The Quality of Terror[1]
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Abstract

I present a model of the interaction between a government, a terrorist organization, and a population of potential terrorist volunteers in which, as a result of an endogenous choice, individuals with low ability or little education are most likely to volunteer to join the terrorist organization. However, the terrorist organization screens the volunteers, only accepting the best recruits. Consequently, the model is consistent with two seemingly contradictory empirical findings. Actual terrorist operatives are not poor or lacking in education. And yet lack of economic opportunity and recessionary economies are positively correlated with terrorism. The model also endogenizes the effect of government counter-terrorism on mobilization. Government crack-downs have competing effects on mobilization: they decrease the ability of terrorists to carry out effective attacks (making mobilization less attractive) and they foment ideological opposition to the government and impose negative economic externalities (making mobilization more attractive). This provides an explanation of conditions under which government crack-downs increase or decrease terrorist mobilization. The model also has implications for the composition of terrorist spending, conditions under which governments adopt overly or underly stringent counter-terrorism policies, why repressive and ethnically divided countries are prone to terrorism, and when economic development aid policies are likely to reduce the threat of terrorism.

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Our biggest problem is the hordes of young men who beat on our doors, clamoring to be sent. It is difficult to select only a few. Those whom we turn away return again and again, pestering us, pleading to be accepted. – A senior member of Hamas as reported by Hassan (2001)

A long research tradition in political science argues that both ideological *and* economic factors are important determinants of violent mobilization (e.g., Gurr (1970), Muller and Seligson (1987), Lichbach (1989)). Surprisingly, empirical findings demonstrate that terrorist operatives tend not to be from societies' worst-off socio-economic groups (Berrebi 2003, Krueger and Maleckova 2002a, Russell and Miller 1977). Terrorists, rather, have levels of educational attainment that are at or slightly above the societal mean and are less likely to live in poverty than the average person. Krueger and Maleckova (2002 a,b) claim that this casts serious doubt on the strength of the causal influence of economic conditions on mobilization. In this paper, I suggest an alternative explanation. Terrorist organizations screen volunteers and select the most competent to become operatives. If screening takes place, one cannot reach conclusions about the composition of the pool of those who are *willing to become terrorists* by studying only those who actually do become terrorists. Building on this idea I argue that the relatively high levels of educational attainment and economic opportunity that characterize terrorist operatives, and a variety of other empirical findings, can be better explained with a model that takes both ideology and economics seriously as determinants of mobilization.

I present a model of the interaction between a government, a terrorist organization, and a population of terrorist sympathizers in which education or economic opportunity, and opposition to the government play important roles in determining whether an individual volunteers to join a terrorist group. In particular, as a result of an endoge-

nous choice between economic activity and terrorist mobilization, individuals with low ability or little education (and consequently few economic opportunities) and strong anti-government dispositions are most likely to volunteer to become terrorists. However, the terrorist organization wants to recruit only the most effective, highly skilled terrorists. This is because higher ability, better educated people are more likely to succeed at the demanding tasks required of a terrorist operative. Consequently the terrorist organization screens the volunteers, only accepting the best recruits.

The advantage of this model is that it is consistent with empirical findings across several studies of terrorism. It explains Russell and Miller's (1977), Krueger and Maleckova's (2002), and Berrebi's (2003) discoveries regarding the socio-economic origins of terrorist operatives. Further, a hypothesis derived from this model, that does not follow from the alternative theory that economics are not an important determinant of terrorism, is that economic contractions will be associated with increased violence because decreased economic opportunity will make more people willing to mobilize and will increase the pool of high quality recruits. This is consistent with recent empirical findings that show that economic downturns are correlated with increases in terrorism (Blomberg, Hess and Weerapana 2002).

The model also addresses the impact of government crack-downs on mobilization. The government engages in crack-downs in order to prevent terrorist attacks. These counter-terrorist crack-downs have competing effects. They decrease the ability of terrorists to carry out effective attacks. However, they also ideologically inflame and impose negative economic externalities on the terrorists' sympathizers, making individuals more willing to mobilize. The government faces a trade-off; it must balance the security benefits of counter-terrorism against the costs in terms of mobilizing potential terrorists.

By explicitly modeling the mobilization decision and the effects of counter-terrorism, I provide an endogenous explanation of conditions under which government counter-terror crack-downs will increase or decrease terrorist mobilization. This allows me to address the variance that exists in empirical cases of mobilization responses to government crack-downs (Ross and Gurr 1989, Crenshaw 1991). It also provides a rationale for why ethnically divided and repressive states are especially prone to terrorism (Krueger 2003).

The model also has implications for the composition of spending by terrorist organizations, when governments might adopt either overly or underly stringent counter-terrorism policies, and whether economic development aid policies are likely to reduce the threat of terrorism.

1 Empirical Regularities and Competing Theories

Recent empirical work has offered new insight into how various factors impact mobilization for terrorist organizations. As mentioned, Krueger and Maleckova (2002a) and Berrebi (2003) report that the terrorist operatives associated with several Middle Eastern terrorist groups tend not to be from the lowest socio-economic groups. Rather, terrorists have average or even slightly better than average educations and are less likely to live below the poverty line than the population in general. This finding is consistent with earlier studies of the composition of European terrorist organizations (Russell and Miller 1977).

Krueger and Maleckova also examine survey data that measures support for terrorism among Palestinians. They find that support for suicide bombings is more or less constant across socio-economic groups, which they argue supports the contention that economics is not a major causal factor in terrorist mobilization.

While Krueger and Maleckova mention the possibility that terrorist organizations select for high skill operatives, they favor a different interpretation of their data. They argue that it indicates that economic deprivation is not a major determinant of terrorist mobilization. And, indeed, they advise policy makers to beware of pursuing policies of economic development in the hopes of curtailing terrorist violence (Krueger and Maleckova 2002 a,b).

Further evidence is discussed by Blomberg, Hess and Weerapana (2002) who report that in democracies with ongoing terrorist conflicts, economic contractions are positively correlated with increased terrorist violence. Similarly, Honaker (2003), in the first study to disaggregate Catholic and Protestant data, reports that increases in Catholic unemployment lead to increases in Republican violence and increases in Protestant unemployment lead to increases in Loyalist violence.

Another relevant empirical fact has to do with the variable effect of government crackdowns on mobilization in support of terror (Ross and Gurr 1989, Crenshaw 1991). In different situations, crack-downs can increase or decrease such support. For instance, Israeli counter-terror measures such as border closings and bombings have inflamed Palestinian public opinion and mobilized support for militants (Bloom forthcoming), while Spanish government crack-downs against Basque separatists in the 1980s coincided with a decrease in support for the Basque terrorist organization ETA (Clark 1990, Funes 1998).

Finally, Krueger (2003) reports that the absence of civil liberties and the existence of ethnic division are important predictors of the presence of terrorism in a country.

While existing models provide insight into many of these phenomena, none are consistent with this full range of empirical results. Krueger and Maleckova's (2002a) contention that economics are not a major determinant of terrorism is difficult to reconcile

with the finding that economic contractions are correlated with increases in terrorist violence. Blomberg, Hess, and Weerapana (2002) offer a model in which people mobilize in response to economic dissatisfaction. However, the Blomberg, Hess, and Weerapana account does not consider screening for quality by the terrorist organization. As such, their model cannot explain the pattern of relatively high socio-economic status among terrorist operatives. Further, neither of these arguments addresses the impact of government crack-downs on mobilization.

Models that do consider the effect of government counter-terrorism policy have tended either to assume that crack-downs always increase support for terrorist organizations (Wilkinson 1986, de Figueiredo and Weingast 2001) or have ignored this effect and argued that crack-downs play only a counter-terror role that decreases the attractiveness of terrorism (Sandler, Tschirhart, and Cauley 1982, Bueno de Mesquita 2003) or leads terrorists to choose new targets and tactics that are less affected by the crack-downs (Enders and Sandler 1993). Consequently, these models cannot account for the variance in mobilization responses. One notable exception is Lichbach (1987), which focuses on the consistency of government policies over time to explain the variance in mobilization responses. Lichbach's model, however, does not consider economic mobilization and so cannot address the evidence provided by Russell and Miller (1977), Krueger and Maleckova (2002a), Berrebi (2003), Honaker (2003), or Blomberg, Hess, and Weerapana (2002).

In the next section I present a formal model that accounts for all of the empirical regularities discussed above. In the following two sections I first discuss evidence for the verisimilitude of the assumptions and dynamics underlying the model and then consider the evidence mentioned above and additional empirical findings regarding the effect of

economic conditions on mobilization, the allocation of scarce resources by terrorist organizations, and the impact of government crack-downs on mobilization in greater detail with reference to the hypotheses generated by the model.

2   The Model

Consider a model of the relations between three actors: the government (G), a terrorist organization (T), and a group of potential terrorists (n) which is a subset of a population (N). The group of potential terrorists is conceptualized as the portion of the population that is sympathetic to the terrorists' goals and would consider engaging in terrorist activity. They will, henceforth, be referred to as *sympathizers*. The government seeks to minimize the amount of terrorist violence perpetrated on its citizens through counter-terrorism policies, while the terrorist organization pursues its goals through violence. Each sympathizer must individually choose whether he or she wishes to join the terrorist organization or to pursue economic activities.

The game is played as follows. The government chooses the extent to which it will crack down in an attempt to prevent terrorist attacks. The crack-down might take the form of closing borders, imposing curfews, bombing areas thought to house terrorists, or a host of other tactics. These government crack-downs have several effects. First, they decrease the effectiveness of terrorist attacks. This may be because they improve the government's probability of preventing terrorist attacks or because they force the terrorists to shift tactics away from their most-preferred tactic to some less efficacious tactic where government counter-terror has less impact (Enders and Sandler 1993). Second, they impose negative economic externalities and increase the sympathizers' anti-government disposition. The negative economic externalities may be the result of border closings that

restrict access to jobs and markets, the creation of uncertainty that diminishes invest-

ment, the destruction of economically vital infrastructure, or a variety of other factors.[1]

The increase in ideological opposition to the government may be due to loss of freedom,

violations of civil liberties, or humiliation.

Following the government's decision, each sympathizer decides whether to engage in

productive economic activity or to volunteer for the terrorist organization. The terrorist

organization then chooses operatives from the set of volunteers and engages in terrorism

which the government attempts to prevent.

The extent of the government's crack-down is $a \in [0, \bar{a}]$. The economic damage

caused by a crack-down is described by a random variable $\tau(a)$ distributed according to

a distribution with cdf $F(a)$ which is strictly increasing on its support – $[0, 1]$ – and has

pdf $f(a)$. Because it takes a value between 0 and 1, τ can be interpreted as the fraction

by which productive capacity is diminished due to government crack-downs. Further, I

assume that if $a' > a$ then $F(a')$ first order stochastically dominates $F(a)$. The more

the government cracks down, for any given level of economic damage, the more likely the

consequences are at least that bad. The expected level of economic damage from a level of

counter-terror a is $\bar{\tau}(a) = \int_0^1 \tau f(a) d\tau$. The first order stochastic dominance relationship

implies that the expected level of economic damage ($\bar{\tau}(\cdot)$) is strictly increasing in the

extent of government crack-downs.

The sympathizers have to decide whether or not to engage in economic activity or

volunteer for the terrorist organization. A sympathizer i is characterized by his or her

type $\theta_i \in \mathbb{R}^+$. The types are distributed according to some continuous, strictly increasing

cdf $\Theta(\cdot)$. I assume that the distribution of types among the sympathizers is the same as the

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[1]Later, I consider the implications for the model if crack-downs have positive rather than negative economic effects.

distribution of types among the population as a whole. While this is clearly a simplifying assumption, support is provided by the findings of Krueger and Maleckova (2002a), who report that the level of support for terrorism among Palestinians is constant across socio-economic groups. Below I discuss the implications for the model if this assumption is relaxed.

Type is positively correlated with the level of economic opportunity the individual has. It can be thought of as innate ability, educational attainment, or some combination of these and other factors. What is important is that an individual's type is positively correlated both with his or her economic opportunity and with his or her ability effectively to carry out the difficult and often complicated tasks associated with being a terrorist. The realism of this assumption is discussed in detail below.

An individual i gains utility from engaging in economic activity given by:

$$U_i^e = (1 - \tau(a))f(\gamma, \theta_i),$$

where $f(\cdot)$ is increasing, and concave in γ and θ_i and represents the utility from economic gains. γ is a parameter that accounts for factors – beyond personal characteristics (θ_i) and the effects of government crack-downs (τ) – that influence economic opportunity, such as the general state of the economy. I further assume that $f(\gamma, 0) = 0$ for all γ. That is, the absolutely lowest ability people ($\theta = 0$) have no economic opportunity.

Individuals receive two types of benefits from becoming a terrorist. The first is an ideological benefit having to do with fighting back against a regime blamed for the loss of freedom, dignity, and rights. This benefit is an increasing function of government crack-downs given by $e(a)$, where $e(\cdot)$ is positive for all a and $e'(\cdot) > 0$. This captures the idea that crack-downs can ideologically inflame sympathizers against the government.

The second benefit an individual receives from joining a terrorist organization is a

function of his or her effectiveness and success as a terrorist. In particular, individuals may gain more utility if they are likely to be successful at furthering the organization's goals or if they have a chance of being promoted within the organization (obviously, only the former applies to those engaged in suicide missions) (Adams 1987). This payoff is decreasing in the level of government counter-terror. The greater the level of counter-terror, the less likely any individual is to carry out successful attacks. Consequently, this payoff is given by $u(a, \theta_i)$, where $u(\cdot)$ is non-negative for all a and θ, $\frac{\partial u}{\partial \theta} > 0$, $\frac{\partial u}{\partial a} < 0$, and $u(\cdot)$ is concave. Thus, in total, an individual who becomes a terrorist gains utility:

$$U_i^v = e(a) + u(a, \theta_i).$$

I also assume that $\frac{\partial f}{\partial \theta} / \frac{\partial u}{\partial \theta}$ is increasing in θ.[2] Recall that both $f(\cdot)$ and $u(\cdot)$ are concave—the marginal product of ability is decreasing for both economic and terrorist activity. The assumption states that the marginal product of ability decreases faster in terrorist activity than economic activity. An intuitive reason this condition might hold is that in the diverse economic sphere people can sort themselves into exactly those areas that best exploit their particular abilities. The same level of flexibility is unlikely to exist within a terrorist organization, since there is a smaller range of activities into which people can be sorted. Consequently, the positive effect on marginal productivity of an increase in ability declines more rapidly for terrorist operatives than for economic agents. Substantively, this assumption will be employed as a sufficient condition to assure that if a person of some ability level finds that economic activity becomes more attractive relative to terrorist activity as his or her ability increases, then a person of even higher ability will also find this to be true.

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[2]Technically, this assumption assures that the utility functions associated with terrorism and economic activity have the necessary single-crossing relationship.

Individuals do not know how many operatives the terrorist organization is looking for and, further, if they are rejected by the terrorist organization they can costlessly rejoin the economy.[3] Thus, individuals volunteer for the terrorist organization if they prefer to be a terrorist than to remain in the economy, even if they will not ultimately be accepted.

The terrorist organization chooses a group of terrorists from the volunteers. The number of operatives accepted into the terrorist organization is taken to be exogenous.[4] I assume that the terrorist organization can observe the type of volunteers by screening for things such as educational attainment. The average quality of a terrorist in the set of those accepted is denoted $\bar{\theta}$.

In addition to accepting volunteers the terrorist organization invests resources r in costly terrorist activity. The impact of terrorist violence is a function of the amount of resources devoted to terror, the average quality of the terrorists, and the level of counter-terror.[5] It is given by $v(r, \bar{\theta}, a)$. $v(\cdot)$ is increasing and concave in both r and $\bar{\theta}$ while it is decreasing and concave in a. That is, terrorist violence is increasing and has decreasing marginal returns in both quality and resource allocation. It is decreasing in the level of counter-terror. The intuition for why $v(\cdot)$ is decreasing in the level of counter-terror is two-fold. First, counter-terror may improve the probability of preventing terror attacks. Second, counter-terror leads terrorists to shift tactics to ones less affected by crackdowns (Enders and Sandler 1993). Even if the first effect is very small because terrorists succesfully change tactics, the second effect implies that terrorists must shift from their

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[3]This assumption of costlessness could be easily relaxed with no substantive change to the model. The cut-point for willingness to volunteer would shift down but no comparative statics would change.

[4]An interesting extension would endogenize demand for operatives. In the current model demand for *terrorism* is endogenous but not demand for operatives, which would add considerable analytic complexity.

[5]The assumption that the effectiveness of terror is a function of the average quality of the terrorists is a simplifying assumption, in that it does not take into account the variance of the quality of terrorists but only the mean. However, this seems a rather benign assumption and it significantly simplifies the analysis.

most preferred tactic to something that is less efficacious. Thus, either through prevention or substitution, counter-terror decreases the impact of terrorist violence. Finally, I assume that $\frac{\partial^2 v(r,\bar{\theta})}{\partial r \partial \bar{\theta}} > 0$ and $\frac{\partial^2 v(r,\bar{\theta})}{\partial r \partial \bar{a}} < 0$. The intuition here is that investments in terrorism are more productive the higher the quality of operatives and less efficient the greater the level of counter-terror.

I do not explicitly model how terrorism benefits the terrorist organization. Different terrorist organizations employ terrorist tactics for a variety of reasons. For instance, terror may be useful for attempting to overthrow a regime (e.g., the Russian revolutionary terrorist organizatoin Narodnaya Volya), seeking national self-determination (e.g. the ETA in Spain, the Irgun in British Mandate Palestine, and Hamas), garnering media attention (e.g., the FLQ's demand to read its manifesto on the radio in exchange for releasing hostages), or for a host of other goals. By not specifying a particular goal for the terrorist organization, the model remains general enough to address a variety of terrorist conflicts.

The use of resources for terror is costly. The costs are given by $c(r)$, where $c(\cdot)$ is increasing and strictly convex. This represents the opportunity costs associated with devoting scarce resources to political violence. These opportunity costs exist because terrorist organizations also require resources for costly non-violent activities. For instance, Hamas has an extensive network of social welfare and health care organizations (Mishal and Sela 2000), the IRA provides vigilante police services for the Catholic population of Northern Ireland (Silke 1999), and the Irgun smuggled Jews from Europe into Palestine during the second world war (Bell 1977).

The terrorist organization's overall expected utility is given by:

$$U^T = v(r, \bar{\theta}, a) - c(r)$$

The government seeks to avoid terrorist attacks. It also bears a cost for engaging in counter-terror given by $k(a)$, where $k(\cdot)$ is increasing and convex. The government's utility, then, is given by[6]:

$$U^G = -v(r, \bar{\theta}, a) - k(a)$$

3 Equilibrium

As is standard I solve the game starting at the end. I begin by looking at the terrorist organization's problem.

Recruitment and Investment

Once the terror organization has chosen its operatives (which determines $\bar{\theta}$), it solves the following maximization problem:

$$\max_r v(r, \bar{\theta}, a) - c(r)$$

Since the objective function is concave, the first order condition characterizes the optimum:

$$\frac{\partial v(r^*, \bar{\theta}, a)}{\partial r} = c'(r^*) \tag{1}$$

The left hand side of equation (1) – which is decreasing in r – represents the marginal benefit to the terrorist organization of increasing the level of resource commitment. This benefit is the extra amount of terrorism realized. The right hand side of equation (1) – which is increasing in r – represents the marginal opportunity costs of increasing the

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[6]Another reasonable specification would have the government's payoff also be a function of economic conditions. This would add considerable complication to the model and it seems reasonable, in many terrorist conflicts, to make the simplifying assumption that the government is not directly concerned about the welfare of the sympathizers.

level of resource commitment. Since concavity insures an interior solution, equation (1) implicitly defines an optimal level of resource commitment: $r^*(a, \bar{\theta})$.

The first fact to note about the terror organization's behavior is that the amount of resources devoted to terrorism is increasing in the quality of the operatives. That is, the more competent the terrorist operatives, the more resources the terror organization is willing to devote to supporting terror attacks. This result is summarized in the following remark.

Remark 1 *The amount of resources that the terror organization devotes to terrorism* (r^*) *is increasing in the quality of the operatives* $(\bar{\theta})$.

The proof is in the appendix.

Given the solution to the maximization problem I can also identify which volunteers the terrorist organization will accept. The higher the quality of the operatives the greater the impact of the campaign of violence. This is true both because of the direct effect of having more skillful operatives and because, as shown in remark (1), the terrorist organization invests more resources in terrorism when the operatives are of higher ability. This second effect, of course, also increases the terror organization's opportunity costs. These increased costs notwithstanding, the terror organization will always take the highest quality volunteers available.

Remark 2 *The terrorist organization chooses the highest ability volunteers available.*

The proof is in the appendix.

The terrorist operatives chosen will be the best among the willing volunteers. Further, the amount of resources allocated to violence by the terrorist organization is increasing in the quality of the operatives. Consequently, the model implies that the level of terrorist violence is increasing in the level of mobilization.

Mobilization

Having found the terrorist organization's best responses, I now turn to the sympathizers who must chose whether to volunteer for the terrorist organization or remain active in the normal economy. A sympathizer, i, will volunteer for the terrorist organization if and only if $U_i^v > U_i^e$. This is true when:

$$e(a) + u(a, \theta_i) > (1 - \tau(a))f(\gamma, \theta_i) \tag{2}$$

Equation (2) implicitly defines a cut-point (θ^*) in type space whereby all sympathizers who have ability (or education, or economic opportunity) θ_i less than θ^* will volunteer for the terrorist organization. The set of volunteers, then, is defined by $\Theta(\theta^*)$. This fact is proven in the next remark.

Remark 3 *There exists a cut-point, θ^*, such that only sympathizers with $\theta_i < \theta^*$ mobilize. Therefore, lower ability and less educated people (low θ_i) are more likely to volunteer for a terrorist organization.*

Equation (2) also reveals how mobilization is affected by changes in various parameters and variables. First note that an increase in an individual's ideological motivation ($e(\cdot)$) makes volunteering more attractive. Further, a downturn in general economic conditions (γ) leads to increased mobilization by making economic activity less attractive. I summarize these results below.

Remark 4 *Greater ideological motivation (higher $e(\cdot)$) and economic downturns (lower γ) increase mobilization.*

Proof. The proof is immediate from the argument in the text and equation (2). ■

The final question that has to be answered before analyzing the government's strategy is how government crack-downs affect mobilization. Rewriting equation (2) shows that an individual mobilizes only if

$$G(a, \theta_i) = e(a) + u(a, \theta_i) - (1 - \tau(a))f(\gamma, \theta_i) > 0$$

Taking the derivative of G with respect to the level of government crack-down (a) yields:

$$\frac{\partial G}{\partial a} = e'(a) + \frac{\partial u}{\partial a} + \tau'(a)f(\gamma, \theta_i)$$

Increasing counter-terror has three effects on the attractiveness of mobilization. The first term ($e'(a) > 0$) represents the increase in ideological anger against the government that follows crack-downs. The second term ($\frac{\partial u}{\partial a} < 0$) represents the deterrent effect of counter-terror. The greater the level of counter-terror the more difficult it is for a terrorist to carry out an effective attack. The third term ($\tau'(a)f(\gamma, \theta_i) > 0$) represents the effect of government crack-downs on economic opportunity. Because crack-downs impose negative economic externalities, they decrease the opportunity costs of mobilization, thereby making mobilization more attractive. Thus, counter-terror increases mobilization only if:[7]

$$e'(a) + \tau'(a)f(\gamma, \theta_i) > -\frac{\partial u}{\partial a} \tag{3}$$

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[7]In some circumstances, increased counter-terror might improve economic conditions rather than imposing negative economic externalities. This could be true if, for example, counter-terror decreases attacks and thereby increases investment in a region. If this is true, then $\tau'(a)$ is negative rather than positive. Thus, in this case counter-terror increases mobilization only if:

$$e'(a) > -\tau'(a)f(\gamma, \theta_i) - \frac{\partial u}{\partial a}.$$

The government still faces a trade-off, however it is now more likely that crack-downs will decrease mobilization. Nonetheless, the other main claims of the model still go through, as the structure of the argument is unchanged. For the rest of the paper I focus on the case where economic externalities are negative because I believe this is descriptive of many protracted terrorist conflicts. However, it is important to see that it is not essential for the other results of the model to hold.

Government crack-downs can lead to either increased or decreased mobilization. Crack-downs increase mobilization if the marginal effects on economic opportunity and ideology are greater than the marginal effect on the ability of terrorists to carry out effective attacks. Otherwise they decrease mobilization.

This is an intuitive feature of this model that has not existed in previous models of government policy and mobilization. By endogenizing mobilization and examining security gains, economic externalities, and ideological effects of counter-terrorism, the model captures the possibility that government crack-downs can cause either an increase or a decrease in mobilization. This result is summarized in the following remark.

Remark 5 *Government crack-downs increase mobilization if the marginal impacts on economic opportunity and ideology are large relative to the marginal impact on security. Otherwise, crack-downs decrease mobilization.*

Proof. The proof follows from equation (3). ∎

Having solved for the effect of counter-terror crack-downs on mobilization, it is also possible to identify the impact of crack-downs on the level of resources invested in terror. An increase in counter-terror has two competing effects on the level of resources that the terror organization invests in violence. On the one hand, increased crack-downs decrease the marginal benefit of investment by decreasing the ability of terrorists to carry out effective attacks. On the other hand, if crack-downs increase mobilization, then the quality of operatives is improved which, according to remark (1), increases investment. Hence, if crack-downs decrease mobilization or if the effect of increased mobilization is more than compensated for by the increase in the difficulty of carrying out effective attacks, then counter-terrorism decreases the amount of resources committed to terror. However, if crack-downs increase mobilization and the positive effect on investment of

increased mobilization is greater than the negative effect on investment of an increase in the difficulty for terrorists to carry out effective attacks, then crack-downs increase the amount of resources devoted to terror. This result is summarized in the following remark.

Remark 6 *If crack-downs decrease mobilization, then they also decrease the amount of resources invested in terror. If crack-downs increase mobilization, then their effect on resources invested in terror can be positive or negative. This depends on whether the negative effect of crack-downs on investment through a decrease in the ability of terrorists to carry out effective attacks is greater or less than the positive effect of crack-downs on investment through an increase in mobilization.*

The proof is in the appendix.

Counter-terrorism Policy

The government engages in crack-downs in order to minimize the impact of violence. In particular the government solves the following maximization problem:

$$\max_a -v(r, \bar{\theta}, a) - k(a)$$

Dropping the arguments for ease of reading and solving for the first order conditions yields the following:

$$\frac{\partial v}{\partial a} + \frac{\partial v}{\partial r^*}\frac{\partial r^*}{\partial a} + \frac{\partial \bar{\theta}}{\partial \theta^*}\frac{\partial \theta^*}{\partial a}\left(\frac{\partial v}{\partial \bar{\theta}} + \frac{\partial v}{\partial r^*}\frac{\partial r^*}{\partial \bar{\theta}}\right) + k'(a) = 0 \qquad (4)$$

Increasing the level of crack-downs has several effects. The first term in equation (4) represents the benefit derived by the government from decreasing the ability of terrorists to carry out effective attacks. The second term ($\frac{\partial v}{\partial r^*}\frac{\partial r^*}{\partial a}$) reflects the fact that an increase in

17

government crack-downs changes the terrorist organization's incentive to invest in terror. As shown in remark (6) this effect on investment can be positive or negative. The third term $(\frac{\partial \bar{\theta}}{\partial \theta^*} \frac{\partial \theta^*}{\partial a} (\frac{\partial v}{\partial \theta} + \frac{\partial v}{\partial r^*} \frac{\partial r^*}{\partial \theta}))$ represents the effect of an increase in counter-terrorism on mobilization. A change in mobilization $(\frac{\partial \theta^*}{\partial a})$ changes the quality of recruits which changes the quality of terrorist operatives $(\frac{\partial \bar{\theta}}{\partial \theta^*})$. This, in turn, has two effects. First, there is a direct effect on the level of violence $(\frac{\partial v}{\partial \theta} > 0)$. Second, a change in the quality of terrorist operatives changes the willingness of the terrorist organization to invest resources in terrorism $(\frac{\partial v}{\partial r^*} \frac{\partial r^*}{\partial \theta} > 0)$. Whether this total effect increases or decreases the government's utility depends on whether crack-downs increase or decrease mobilization. The final term represents the opportunity costs to the government of resources devoted to counter-terror.

Recall from remark (5) that the effect of a crack-down on mobilization $(\frac{\partial \bar{\theta}}{\partial a})$ can be positive or negative depending on the relative impact of crack-downs on the economy, ideology, and security. If the marginal security impact is greater than the marginal economic and ideological impacts then crack-downs decrease mobilization.

The government is uncertain of the magnitude of the economic impact of crack-downs. $\tau(a)$ is a random variable. Consequently, the government makes its decision with respect to the expected level of mobilization for a given level of crack-downs, $\bar{\tau}(a)$. This means that in equation (4) the term representing the effect of crack-downs on mobilization $(\frac{\partial \theta^*}{\partial a})$ is actually the expected effect. If the government's estimate of the economic effects of crack-downs $(\bar{\tau}(a))$ is incorrect, then its estimate of the effect on mobilization will also be mistaken.

The government, in choosing its level of counter-terror, balances marginal benefits and marginal costs. In the case where crack-downs are expected to decrease mobilization the only costs associated with an increase in crack-downs are the opportunity costs

$(k(a))$. This is because, if crack-downs decrease mobilization, all the effects of increasing counter-terror are good for the government; it decreases the ability of terrorists to carry out effective attacks, decreases investment in terror by the terrorist organization, and decreases mobilization. However, if crack-downs lead to more mobilization, then there are additional costs associated with counter-terrorism. In particular, when crack-downs are expected to increase mobilization, the government chooses a level of crack-downs so that the expected marginal benefits (the decreased ability of terrorists to carry out effective attacks and a possible decrease in investment in terrorism by the terrorist organization) equal the expected marginal costs (increased mobilization and a possible increase in investment in terrorism by the terrorist organization). That is, crack-downs have both positive and negative impact on the terror campaign. The government chooses a level of counter-terrorism to minimize the overall impact of terrorist violence and the opportunity costs.

Having solved the backwards induction, I can now characterize the equilibrium of this game.

Proposition 1 *In a sub-game perfect equilibrium of the game the terrorist organization always chooses the highest ability (θ_i) operatives available from the set of volunteers and then chooses a level of investment in terrorism that solves equation (1). A sympathizer volunteers for the terrorist organization if $G(a, \theta_i) > 0$. The government chooses a level of counter-terrorism that solves equation (4).*

Proof. The proposition follows from backward induction and the arguments in the text. ∎

4 Verisimilitude of the Model

Before turning to a discussion of whether available empirical evidence supports the conclusions implied by the above analysis, it is important first to assess whether the model's structure and assumptions are sufficiently realistic. Do people actually consider ideology and economic opportunity when deciding whether to mobilize? Are the skills that increase economic opportunity positively correlated with those that make for an effective terrorist? Is there evidence that terrorist organizations are concerned about the ability of recruits? Is the supply of potential volunteers ever large enough that terrorist groups actually turn away those whom they consider unfit?

As is common in the study of terror, it is difficult to give decisive answers to these questions. Terrorist organizations are by their nature clandestine, making it difficult to analyze their inner workings. Nonetheless, the brief glimpses that are accessible through journalism and publicly available intelligence provide support for the verisimilitude of the model.

The key assumption of the model is that education and ability, which create greater economic opportunity, also increase an individual's effectiveness as a terrorist and that terrorist organizations therefore screen for such attributes. The most convincing evidence that terrorist organizations screen volunteers for ability can be found in the Al Qaeda training manual, which was recovered by British police and is available in translation from the Department of Justice (see references). This manual provides a rare view of the actual operations of a terrorist organization.

The manual contains a chapter devoted to instructing Al Qaeda commanders how to recruit operatives. These instructions stress two key qualifications: (1) commitment to Islam and Al Qaeda and (2) ability. The manual advises commanders in "selecting the

20

trainees carefully," noting, for example:

> The nature of hard and continuous work in dangerous conditions requires
> a great deal of psychological, mental and intellectual fitness... (Al Qaeda
> Manual).

A list of fourteen items labeled "necessary qualifications and characteristics for the organization's members" includes, among other things: intelligence and insight, ability to observe and analyze, truthfulness and counsel, ability to act, change positions, and conceal oneself, caution and prudence, maturity, concealing information, and patience.

Further evidence for screening by terrorist organizations is provided by Hassan (2001), who reports that an important factor considered by Palestinian terrorist groups in selecting suicide bombers is the ability to pass as an Israeli. This includes, among other things, the ability to speak Hebrew convincingly. This skill is clearly correlated with education and, since many of the best-paying jobs are on the Israel side of the Green Line, is also correlated with economic opportunity. Despite these standards there seem to be plenty of volunteers, making screening feasible. In addition to the quotation with which this paper began, Hassan (2001) reports that a senior member of the al-Qassam Brigades stated:

> The selection process is complicated by the fact that so many wish to embark on this journey of honor. When one is selected, countless others are disappointed.

Clearly, Al Qaeda and other terrorist groups are concerned not only with the ideological fidelity of their operatives but with their cognitive and intellectual abilities as well. As terrorism expert James Adams (1987) articulates:

> A high degree of sophistication has been added...so that the terrorist is now
> more likely to conform to the image of a middle ranking clerk than to a
> gun-toting hoodlum.

Another assumption underlying the analysis is that potential terrorist volunteers are motivated by both lack of economic opportunity and ideological considerations when deciding whether to mobilize. The primary evidence for this will be presented in detail in the next section because it simultaneously constitutes evidence for predictions of the model. In particular, empirical findings indicate that economic contractions are positively correlated with increased mobilization (Blomberg, Hess, and Weerapana 2002). Anecdotally, press reports are filled with individuals citing both lack of economic opportunity and anger at a regime as a justification for their participation in violence. The following quotation by an unemployed Iraqi, discussing his willingness to participate in guerilla attacks against American forces, is typical:

> Resistance is an individual decision. And as long as we suffer without electricity, without work, without safety, every man in this city will resist. – Reported by Raz (2003).

I now turn from a justification of the *assumptions* of the model to an examination of how well the *results* of the model explain existing empirical evidence.

5   Interpretation and Results

According to remark (2) the terrorist operatives selected will be the highest ability people available in the set of volunteers because the terror organization screens for ability. This is consistent with Russell and Miller's (1977), Krueger and Maleckova's (2002a), and

Berrebi's (2003) empirical findings that terrorist operatives tend not to be from the lowest socio-economic groups. Krueger and Maleckova argue that their findings imply that poverty and poor education are unlikely to be important determinants of mobilization. The model presented here, however, also predicts that terrorist operatives will not be poor or uneducated, while still arguing that people without economic opportunity or good educations are more likely to be willing to mobilize.[8] As argued in remark (3) and revealed in the Al Qaeda manual, the reason that the poor and uneducated are not the modal terrorists is not because they do not want to be terrorists or because economic factors are uncorrelated with violent mobilization. Rather, terrorist organizations choose not to use low ability and uneducated sympathizers because there are better options available. This result is summarized in the following proposition.

Proposition 2 *Terrorist volunteers will be drawn from the people with the lowest level of economic opportunity and education (θ_i). However, the level of economic opportunity and education of those actually chosen to be terrorists will be higher than that of the typical volunteer.*

Proof. Follows immediately from equation (2) and remark (2). ∎

As Krueger and Maleckova point out, many different theories could plausibly explain the socio-economic origins of terrorists. Since both their argument that economics are not an important determinant of terrorism and the model presented here are consistent with the empirical fact that terrorist operatives have relatively good educations and economic opportunities, this empirical finding is insufficient to judge between them.

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[8]This is, of course, dependent on the assumption that sympathizers have a similar distribution of ability to the population as a whole. As discussed earlier, Krueger and Maleckova (2002a) provide some empirical justification for this assumption with their survey results. Further, if the distribution is not the same, it is still the case that the terrorists will not be drawn from the worst of the population, though there will be a natural downward bias in the quality of terrorists if the pool of potential volunteers is of systematically lower ability than the population in general

Krueger and Maleckova also present survey evidence showing that support for suicide bombings is basically constant across socio-economic groups to support their theory. This finding, however, is also consistent with the model presented here. In the model, high ability people are as likely to be among the pool of sympathizers as are low ability people. However, that does not imply that everyone is equally willing to mobilize. While sympathy may be an across-the-board phenomenon, I contend that lack of economic opportunity nonetheless exerts a positive influence on willingness to actually volunteer.

The evidence considered thus far is consistent with the model developed here and with the interpretation that economics does not exert causal influence on terrorism. However, the theoretical arguments yield other predictions that are not observationally equivalent and scholars have identified empirical regularities which make possible a more thorough evaluation based on these predictions.

Blomberg, Hess, and Weerapana (2002) report that in societies with ongoing terrorist conflicts downturns lead to an increase in terrorist violence. This empirical finding seems inconsistent with the claim that economic conditions and opportunity are not important determinants of terrorist violence. It is, however, consistent with the model presented above. Remark (4) implies that when there is an economic downturn higher ability people become willing to volunteer. Remark (2) shows that the terrorist organization will accept these high ability volunteers as operatives. This increases the campaign of terrorist violence both by increasing the quality of the operatives *and* by causing the terrorist organization to invest more resources in violence. This result is summarized in the next proposition

Proposition 3 *The level of terrorism is expected to increase when there are economic downturns because of an increase in mobilization and a resulting increase in investment*

24

in violence by the terrorist organization.

Proof. Follows immediately from equation (2) and remarks (1) and (2)). ■

Angrist (1995) presents another piece of relevant empirics. Angrist finds that during the 1980s there were two important trends in the Palestinian labor market. First, the level of education among Palestinians rose. Second, there was a serious economic contraction. Unemployment increased in every socio-economic group. Angrist reports that between 1981 and 1985 unemployment for Palestinian men increased by anywhere from a factor of 3 to 5 depending on their socio-economic group. Hence, while the skill of Palestinians increased this did not translate into increased economic opportunity due to a recessionary economy. According to remark (4) this situation is expected to cause an increase in mobilization. Further, the lack of economic opportunity for the most skillful (Angrist reports that unemployment for Palestinian males with a high level of education was around 15%) is expected to make the resulting increase in terrorism particularly strong by increasing the pool of highly qualified volunteers. And, indeed, this period of economic downturn was concomitant with the outbreak of the first Intifada, which brought with it a significant increase in terrorist violence.

Similarly, Honaker (2003) reports that in Northern Ireland, increases in Catholic unemployment led to increases in Republican violence and increases in Protestant unemployment led to increases in Loyalist violence. This is, again consistent with the prediction offered by proposition (3).

The model is consistent with another fact about the conflict between Palestinians and Israelis. Keller (2002) reports that the amount of money paid to the families of suicide bombers increased during the second Intifada from $10,000 to $25,000. This fits the predictions of the model in two ways. The second Intifada coincided with significant

Israeli counter-terrorism crack-downs that had an enormous negative economic impact on Palestinians living in the Gaza strip and West Bank. The model, hence, predicts an increase in mobilization and in the quality of terrorist recruits. Remark (6) demonstrates that when the economic impact of crack-downs is large, the resulting increase in mobilization (and consequently on the quality of terrorist recruits) is likely to give the terrorist organization (and its backers) an incentive to *increase* the amount of resources devoted to terror. This is because the marginal return to investment in terror is greater the higher the quality of the operatives.

The model is also consistent with the increased pay for suicide bombers if one considers the supply of and demand for terrorist operatives. The second Intifada has increased mobilization. Further, for reasons exogenous to the model (for example, a desire to undermine peace negotiations (Kydd and Walter 2002) or an increase in the militancy of the terrorist organization's leadership (Bueno de Mesquita 2003)) the terrorist organizations' demand for high quality operatives may have grown at an even faster rate than the increase in mobilization, thereby creating a shortage of high ability operatives. Equation (2) demonstrates that if a terrorist organization wants to increase the supply of high quality terrorists, it can increase selective incentives associated with joining the terrorist organization. That is, adding a constant to the left-hand side of equation (2) will increase the cut-point for mobilization. Thus, an increase in selective incentives increases mobilization and provides a larger pool of high quality recruits. One way to increase the benefits of joining a terrorist organization is to increase compensation. Thus, the increase in pay following an increase in demand is consistent with the claim that a comparison of economic opportunity and the benefits of volunteering for a terrorist organization plays a role in determining who becomes a terrorist.

Interestingly, another way in which terrorists can increase recruitment, according to equation (2) is to increase anti-government sentiments. Thus, the model also predicts that, during times of increased demand for operatives, terrorist organizations are likely to engage in propaganda and ideological manipulation in order to fan the flames of anti-government resentment, thereby improving recruitment.

The model also addresses empirical findings regarding the type of places where terrorism is likely to occur. Recall from remark (4) that mobilization is increasing in the ideological benefits associated with being a terrorist. These ideological motivations for armed resistance may be significantly greater in countries with repressive regimes, limited civil liberties, or contentious ethnic cleavages. Krueger (2002) identifies these types of factors as key determinants of whether a country will experience terrorism, consistent with the predictions of the model.

In addition to providing a theoretical account that integrates these empirical findings the model yields additional hypotheses. Equation (4) shows that the government chooses the level of counter-terrorism to minimize the total impact of terrorism. It does so by balancing several factors: the ability of terrorists to carry out effective attacks, the effect of crack-downs on the level of resources that the terror organization devotes to violence, the impact of crack-downs on mobilization and on the quality of terrorists, and the opportunity costs of spending resources on counter-terror. The government chooses a level of counter-terrorism that most favorably balances the trade-off between heightened security and the expected level of mobilization. However, the government is uncertain about the extent to which its counter-terrorism policies will have negative economic consequences ($\tau(a)$ is a random variable). Thus, the government strikes this balance with respect to the expected economic consequences ($\bar{\tau}(a)$).

If the actual economic consequences turn out to be greater than expected ($\tau(a) > \bar{\tau}(a)$), then government counter-terrorism efforts have the counter-intuitive effect of *increasing* the amount of terrorist violence relative to a more lax security policy. This is due to the fact that when the government underestimates the economic impact of its counter-terrorism policies it engages in more counter-terrorism than is productive, such that the increase in mobilization dominates the increase in security. Thus, in cases where strong government crack-downs occur and have economic consequences that are greater than was anticipated, the model yields the hypothesis that the level of terrorist violence could be diminished by a less aggressive counter-terrorism policy. Similarly, in cases where the government does not engage in strong counter-terrorism because it overestimates the impact that crack-downs will have on mobilization, violence could be reduced by imposing a stronger counter-terror regime. This result is summarized in the following proposition.

Proposition 4 *When crack-downs increase mobilization, if the level of economic damage from government crack-downs is greater than expected ($\tau(a) > \bar{\tau}(a)$), then the total level of terrorist violence ($v(r^*, \bar{\theta}), a$) could be diminished by decreasing the level of counter-terrorism. If the level of economic damage from government crack-downs is less than expected, then the total level of terrorist violence could be diminished by increasing the level of counter-terrorism*

The proof is in the appendix. The result may be somewhat counter-intuitive yet it also conforms to observation. In particular, there are situations where governments engage in actions that seem to fan the flames of conflict. While there are several potential explanations for this behavior (for instance, a government may not be interested in achieving peace or may face domestic political pressures to crack down) the model offers

a plausible one. Sometimes government policies have more adverse effects in terms of mobilizing the other side than were anticipated. The uncertainty that the government faces regarding the consequences of its actions means that sometimes the government will make a mistake, engaging in overly repressive policies that increase, rather than decrease violence. Of course, as shown in the proposition, the opposite is also possible. Sometimes a government may overestimate the extent to which crack-downs will mobilize terrorist sympathizers. This will lead the government to take too gentle an approach to counter-terrorism (from its perspective). In such a scenario, the level of violence could be diminished by a more stringent counter-terrorism policy.

It is worth noting that one could similarly model the effect on ideology as a random variable, which would allow for government mistakes on the ideological dimension as well. That is, governments may sometimes under- or over-estimate how much anti-government sentiment will be created by counter-terror crack-downs.

This model sheds some light on the question of the effect of government crack-downs on mobilization in support of terrorist movements. Studies of terrorism have generally either assumed that government crack-downs always increase support for terrorist organizations (Wilkinson 1986, de Figueiredo and Weingast 2001) or have ignored this effect and argued that crack-downs play only a counter-terror role that decreases the attractiveness of terrorism (Sandler, Tschirhart, and Cauley 1982, Bueno de Mesquita 2003) or leads terrorists to choose targets and tactics that are less affected by the crack-downs (Enders and Sandler 1993).

The empirical record, however, reflects a broad range of mobilization responses to government crack-downs. For instance, Israeli border closings, bombings, and curfews have tended to inflame Palestinian public opinion and mobilize support for militants

(Bloom forthcoming). The Spanish and French crack-downs of the 1980s against Basque separatists (Clark 1990), on the other hand, coincided with a significant decrease in support for the Basque terrorist organization ETA (Funes 1998). An important question in the study of terrorism, then, is, under what conditions do government counter-terror crack-downs lead to mobilization in favor of the terrorists and under what conditions do they discourage participation in terrorism?

This model does not assume that increased or decreased support will occur whenever there are counter-terrorism crack-downs. Instead, mobilization is an endogenous choice made by heterogeneous individuals. Further, government crack-downs have competing effects on mobilization. On the one hand, they make becoming a terrorist less attractive by decreasing the ability of terrorists to carry out effective attacks. On the other hand, they make terrorism more attractive by exerting a negative impact on economic opportunity and by radicalizing people's anti-government views. As such, the model yields conditions under which mobilization will increase or decrease following concessions. This provides a partial account of the variance in mobilization responses across different terrorist conflicts.

As discussed in remark (5) the model predicts that the relative impact of crack-downs on economic opportunity, ideology, and security are important explanatory variables. And, indeed, in the Palestinian case, increased mobilization has coincided with crack-downs that imposed devastating economic costs on Palestinians living in the West Bank and Gaza Strip and outraged the population. Further, decreased support for ETA coincided with a counter-terror campaign that did not disrupt a surging economy. The largest anti-ETA rallies in Basque history occurred in late 1997, coinciding with the fastest economic growth and lowest unemployment rates experienced in modern Spain

30

(Irish Times, December 30, 1997). This argument regarding the relative effect of crackdowns on economics, ideology, and security implies that governments facing situations where counter-terrorism requires the closing of borders which limits access to jobs and markets, the imposition of curfews that limit economic activity, the destruction of economically vital infrastructure, or the humiliation and dehumanization of a population are more likely to face increased mobilization than governments that can engage in less destructive forms of counter-terrorism.

6   Policy Implications

The model offers some reason to believe that policies that promote economic growth may decrease violence in countries suffering from terrorist conflicts. It is clear from equation (2) that the level of mobilization, and thus the level of violence, is decreasing in γ. Hence, policies that improve the economic situation of potential terrorists are expected to decrease mobilization and thereby undermine the ability of the terrorist organization to recruit high quality operatives. This, as shown in remark (1), has the additional positive effect of decreasing the terrorist organization's incentive to invest scarce resources in violence.

This policy implication is the opposite of the conclusion that a variety of writers in academia and the press have reached based on the evidence regarding the socio-economic origins of terrorists (e.g., Atran 2003, Barro 2002, Eisner 2002, Krueger 2003, Krueger and Maleckova 2002a,b). These writers conclude that, because terrorists tend not to be poor or undereducated, economic opportunity is not a major determinant of terrorism. Consequently, they argue, growth aid, while potentially laudable for other reasons, should not be used to prevent terror. The model presented here suggests that this is an

unwarranted conclusion. As stated at the outset, because of screening one cannot reach conclusions about who is *willing to become a terrorist* only by studying those who actually do become terrorists. The argument I have advanced shows that when a broader range of empirical findings are considered, a model that takes seriously the effect of ideology *and* economics on mobilization (and consequently on violence) fits the evidence better than the contention that economics do not exert a causal effect on terrorist violence.

It is important to qualify this prediction in a few ways. First, if, as resource mobilization theorists have argued, a terrorist group's resources increase with general economic conditions, then the terrorists may be able to competitively bid for high quality recruits. Further, if the terrorist organization is able to increase its budget in this way, it may be in an even better position, as the pool of qualified operatives expands.[9] Thus, the policy recommendations of this model should be taken as equivocal. Nonetheless, the model provides at least some reason to reconsider the policy conclusions that have been reached based on the evidence regarding the socio-economic origins of terrorists.

7   Conclusion

I have presented a model of the interaction between a terrorist organization, a government, and a population of potential terrorist volunteers which is consistent with a host of empirical findings in the terrorism literature.

The model takes seriously the impact of ideology and economic conditions on the mobilization decisions of heterogeneous individuals. It also posits that terrorist organizations may not be indifferent to the ability of their operatives. Consequently, even though lack of education and economic opportunity are determinants of mobilization – so that the pool of volunteers is drawn from the lowest socio-economic groups – the set of

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[9]I am indebted to an anonymous referee for pointing out this line of argument.

actual terrorist operatives will be the highest ability, best educated people from within that pool. Hence, the model is consistent with Russell and Miller's (1977), Krueger and Maleckova's (2002a), and Berrebi's (2003) findings regarding the characteristics of terrorist operatives but also explains the finding in Blomberg, Hess, and Weerapana (2002) and Honaker (2003) that terrorism increases when economic conditions worsen.

The model also sheds light on the different effects that government crack-downs can have on terrorist mobilization. On the one hand, government crack-downs decrease the ability of terrorists to carry out effective terrorist attacks, decreasing mobilization. On the other hand, government crack-downs impose negative economic externalities on the sympathizers and increase ideological motivations, making participation in the normal economy less attractive and mobilization more attractive. This endogenous account of the effect of counter-terrorism provides a framework for understanding the differences across countries in mobilization responses to government counter-terrorism policies.

Finally, the model has implications for why repressive and ethnically divided societies might be particularly prone to terrorism, yields predictions about the composition of spending by terrorist organizations that are consistent with journalistic evidence, suggests conditions under which governments might adopt either overly or underly stringent counter-terrorism policies, and posits a causal mechanism by which economic development aid policies might reduce the threat of terrorism.

8   Appendix

Proof of Remark 1 We have already seen that r^* is interior. I further claim that $U^T(r, \bar{\theta}, a)$ has strictly increasing marginal returns in r and $\bar{\theta}$, and therefore Edlin and Shannon's (1998) Monotonicity Theorem implies that r^* is increasing in $\bar{\theta}$. All that has

to be done is to prove strictly increasing marginal returns which can be seen as follows:

$$\frac{\partial^2 U^T}{\partial \bar{\theta} \partial r} = \frac{\partial^2 v}{\partial \bar{\theta} \partial r} > 0.$$

So the claim is true. ∎

Proof of Remark 2 The terrorist organization's utility in equilibrium is given by the value function:

$$V\left(\bar{\theta}, a\right) \equiv U^T\left(r^*\left(a, \bar{\theta}\right), \bar{\theta}, a\right) = v\left(r^*\left(a, \bar{\theta}\right), \bar{\theta}, a\right) - c\left(r^*\left(a, \bar{\theta}\right)\right).$$

The envelope theorem implies that

$$\frac{\partial V(\bar{\theta})}{\partial \bar{\theta}} = \frac{\partial v\left(r^*\left(a, \bar{\theta}\right), \bar{\theta}, a\right)}{\partial \bar{\theta}} > 0$$

Thus the terrorist organization's equilibrium payoff is increasing in the quality of its operatives. ∎

Proof of Remark 3 Define the function:

$$G(a, \theta) = e(a) + u(a, \theta_i) - (1 - \tau(a))f(\gamma, \theta_i)$$

An individual i volunteers for the terrorist organization if an only if $G(a, \theta_i) > 0$. Note that it is clear that $G(a, 0) > 0$. A sympathizer of type $\theta = 0$ always mobilizes. Further, the derivative of G with respect to θ is

$$\frac{\partial G}{\partial \theta} = \frac{\partial u}{\partial \theta} - (1 - \tau)\frac{\partial f}{\partial \theta}.$$

Consider two cases (for a fixed a):

1. $\frac{u'(0)}{f'(0)} > (1 - \tau)$

2. $\frac{u'(0)}{f'(0)} < (1 - \tau)$

In case 1, G is an increasing function at $\theta = 0$. There are now two possible sub-cases.

(a) $\frac{u'(\theta)}{f'(\theta)} > (1 - \tau)$ for all θ

(b) There exists at least one θ' such that $\frac{u'(\theta')}{f'(\theta')} = (1 - \tau)$

In sub-case $(1.a)$, the derivative is positive for all θ which means that the function G is everywhere positive. Thus all sympathizers mobilize.

In sub-case $(1.b)$, there exists at least one value of θ such that the derivative equals zero. Label the first such value θ'. For all $\theta < \theta'$ it is clear that G is positive since the derivative of G is positive. Recall that $\frac{f'}{u'}$ is increasing, which implies that $\frac{u'}{f'}$ is decreasing. Since $\frac{u'}{f'}$ is decreasing, it is clear that for all $\theta > \theta'$, the derivative of G is negative. Thus, θ' is unique. Once the derivative turns negative there are two possible sub-sub-cases. $(1.a.i)$ G may decrease for all $\theta > \theta'$ but never cross zero, in which case all sympathizers mobilize. $(1.a.ii)$ G may cross zero at some point $\hat{\theta}$. In this event, once G crosses zero it will remain negative for all $\theta > \hat{\theta}$ since, as we have already seen, G's derivative is negative for all $\theta > \theta'$.

In case 2, G is a decreasing function at 0 and will remain decreasing forever, since $\frac{u'}{f'}$ is decreasing . Thus, just as is sub-case $(1.b)$ above there are two possibilities. $(2.a)$ G may decrease for all $\theta > 0$ but never cross zero, in which case all sympathizers mobilize. $(2.b)$ G may cross zero at some point $\hat{\theta}$. In this event, once G crosses zero it will remain negative for all $\theta > \hat{\theta}$ since, as we have already seen, its derivative is negative for all θ.

We have seen that either G is always positive (cases $1.a$, $1.b.i$, and $2.a$) or it crosses 0 at some value $\hat{\theta}$, and remains negative for all $\theta > \hat{\theta}$ (cases $1.b.ii$ and $2.b$). The cut-point,

θ^*, can be defined as follows:

$$\theta^* = \begin{cases} \infty & \text{if } G \text{ is everywhere positive} \\ \hat{\theta} \text{ such that } G(\hat{\theta}) = 0 & \text{if } G \text{ crosses } 0 \end{cases}$$

Thus, it follows that only individuals with $\theta < \theta^*$ mobilize, which establishes the result. ∎

Proof of Remark 6 The level of resource investment is defined implicitly by the first-order conditions in equation (1). By Edlin and Shannon's (1998) Monotonicity theorem, r^* is increasing in a if the cross-partial is positive and decreasing in a if the cross-partial is negative. The cross-partial is:

$$\frac{\partial^2 U^T}{\partial a \partial r} = \frac{\partial^2 v}{\partial r^* \partial a} + \frac{\partial^2 v}{\partial r^* \partial \bar{\theta}} \frac{\partial \bar{\theta}}{\partial \theta^*} \frac{\partial \theta^*}{\partial a} \tag{5}$$

Note that $\frac{\partial^2 v}{\partial r^* \partial \bar{\theta}} > 0$ and $\frac{\partial \bar{\theta}}{\partial \theta^*} > 0$. Further, if mobilization is decreasing in crack-downs, then $\frac{\partial \theta^*}{\partial a} < 0$ and if mobilization is increasing in crack-downs, then $\frac{\partial \theta^*}{\partial a} > 0$. This implies that the second term of equation (5), which represents the effect on investment of a change in mobilization, is negative if mobilization is decreasing in crack-downs and positive if mobilization is increasing in crack-downs. The first term of equation (5), which represents the effect on increased counter-terror on the effectiveness of terrorism is strictly negative. Thus, if mobilization is decreasing in crack-downs, then both the first and second terms of equation (5) are negative and so $\frac{\partial r^*}{\partial a} < 0$. If mobilization is increasing in crack-downs, then $\frac{\partial r^*}{\partial a}$ is positive if the first term of equation (5) is larger than the second term and negative otherwise. ∎

Proof of Proposition 4

a^* is defined implicitly by equation (4):

$$\frac{\partial v}{\partial a} + \frac{\partial v}{\partial r^*} \frac{\partial r^*}{\partial a} + \frac{\partial \bar{\theta}}{\partial \theta^*} \frac{\partial \theta^*}{\partial a} \left(\frac{\partial v}{\partial \bar{\theta}} + \frac{\partial v}{\partial r^*} \frac{\partial r^*}{\partial \bar{\theta}} \right) + k'(a) = 0$$

Further, equation (2) demonstrates that when $\tau(a) > \bar{\tau}(a)$ the actual effect of counter-terrorism on mobilization (call it $\frac{\partial \hat{\theta}^*}{\partial a}$) is greater than the expected effect that the government used to solve the maximization problem ($\frac{\partial \theta^*}{\partial a}$). Call the solution to the maximization problem with this actual effect $\hat{a}^*$. It is clear from equation (4) that $\hat{a}^* < a^*$ because $\frac{\partial \theta^*}{\partial a}$ is part of the marginal costs.

Recall that a is chosen to minimize the level of terrorism ($v(r, \bar{\theta}, a)$). Thus, the fact that the optimal choice of counter-terrorism ($\hat{a}^*$) is less than the amount actually chosen (a^*) when $\tau(a) > \bar{\tau}(a)$, demonstrates that a decrease in counter-terror would decrease the level of violence. An identical argument proves the result when $\tau(a) < \bar{\tau}(a)$. ∎

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