Foreign Aid as Counterterrorism Policy

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This paper presents a model where foreign aid bolsters a developing country's proactive counterterrorism efforts against a resident transnational terrorist group. In stage 1 of the game, the donor country allocates resources to terrorism-fighting tied aid, general assistance, and defensive actions at home. The recipient country then decides its proactive campaign against the common terrorist threat in stage 2, while the terrorists direct their attacks against the donor and recipient countries in stage 3. Terrorists' choices in the final stage provide a solid microfoundation for the terrorists' likelihood of success function. In stage 2, greater tied aid raises the recipient country's proactive measures and regime instability, while increased general aid reduces these proactive efforts and regime instability. In stage 1, a donor's homeland security decisions are interdependent with its aid package to a recipient country, hosting resident transnational terrorists. This interdependency has gone unrecognized to date.

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1. Introduction

Ever since the late 1960s, terrorism has acquired a transnational component, whereby a country must be concerned about terrorist attacks against its interests (i.e., people and property) at home and abroad (Hoffman, 2006). These attacks assume myriad forms: hostage taking, bombings, armed attacks, suicide bombings, or assassinations. Countries can deploy defensive measures to guard their assets and limit terrorists' logistical success in completing planned attacks. Alternatively, countries can apply proactive or offensive measures that confront the terrorists or their supporters directly. Efforts to limit terrorists' resources, finances, safe havens, infrastructure, or sponsors are proactive and reduce the terrorism threat to all at-risk countries. When, however, a country's people or property is attacked abroad, the targeted country must rely, in large part, on the venue country for protection (Sandler and Lapan, 1988; Drakos and Gofas, 2006). A targeted country is also reliant on another country's offensive actions if the terrorists use a host country as a base from which to train and disperse attack forces. For example, the skyjackers from September 11, 2001 (henceforth, 9/11) were trained in al-Qaida camps in Afghanistan.

There are numerous examples where terrorist groups in foreign bases pose threats to targeted countries. For example, al-Qaida's command and control center has included bases in the tribal areas of Pakistan and Afghanistan. Jemaah Islamiyah operates out of Indonesia, but poses a threat throughout the region in its quest for a pan-Islamic state. Recently, al-Qaida affiliates conducted attacks in Iraq and Saudi Arabia (Mickolus and Simmons, 2006; Economist.com, 2008; Mickolus, 2008). Currently, al-Qaida elements are showing up in Yemen and Somalia. In the 1980s, the Abu Nidal Organization, led by Sabri al-Banna, operated from Syria, Iraq, and Libya and targeted European nations (Hoffman, 2006, p. 259). The spillover of Middle Eastern terrorism in the 1970s and 1980s to Europe fits the pattern of foreign-based

terrorist groups launching operations abroad.

The purpose of this paper is to investigate the role of foreign aid as a counterterrorism tool, whereby a targeted country (called the home country) gives aid to a foreign (recipient) country to bolster its counterterrorism efforts against a resident transnational terrorist group. US aid given to Pakistan after 9/11 is an example, as is US aid given to Afghanistan in recent years. Such counterterrorism aid is one of the four pillars of US counterterrorism policy, where the United States 'bolsters the counterterrorist capabilities of those countries that work with the United States and require assistance' (US Department of State, 2003, p. xi). We allow the foreign recipient's regime stability to depend, in part, on antiterrorism-contingent aid. As this tied aid increases, the regime may lose popular support and become more fragile. This agrees with recent situations in Pakistan, Yemen, and Iraq, where US-supported counterterrorism did not please all constituencies. This is a real concern because the collapse of a friendly regime may lead to an even greater terrorism threat at home and abroad.

We construct a three-stage game involving three active agents: the aid-giving home country (*H*), the aid-recipient foreign country (*F*), and the terrorists. In stage 1, the donor country allocates resources to general assistance, counterterrorism tied aid, and defensive measures at home. The donor's choice between general assistance and tied aid must balance concerns about the recipient's regime stability and its proactive measures. We show that general assistance limits regime instability, but at the expense of foreign proactive measures against the common terrorist threat. In contrast, tied aid increases these proactive measures, but at the expense of regime stability. In stage 2, the recipient country decides its proactive efforts against the resident terrorists. The terrorists then determine in stage 3 their distribution of attacks in countries *H* and *F*, based on their respective defensive and proactive measures.

F's proactive measures exhibit strategic substitutability with *H*'s defensive efforts, so that

increased home defense results in less proactive measures abroad. This is due, in part, to *H*'s defensive efforts limiting its need for tied aid to bolster *F*'s operations to root out the resident (common) terrorist threat. Thus, both countries' counterterrorism decisions are dependent on aid allocations. The terrorist group decides its attacks on the two countries' interests based on its targeting preferences and the countries' counterterrorism allocations. *F*'s counterterrorism reduces the likelihood of attacks against *H* (the donor), while *H*'s defensive measures raise the likelihood of attacks in *F* (the recipient). A greater preference of the terrorists for attacking *F* will result in more attacks there, while, surprisingly, a greater preference of the terrorists for attacking *H* may or may not raise attacks there. Unlike previous studies of transnational terrorism, our three-stage model endogenizes the terrorists' attack likelihood success function in *H* and *F*, while allowing both nations to choose their counterterrorism efforts.[1]

Insightful papers by Azam and Delacroix (2006) and Azam and Thelen (2008, 2010) also addressed foreign aid as a counterterrorism policy. In their analysis, the targeted nation provides foreign aid to other countries in a "delegated" fight against terrorism. Like our analysis, foreign aid is cast in these earlier papers as an incentive to the source countries of terrorism to reduce the supply of terrorists. Azam and Thelen (2008) viewed aid as a two-pronged tool: one geared toward enhanced countermeasures and the other aimed at subsidizing education. Education deters terrorism indirectly by raising human capital, thereby freeing up the recipient government's resources to augment its counterterrorism efforts. In Azam and Thelen (2010), the donor country chooses between aid and military intervention in the recipient country. There are crucial differences between their models and ours. First, we allow the damage from terrorism to impact not only the donor country, but also the recipient country. Thus, the recipient also has a stake in the fight against the terrorists. Second, we focus on the strategic interaction in the choice of counterterrorism measures by the donor and recipient country, as conditioned by the

aid package. Azam and Thelen (2008, 2010) focused, instead, on the strategic choice of the terrorists and the recipient government. In their analyses, the home (target) country chooses its aid package and allocation among foreign countries, but does not choose its own *defensive* countermeasures. Thus, their analysis cannot relate aid to homeland security. Third, we permit the donor country to possess assets at home and abroad. Fourth, unlike Azam and Thelen (2008, 2010), we consider the impact of counterterrorism-conditional aid on the regime stability of the recipient government. This is a crucial consideration for many aid recipients, given terrorists proclivity to locate in weak regime-stressed countries. Fifth, we do not investigate aid's influences on human capital. The model here treats the terrorists, the recipient country, *and* the donor country as active agents. Our two approaches study different essential issues regarding delegated aid. The analysis is complex and, hence, tractability requires that choices be made regarding active agents, the choice variables, and the policy concerns.

The remainder of the paper contains four sections. Section 2 provides some necessary background, while Section 3 presents the three-stage model and its implications. Section 4 investigates a corner solution, where the donor country is not attacked at home; however, its interests may be targeted in the recipient country. Concluding remarks follow in Section 5.

2. Background

Terrorism is the premeditated use or threat to use violence by individuals or subnational groups in order to obtain a political or social objective through the intimidation of a large audience beyond the immediate victim. Terrorism is associated with violence to further a political agenda. In so doing, terrorists try to circumvent the political process by intimidating a government into conceding to their demands for political change. Terrorism comes in two basic varieties: domestic and transnational. Domestic terrorism is homegrown and home directed. As such, the

perpetrators, victims, and audience are from the venue country. In contrast, transnational terrorism may involve perpetrators, supporters, victims, or audience that affects two or more countries. The hijacking of an Air India flight in 1999 that eventually landed in Afghanistan is a transnational terrorist incident, as was the 1983 bombing of the US embassy in Beirut by Islamic Jihad. When terrorists abduct hostages and make demands on a second country for the release of prisoners or ransom, the incident is a transnational terrorist incident. Although transnational terrorist events are far fewer in number than domestic terrorist attacks (Enders and Sandler, 2006a), the former are more newsworthy and display greater economic consequences on average (Gaibulloev and Sandler, 2008). A donor country is motivated to support foreign counterterrorism efforts if indigenous terrorists pose a risk to donor's interests at home or abroad. As a counterterrorism tool, foreign aid must necessarily be associated with transnational terrorism.

Suppose that two countries are confronted by the same transnational group or network – e.g., al-Qaida as a threat over the last two decades. Defensive measures at home are likely to deflect the attack abroad as terrorists seek soft targets. Consequently, defensive measures can be strategic complements[2] when both targeted countries employ them (Sandler and Lapan, 1988; Sandler and Siqueira, 2006). A defensive counterterrorism race can ensue with each nation trying to deflect potential terrorist attacks abroad. This deflection can be greatly attenuated if each nation has interests abroad (Bandyopadhyay and Sandler, 2011). In contrast, proactive efforts are purely public goods to at-risk countries, since actions to weaken a common terrorist threat benefit everyone. One country's effort to reduce a terrorist group's assets is a perfect substitute for the same efforts by other countries, so that too little action is anticipated (Arce and Sandler, 2005; Sandler and Siqueira, 2009).

After 9/11, rich Western countries deployed much greater defensive measures that have

caused transnational terrorist attacks to shift away from Western Europe to the Middle East, Eurasia, and Asia (Enders and Sandler, 2006b). However, the share of attacks against Western interests has remained roughly unchanged. This shift in attack geography means that venue countries must not only protect rich nations' assets abroad, but also must weaken resident transnational terrorists. Terrorist groups have gravitated to weak or failed regimes where they can assume refuge to train and plan attacks. The need to bolster proactive efforts abroad has led to foreign aid becoming a counterterrorism policy instrument.

Foreign-aid counterterrorism creates an interesting combination of counterterrorism instruments. From the donor country's viewpoint, it deploys defensive homeland security to guard potential targets at home. The donor country also applies defensive measures at its border crossings and ports of entry to keep the terrorists out. Because terrorist groups are based abroad, the host country is motivated to deploy proactive countermeasures to eliminate the threat from its soil. The donor country can subsidize foreign efforts through counterterrorism-conditional aid. This subsidy is sorely needed because terrorists purposely locate in countries with limited counterterrorism capacity. Azam and Delacroix (2006) showed that increased aid flows went to countries with terrorist attacks. More recently, Fleck and Kilby (2010) established that US post-9/11 bilateral aid flows are based less on recipient need, thereby suggesting that increased assistance went to nations helping in the fight against terrorism. Large post-9/11 aid to Afghanistan, Iraq, Pakistan, Yemen, and Sudan is consistent with this conjecture. Unlike the standard analysis where both countries choose defensive and/or proactive measures, foreign-aid counterterrorism is associated with a defensive-proactive mix that makes for a rich strategic environment that contains substitute and complementary policy instruments.

3. The model

We use a single-good model (like Ethier, 1986), where the measure of national welfare is national income. The advantage of such an approach is that it simplifies the policy analysis, without having to make restrictive assumptions on preferences. Consider *H*'s economy in which good Q^H is produced with the following constant returns to scale technology:

$$Q^H = Q^H\left(L^H, K^H\right), \tag{1}$$

where L^H and K^H are labor and capital, respectively. If labor and capital in *H* are fixed at $\overline{L}^H$ and $\overline{K}^H$, respectively, and if individual firms equate their factor returns to marginal product, then national output is fixed at $\overline{Q}^H = Q^H\left(\overline{L}^H, \overline{K}^H\right)$.

We consider a unitary terrorist organization, interested in hitting targets in two nations, *H* and *F*. The terrorists operate and train in country *F*, but may hit targets in either country. A successful terrorist attack occurring on *H*'s soil creates damage T^H for just the home nation, measured in units of the numéraire good. Given the aid-dependency of *F*, it is reasonable to assume that this country has no assets that can be targeted in *H*. If, on the other hand, a successful attack occurs on *F*'s soil, the damage is $\tilde{T}^H$ for *H*'s assets in *F*, while it is T^F for *F*'s interests there. *H*'s counterterrorism effort, e^H, is defensive, while *F*'s counterterrorism effort, e^F, is proactive. This scenario agrees with US counterterrorism policy in Pakistan, Afghanistan, Yemen, the Philippines, and elsewhere following 9/11 as terrorists sought remote home bases. It also corresponds to Indian and Pakistani counterterrorism actions with respect to Laskkar-e-Taiba, believed responsible for the November 26, 2008 terrorist attacks in Mumbai, India. India must rely on Pakistan to take proactive measures against this group that operates from Pakistani soil. a^H denotes the terrorist organization's effort or attack level against *H*, while a^F indicates its attack level against *F*. The probability of a successful terrorist attack on *H* is

$$\sigma^H = \sigma^H\left(e^H, a^H\right),\ \sigma_1^H\left(e^H, a^H\right) < 0,\ \sigma_2^H\left(e^H, a^H\right) > 0, \text{ and } \sigma_{21}^H\left(e^H, a^H\right) < 0, \tag{2a}$$

where first-order and second-order partial derivatives are denoted by subscripts so that $\sigma_1^H = \partial\sigma^H / \partial e^H$. In (2a), σ_1^H is negative: as *H* raises its counterterrorism defense, this reduces the terrorists' probability of success, given their attack effort a^H. On the other hand, σ_2^H is positive because increased terrorists' efforts raise their success probability for a given e^H. Moreover, σ_{21}^H is negative because the marginal increase in the success probability (i.e. σ_2^H) is smaller when the defense level is higher. Finally, we assume that country *H* faces diminishing returns to defense so that $\sigma_{11}^H > 0,$ and the terrorist group faces diminishing returns in its effort so that $\sigma_{22}^H < 0.$

The terrorists' success probability σ^H may, however, increase if there is a regime change in host country *F*, more sympathetic to their radical views. This is captured by transforming σ^H as

$$\tilde{\sigma}^H = (1+\eta)\sigma^H\left(e^H, a^H\right),\ \eta > 0, \tag{2b}$$

where η scales up the probability of a successful attack on *H* if there is a regime change in *F*. With no regime change, the probability of a successful attack in *H* is captured by (2a) where $\eta = 0.$ The η parameter captures the terrorism-related cost of a regime change in terms of a more potent threat in *H*.

The foreign (or host) country's proactive policy, e^F, aims to reduce the resources available for the terrorists to carry out attacks. With fewer resources, the terrorist organization must reduce attacks on at least one of the two nations, perhaps both, an issue that we analyze below. Unlike defensive measures, proactive effort is effective *prior* to a planned attack so that the outcome of attacks in progress is not affected by such actions. Thus, for a given attack level

a^F of the terrorists, the likelihood of their attack success in *F* is not affected by e^F. This difference between how defensive and proactive countermeasures work leads to an interesting asymmetry in the probability of success functions in *H* and *F*. The terrorists' success probability of an attack on *F* is

$$\sigma^F = \sigma^F\left(a^F\right),\ \sigma^{F\prime} > 0, \text{ and } \sigma^{F\prime\prime} < 0. \tag{3a}$$

In (3a), $\sigma^{F\prime}$ is positive because increased efforts by the terrorists to hit targets in their base country, *F*, raise their probability of success. In (3a), $\sigma^{F\prime\prime}$ is negative owing to diminishing returns. This probability increases if there is a regime change in *F*. Analogous to (2b), we have:

$$\tilde{\sigma}^F = (1+\eta)\sigma^F\left(a^F\right),\ \eta > 0. \tag{3b}$$

We now turn to aid provided by country *H* to country *F*. This aid consists of general assistance, *A,* and tied aid, αe^F, to bolster *F*'s proactive measures against the resident terrorists, so that total aid, $\tilde{A}$, is

$$\tilde{A} = A + \alpha e^F, \tag{4}$$

where α is a subsidy. Aid serves two counterterrorism roles in this representation. By improving the economy, general assistance may limit terrorism by improving opportunities for the population.[3] This view accords with Blomberg *et al.* (2004), which showed that economic downturns are associated with increased terrorist attacks. In its second role, aid fosters foreign counterterrorism efforts against a terrorist group that attacks country *H*'s interests at home or abroad. For example, al-Qaida has attacked US interests in Pakistan and the United States. Country *H* levies a lump-sum tax, t^H, on its population to finance counterterrorism at home and its aid abroad:

$$t^H = e^H + \tilde{A}. \tag{5}$$

The probability of a regime change in country *F* is

$$p^F = p^F(\alpha, A), \text{ with } p_1^F > 0 \text{ and } p_2^F < 0. \tag{6}$$

As more tied aid is given, the regime is viewed as catering to the donor's foreign policy interests, which jeopardizes the regime's standing among its constituency so that $p_1^F > 0$. For example, after 9/11, the Pevez Musharraf government took assistance from the United States to help US efforts in its War on Terror against al-Qaida and the Taliban in Afghanistan and Pakistan. US tied assistance jeopardized the stability of Musharraf's regime, which was viewed by opposition elements as a puppet of the US government. A similar scenario applied to the Maliki government in Iraq after it took office in May 2006. In contrast, greater general aid lowers the chance of a regime collapse as greater prosperity wins supporters and quells criticism, so that $p_2^F < 0$. General aid does not necessarily taint the regime as serving a donor's geo-political interests. We also assume that $p_{11}^F > 0$ so that regime instability costs are convex, and that $p_{22}^F > 0$ so that general assistance curbs regime instability at a diminishing rate.

Expected national income in the home country, Y^H, is

$$Y^H = \bar{Q}^H - t^H - (1 - p^F)\left[\sigma^H T^H + \sigma^F \tilde{T}^H\right] - p^F\left[\tilde{\sigma}^H T^H + \tilde{\sigma}^F \tilde{T}^H\right], \tag{7}$$

which equals output less taxes and *H*'s expected terrorism losses at home and abroad, with and without a change of regime. Using (2b), (3b), (4), (5), and (6), we can rewrite (7) as:

$$Y^H = \bar{Q}^H - \gamma(\alpha, A, \eta)\left[\sigma^H T^H + \sigma^F \tilde{T}^H\right] - e^H - A - \alpha e^F, \tag{8}$$

where $\gamma(\bullet) = 1 + p^F(\alpha, A)\eta$. Similarly, we can express expected foreign national income, Y^F, as:

$$Y^F = \bar{Q}^F - \gamma(\alpha, A, \eta)\sigma^F T^F - e^F + A + \alpha e^F. \tag{9}$$

In contrast to Y^H, country *F*'s income reflects the aid flow and the assumed absence of attacks

against its interests in H – i.e., $\tilde{T}^F = 0$.

Based on (8), the expected damage inflicted by the terrorist group on H is $\gamma\left(\sigma^H T^H + \sigma^F \tilde{T}^H\right)$. Similarly, eq. (9) indicates that F's expected damage is $\gamma\sigma^F T^F$. The terrorist group derives utility from these expected damages. Let ϕ^H and ϕ^F be the respective utility weights attached by the group to the damages inflicted on the two targeted nations' assets. The terrorist group's utility function is

$$U = \gamma(\alpha, A, \eta)\left\{\phi^H\left[\sigma^H\left(e^H, a^H\right)T^H + \sigma^F\left(a^F\right)\tilde{T}^H\right] + \phi^F\sigma^F\left(a^F\right)T^F\right\}. \tag{10}$$

That is, the terrorists gain satisfaction from the expected losses sustained by their targeted countries. The nature of this utility function is applicable to today's fundamentalist terrorists, who seek revenge and have not presented politically feasible demands. The fatwa issued by Osama bin Laden in February 1998 indicated that every Muslim has the duty to murder Americans, including women and children (National Commission on Terrorist Attacks upon the United States, 2004). Thus, al-Qaida and its affiliated groups (e.g., Abu Sayyaf, al-Qaida in Iraq, Egyptian Islamic Jihad, and Jemaah Islamiyah) possess such a damage-orientated utility function. These groups maximize carnage without issuing demands and, on many occasions, not claiming credit for the attack.

We denote the total resources available to the organization by $\bar{M}$. F's proactive response e^F reduces these resources, but at a diminished rate so that

$$\bar{M} = \bar{M}\left(e^F\right), \bar{M}' < 0, \text{ and } \bar{M}'' > 0. \tag{11}$$

Normalizing the prices of a^H and a^F to unity (because they do not vary in this analysis), we express the terrorist organization's resource constraint as:

$$a^H + a^F = \bar{M}\left(e^F\right). \tag{12}$$

3.1. Staging assumptions

We find the subgame perfect Nash equilibrium for our three-stage game by starting with the terrorist organization's optimal distribution of attacks in stage 3. Next, we consider host country *F*'s proactive level in stage 2, conditioned on terrorists' efforts in stage 3. Finally, the home government chooses its aid parameters and defensive measure in stage 1, conditioned on the choices in stages 2 and 3.

3.2. Stage 3: terrorists' distribution of attacks

In this section, we provide a microfoundation for the likelihood of terrorist attacks in each of the targeted countries, based on the terrorist group's constrained optimization problem. In particular, we establish that defensive measures in donor country *H* raise the probability of attacks in the aid recipient, country *F*. However, proactive measures in *F* limit the likelihood of attacks in *H*. An increased preference of the terrorists to target *H*'s assets need not augment attacks in *H*.

The terrorist group maximizes U by choosing a^H and a^F, subject to its resource constraint. The first-order conditions (FOCs) of the constrained optimization problem consist of (12) and the familiar indifference curve tangency condition, $U_{a^H} / U_{a^F} = 1$, which implies that[4]

$$\phi^H T^H \sigma_2^H \left(e^H, a^H\right) = \left(\phi^H \tilde{T}^H + \phi^F T^F\right) \sigma^{F\prime}\left(a^F\right). \tag{13}$$

Substituting (12) into (13), we have:

$$\phi^H T^H \sigma_2^H \left(e^H, a^H\right) - \left(\phi^H \tilde{T}^H + \phi^F T^F\right) \sigma^{F\prime}\left[\bar{M}\left(e^F\right) - a^H\right] = 0. \tag{14}$$

Equation (14) implicitly defines the terrorists' attack functions,

$$a^H = a^H\left(e^H, e^F, V\right) \text{ and } a^F = a^F\left(e^H, e^F, V\right) = \bar{M}\left(e^F\right) - a^H\left(e^H, e^F, V\right), \tag{15}$$

with $V = \left(\phi^H, \phi^F, T^H, \tilde{T}^H, T^F\right)$. Suppressing V, the vector of parameters, from the functional forms, we can use the implicit function theorem on (14) to get:

$$\frac{\partial a^H}{\partial e^H} = a_1^H = \frac{\phi^H T^H \sigma_{21}^H}{D} < 0 \text{ and } \frac{\partial a^F}{\partial e^H} = a_1^F = -a_1^H > 0, \tag{16a}$$

where $D = -\left[\phi^H T^H \sigma_{22}^H + \left(\phi^H \tilde{T}^H + \phi^F T^F\right)\sigma^{F\prime\prime}\right] > 0$. Also, we have:

$$\frac{\partial a^H}{\partial e^F} = a_2^H = -\frac{\left(\phi^H \tilde{T}^H + \phi^F T^F\right)\sigma^{F\prime\prime}\bar{M}'}{D} < 0 \text{ and}$$

$$\frac{\partial a^F}{\partial e^F} = a_2^F = \bar{M}' - a_2^H = -\frac{\left(\phi^H T^H \bar{M}' \sigma_{22}^H\right)}{D} < 0. \tag{16b}$$

Equation (16a) indicates the reasonable outcome that the terrorists reduce attacks in country H and increase them in the foreign (host) country as H spends more on defensive measures. These results are indicative of attack transference to softer targets (Sandler and Lapan, 1988), which highlights the strategic bonds between the two countries, given a common terrorist threat. An increase in defensive measures in H changes the slope of the terrorist group's indifference curve to favor attacks in country F. In contrast, (16b) shows that proactive measures in F decrease attacks in both countries, as the terrorists are weakened. In essence, proactive measures in F shift in the terrorists' resource constraint.

Using (15) and again suppressing the vector V, we can write the terrorists' likelihood for successful attacks in (2a) and (3a) as:

$$\delta^H\left(e^H, e^F\right) \equiv \sigma^H\left[e^H, a^H\left(e^H, e^F\right)\right] \text{ and} \tag{17a}$$

$$\delta^F\left(e^H, e^F\right) \equiv \sigma^F\left[a^F\left(e^H, e^F\right)\right]. \tag{17b}$$

Differentiating (17a) and (17b), we display how the terrorists' likelihoods for successful attacks in the two countries are influenced by the various counterterrorism measures:

$$\delta_1^H = \sigma_1^H + \sigma_2^H a_1^H < 0, \tag{18a}$$

$$\delta_2^H = \sigma_2^H a_2^H < 0, \tag{18b}$$

$$\delta_1^F = \sigma^{F\prime} a_1^F > 0, \text{ and} \tag{18c}$$

$$\delta_2^F = \sigma^{F\prime} a_2^F < 0. \tag{18d}$$

Terrorists' success likelihood in *H* decreases with either defensive countermeasures at home or proactive measures in *F*, as shown in (18a)-(18b), respectively. The latter justifies country *H*'s aid flows to *F* on grounds other than altruism. Equations (18c)-(18d) indicate that defensive measures in *H* augment terrorists' outlook in *F*, while proactive measures in *F* decrease their outlook in *F*.

For tractability, we take a second-order approximation, in which the third derivatives of the probability functions, σ^j ($j = H, F$), are set to zero. Using this assumption, we have:

$$\delta_{12}^H = \left(\sigma_{12}^H + \sigma_{22}^H a_1^H\right) a_2^H > 0 \text{ and} \tag{19a}$$

$$\delta_{12}^F = \sigma^{F\prime\prime} a_1^F a_2^F > 0. \tag{19b}$$

The inequality in (19a) holds because $a_2^H < 0$ and the term in parentheses equals $-\dfrac{\sigma_{12}^H \left(\phi^H \tilde{T}^H + \phi^F T^F\right)\sigma^{F\prime\prime}}{D} < 0$, via substitutions involving (16a). Thus, (19a) shows that the cross-partial derivative of terrorists' success likelihood is positive. In (19b), this cross partial for country *F* is also positive, so that deflected attacks stemming from *H*'s defenses limit the proactive effectiveness of host country *F* to curb the terrorist threat on its soil.

Because the sum of a^H and a^F is constant for a given e^F, the comparative statics of the

different parameters on the terrorist effort levels in both countries can be easily derived. We display two of them here:

$$\frac{\partial a^H}{\partial \phi^H} = \frac{\sigma_2^H T^H - \sigma^{F\prime}\tilde{T}^H}{D} > 0 \Rightarrow \frac{\partial a^F}{\partial \phi^H} < 0 \text{, if and only if } \sigma_2^H T^H > \sigma^{F\prime}\tilde{T}^H \text{, and} \tag{20a}$$

$$\frac{\partial a^H}{\partial \phi^F} = -\frac{\sigma^{F\prime} T^F}{D} < 0 \Rightarrow \frac{\partial a^F}{\partial \phi^F} > 0 . \tag{20b}$$

The comparative statics for the three damage parameters are given in Appendix 1. We summarize some key findings in Proposition 1.

Proposition 1 A resource-constrained, utility-maximizing terrorist group chooses to scale down its attacks in *H* and to raise them against *F* in response to enhanced defensive actions in *H*. The terrorist group reduces its attacks on both countries in response to *F*'s enhanced proactive efforts. Although *F*'s proactive action reduces the probability of attack on *H*'s soil (i.e., a positive spillover), *H*'s defensive measures raise the probability of attack on *F* (i.e., a negative spillover). A higher utility weight placed by the terrorists on attacking *H*'s assets need not raise attacks in *H*; however, a higher utility weight placed by the terrorists on attacking *F* will raise attacks in *F*. Terrorists will augment attacks where they perceive a greater resulting damage.

Dating back to Sandler and Lapan (1988), the literature on transnational terrorism has assumed that terrorists' attack probabilities fall with proactive measures when terrorists are passive agents. Proposition 1 and its development provide a microfoundation for this notion when the terrorist group is an active utility-maximizing agent. In addition, this literature has assumed that terrorists' attack likelihood falls in a country instituting defensive measures and rises elsewhere. Proposition 1 also formalizes this result for active terrorist agents. This microfoundation allows us not only to sign the cross-partial derivative of the terrorists' attack

probability, but also permits us to investigate the impact of other parameters on terrorists' attack choices. In short, the analysis of stage 3 endogenizes the terrorists' likelihood of attack function for a transnational setting with targeted governments choosing their counterterrorism measures.

Interestingly, if the terrorists' utility weight from damaging *H* rises, it is conceivable that their effort to hit *H*'s homeland falls – see (20a). This apparently paradoxical result makes sense when one considers the presence of foreign interests for *H*, an issue that is often overlooked in the literature – e.g., Azam and Thelen (2008, 2010). The terrorists weigh the marginal effectiveness of hitting *H* on its own soil versus that of hitting its interests on *F*'s soil. If $\sigma_2^H T^H < \sigma^{F'} \tilde{T}^H$, then the expected damage inflicted on *H* is greater by attacking its assets in *F*. This leads the terrorists to allocate more of their scarce resources toward attacks in *F*, and to reduce attacks in country *H*. If, instead, this inequality is reversed, then terrorist attacks in *H* are "sweeter" to the terrorists and they will allocate more effort to a^H. Thus, US officials must remain vigilant to terrorist attacks at home despite recent success in diverting attacks abroad, because al-Qaida probably puts a higher weight on such attacks every time an unmanned drone takes out al-Qaida leaders and operatives in Pakistan and Afghanistan. In recent years, al-Qaida inspired attacks have come from homegrown terrorists in the United Kingdom (e.g., the subway bombing on July 7, 2005) and the United States (e.g., the botched Times Square car bombing on May 1, 2010). The use of citizens allows terrorists to circumvent defensive measures at the borders. As active agents in the model, terrorists' tastes for attacking the two countries have a real role to play in the government's decision to allocate protective measures at home versus its choice to subsidize proactive measures abroad.

The other comparative-statics effects in (20b) and Appendix 1 are intuitive. Given the scarcity of resources, a greater utility weight ϕ^F will make the terrorists raise their attacks on *F*

and lower them on H – see (20b). If the scale of damage inflicted by an attack on H's soil (i.e., T^H) rises, the marginal benefit for the terrorists of hitting H's homeland increases, thereby raising a^H and reducing a^F. Similarly, an increase in either $\tilde{T}^H$ or T^F raises the terrorists incentive to hit targets in F, and therefore reduces attacks in H. Clearly, the fate of the two countries is integrally tied together so that foreign aid as a counterterrorism tool has a real role to play.

3.3. Stage 2: proactive measures by F

Stage 2 assumes that the aid recipient, F, chooses its proactive counterterrorism measures as a follower, after H's defensive efforts are chosen in stage 1. This representation is consistent with the position of power afforded to H, which is bolstering not only F's counterterrorism measures but also F's general well-being through foreign assistance. For example, the United States is better positioned to exploit its strategic advantage over an aid recipient if the former decides the composition of its aid package at the same time that it deploys defensive measures at home. Greater defense at home is consistent with less need to foster proactive measures abroad unless the donor's foreign assets are extensive. Our leader-follower representation agrees with US homeland security allocations coming before, say, Pakistan or Yemen chooses its proactive response in light of its receipt of tied aid from the United States. Our aim is to show some subtle trade-offs – e.g., greater defensive measures in H and increased general aid actually reduces the recipient country's proactive response. Terrorists' targeting preferences and damage parameters influence proactive efforts in F in interesting ways.

Given this leader-follower depiction of stage 2, we first look at F's choice of e^F to maximize its national income. By substituting δ^F for σ^F [see (17b)] into (9), we can express

F's national income as:

$$Y^F = \bar{Q}^F - \gamma\left(\alpha, A, \eta\right)\delta^F\left(e^H, e^F, V\right)T^F - e^F + A + \alpha e^F, \tag{21}$$

where $-\gamma = -1 - p^F\left(\alpha, A\right)\eta$ accounts for the expected cost of a regime change in *F*. Country *F*'s FOC, arising from its choice of e^F to maximize Y^F, gives:

$$Y^F_{e^F} = -\gamma\left(\alpha, A, \eta\right)T^F\delta^F_2\left(e^H, e^F, V\right) - 1 + \alpha = 0. \tag{22}$$

At the optimum, the aid-recipient nation equates its expected marginal benefit from terror reduction (i.e., $-\gamma T^F\delta^F_2$) to its net marginal proactive cost (i.e., $1-\alpha$). Equation (22) implicitly defines *F*'s proactive choice as:

$$e^F = e^F\left(\alpha, A, e^H; \eta, V\right), \tag{23}$$

which depends on its aid package, *H*'s defensive measures, regime stability cost, and exogenous parameters. The latter includes the terrorists' preferences for attacking each of the two countries and the damages to the countries' interests. Using the second-order condition of *F*'s optimization problem,[5] $Y^F_{e^Fe^F} < 0$, and the implicit function theorem applied to (22), we obtain some comparative-static results with respect to *H*'s choice variables:

$$\frac{\partial e^F}{\partial \alpha} = \frac{1 - T^F\eta p^F_1\delta^F_2}{\left(-Y^F_{e^Fe^F}\right)} > 0, \tag{24a}$$

$$\frac{\partial e^F}{\partial A} = \frac{-T^F\eta p^F_2\delta^F_2}{\left(-Y^F_{e^Fe^F}\right)} < 0, \text{ and} \tag{24b}$$

$$\frac{\partial e^F}{\partial e^H} = \frac{-\gamma T^F\delta^F_{21}}{\left(-Y^F_{e^Fe^F}\right)} < 0. \tag{24c}$$

These results follow immediately from (22) and the expression for $-\gamma$. To reduce the number of possible cases, we initially assume that $\sigma^H_2 T^H > \sigma^{F\prime}\tilde{T}^H$ in (20a) so that terrorist

attacks against *H*'s interests at home are more damaging than attacks against its interests abroad. Given nations' focus on homeland security, this appears to be a reasonable assumption. Moreover, this assumption is consistent with a country's most prized assets – its governance structure, its cities, its population concentrations, its infrastructure, and its national treasures – being located at home, where the terrorists can do the most damage.

In (24a), the subsidy rate α encourages proactive measures through two channels: First, the subsidy reduces the net marginal cost of proactive efforts, making them more attractive. Second, the subsidy raises the level of the regime-instability variable γ, suggesting a greater expected cost from attacks and, thus, a greater benefit from counterterrorism action that reduces these attacks. Both channels work to augment *F*'s proactive efforts. The effect of general aid on e^F in (24b) is precisely the opposite because it reduces γ, thereby lessening the need for counterterrorism as the cost of attacks dwindle. Home defensive actions reduce the absolute value of δ_2^F [because $\delta_{21}^F > 0$, see (19b)], which represents the marginal productivity of foreign proactive measures. This reduced productivity curbs the optimal level of such measures – see (24c).

Next, we turn to the comparative-static expressions associated with η and the *V* vector in (22). Implicit differentiation of (22) and simplification give the following expressions:

$$\frac{\partial e^F}{\partial \eta} = \frac{-T^F p^F \delta_2^F}{\left(-Y_{e^F e^F}^F\right)} > 0, \text{ and} \tag{24d}$$

$$\frac{\partial e^F}{\partial \phi^H} = \frac{-\gamma T^F \delta_{2\phi^H}^F}{\left(-Y_{e^F e^F}^F\right)} > 0, \text{ with } \delta_{2\phi^H}^F = a_2^F \sigma^{F\prime\prime}\left(\frac{\partial a^F}{\partial \phi^H}\right) + \sigma^{F\prime}\left(\frac{\partial a_2^F}{\partial \phi^H}\right) < 0. \tag{24e}$$

$$\frac{\partial e^F}{\partial T^F} = \frac{-\gamma\left(\delta_2^F + T^F \delta_{2T^F}^F\right)}{\left(-Y_{e^F e^F}^F\right)} > 0, \text{ if and only if } \left|\delta_2^F\right| > T^F \delta_{2T^F}^F, \tag{24f}$$

with $\delta_{2T^F}^F = a_2^F \sigma^{F\prime\prime}\left(\frac{\partial a^F}{\partial T^F}\right) + \sigma^{F\prime}\left(\frac{\partial a_2^F}{\partial T^F}\right) > 0$.

For given levels of *H*'s aforementioned policy variables, we can infer the effects of parametric shifts displayed in (24d)-(24f) and Appendix 2. An increase in η does not affect terrorists' effort levels in either country because (14) is independent of γ. Regime-instability cost simply raises the expected cost from terrorist attacks and encourages more proactive vigilance in the aid recipient, so that e^F rises with η in (24d). The effects of the other parameters are somewhat more complicated and, at times, counterintuitive, because they affect the optimal choices of terrorists' effort levels, as stage 2's choices are conditioned on stage 3 choices. Using (18d), we see that a higher utility weight ϕ^H given to attacks against *H*'s assets at home and abroad affects the absolute value $\left|\delta_2^F\right|$ in two ways. First, from (20a), we find that a^F is reduced by ϕ^H. With smaller a^F, the terrorists' productivity $\sigma^{F\prime}$ is larger, implying a larger $\left|\delta_2^F\right|$ or reduced likelihood of terrorist success. Second, eq. (16b) shows that the absolute value of $a_2^F(\bullet)$ is raised by ϕ^H, leading to an increase in $\left|\delta_2^F\right|$. Both of these effects augment the net marginal benefit from proactive measures in the aid recipient, thereby raising e^F in (24e). Except for T^F, the explanations for the effects of the other parameters follow a similar line of reasoning (see expressions in Appendix 2). In particular, *F* reduces its proactive efforts as terrorists' preferences increase for attacking *F*'s or *H*'s assets in *F*, while increased damages to *H*'s interests at home augment *F*'s proactive measures, in part, due to a greater subsidy. In (24f), a rise in T^F directly amplifies the expected costs of a terror attack for *F*, making proactive efforts there more valuable. On the other hand, T^F reduces $\left|\delta_2^F\right|$ through its effect on the third-stage optimum. In the final analysis, proactive effort in *F* rises if the first effect dominates. Thus, the

strategic interaction between the aid-recipient government and the terrorists determines how terrorist damages influence the proactive response to the former. This and the other results above highlight the importance of representing the terrorist group as an active strategic participant.

The comparative-static changes can be summarized in Proposition 2:

Proposition 2 A higher subsidy rate α raises the aid recipient's proactive level; however, a higher level of either untied aid or donor *H*'s defensive measures reduces *F*'s proactive response. For given levels of *H*'s policy variables, taste and damage parameters affect proactive efforts as follows: (i) η increases it, (ii) ϕ^H increases it, (iii) ϕ^F decreases it, (iv) T^H increases it, (v) $\tilde{T}^H$ decreases it, and (vi) T^F may or may not increase it.

Proposition 2 shows that the location of terrorist damage to the aid donor's assets greatly affects the optimal proactive measures of the aid recipient. An increase in T^H increases the need for the aid recipient's proactive measures, while an increase in $\tilde{T}^H$ decreases the need for these measures.

3.4. Stage 1: optimal policy package for the donor

We now turn to country *H*'s choice of its foreign aid package (α, A) and defense in stage 1 to maximize national income, Y^H, given the anticipated proactive effort chosen by *F* in stage 2 and the terrorists' anticipated distribution of attacks in stage 3. Our goal is to show how the division between tied and general assistance to *F* must account for *H*'s global interests and defensive measures. As such, budgetary considerations, regime stability in *F*, and the induced responses to e^F are key. The three stages make for a complex analysis.

Using Eqs. (8), (17a), (17b), and (23), we can write $Y^H\left(\alpha, A, e^H; \eta, V\right)$ as:

$$\bar{Q}^H - \gamma(\alpha, A, \eta)\left[\delta^H\left(e^H, e^F(\bullet), V\right)T^H + \delta^F\left(e^H, e^F(\bullet), V\right)\tilde{T}^H\right] - e^H - A - \alpha e^F(\bullet), \qquad (25)$$

where $e^F(\bullet) = e^F\left(\alpha, A, e^H; \eta, V\right)$ and $V = \left(\phi^H, \phi^F, T^H, \tilde{T}^H, T^F\right)$. At an interior optimum, the FOC associated with maximizing Y^H with respect to α is[6]

$$-\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F - e_1^F\left[\alpha + \gamma\left(T^H \delta_2^H + \tilde{T}^H \delta_2^F\right)\right] - e^F = 0. \qquad (26a)$$

This then implies an optimal subsidy:

$$\alpha^* = -\gamma\left(T^H \delta_2^H + \tilde{T}^H \delta_2^F\right) - \beta, \text{ where } \beta = \frac{e^F + \left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F}{e_1^F} > 0. \qquad (26b)$$

F's proactive efforts reduce the expected cost of terrorism to donor *H* by $\left[-\gamma\left(T^H \delta_2^H + \tilde{T}^H \delta_2^F\right)\right]$, which represents H's marginal benefit from subsidizing such efforts. In (26b), β captures the subsidy-associated marginal cost for H. β's numerator includes both the extra per-unit subsidy expense, e^F, and the subsidy-induced regime instability cost (i.e., the second term). The positive denominator of β represents the marginal effectiveness of the subsidy rate in increasing e^F. Therefore, eq. (26b) states that the optimal subsidy equals the net marginal benefit (for *H*) from *F*'s aid-assisted proactive response.

The home country's optimal choice of general aid satisfies:

$$-\left[\alpha + \gamma\left(T^H \delta_2^H + \tilde{T}^H \delta_2^F\right)\right]e_2^F - \left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_2^F\left(\alpha, A\right) - 1 = 0. \qquad (27a)$$

Using the expression for the optimal subsidy in (26b), we rewrite (27a) as:

$$-\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_2^F = 1 - \left(\frac{e_2^F}{e_1^F}\right)\left[\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F + e^F\right]. \qquad (27b)$$

For given e^H, $\left(\frac{d\alpha}{dA}\right)_{|e^F=\bar{e}} = -\left(\frac{e_2^F}{e_1^F}\right) > 0$ because $e_1^F > 0$ and $e_2^F < 0$. The term $\left(\frac{d\alpha}{dA}\right)_{|e^F=\bar{e}}$ denotes the marginal rate of substitution between α and *A* along *F*'s positively sloped iso-proactive curve.[7] Eq. (27b) reduces to:

$$-\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_2^F = \left[\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F + e^F\right]\left(\frac{d\alpha}{dA}\right)_{|e^F=\bar{e}} + 1, \tag{27c}$$

where the left-hand expression is the marginal gain from reduced terrorism owing to greater regime stability. The first right-hand-side term of (27c) reflects that, as *A* increases, e^F falls ($e_2^F < 0$), so that the aid subsidy must be augmented to maintain foreign counterterrorism at a desired level. The increased subsidy α comes with its associated costs, captured by the term in brackets in (27c). On the right-hand side of (27c), unity is the direct marginal cost of *A*. Thus, at an optimum, the marginal regime-stability benefit of general aid must be weighed against its associated marginal costs.

Finally, *H*'s optimal defense choice satisfies:

$$-\left[\alpha + \gamma\left(T^H \delta_2^H + \tilde{T}^H \delta_2^F\right)\right] e_3^F - \gamma\left(T^H \delta_1^H + \tilde{T}^H \delta_1^F\right) - 1 = 0, \tag{28a}$$

which, by (26b), becomes

$$-\gamma T^H \delta_1^H = -\left(\frac{e_3^F}{e_1^F}\right)\left[\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F + e^F\right] + \gamma \tilde{T}^H \delta_1^F + 1. \tag{28b}$$

For given *A*, $\left(\frac{d\alpha}{de^H}\right)_{|e^F=\bar{e}} = -\left(\frac{e_3^F}{e_1^F}\right) > 0$ since $e_3^F < 0$ by (24c). The term $\left(\frac{d\alpha}{de^H}\right)_{|e^F=\bar{e}}$ represents a positive marginal rate of substitution between α and e^H along *F*'s iso-proactive curve. Equation (28b) can be expressed as:

$$-\gamma T^H \delta_1^H = \left[\left(\delta^H T^H + \delta^F \tilde{T}^H\right)\eta p_1^F + e^F\right]\left(\frac{d\alpha}{de^H}\right)_{\left|e^F=\bar{e}\right.} + \gamma \tilde{T}^H \delta_1^F + 1, \tag{28c}$$

where the left-hand expression is the marginal benefit from reduced terrorism at home. The first right-hand term reflects that, as e^H increases, foreign proactive effort falls ($e_3^F < 0$) so that α must increase to offset this decline. The bracketed term captures the costs associated with this increased subsidy. The second right-hand term of (28c) is the cost to the aid provider (say the United States) as more terrorist attacks are deflected to its interests in the aid recipient (say Pakistan). Unity is the direct marginal cost of defense. These FOCs are captured by:

Proposition 3 The optimal subsidy, α^*, on foreign enforcement reflects the net gains from reduced terrorism for the aid donor, considering its global interests. This subsidy's size must be moderated based on budgetary considerations, as well as the regime instability that tied aid causes in the recipient. Although general aid reduces regime instability, its benefits must balance budgetary expense and the discouragement of foreign enforcement. The latter requires a higher offsetting subsidy and associated costs. Finally, increased security at home from *H*'s defense must be weighed against: (i) the costs of deflected terrorist attacks on *H*'s foreign interests, (ii) the higher subsidy costs to offset the discouragement of foreign proactive measures, and (iii) the direct budgetary cost of *H*'s defense.

A donor country gains more from assisting proactive counterterrorism abroad when this assistance greatly reduces the threat of attacks at home and abroad (i.e., when δ_2^H and δ_2^F are large in absolute value). The donor country is particularly interested in curbing attacks abroad when it has significant assets – people or investments – there (i.e., when $\tilde{T}^H$ is large). Subsidizing foreign proactive measures against a common terrorist threat allows the donor to

partly internalize its associated externality, thereby providing non-altruistic motives for this aid. Unfortunately, this subsidy may weaken the foreign regime through protests and other repercussions. If the regime is sufficiently stressed and collapses, then the terrorism threat may worsen; hence, a judicious mix of aid and home defensive efforts are needed for the trade-offs in Proposition 3. Neither instrument can be examined in isolation. A donor is generally better off assisting strong regimes battle indigenous transnational terrorists. As terrorists seek sanctuary in failed states with unstable regimes, the essential trade-off between general and tied aid is ever present. Thus, al-Qaida's presence in Afghanistan, Pakistan, Somalia, and Yemen makes aid-assisted proactive responses by these countries more problematic. While home defense makes the donor safer, this defense makes its foreign interests at greater risk and induces the recipient nation to scale back its proactive efforts, thereby calling for a countervailing subsidy to prop these efforts up. Thus, the benefits of greater homeland security must be measured against the costs that *H* incurs in terms of a larger aid package and enhanced threats abroad. The important interdependence of these policy instruments has not been previously displayed.

3.5. Comparative statics for stage 1

Comparative statics that involve all the three choice variables – α, *A*, and e^H – are analytically intractable; thus, we analyze a reduced-form model where there are no regime-instability concerns and general aid is not a choice variable.[8] At an interior optimum, the FOCs associated with maximizing the donor's income, Y^H, with respect to α and e^H are given by (26a) and (28a), where we set η and A to zero. For the reduced-form model, the main comparative statics for stage 1 are captured by Proposition 4:

Proposition 4 When $\tilde{T}^H$ is sufficiently small, a higher utility weight placed by the terrorists

group on the home nation's interests encourages *H* to raise its defense level and reduce its aid subsidy of foreign proactive efforts. If, however, *H*'s foreign interests are large, home defense is less effective in limiting *H*'s global damages, thus curbing the desirability of such defense. *H* may then reduce its defense and raise its aid subsidy as its interests are favored by the terrorists.

The proof is in Appendix 3. This proposition indicates that, as the terrorists grow to prefer attacking *H*'s interests, *H* becomes more self-reliant on its own defense, provided that its assets in *F* are not too extensive. With greater assets abroad, *H* will bolster *F*'s proactive measures through aid.

In a virtually identical exercise, we can also allow terrorists' preference in attacking the aid-recipient *F* to increase – i.e., ϕ^F to rise. This change in terrorists' preferences will encourage donor *H* to reduce its defense efforts and raise its subsidy of foreign proactive efforts, thereby relying more on the host country in the war on terrorism as the United States has done in Pakistan and elsewhere following 9/11. Enhanced terrorists' preference for attacking *F* limits the deflection of attacks from *F* to *H*, which reinforces *H*'s desire to bolster *F*'s proactive measures.

We discuss briefly the implications of increased terrorism damage in *H* – i.e., T^H – on *H*'s home defense and its foreign aid subsidy to *F*. The derivation is analogous to that associated with changes in ϕ^H and is not repeated here. As terrorists inflict more damage on *H* at home, *H*'s *direct* marginal benefit from home defense and supporting proactive measures abroad increases. The direct benefit from home defense is limited somewhat by *H*'s assets abroad, owing to the deflection of attacks to *F*. In addition, *H*'s direct marginal benefit from its aid subsidy is offset somewhat by the terrorists' reduced marginal effectiveness in *H* as they increase their attacks there. This decreased effectiveness limits the need for foreign proactive efforts. If, as is likely, the direct effect dominates the induced effect, then a larger T^H raises the aid subsidy

and home defense efforts. Understandably, large foreign interests ($\tilde{T}^H$) and a large negative response in foreign enforcement limits the increase in *H*'s optimal defense level. Greater foreign interests mean that deflection of attacks to the aid recipient becomes a greater concern for donor *H* as it bolsters home defense.

4. Corner solution: no terrorist attacks in the donor

It is possible that the exogenous parameter values are such that (13) holds with a strict inequality. Two corner solutions are possible: the terrorists attack only in country *H* or *F*, respectively. We focus on the latter case because the former is unrealistic and uninteresting, because *F* is reduced to being a pure agent of *H*, with no risk of an attack on its own interests. When terrorists exclusively attack in *F*, country *H* also suffers because of its foreign interests. This corner arises when the marginal benefit of attacking *H* in its homeland is strictly lower than that of staging attacks in *F*. Using (12) and (13), we have

$$a^H = 0 \text{ if } \frac{\phi^H T^H}{\phi^H \tilde{T}^H + \phi^F T^F} < \frac{\sigma^{F\prime}\left[\bar{M}\left(e^F\right)\right]}{\sigma_2^H\left(e^H, a^H\right)_{\left|a^H=0\right.}}. \tag{29}$$

In this case the probability of an attack on *H*'s homeland is zero, while the probability of an attack in *F* depends only on foreign proactive efforts, where $\delta^F = \sigma^F\left[\bar{M}\left(e^F\right)\right] = \delta^F\left(e^F\right)$. Thus, the sole result of Proposition 1 that continues to be relevant is that a rise in foreign proactive efforts reduces the probability of an attack in *F*. Analyzing stage 2, we find that foreign proactive measures are independent of *H*'s defense choice, but remain a function of both types of aid. Stage-1 choices reveal that there is no incentive for *H* to choose a positive defense level, because the probability of attack on *H* is zero. It is, however, in *H*'s interest to use both types of aid to reduce its expected damages from attacks on its foreign interests in *F*. The qualitative

nature of these aid choices remains similar to Proposition 3.

Even in this extreme case, the global interests of the donor country and the foreign residency of the terrorists make any war on terrorism an international affair. The rise of globalization allows terrorists to threaten other countries' interests without leaving their borders.

5. Concluding remarks and policy conclusions

This paper presents a three-stage game with three active agents: a donor (home) nation, an aid-recipient nation, and a terrorist group. Stage 3 provides a microfoundation to the terrorists' targeting decision, based on the countermeasures of the donor and recipient nations. In particular, defensive measures in the donor transfers attacks to the recipient country. Proactive measures in the latter curtail attacks everywhere, thereby justifying counterterrorism-based aid. Greater terrorist preference for hurting the donor country's interests does not necessarily raise attacks at home. Attacks may still increase in the aid recipient if the terrorists view their marginal effectiveness against the donor's assets to be greater abroad. In stage 2, the regime stability of the aid recipient becomes a key consideration. Greater tied aid increases the recipient's proactive efforts, but at the expense of increased regime instability and subsequent terrorism. Untied aid and/or defensive measures in the donor reduce the recipient's proactive response. Terrorists' taste and damage parameters affect the recipient's proactive efforts in complex ways, given the interplay between stages 2 and 3. For example, as terrorists' proclivity for attacking the donor's assets increases, the terrorists tend to reduce operations in the recipient country. This, in turn, enhances the donor's net marginal benefit of proactive measures in the recipient country, thereby leading to a greater subsidy and increased proactive measures.

Finally, in stage 1, the donor chooses its defensive measures and its aid package. Each of these instruments has its opposing aspects – e.g., general aid reduces regime instability in the

recipient, but discourages its proactive efforts. In addition, donor's defensive measures increase homeland security but jeopardize donor's assets abroad, which necessitate higher tied aid to offset reduced counterterrorism in the recipient. However, this tied aid negatively impacts the recipient's regime stability.

The paper adds a novel prospective to the emerging literature that views foreign aid as a means of delegating the fight against terrorism to a source nation (Azam and Thelen, 2008, 2010). The analysis here shows how homeland security is integrally related to the composition of the aid package – tied versus general assistance – to the country that hosts the common terrorist threat. Because previous analyses did not allow the donor to decide defensive measures, this important relationship has gone unrecognized. The presence of donor's assets abroad makes this analysis more interesting because deflecting attacks abroad is not always a good thing. Regime instability in the recipient also adds an important new dimension to the study of aid as a counterterrorism tool. Our study demonstrates that terrorists greatly limit the effectiveness of counterterrorism aid by taking refuge in weak states with unstable regimes. In such states, general aid assumes an increased importance in fighting a common terrorist threat.

The analysis here shows that targeted countries with global interests must bolster proactive measures through tied aid to countries where transnational terrorist groups reside. With many targeted donor countries, this raises a free-ride problem because counterterrorism aid generates global benefits in terms of reduced terrorism for all targeted countries. A prime-target country, like the United States, may take up the fight and subsidize proactive measures abroad. If, however, the wrong mix of general and tied aid is given, then sufficient regime instability can produce a global public bad to all targeted countries as more terrorism results. The fight against transnational terrorism must develop a judicious mix of homeland defenses and counterterrorism foreign assistance. An analysis of this multi-donor environment is left for future research.

Footnotes

1. There is a rich game-theoretic literature on counterterrorism, recently surveyed by Sandler and Siqueira (2009). Game-theoretic models involve a host of alternative agents: two commonly targeted governments; terrorists and a government; terrorist factions and a government; voters, terrorists, and a government; and other combinations of agents. Unlike our exercise, many recent articles are concerned with domestic terrorism. For example, Powell (2007) examined how a domestic government should allocate its defensive countermeasures to protect multiple targets against a strategic terrorist adversary. Dragu and Polborn (2010) presented an interesting three-agent – a government, a representative citizen (voter), and nonterrorist community members – model, where greater electoral pressure for counterterrorism may actually increase terrorism as the community limits its own effort to indoctrinate against terrorism. Additionally, Bueno de Mesquita (2007) showed for three agents that election-driven governments are motivated to engage in tactic-specific observable counterterrorism and to eschew general nonobservable countermeasures.

2. On strategic substitutes and strategic complements, see Eaton (2004).

3. There are some researchers (see, especially, Krueger and Maleckova, 2003), who did not find a poverty explanation of terrorism at the microeconomic level.

4. Given that the marginal utility of a^H is independent of a^F, strict concavity of σ^H and σ^F in a^H and a^F, respectively, is sufficient for the terrorists' utility function to be strictly concave. This then ensures that the second-order condition is satisfied in stage 3.

5. The second-order condition requires that

$$Y^F_{e^F e^F} = -\gamma T^F \delta^F_{22}\left(e^H, e^F\right) < 0,$$

which holds when $\delta^F_{22} > 0$. By differentiating (18d) and using (16b), we have

$$\delta_{22}^{F}\left(e^{H},e^{F}\right)=\left(a_{2}^{F}\right)^{2}\left[\sigma^{F\prime\prime}+\frac{\sigma^{F\prime}\bar{M}^{\prime\prime}}{\bar{M}^{\prime}a_{2}^{F}}\right],$$

where $\sigma^{F\prime\prime}<0$, $\sigma^{F\prime}\bar{M}^{\prime\prime}>0$, and $\bar{M}^{\prime}a_{2}^{F}>0$. Thus, the second-order condition for a stage-2 maximum requires that $\frac{\sigma^{F\prime}\bar{M}^{\prime\prime}}{\bar{M}^{\prime}a_{2}^{F}}>-\sigma^{F\prime\prime}>0$. That is, diminishing returns from proactive efforts, captured by $\bar{M}^{\prime\prime}\left(e^{F}\right)>0$, should be sufficiently strong.

6. The second-order condition is satisfied if Y^{H} is strictly concave in *H*'s choice variables. This is the case when diminishing returns, captured by $\delta_{22}^{H}>0, p_{22}^{F}>0,$ and $\delta_{11}^{H}>0,$ are sufficiently strong.

7. An iso-proactive contour is the locus where $e^{F*}\left(\alpha,A\right)=\bar{e}$. It indicates the combinations of aid instruments that achieve a given level of *F*'s proactive effort, $\bar{e}$.

8. Under conditions introduced in Appendix 3 involving the second-order partials of Y^{H}, a rise in ϕ^{H} will augment defense at home and reduce the optimal level of the subsidy. However, this may not be the case in the full-blown model, because the interaction of general aid with the other two choice variables may actually increase the marginal benefit of the subsidy. Essentially, bringing in a third dimension does not allow us the simple trade-offs of the reduced-form model. Another benefit is technical. Notice from (22) that if $A=\eta\equiv 0$, δ_{2}^{F} cannot change for a given α. Ignoring the derivatives of δ_{2}^{F} substantially simplifies the analysis.

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Appendix

1. Other comparative statics for stage 1

These additional results with respect to changes in the damage parameters are:

$$\frac{\partial a^H}{\partial T^H} = \frac{\phi^H \sigma_2^H}{D} > 0 \Rightarrow \frac{\partial a^F}{\partial T^H} < 0, \tag{20c}$$

$$\frac{\partial a^H}{\partial \tilde{T}^H} = -\frac{\phi^H \sigma^{F\prime}}{D} < 0 \Rightarrow \frac{\partial a^F}{\partial \tilde{T}^H} > 0, \text{ and} \tag{20d}$$

$$\frac{\partial a^H}{\partial T^F} = -\frac{\phi^F \sigma^{F\prime}}{D} < 0 \Rightarrow \frac{\partial a^F}{\partial T^F} > 0. \tag{20e}$$

2. Other comparative statics for stage 2

These additional results with respect to changes in terrorists' preference for attacking *F* and damage parameters to *H* at home and abroad are:

$$\frac{\partial e^F}{\partial \phi^F} = \frac{-\gamma T^F \delta^F_{2\phi^F}}{\left(-Y^F_{e^F e^F}\right)} < 0, \text{ with } \delta^F_{2\phi^F} = a_2^F \sigma^{F\prime\prime}\left(\frac{\partial a^F}{\partial \phi^F}\right) + \sigma^{F\prime}\left(\frac{\partial a_2^F}{\partial \phi^F}\right) > 0, \tag{24g}$$

$$\frac{\partial e^F}{\partial T^H} = \frac{-\gamma T^F \delta^F_{2T^H}}{\left(-Y^F_{e^F e^F}\right)} > 0, \text{ with } \delta^F_{2T^H} = a_2^F \sigma^{F\prime\prime}\left(\frac{\partial a^F}{\partial T^H}\right) + \sigma^{F\prime}\left(\frac{\partial a_2^F}{\partial T^H}\right) < 0, \text{ and} \tag{24h}$$

$$\frac{\partial e^F}{\partial \tilde{T}^H} = \frac{-\gamma T^F \delta^F_{2\tilde{T}^H}}{\left(-Y^F_{e^F e^F}\right)} < 0, \text{ with } \delta^F_{2\tilde{T}^H} = a_2^F \sigma^{F\prime\prime}\left(\frac{\partial a^F}{\partial \tilde{T}^H}\right) + \sigma^{F\prime}\left(\frac{\partial a_2^F}{\partial \tilde{T}^H}\right) > 0. \tag{24i}$$

3. Proof of Proposition 4

We consider the case for which ϕ^H changes. Differentiating (26a) and (28a) and using the second-order condition for stage-1 maximization, we have:

$$\frac{d\alpha}{d\phi^H} = \frac{Y^H_{13} Y^H_{3\phi^H} - Y^H_{33} Y^H_{1\phi^H}}{D_1},\ D_1 = Y^H_{11} Y^H_{33} - \left(Y^H_{13}\right)^2 > 0,\ Y^H_{1\phi^H} = \frac{\partial Y^H_1}{\partial \phi^H},\ Y^H_{3\phi^H} = \frac{\partial Y^H_3}{\partial \phi^H}, \text{ and} \tag{30a}$$

$$\frac{de^H}{d\phi^H} = \frac{Y_{13}^H Y_{1\phi^H}^H - Y_{11}^H Y_{3\phi^H}^H}{D_1}. \tag{30b}$$

Equation (22) implies that $\delta_2^F \left(= \frac{\alpha - 1}{T^F} \right)$ cannot change with ϕ^H. Using this information and ignoring third-order derivatives, (26a) yields (see Supplementary Material):

$$Y_{13}^H = -e_1^F T^H \delta_{21}^H - e_3^F \left(1 + T^H e_1^F \delta_{22}^H\right). \tag{31}$$

Given (19a), the first term on the right-hand side of (31) is negative. Given diminishing returns, we have that δ_{22}^H is positive. The latter implies that, while foreign proactive efforts reduce the probability of attack on *H*, it does so at a diminishing rate. By (24c), the second term on the right-hand side of (31) is positive. When δ_{21}^H is large and positive, *H*'s defense sharply reduces the effectiveness of foreign efforts in limiting terrorist attacks in *H*. Under these circumstances, the marginal benefit of the aid subsidy falls with a higher level of defense in *H*, so that

$$Y_{13}^H < 0. \tag{32}$$

Using (26a) and (24e), we have:

$$Y_{1\phi^H}^H = -e_1^F T^H \frac{\partial \delta_2^H}{\partial \phi^H} - e_{\phi^H}^F, \text{ with } e_{\phi^H}^F = \frac{\partial e^F}{\partial \phi^H} > 0. \tag{33}$$

Differentiating (17a) gives:

$$\frac{\partial \delta_2^H}{\partial \phi^H} = \delta_{22}^H e_{\phi^H}^F + \delta_{2\phi^H\left|\left(e^H, e^F\right)\right.}^H > 0, \tag{34}$$

because $\delta_{2\phi^H\left|\left(e^H, e^F\right)\right.}^H > 0$ via (18a). Therefore, using (19a), (24a), (24e), and (34) in (33), we have:

$$Y_{1\phi^H}^H < 0. \tag{35}$$

Equation (34) indicates that a greater ϕ^H reduces the absolute value of δ_2^H, because, as terrorist attacks in *H* increase, diminishing returns reduce their marginal effectiveness, σ_2^H. This, in turn,

limits the absolute value of δ_2^H, thereby making foreign proactive efforts less useful. Budgetary considerations also work to reducing the aid subsidy. Thus, a larger ϕ^H reduces the marginal benefit of the subsidy, as shown in (35).

Differentiating (28a) yields:

$$Y_{3\phi^H}^H = -T^H\left(e_3^F\frac{\partial\delta_2^H}{\partial\phi^H}+\frac{\partial\delta_1^H}{\partial\phi^H}\right)-\tilde{T}^H\frac{\partial\delta_1^F}{\partial\phi^H}. \tag{36}$$

Using (24c), we have that *H*'s defense discourages foreign proactive actions, so that $e_3^F<0$. Hence, by (34), we have $\left[-T^H e_3^F\frac{\partial\delta_2^H}{\partial\phi^H}>0\right]$ in (36) as *H*'s defense becomes more desirable. When terrorists fixate on attacks in *H*, the marginal effectiveness of defense $\left|\sigma_1^H\right|$ rises, because $\sigma_{21}^H<0$. This increases the marginal benefit from defensive actions, captured by $\left[-T^H\left(\frac{\partial\delta_1^H}{\partial\phi^H}\right)>0\right]$ in (36). Finally, when a^F is reduced in response to a rise in ϕ^H, the terrorists' marginal effectiveness $\sigma^{F\prime}$ rises, which, then, increases the magnitude of the terror deflection effect, δ_1^F [see (18c)]. The associated cost to *H* from losses to its assets in *F* is $\left[-\tilde{T}^H\frac{\partial\delta_1^F}{\partial\phi^H}<0\right]$ in (36). If $\tilde{T}^H$ is small, this cost is dominated by the aforementioned benefits, and greater home defense is desirable, so that:

$$Y_{3\phi^H}^H>0. \tag{37}$$

The second-order condition of stage 1 requires that both Y_{11}^H and Y_{33}^H are negative. Using (32), (35), and (37) in (30a) and (30b), we have the comparative statics:

$$\frac{d\alpha}{d\phi^H}<0 \text{ and } \frac{de^H}{d\phi^H}>0. \ \square \tag{38}$$