hezbollah, and the Mahdi Army.[5] Finally, a citizen given a sensitive task selects an effort level to exert to complete his operation.

Information. Central to the information problem, Nature assigns a level of ideology i to a citizen from the probability distribution function $f(i)$. This function has support exclusively on the interval $[0, 1]$. Its cumulative distribution function $F(i)$ is

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Klor 2012.

[5]In practice, those assigned sensitive tasks may also shift into non-sensitive roles when there are no sensitive tasks available. Thus, the interesting question is who receives the sensitive tasks when the group needs to choose someone for them.

differentiable everywhere on its support. The draw value i represents how much the citizen values terrorist activities. Consistent with the notion that ideology is an internal trait, a citizen observes his draw but the terrorist organization does not. Thus, the organization must use other observable factors to deduce the individual's level of commitment.

One potential signal of commitment is the citizen's wealth value w. Although this section discusses a single citizen, the later extension considers how a third-party can influence recruitment on a macro level.[6] As such, it is useful to think of w as drawn from the function $g(w)$. This function has support exclusively on the positive reals. Its cumulative distribution function $G(w)$ is differentiable everywhere on its support. Unlike the ideology draw, both the individual and the organization see w because opportunities like education, current employment, familial ties, and money donated upon entering the organization are publicly observable.

Note that w and i are uncorrelated in this setup. Given the empirical connection between observed attackers and wealth, this may seem strange. However, in practice, ideological extremism is not consistently connected to economic opportunities (Krueger and Maleckova 2003; Krueger 2007).[7] Further, this stacks the deck against the empirical implications I find. If wealthier individuals were more extreme on average, it would not be surprising that wealthier individuals committed more attacks. In contrast, I assume that wealthier individuals are no more extreme than their poorer counterparts, and yet they receive sensitive assignments more often through an endogenous selection process.

Payoffs. Two outcomes have simple payoffs. If the citizen declines to join, he keeps his wealth value w and the organization receives 0. Meanwhile, if the citizen joins and the organization assigns him to a non-sensitive task, the citizen forgoes w and instead receives i (in fulfilment of his ideological persuasion) and the organization receives 1 without loss of generality.[8]

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[6]In this manner, the organization does not have a cap on the number of attacks it would want to commit. Relaxing this would only strengthen the results—the organization would select the wealthiest individuals because most extreme in expectation and leave the rest non-sensitive roles.

[7]Unfortunately, data on support for extremism across socioeconomic strata are hard to come by due to locations where such data would be most applicable. However, hate crimes—which would not suffer from the selection problems I discuss here (Krueger 2007)—are relatively constant across economic levels (Green, Glasser, and Rich 1998; Krueger and Pishke 1997).

[8]The value w is therefore more accurately the opportunity cost of joining. This may come in the form of lost wages from giving up a job or the time lost working for the organization, which prevents

The final case involves the citizen joining and the organization assigning him to a sensitive task. Unlike non-sensitive tasks, the citizen's effort level determines both players' payoffs. Let $e_i \geq 0$ represent the effort of a citizen with ideology level i. The citizen earns a payoff $r_i(e_i)$, where r_i is type i's function reflecting ideological fulfilment from the task and the costs associated with the operation. Meanwhile, the terrorist organization receives $v(i, e_i)$ if it assigns the recruit to a sensitive task. This function maps the individual's ideological level and the effort level e_i from an individual with that ideological level to substantive results.

I make four assumptions about $r_i(e_i)$. First, for all i, a value $r_i(e_i) > i$ exists. In words, a citizen can always exert enough effort in the sensitive task that his payoff is greater than if the terrorist group assigned him a non-sensitive task. Substantively, I make this assumption because militants find violent tasks as the most appealing (Hassan 2001).[9] Second, I assume $r_i(e_i)$ is strictly concave. This implies that $r_i(e_i)$ has a unique maximizer, which I call e_i^*. Third, for all $i' > i$, $e_{i'}^* > e_i^*$; in words, the optimal effort for a more extreme individual is greater than the optimal effort for a less extreme individual. Substantively, I make this assumption because more extreme individuals have a greater natural affinity for their work and thus expend more effort in pursuit of the organization's goals. Lastly, let $r_{i'}(e_{i'}^*) - i' > r_i(e_i^*) - i$ for all $i' > i$; in words, the gain more ideologically extreme individuals receive from a sensitive tasks over a non-sensitive tasks is greater than the gain of less extreme individuals.[10] Thus, more extreme individuals are willing to make greater sacrifices in fulfilling sensitive tasks than are less extreme individuals.

As for the organization's payoff function $v(i, e_i)$, one direct interpretation of it is the quantity of violence the organization produces.[11] Regardless, because an organization naturally values more effort from its recruits to less, let $\frac{\partial v}{\partial e_i} > 0$. Additionally, to reflect how more extreme individuals have at least as great of loyalty holding effort constant, let $\frac{\partial v}{\partial i} \geq 0$. That is, holding effort constant, the organization is no worse off selecting a

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the individual from consuming these benefits.

[9]Relaxing this assumption would not significantly change the main results.

[10]Relaxing this assumption also does not significantly change the main results but does create equilibria that are not robust to the D1 refinement. I discuss this further in the appendix.

[11]Throughout, I hold the latent skill of a recruit constant. This does not affect the theoretical insights I uncover because greater agent effort improves terrorist organization outcomes across latent skill levels.

more extreme individual than a less extreme individual.[12]

Many other factors might influence the exact shape of $v(i, e_i)$, but I leave it general to allow for broader results. Note critically that the functional form permits $v(i, e_i)$ to be less than 1 for low effort levels. Intuitively, low effort may result in organization embarrassment and thus loss of market share (Bloom 2004; Conrad and Greene 2015), reduces the organization's power and thus hinders it in coercive bargaining (Bapat 2006; Bapat 2014), wastes valuable resources in the process (Shapiro and Siegel 2007), and risks an operative getting caught and yielding information to the target's intelligence agencies.[13] In turn, the terrorist organization may prefer giving the recruit a non-sensitive assignment if it suspects that he will only commit low effort.

Breaking from previous models, note that $v(i, e_i)$ is *not* a function of wealth. Consequently, wealth has no direct bearing on the effectiveness of a terrorist's actions. In contrast, others assume that terrorists with better outside options are more competent field agents. Empirical evidence indicates that wealthier terrorists are indeed deadlier. However, as I later show, this may not be due to some latent skill factor. Rather, a selection process ensures that wealthier recruits have more extreme ideologies, and these more extreme ideologies lead those recruits to endogenously work harder than their less wealthy compatriots.

To recap, the game proceeds as follows:

1. Nature selects a citizen's wealth w and ideology i from $G(w)$ and $F(i)$

2. The citizen observes both draws but the organization only observes w

3. The citizen chooses to join the organization or not

4. If the citizen joins, the organization assigns a sensitive task or a non-sensitive task

5. If the organization assigns a sensitive task, the citizen chooses an effort level e_i

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[12]Some may argue that the organization's payoff should be exclusively a function of effort (i.e., $\frac{\partial v}{\partial i} = 0$). All results hold under these conditions.

[13]For example, such interrogations led to the assassination of Abu Muasb al-Zarqawi in 2006 (Berman and Laitin 2008, 1964-1965). Berman (2009) further argues that minimizing the potential for defection is a top priority for terrorist organizations.
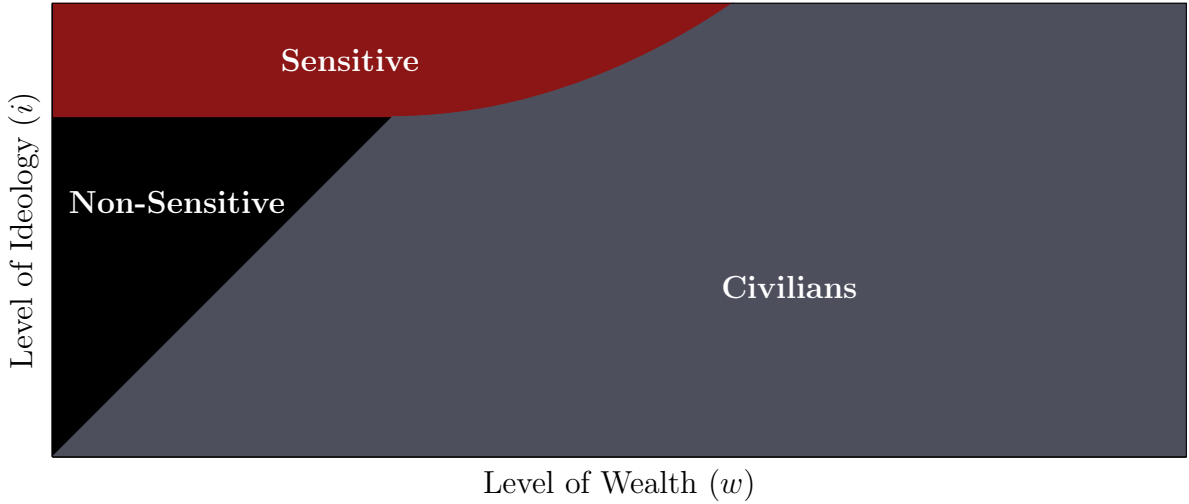
Figure 1: The outcome for each citizen as a function of his level of wealth (w) and ideology (i) with complete information.

Signaling Extremism

To build a baseline understanding of the strategic incentives, consider how the game would unfold with complete information. At the end of the interaction, the recruit has a simple optimization problem and picks effort level e_i^*, generating a payoff of $r_i(e_i^*)$ for himself and $v(i, e_i^*)$ for the terrorist organization. Moving up, the organization secures 1 if it assigns the recruit to a non-sensitive task and $v(i, e_i^*)$ to a sensitive task. Consequently, the recruit receives the sensitive task if $v(i, e_i^*) > 1$ and the non-sensitive task if $v(i, e_i^*) < 1$. In the first case, at the initial node, the recruit joins the organization if $r_i(e_i^*) > w$ and remains a civilian if $r_i(e_i^*) < w$; in the second case, the recruit joins the organization if $i > w$ and remains a civilian if $i < w$. Figure 1 plots each type's equilibrium role with complete information given those parameters.

Throughout, I only make the assumptions that that $\int_0^1 v(i, e_i^*) f(i) di < 1$ and $v(i, e_1^*) > 1$. I do this because the other cases are theoretically uninteresting. The first condition says if all types of citizens join the terrorist organization, the organization expects to be worse off assigning him a sensitive task than giving him a non-sensitive one. In essence, the condition assures that the organization faces a compliance problem from recruits with sensitive tasks and worries about failed operations. Thus, if the citizen would assuredly become a recruit regardless of type, the organization would refuse

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to give him a sensitive task out of fear that the individual might put in insufficient effort, blow the operation, get caught, and reveal vital information about the organization. This matches the empirical observation more individuals are willing to volunteer for attacks than an organization is willing to hire (Hassan 2001; Iannaccone 2006, 14). The second condition says that the organization wishes to assign the most extreme individual a sensitive task. If this were not the case, then the organization would never give a recruit a sensitive role and thus make the remainder of the interaction trivial.

Regardless of those conditions, with complete information, the terrorist organization sorts the ideologies. Those most extreme receive sensitive assignments. The least extreme stay home. Those in the middle join and receive non-sensitive assignments. In contrast, the organization faces a challenge when it cannot observe the recruit's ideology. Here, whenever the organization recruits a member, it must weigh the relative risks and rewards. The following propositions explain how the organization resolves its problem as a function of the citizen's commonly known wealth value.

Because this is a sequential game of incomplete information, perfect Bayesian equilibrium (PBE) is the appropriate solution concept. For clarity, I limit the equilibrium discussion below to those that satisfy the D1 refinement. Here, D1 implies that the organization believes a recruit has the most extreme ideology if it must assign a belief off-the-equilibrium-path. The D1 refinement does not substantially alter the empirical implications of the model, and I give a complete description of all PBE in the appendix along with proofs for all the propositions.

To begin, consider situations in which the citizen's wealth is great:

Proposition 1. *If wealth is sufficiently large (i.e., $w > r_1(e_1^*)$), all types remain civilians.*

Here, the terrorist organization never encounters an assignment decision because it never receives such a wealthy recruit. Indeed, no matter how the organization would assign wealthy citizens, they prefer not to join. As such, all ideology types pool on remaining civilians; no matter what belief the organization has off-the-path, no ideology type would want to deviate.

In contrast, the information problem is most acute when wealth is low. Specifically, the next proposition details the outcome of the game when wealth is below i^*, where i^* is the lowest level of ideology such that the organization is willing to assign all individuals

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with ideology at least i^* sensitive tasks[14]:

Proposition 2. *If wealth is sufficiently low (i.e., $w < i^*$), types with ideological levels greater than their wealth join the organization (i.e., $w < i$). The organization assigns a non-sensitive task with certainty.*

Intuitively, any citizen with ideology greater than wealth (i.e., $i > w$) strictly prefers to join. This is because joining gives the citizen at least i (and potentially $r_{i^*}(e_{i^*}^*)$ if the organization assigns him a sensitive task), whereas the civilian life only generates w. A semi-separating equilibrium arises from this, with the least extreme citizens staying home and a range of more extreme citizens joining. The organization updates its belief that the recruit is not from the least extreme segment of society. But because wealth is so low here, this does not give the organization much faith that the recruit is truly extreme. It therefore assigns the recruits non-sensitive tasks. This helps explain why so few terrorist attacks occur despite copious willing volunteers and low operational costs (Hassan 2001; Iannaccone 2006, 14; Hoffman 2006, 132-134): for many types of volunteers, the risk of low effort is not worth the potential reward.

Moderate levels of wealth provide the most strategically rich play:

Proposition 3. *If wealth falls in a high-middle range (i.e., $r_{i^*}(e_{i^*}^*) < w < r_1(e_1^*)$), sufficiently extreme types (i.e., types for which $r_{i^*}(e_{i^*}^*) > w$) join the organization. The organization assigns a sensitive task.*

The organization can make a much stronger inference in this parameter space. The citizens again semi-separate, with the most extreme joining and the remainder staying home. For the most part, the organization knows that it can rely on such recruits. After all, wealth levels are relatively high, so the more ideologically inclined types can signal their preferences. The organization's updated belief truncates all but the most extreme individuals, so it assigns sensitive tasks. In turn, those types want to join the organization because their value for sensitive tasks $r_{i^*}(e_{i^*}^*)$ is greater than their wealth value w.

However, as wealth declines in this range, recruits become increasingly unreliable. Eventually, some segment of types shirk enough that the organization prefers giving

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[14]Formally, i^* is the unique solution to $\frac{1}{1-F(i')} \int_{i'}^1 v(i, e_i^*) f(i) di = 1$. See the appendix a more detailed explanation of this value.

them non-sensitive tasks. Yet, because of the information problem, the organization cannot do that without doing the same for *all* recruits with that ideological level. As such, the organization is willing to accept some chance of failure because the expected payoff remains greater than giving them a non-sensitive task.

Further decreasing wealth makes this tradeoff more difficult, though:

Proposition 4. *If wealth falls in a low-middle range (i.e., $i^* < w < r_{i^*}(e_{i^*}^*)$), sufficiently extreme types (i.e., types for which $i > i^*$) join the organization. The organization assigns a sensitive task with probability $\frac{w - i^*}{r_{i^*}(e_{i^*}^*) - i^*}$ and a non-sensitive task with complementary probability.*

The intuition rests on the above logic. As wealth declines, citizens still semi-separate, but unreliable types increasingly flood the organization. Further, the most unreliable of this subset joins because it hopes for a sensitive task—they would be unwilling to join if they knew they would receive non-sensitive tasks, as this provides them a lower payoff. The organization's truncated belief now includes a moderate swath of citizens. Thus, the organization begins finding sensitive assignments no better than non-sensitive assignments.

To resolve the tradeoff, the organization mixes between assignment to the different roles. Because a recruit cannot expect to receive the more desirable sensitive tasks with certainty, the least extreme types (those with levels below i^*) remain civilians. Nevertheless, the information problem causes the organization to inefficiently allocate its resources—even the most reliable recruits sometimes receive non-sensitive tasks.

Recapping, when ideology is private information to the recruit, the organization struggles to find the right agent. Further, because sensitive tasks are also the most desirable, they cannot simply ask recruits for their true ideological commitment and expect a revelatory response. Thus, as Figure 2 illustrates, the organization falls back on the recruit's level of wealth to assign the appropriate task. If a wealthy recruit has joined, the organization interprets the forgone benefits as a credible signal of the recruit's ideology.[15] Less extreme individuals stay in the civilian sector, allowing the organization to update its belief. This explains why citizens with sufficiently large values of w avoid the organization, per Proposition 1.

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[15]See Iannaccone (1992) and Berman and Laitin (2008) for related arguments.
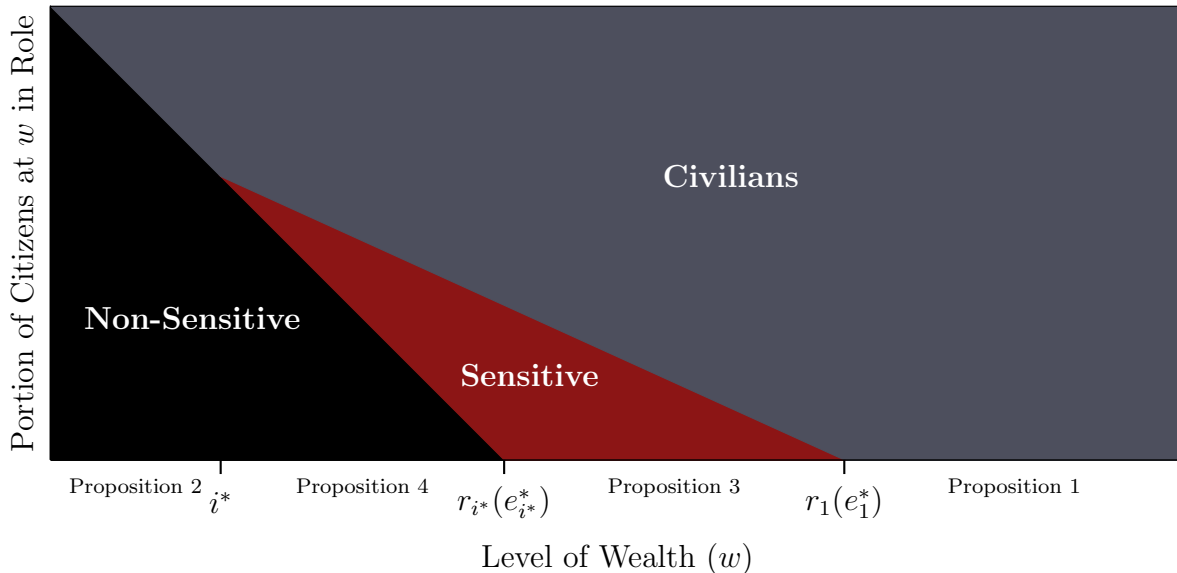
Figure 2: Proportion of citizens who receive sensitive tasks, receive non-sensitive tasks, and remain civilians for any given wealth value w. Hashmarks indicate the cutpoints to the corresponding propositions.

On the other end of the spectrum, the organization must be cautious. Per Proposition 2, low wealth levels yield unreliable recruits, forcing the organization to give all such individuals—even the most extreme—non-sensitive tasks. However, increasing wealth gradually encourages the organization to give sensitive tasks, first randomizing to deter the least extreme of individuals to join (Proposition 4) before giving all recruits sensitive tasks (Proposition 3).

Terrorist Background and Effectiveness of Attacks

Empirical scholars find a connection between a terrorist's economic background and the effectiveness of attacks. One explanation is that wealthier terrorists are more competent and have better access (Bueno de Mesquita 2005). My model shows that this relationship can form purely from a selection effect. To see how, recall that the function $v(i, e_i)$ measures the organization's benefit for assigning a sensitive task. One obvious interpretation of this is the number of casualties attributable to an individual. Even so, we do *not* observe that number among all who wish to become terrorists. Rather, we

only observe terrorist effectiveness among those who receive sensitive tasks (Krueger 2007, 35-36).

With that in mind, consider how terrorist quality varies by wealth level, as illustrated in Figure 2. Only types with wealth levels in the middle generate data on terrorist effectiveness. In the poorer portion of this middle range, the organization randomizes its assignment decision. Consequently, a large portion of less extreme types commit attacks in this range. Because e_i^* is increasing in i, terrorists in this region exert less effort and therefore produce middling results. However, as wealth increases, fewer of these less extreme types join, driving up the expected level of ideology and thus the quality of the attacks. Increasing wealth further ensures that only trusted extremists join the interaction, leading to yet more effective terrorism.

This selection effect indicates a second issue with making inferences about terrorist organization composition based on those who commit attacks. Scholars want to know the background of the average terrorist. However, terrorist organizations value their secrecy, so taking a census on any particular organization is impossible. The fall-back option has been to analyze leadership and those who commit attacks (Russell and Miller 1977; Krueger and Malechova 2003; Berrebi 2007), which are readily available due to the saliency of such individuals.

Nevertheless, the claims we can make about such data prove inherently limited. The model demonstrates that using wealth as a signal leads to two different types of terrorists: those who eventually reach the public eye (via sensitive tasks, once completed) and those who do not (via non-sensitive tasks). Those who are wealthy are disproportionately likely to become well-known, while the poorest of recruits inevitably remain obscure. As such, observing that the average attacker comes from an economically privileged background does not say much about the average member of the entire organization.

Those caveats aside, the Sinjar records conform to the empirical implications of the model. Discovered by coalition forces in Northern Iraq in 2007, the Sinjar records are Al-Qaeda's own detailed descriptions of 563 foreign fighters. Most importantly, they contain the amount of money that the individual donated upon his arrival and the task he received. Those who became suicide bombers donated 56% more on average than those assigned to other roles. This is consistent with the signaling mechanism.

Manipulating Wealth and Terror

The above analysis took the quality of a citizen's economic opportunity as given. However, various groups give conflict-prone regions large quantities of economic aid (Fleck and Kilby 2010). Beyond funding domestic military infrastructure, this aid theoretically improves economic conditions. Potential terrorist recruits therefore face a greater opportunity cost for joining the organization, which ought to decrease membership on the whole.

Policymakers echo such theories (Krueger 2007, 13). For example, in a speech at a 2002 United Nations conference on development, President George W. Bush argued that the United States "fight[s] poverty because hope is an answer to terror." Nine years later, Russian President Dmitry Medvedev echoed Bush, saying that Russia "must do everything possible to influence...the socioeconomic roots on terrorism: poverty, unemployment, illiteracy, and orphanhood" following the suicide bombing of a Moscow airport.[16]

These examples support the notion that a third party often manipulates the financial incentives in terrorist recruiting. However, McBride and Richardson (2012) warn that counterterrorism interventions in complicated strategic environments can have unintended consequences. As such, I now add a move to the beginning of the game, allowing a third party to select a subsidy. I conceptualize the third party as a potential target or an international body that wishes to reduce political violence. One may therefore think of it as the United States, as a foreign aid donor to Middle East countries, a United Nations effort to build infrastructure in the developing world, or economic inducements from the home government.[17]

Formally, prior to the citizen choosing whether to join, the third party selects a subsidy $s \geq 0$. This subsidy improves economic opportunities in the civilian sector.[18] Thus, rather than receive w by not joining the organization, a citizen now receives $w + s$. For simplicity, I assume that the subsidy does not temper ideology, though

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[16]See Bush 2002 and Medvedev 2011.

[17]In practice, third parties have a number of means to reduce the frequency and intensity of attacks, including military interventions, infiltration, and investment in target-hardening. I focus on economic options because costly signaling drives the strategic tension.

[18]An alternative interpretation is that the subsidy generally makes it costlier for a citizen to join the terrorist organization, perhaps due to military aid to the home state (Bandyopadhyay et al 2011; Azam and Thelen 2010; Bapat 2011).

similar results follow if subsidies do not too easily moderate the population.[19]

The third party's payoff function has two parts. First, it suffers the realized value of a sensitive assignment. This means that attacks are zero-sum for the third party and the organization.[20] Second, the third party pays a cost given by the strictly convex function $c(s)$. To make costs costly, I assume that $c(s') > c(s)$ for $s' > s$. Note that this function implicitly accounts for how much the third party values money over eliminating terrorist attacks.[21] It also tracks the effectiveness of disbursements. Aid rarely transfers dollar-for-dollar; holding fixed a level of s, $c(s)$ is larger when graft and transaction losses are larger. Overall, its payoff is $-v(i, e_i) - c(s)$.

In practice, subsidies of this nature can take two forms. First, third parties can pay for *general* welfare improvements in the form of public goods like access to education (Azam and Thelen 2008), roads, and public health. These have the effect of distributing the s value across all levels of w.[22] Second, third parties may try to provide subsidies to specific groups, which can be effective under the right circumstances (Blattman and Ralston 2015). These subsidies increase the value of remaining a citizen to some levels of w but not others.[23]

Because there are two plausible ways to think about the interaction, I consider both of them below. However, the analytical results depend heavily on the shape of the distribution functions over i and w. As such, rather than develop any one individual solution, I discuss some of the interesting properties of the third party's optimization problem.

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[19]This is a reasonable expectation if the ideological issue is about policy, not economic hardship. Further, if the organization providing the subsidy is not the target of the violence, such aid seems unlikely to change ideological beliefs about a third party.

[20]Similar results would hold if the third party also cared to some degree about overall terrorist organization membership instead of just sensitive assignments.

[21]For example, if the third party is an autocrat that could cover up the attack, the autocrat's $c(s)$ would map to a smaller value than a government more sensitive to attacks holding s constant.

[22]One might imagine that individuals joining a group also enjoy some of these additional benefits. To generate the results below, I only need to assume that civilians benefit *more* than recruits, which is sensible given that many of these subsidies aim to increase quality of life. More precisely, s represents the additional benefit to civilians because additions to payoffs for both recruits and civilians cancel out in the strategic calculus.

[23]Such specific aiming is difficult to achieve because economic benefits to one social class can spill over to others. Nevertheless, many forms of aid attempt to target in this manner, so it is worth analyzing the optimal method for doing so.

Subsidies and the Prevalence of Terrorism

To begin, consider the utility of untargeted subsidies. That is, the third party cannot observe i or w when it chooses s, or the form of aid the actor has at its disposal cannot target one particular group.[24] The intuition about increasing an individual's opportunity cost and overall terrorist membership holds true:

Remark 1. *Increasing the subsidy weakly decreases overall terrorist membership.*

To see why this is the case, refer back to Figure 2. As wealth increases, the proportion of individuals who remain civilians decreases; membership regardless of assigned task looks less exciting when the civilian life promises greater riches. Thus, holding $g(w)$ constant, shifting wealth levels by s decreases each individual's probability of joining the organization, implying that organizational membership declines as a whole. Moreover, the civilian population grows as s increases, though further subsidies eventually yield no improvement once all citizens choose to remain civilians.

From this, one might extrapolate that the $-v(i, e_i)$ portion of the third party's utility is strictly increasing in s, which would support the argument that increasing economic capacity reduces the quality of terrorism (Benmelech, Berrebi, and Klor 2012). However, this intuition does not hold when terrorists face an information problem:

Remark 2. *If the third party's subsidies do not discriminate based on wealth levels, terrorist attacks can have a non-monotonic relationship with the third party's subsidy. That is, increasing the subsidy can increase the severity of attacks. However, sufficiently large subsidies decrease the severity of attacks.*

Figure 3 illustrates the problem the third party faces using the same utility function as Figure 2. Suppose that w is distributed uniformly on the shaded interval in the top-third of the figure. Without any subsidies, the vast majority of types remain civilians or receive non-sensitive tasks. Most are too poor for the terrorist organization to trust with sensitive roles.

Now imagine that the third party provides a small subsidy. This has the effect of moving the population to the right of Figure 2 by s units. The result is the middle

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[24]One might think that this form of aid would be more common if the third party were a government that the terrorist group was targeting. The subsidy s could then be interpreted as the level of public goods the government provides.
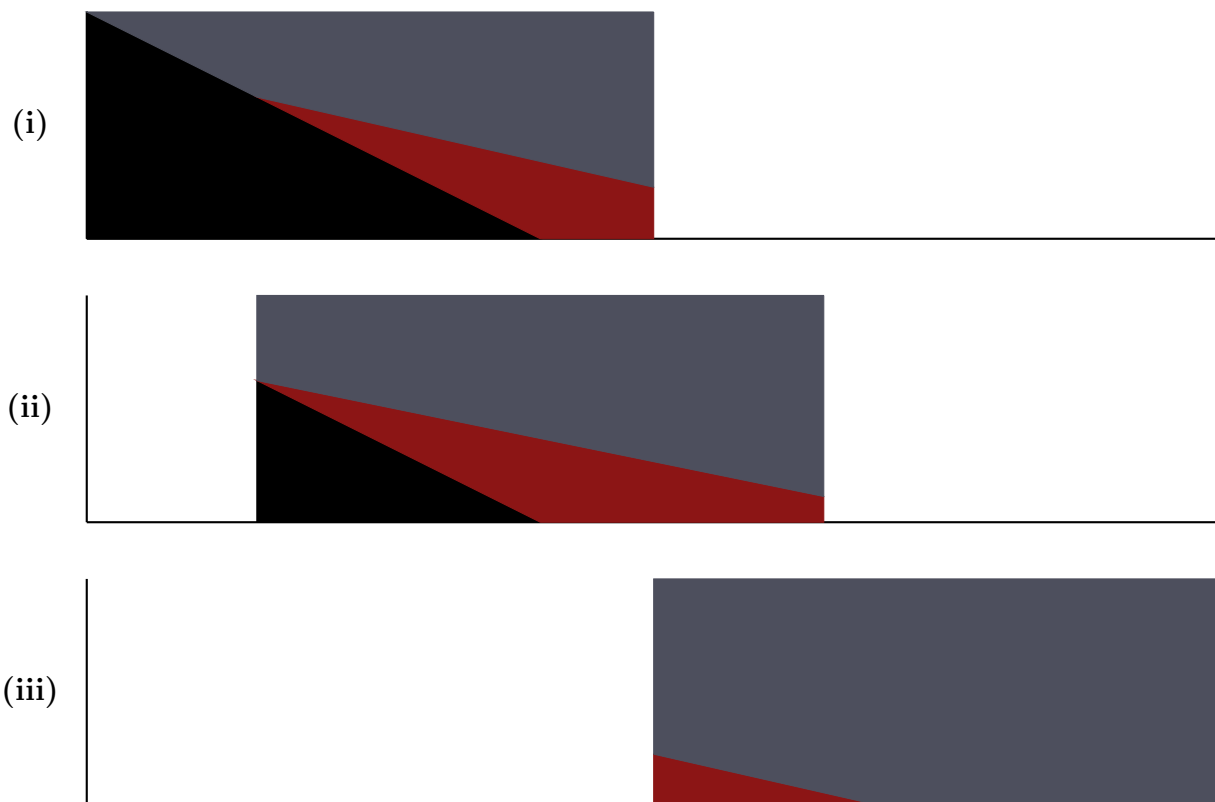
16

Figure 3: The distribution of individuals assigned to sensitive tasks, individuals assigned to non-sensitive tasks, and civilians with (i) no subsidy, (ii) a small subsidy, and (iii) a large subsidy. When the distribution of citizens is sufficiently poor, small subsidies decrease the number of terrorist volunteers but increase the organization's trust of their recruits. This results in a net increase in the frequency of attacks. Sufficiently large subsidies resolve the problem; although the additional wealth further increases the organization's trust of their recruits, few citizens leave the civilian population.

third of Figure 3. Note that much of the population overlaps between this case and the previous. The only difference is that the subsidy has cut the first s portion of individuals by shifting them over. Although that extra wealth convinces a percentage of the previously poor citizens to not join the organization, those individuals would have only received non-sensitive tasks. The organization covers its loss, though, by using the higher levels of wealth to identify committed types. Further, because the organization obtains better information under these conditions, the average ideology of types with sensitive tasks is greater. Therefore, the effectiveness of attacks increases as well. In turn, the external party would never pick such a small subsidy, as it needlessly wastes the cost and is ultimately counterproductive.

Fortunately for the third party, sufficiently large subsidies fix these problems. The bottom third of Figure 3 provides an example. Now all but most extreme of the least well-off segment of society join. Although the organization knows to assign them sensitive tasks, the third party's ploy works. Few citizens join.

Thus, third party must employ a "go big or go home" strategy. Small subsidies only help the organization identify committed types. Large subsides still aid the signaling mechanism but diminish the overall supply of terrorism. In turn, the third party must weigh the costs of providing the larger subsidy to maintaining the status quo. If wealth improvement is relatively cheap, then the third party should provide the subsidy. But if disbursement is ineffective, no subsidy at all may be optimal.

These results suggest caution in interpreting empirical effects of aid on terrorist activity. Many studies find that aid has a positive effect (Burgoon 2006; Azam and Thelen 2008; Azam and Thelen 2010), and the United States succeeded in paying off potential recruits during the Anbar Awakening.[25] Azam and Thelen correspondingly conclude that "Western democracies, which are the main targets of terrorist attacks, should invest more funds in foreign aid" (2008, 375; 2010, 237). Unfortunately, this policy recommendation backfires if the data generating process matches my model. In equilibrium, third parties only give aid to the places where it is effective, *not* to the places where it leads to an increase in terrorist attacks. This would allow Azam and Thelen to uncover their relationship. However, because the third party already provides aid where it is effective, expanding could increase the prevalence of attacks.

The theoretical mechanism also has empirical implications regarding general eco-

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[25]Gassebner and Luechinger (2011) recover only tempered effects in a meta-analysis.

nomic well-being and the prevalence of terror. The same non-monotonic relationship holds for measures like gross domestic product rather than an external subsidy. Indeed, a couple empirical studies recover this effect, with terrorism maximizing at a middle range of state GDP (Lai 2007; Freytag et al 2011). Freytag et al suggest that terrorism shrinks at high levels of GDP due to superior state capacity (Fearon and Laitin 2003). My opportunity cost argument indicates that disaffected populations could simply prefer their economic options to terrorism when aggregate wealth is high.

Lastly, the model's scope conditions reveal when increasing wealth does not backfire. Information problems drive these results. Some violence-producing actors such as rebel groups with regular soldiers can better monitor their agents. For these groups, placing less extreme individuals in sensitive tasks is less risky. In turn, increasing wealth levels can only decrease violence and membership.

Inequality and the Prevalence of Terrorism

Now suppose the third party can target its aid. The following remark gives a strategy the third party should avoid:

Remark 3. *If the third party can target its subsidy, it should increase its aid exclusively to the middle class (i.e., individuals with wealth $i^* < w < r_1(e_1^*)$).*

To understand why, again refer back to Figure 2. On one end, sufficiently wealthy citizens never commit attacks—they never join the organization and thus never receive sensitive tasks. Aid is unhelpful here. At the other end, the poorest of individuals never receive sensitive assignments. Rather, an individual must achieve a minimum amount of wealth (specifically, i^*) to receive such a task. In turn, targeting aid to this poorest segment of the population can only increase the quality of attacks.[26]

This leaves the middle class. The third party must still exercise caution here. Increasing aid by small amounts to the lower middle class leads to more attacks from more motivated (and therefore deadly) individuals. A large subsidy is necessary to achieve a net improvement. Meanwhile, the upper middle class sees a decrease in attack prevalence, so aid leads to improvement on that end.

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[26]It will, however, decrease overall membership. That said, even if the third party places some value on reducing membership, the increase in attacks devalues expenditures on the society's poorest citizens.

The normative implications are unfortunate here. From a humanitarian standpoint, states wish to target aid at to the neediest. Yet these individuals rarely participate in sensitive tasks. Moreover, increasing their economic outlook allows them to send a costly signal to the organization and receive a proper assignment. Reducing attacks and promoting humanitarian intervention appear to be inconsistent with each other in this manner.

It is worth emphasizing that the modeling assumptions represent a worst-case scenario, which tempers the policy implications here. If the third party is the target of the attacks, giving large amounts of aid might also alter the distribution of citizen ideology. In turn, while a subsidy may permit a costly signal, the tempering of citizen ideology can more than compensate.

Still, there are two situations where such a countervailing effect does not predominate. First, if citizen radicalization is not the result of economic discrepancies but rather cultural or geopolitical disagreement, aid will not mitigate ideology. Second, if the third party is not the target of the attacks but rather an international organization that wants to improve quality of life and decrease terrorism worldwide, ideology ought to remain unchanged because aid does not alter beliefs about the target of the attacks.

As Remark 4 summarizes, these results also indicate caution in interpreting terrorism's relationship with inequality:

Remark 4. *The effect of inequality on terrorist attacks depends on the precise distribution of wealth.*

The intuition is an accumulation of the discussion above, so I focus on Figure 4 as an illustration of the problem. Suppose the wealth of the population is uniformly distributed as in the top portion of the graph. Like Figure 3, this is a subset of Figure 2. A small number of terrorist attacks occur here. Now suppose the poorer majority was even poorer. The resulting society, showcased in the middle of the graph, is less equal than the original. Terrorist attacks increase in frequency and intensity; fewer wealthy individuals mean that a larger portion of the population is willing to forgo its economic opportunities and join the organization.

However, suppose inequality further increases by decreasing the wealth of the poorest majority. The wealthy continue to not join. Meanwhile, a large percentage of the poorest segment is willing to join the organization due to their abysmal outside
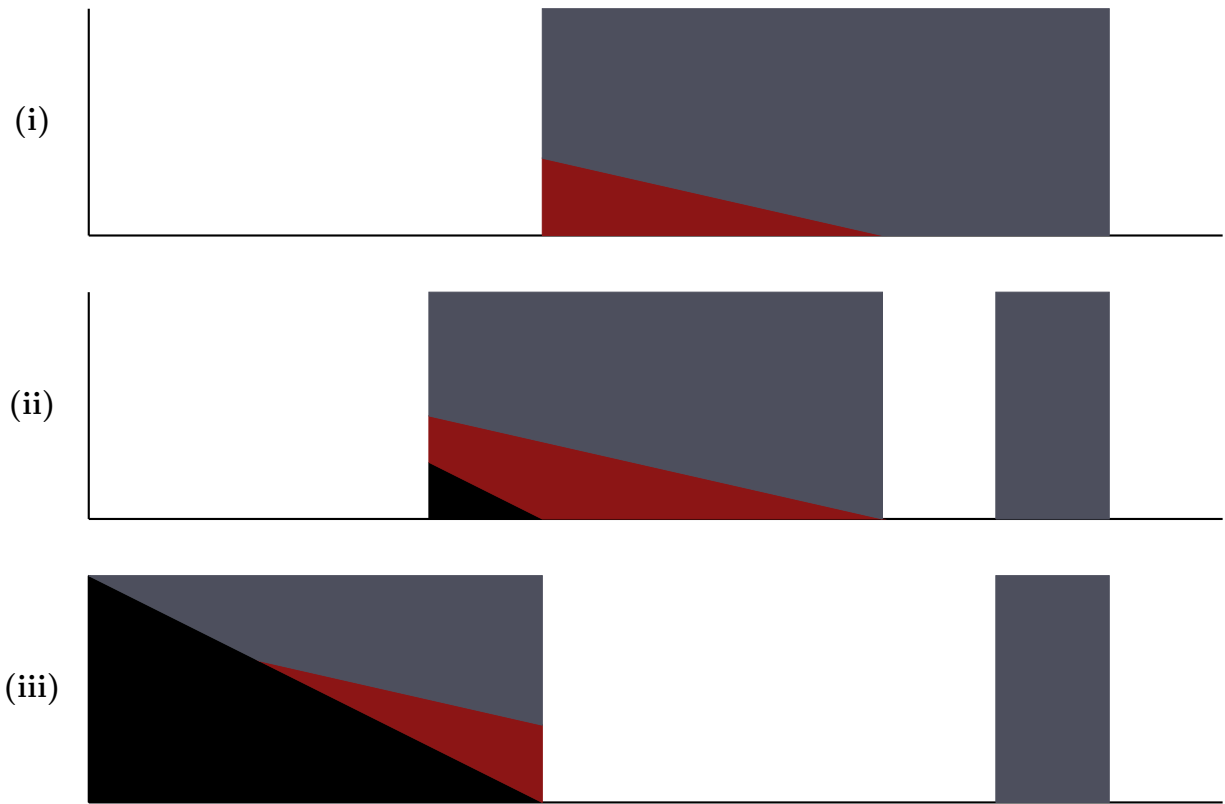
Figure 4: The distribution of individuals with sensitive tasks, individuals with non-sensitive tasks, and civilians under increasing inequality. For the parameters illustrated, increasing inequality from (i) to (ii) increases the poorer population, which yields more individuals willing to join the terrorist group. Further, these new recruits remain wealthy enough to be trusted with sensitive tasks. Increasing inequality from (ii) to (iii) prevents recruits from effectively signaling their type. The number of recruits with sensitive tasks consequently drops, and those who receive such assignments are less extreme on average and therefore less destructive.

options. This creates the familiar information problem for the organization. It consequently assigns most of its recruits to non-sensitive roles. Now those who receive sensitive assignments are less extreme in expectation. In turn, the average quality of attacks diminishes. Increasing inequality has *decreased* the prevalence of terror.

All told, Figure 4 shows that inequality does not inherently create terrorism. Rather, the type of inequality matters. The society needs some form of a middle class to produce terrorist attackers. That is, it needs individuals who are wealthy enough to provide an effective signal yet poor enough to find terrorism more attractive than civilian life. Even great inequality does not lead to substantial attacks if the poorer segments of the population maintain sufficiently strong outside options.

This helps explain the lack of consistent findings regarding inequality and prevalence of terrorism (Abadie 2006; Piazza 2006; Gassebner and Luechinger 2011). Inequality may matter, but how it matters varies sufficiently state-by-state that the exact result changes according to the research design. Operationalizing inequality using the standard measures—in particular, the Gini coefficient—fails to capture the underlying theoretical relationship between willingness to attack and willingness of an organization to assign a sensitive task. These results indicate that scholars of terrorism need to consider the precise economic issues a country faces to recover the relationship.

As a word of caution, however, improving the middle class's economic opportunities can have positive spillovers to lower classes. For example, increased consumption leads to more jobs for lower wage workers. Unfortunately, because this allows the terrorist organization to learn more, individuals who would otherwise receive non-sensitive roles shift to sensitive roles. Consequently, targeted aid is not a silver bullet.

Conclusion

This paper investigated how a terrorist organization delegates tasks to its recruits. Without careful planning, the organization may assign uncommitted individuals sensitive tasks, which risks compromising organizational integrity. As a result, the terrorist group uses a recruit's forgone economic opportunities as a costly signal of commitment. In turn, wealthier recruits are more likely to receive sensitive tasks, whereas poorer recruits receive non-sensitive tasks.

These results provide an alternative mechanism for why terrorists come from above-

average economic backgrounds and why wealthier attackers tend to be more deadly. The standard explanation is that organizations prefer wealthier recruits because they have more skill or better access to sensitive targets. I show that similar patterns arise endogenously due to a selection effect: attackers with better economic opportunities tend to be more ideologically extreme. These extreme beliefs compel them to work harder than poorer recruits, which leads to greater casualty counts.

Focusing on the selection mechanism leads to important policy implications that differ from the quality mechanism. Subsidies from foreign powers seemingly ought to increase the opportunity cost of joining a terrorist organization. Although this is sometimes true, it can backfire when terrorist organizations face an information problem. Subsidies allow otherwise poor extremists to send the proper costly signal, which leads to more effective attacks. As such, a foreign subsidy provider only interested in reducing terrorist attacks would be best off targeting its economic assistance toward the middle class. Future empirical research ought to investigate the correlates of the problem to locate areas where aid proves most useful.

Finally, these findings indicate that scholars should investigate other methods terrorist organizations use to identify commitment. Although updating based on economic opportunities provides an inexpensive solution, organizations have historically used costlier methods—i.e., long-term training camps—to further separate types. While these other solutions do not immediately generate rich empirical implications, deeper analysis may still prove fruitful.

Appendix

This appendix proves the propositions found in the main paper.

Proof of Proposition 1

Recall that $r_1(e_1^*)$ is the payoff the most ideologically extreme individual receives for putting his optimal effort into sensitive roles, which is also more than he receives for non-sensitive roles. If $w > r_1(e_1^*)$, then the wealth of a citizen is so great that he cannot earn more as a terrorist regardless of the organization's decision even if he had the most extreme ideology possible. Thus, all types of citizens remain civilians in every PBE.

Proof of Proposition 2

To begin, recall that the reward for a recruit assigned to a sensitive task and using optimal effort is greater than his payoff for receiving a non-sensitive task. That is, $r_{i^*}(e_i^*) > i$ for all i. Thus, all citizens for which $i > w$ must join.

Now recall that the organization receives a value of 1 for assigning a recruit a non-sensitive task regardless of the exact level of ideology. The function $\frac{1}{1-F(i')} \int_{i'}^1 v(i, e_i^*) f(i) di$ denotes the organization's expected utility for assigning a recruit a sensitive task if all citizens with ideology greater than i' volunteer and all citizens with ideology less than i' remain civilians. This function is strictly increasing in i' because effort increases in ideology. Put differently, higher minimum ideologies imply greater average effort, which generates a greater payoff for the organization.

Let i^* be the unique solution to $\frac{1}{1-F(i')} \int_{i'}^1 v(i, e_i^*) f(i) di = 1$.[27] Suppose that $w < i^*$. Then, through iterated elimination of dominated strategies, assigning the citizen a non-sensitive task dominates assigning him a sensitive task. (Although we do not yet know what individuals for which $i < w$ will do, any additional citizens who join will only reduce the value of sensitive tasks, which is already below 1.) Through another round of iterated elimination of dominated strategies, all citizens for which $i < w$ remain civilians because they know they will receive i if they join and obtain w if they stay out. The terrorist organization therefore assigns all recruits to non-sensitive tasks. $\quad\square$

Proof of Propositions 3 and 4

The above leaves situations in which $w \in (i^*, r_1(e_1^*))$. If $w < r_{i^*}(e_{i^*}^*)$, the terrorist organization cannot assign recruits to be terrorists as a pure strategy. If it did, all citizens for which $r_i(e_i^*) > 1$ would join. But because $\frac{1}{1-F(i')} \int_{i'}^1 v(i, e_i^*) f(i) di$ is strictly increasing in i' and $\frac{1}{1-F(i^*)} \int_{i^*}^1 v(i, e_i^*) f(i) di = 1$, the organization's expected payoff is less than 1. As such, the organization could profitably deviate to assigning the recruit a non-sensitive task and receive a flat 1 instead. But the organization cannot assign recruits non-sensitive tasks as a pure strategy either. If it did, only citizens with $i > w$ would join. Yet because $w > i^*$, $\frac{1}{1-F(w)} \int_w^1 v(i, e_i^*) f(i) di > 1$. In turn, the organization could profitably deviate to assigning a sensitive task.

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[27]Such a solution exists because $\frac{1}{1-F(0)} \int_0^1 v(i, e_i^*) f(i) di < 1$ and $v(e_1^*) > 1$.

Consequently, the solution must be in mixed strategies. For the organization to be willing to mix, it must be that all citizens with $i > i^*$ join and all citizens with $i < i^*$ do not join. Such a division implies that assigning a sensitive task yields $\frac{1}{1-F(i^*)} \int_{i^*}^{1} v(i, e_i^*) f(i) di = 1$, which is identical to the payoff that the organization would receive if it assigned the recruit a non-sensitive task.

To maintain that division of civilians to recruits, the organization must assign the recruit as a terrorist at a frequency that would leave type i^* indifferent between joining and not joining; this ensures that citizens with $i > i^*$ are strictly better off joining and all citizens with $i < i^*$ are strictly better not joining. Let σ_A be the organization's probability of choosing a sensitive assignment. Then this indifference condition is:

$$\sigma_A r_{i^*}(e_{i^*}^*) + (1 - \sigma_A)(i^*) = w$$

$$\sigma_A = \frac{w - i^*}{r_{i^*}(e_{i^*}^*) - i^*}$$

This completes the proof for $w < r_{i^*}(e_{i^*}^*)$.

If $w \in (r_{i^*}(e_{i^*}^*), 1)$, the above shows that the the indifference conditions for the organization cannot be met in equilibrium. This leaves only pure strategies as equilibrium possibilities. Assigning non-sensitive tasks as a pure strategy cannot be an equilibrium. Doing so would prompt only those with $i > w$ to join. But because $w > r_{i^*}(e_{i^*}^*) > i^*$, the organization could assign them sensitive roles and earn $\frac{1}{1-F(w)} \int_{w}^{1} v(i, e_i^*) f(i) di > 1$ instead, a profitable deviation.

However, if the organization assigns sensitive roles as a pure strategy, all individuals for which $r_i(e_i^*) > w$ would join. Since $w > r_{i^*}(e_{i^*}^*)$, this set of citizens is bounded strictly above i^*. And because $\frac{1}{1-F(i^*)} \int_{i^*}^{1} v(i, e_i^*) f(i) di = 1$, the organization's payoff for giving those citizens sensitive assignments is strictly greater than 1. As such, all citizens who join receive their best possible payoffs, while all citizens who do not join also receive their best possible payoff. The organization is optimizing given that, and therefore there is no profitable deviation.

Finally, if $w \in (1, r_1(e_1^*))$, multiple PBE exist. First, I analyze those that satisfy the D1 refinement. Loosely, the D1 refinement restricts a receiver's off-the- equilibrium-path beliefs to the type willing to make that signal under the widest range of responses from the receiver. For this game, the organization must believe that the recruit is the type for which $\sigma_A(r_i)(e_i^*) + (1 - \sigma_A)i \geq w$ holds for the widest range of σ_A values.

Solving for σ_A, type i is willing to join the organization if $\sigma_A \geq \frac{w-i}{r_i(e_i^*)-i}$. Let $i' > i$. Then type i' is willing to join under a wider range of values for σ_A if:

$$\frac{w-i'}{r_{i'}(e_{i'}^*)-i'} < \frac{w-i}{r_i(e_i^*)-i}$$

$$[r_{i'}(e_{i'}^*)-i'](w-i) > [r_i(e_i^*)-i](w-i')$$

Recall that $r_{i'}(e_{i'}^*)-i' > r_i(e_i^*)-i$ (that is, more ideologically extreme individuals have greater gains for sensitive tasks) and note that $w-i > w-i'$. As such, the left side of the inequality consists of two strictly positive numbers multiplied together that are individually greater than their respective counterparts on the right side of the inequality. In turn, the product of the left side is greater than the right side. Because this holds for all i' and i, the type that is willing to join under the widest range of circumstances is the type for which i is the greatest, or $i = 1$. Using this off the path belief, the remainder of the proof is identical to the case in which $w \in (r_{i^*}(e_{i^*}^*), 1)$.

Other PBE exist in which the organization adopts an off the path belief that the recruit's expected ideology is sufficiently low that it should assign him a non-sensitive task. Citizens, in turn, must decide whether to join and earn i or remain civilians and earn w. Because $w > 1$, all types' best response regardless of exact ideology is to remain civilians. □

It is worth noting that these other PBE do not substantially impact the remarks presented in the body of the paper. Indeed, the skeptical off the path beliefs only decrease the cutoff point at which all terrorist attacks cease. The bulge in Figure 2 around $r_{i^*}(e_{i^*}^*)$ that drives the key non-monotonicity claims remains.

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