**Foreign Aid as Counterterrorism Policy**

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**Abstract**

We present a model of foreign aid where aid is used to encourage counterterrorism efforts of a foreign nation which is also the source nation for transnational terrorism. Like the U.S. and Pakistan, both nations suffer from terrorism and therefore have an incentive to fight it out of self-interest. However, given that the enemy is common, counterterrorism efforts cause spillovers and this interdependence is captured by analyzing a Nash equilibrium in counterterrorism policies of the two nations. Recent U.S. policy has focused on encouraging preemptive actions by foreign nations. An important incentive for such actions is foreign aid. Accordingly, we consider aid tied to foreign counterterrorism effort. In addition, aid used to support the current regime (an ally) is also considered. We consider optimal aid policy in this context. An interesting finding is that while the foreign enforcement reaction function is likely to exhibit strategic substitutability, home's will exhibit strategic complementarity. Also, a rise in the level of terror at home will raise home enforcement and also the optimal subsidy on foreign enforcement, but may not lead to the intended outcome of a more active foreign counterterrorism policy. This is because when home enforcement is raised, foreign enforcement declines as a Nash reaction and this strategic effect may outweigh the subsidy expansion effect.

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## 1. Introduction

To the extent that foreign nations may help control the impact of terrorism on the donor nation, the donor nation may have an incentive to subsidize that effort. In turn, the recipient nation's enforcement effort may substitute (or complement) for the donor nation's effort, in which case we may see either a rise or a fall in homeland enforcement effort when foreign enforcement is being subsidized. In recent times these issues have been particularly relevant to the US-Pakistan context, where the US provides aid to Pakistan to strengthen its counterterrorism efforts. Given that much of Al Qaeda type terror command-and-control is in the Pakistani tribal areas, the Pakistani effort is seen as crucial to reducing the incidence of terror in the US.

Since 9/11, foreign aid has been a prominent tool in encouraging counterterrorism efforts in poorer nations like Pakistan. However, the economic analysis of such aid is still in a state of relative infancy. Recent papers by Azam and Delacroix (2006) and Azam and Thelen (2008) have addressed this issue in the context of what they term as a "delegated" fight on terror. In their analyses the nation that suffers from terrorism provides foreign aid as an incentive to the source nation (of terrorism) to reduce the supply of terrorism. Their 2008 article considers a strategy of providing aid with a two-pronged tool, one geared towards raising enforcement against terrorists and the other at subsidizing education. The latter is expected to indirectly deter terror by raising human capital and thus freeing up the recipient government's resources to be devoted to greater enforcement.

Consistent with the recent US-Pakistani scenario the focus of our paper is on terrorism that is based in the recipient (of aid) nation but impacting both the donor and the recipient. The donor cares about damage from terrorism that is targeted at it and when it is altruistic, also about the damage suffered by the recipient. The similarity of the analysis with Azam and Delacroix

(2006) and Azam and Thelen (2008) is that it fits the aid as delegation approach that the authors pursued. The difference is that we consider the damage from terrorism to not only impact the donor but also the recipient. Indeed, the recipient fights terrorism both as an agent of the donor and also in its self-interest. This angle is novel to this emerging aid and terrorism literature, and raises interesting strategic issues arising out of interdependence of the donor-recipient enforcement actions. Furthermore, we consider aid that is targeted toward aiding regime stability of a friendly foreign government. The interaction of such aid with the aid geared towards antiterrorism is another novelty of our approach. Finally, unlike Azam and Thelen (2008), we do not consider aid for development of human capital.

## 2. The Model

We use a single good model (like Ethier, 1986, for example), 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 patterns of preferences. Consider a single good home (say US, denoted by $H$ ) economy, where the consumption good $Q^H$ is made through the following CRS technology:

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

where $L^H$ and $K^H$ are labor and land, respectively. Assuming that $(L^H, K^H)$ is fixed at $(\bar{L}^H, \bar{K}^H)$ at the national level (while individual firms equate factor return to marginal product), it must be that national output is fixed at $\bar{Q}^H$ [where, $\bar{Q}^H = F(\bar{L}^H, \bar{K}^H)$ ]. Terrorism creates a damage $T^H$ measured in units of the consumption good (the numeraire in the model). This damage occurs with probability $\delta^H$ , which depends on home and foreign (denoted by $F$ )

enforcement levels, $e^H$ and $e^F$, respectively. The focus of US counterterrorism policy as it relates to Pakistan has been to engage in defensive actions at home, and to encouraging Pakistani preemptive actions within its borders. To reflect this, we assume that $e^H$ is a defensive action, while $e^F$ is preemptive. Now:

$$\delta^H = \delta^H(e^H, e^F),\ \frac{\partial \delta^H}{\partial e^H} = \delta_1^H(e^H, e^F) < 0^{1},\ \delta_{11}^H > 0,\ \delta_2^H < 0,\ \delta_{22}^H > 0, \text{ and } \delta_{12}^H < 0. \quad (2)$$

It is intuitive that $\delta_1^H$ is negative, because US defense will reduce the ability of the terrorists to commit terror at home. Furthermore, we assume that the second derivative ($\delta_{11}^H$) is positive to capture the diminishing returns from such an action. Also, $\delta_2^H$ is negative, because foreign preemption reduces the supply of terrorists, thereby reducing the probability of an attack in the US. Diminishing returns from preemption requires that $\delta_{22}^H$ is positive. Finally, it is reasonable to assume that as preemption reduces the supply of terrorists, defensive efforts are more effective on a smaller pool of potential miscreants, suggesting that $\delta_{12}^H$ is negative. That is, foreign preemption complements domestic enforcement. Let the terrorism related foreign aid be $\tilde{A}$,

$$\tilde{A} = A + \alpha e^F, \quad (3)$$

where $\alpha$ is a subsidy that is tied to the degree of foreign enforcement, while $A$ is not. Let home use a lump sum tax $t^H$ on its population. The government budget constraint dictates that:

$$t^H = e^H + \tilde{A}. \quad (4)$$

Therefore, home national income is:

$$Y^H = \bar{Q}^H - \delta^H(e^H, e^F)T^H - t^H = \bar{Q}^H - \delta^H(e^H, e^F)T^H - e^H - A - \alpha e^F.^{2} \quad (5)$$

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[1] We will use the convention that partial derivative of any function $f(x_1, x_2, ..x_n)$ with respect to its *i*-th. argument is $f_i(.)$, and therefore the partial of $f_i(.)$ with respect to its *j*-th argument is $f_{ij}(.)$.

Similarly, using corresponding notation, foreign national income is:

$$Y^F = \bar{Q}^F - p^F(\alpha, A)R^F - \delta^F(e^H, e^F)T^F - e^F + A + \alpha e^F, \tag{6a}$$

where $\delta^F$ and $p^F$ are, respectively, the probability of a terrorist attack on the foreign nation, and the probability of a hostile regime change (as opposed to a peaceful democratic transition). $R^F$ is the loss in national income due to such a regime change. Note that,

$$\delta_1^F > 0,\ \delta_{11}^F < 0,\ \delta_2^F < 0,\ \delta_{22}^F > 0, \text{ and } \delta_{12}^F > 0. \tag{6b}$$

A rise in home defense makes it a relatively hard target and deflects terror to the foreign nation, raising $\delta^F$ (i.e., $\delta_1^F > 0$). Diminishing returns in such terror deflection is captured by a negative $\delta_{11}^F$. Higher preemption reduces the probability $\delta^F$ (i.e., $\delta_2^F < 0$). Diminishing returns is captured by a positive $\delta_{22}^F$. Finally, we make the additional assumption that $\delta_{12}^F$ is positive, which captures the fact that greater defense deflects terror to the foreign nation, which in turn reduces the ability of the foreign nation to reduce terror on its soil through its preemptive actions. We also propose that:

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

As more tied aid is given, the regime is seen as one that is driven by US foreign policy interests and hence less credible, suggesting that $p_1^F$ is positive. On the other hand, higher unconditional aid lowers the chance of a regime collapse, because more prosperity is desired by the population. Therefore, $p_2^F$ is negative. Home utility function is:

$$W = Y^H + \theta Y^F, \qquad 0 \le \theta < 1 \tag{7}$$

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[2] Notice that while $\tilde{A}$ is not part of national income because it is a net outward foreign transfer, $e^H$ is also not part of national income because it uses up real resources (measured here in units of the numeraire good) in order to deter terrorism. For example, if some of the labor is used to police rather than to produce, national income is reduced below $\bar{Q}^H$, thus the greater is $e^H$, and the greater is the reduction in national income $Y^H$. The way we model it is a simple way of handling this.

where $\theta$ parameterizes Home's altruism. When $\theta = 0$, we have the special case of the absence of altruism and the foreign aid motive arising entirely out of donor's self-interest – as was the case in Azam and Delacroix (2006).

*Staging Assumption*:

Enforcement levels $(e^H, e^F)$ are chosen simultaneously in stage-2 by the home and foreign governments, respectively. In stage-1, the home government chooses the aid parameters $A$ and $\alpha$. To ensure subgame perfectness, we solve the game by backward induction.

<u>Stage-2</u>

Suppressing $\theta$ from the functional forms, Home's enforcement choice is:

$$\frac{\partial W}{\partial e^H} = W_1(e^H, e^F, \alpha, T^H, T^F) = 0 \Rightarrow -(T^H \delta_1^H + \theta T^F \delta_1^F) = 1. \tag{8}$$

(8) implicitly defines the stage-2 reaction function for the home nation:

$$e^H = e^H(e^F, \alpha, T^H, T^F), \text{ where } \rho^H = \frac{\partial e^H}{\partial e^F} = \frac{T^H \delta_{12}^H + \theta T^F \delta_{12}^F}{W_{11}},$$

and $W_{11} = -(T^H \delta_{11}^H + \theta T^F \delta_{11}^F) < 0$.[3] (9a)

$e^F$ is a strategic substitute for $e^H$ if and only if:

$$T^H \delta_{12}^H + \theta T^F \delta_{12}^F > 0 \Rightarrow -\frac{\delta_{12}^F}{\delta_{12}^H} > \frac{T^H}{\theta T^F}. \tag{9b}$$

Recipient's first order condition for the choice of enforcement:[4]

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[3]This is required by the second order condition and implies that $T^H \delta_{11}^H$ must be sufficiently large to ensure concavity of $W$.

$$\frac{\partial Y^F}{\partial e^F} = Y_2^F(e^H, e^F, \alpha, T^F) = 0 \Rightarrow -T^F \delta_2^F - 1 + \alpha = 0. \tag{10}$$

$$\Rightarrow e^F = e^F(e^H, \alpha, T^F), \text{ where } \rho^F = \frac{\partial e^F}{\partial e^H} = -\frac{\delta_{21}^F}{\delta_{22}^F} \tag{11}$$

Given that $\delta_{21}^F$ is positive, $e^H$ is a strategic substitute for $e^F$.

Proposition 1

Foreign reaction function is negatively sloped. Home's reaction function is negatively sloped if and only if: $-\frac{\delta_{12}^F}{\delta_{12}^H} > \frac{T^H}{\theta T^F}$. In the special case of no-altruism (i.e., $\theta = 0$), it must be positively sloped.

*Comment:*

Strategic interaction in this type of setting may present opposing scenarios to a policymaker. For example, as altruism becomes limited, a policy that may encourage foreign enforcement will lead to a further rise of home enforcement deterring terror at home. On the other hand, a rise in home enforcement will reduce foreign enforcement partially offsetting the effectiveness of such an effort. In the presence of altruism, the larger $\theta$ and $T^F$ are relative to $T^H$, the greater is the likelihood of obtaining strategic substitutability. This reflects the fact that as the other nation's objective becomes more important in the home objective function, their views of each other's instruments converge. ■

[4] The second order condition requires that $Y_{22}^F = -T^F \delta_{22}^F < 0$. This is assured by diminishing returns to foreign preemption (i.e., recall that $\delta_{22}^F > 0$).

Simultaneous solution of (9a) and (11) allows us to solve for the second stage equilibrium values of $e^H$ and $e^F$ as:

$$e^{H*} = e^{H*}(\alpha, T^H, T^F)\text{, and } e^{F*} = e^{F*}(\alpha, T^H, T^F)\,. \tag{12}$$

Differentiating (8) and (10):

$$\begin{pmatrix} W_{11} & W_{12} \\ Y_{21}^F & Y_{22}^F \end{pmatrix}\begin{pmatrix} de^H \\ de^F \end{pmatrix} = \begin{pmatrix} -W_{1\alpha}d\alpha - W_{1T^H}dT^H - W_{1T^F}dT^F \\ -Y_{2\alpha}^F d\alpha - Y_{2T^F}^F dT^F \end{pmatrix} \tag{13}$$

Using the stability condition: $D = W_{11}Y_{22}^F - W_{12}Y_{21}^F > 0$, and solving using Cramer's rule, we get:

$$\frac{de^H}{d\alpha} = e_1^{H*}(\alpha, T^H, T^F) = \frac{W_{12}}{D},\; W_{12} = -(T^H\delta_{12}^H + \theta T^F\delta_{12}^F)\,, \tag{14a}$$

$$\frac{de^H}{dT^H} = e_2^{H*}(\alpha, T^H, T^F) = \frac{\delta_1^H Y_{22}^F}{D} > 0\,, \tag{14b}$$

and,

$$\frac{de^H}{dT^F} = e_3^{H*}(\alpha, T^H, T^F) = \frac{\theta\delta_1^F Y_{22}^F - \delta_2^F W_{12}}{D}\,. \tag{14c}$$

Similarly,

$$\frac{de^F}{d\alpha} = e_1^{F*}(\alpha, T^H, T^F) = -\frac{W_{11}}{D} > 0\,, \tag{15a}$$

$$\frac{de^F}{dT^H} = e_2^{F*}(\alpha, T^H, T^F) = \frac{W_{1T^H}Y_{21}^F}{D} = \frac{T^F\delta_1^H\delta_{21}^F}{D} < 0\,, \tag{15b}$$

and,

$$\frac{de^F}{dT^F} = e_3^{F*}(\alpha, T^H, T^F) = \frac{W_{1T^F}Y_{21}^F - W_{11}Y_{2T^F}^F}{D} = \frac{\delta_2^F W_{11} + \theta T^F\delta_1^F\delta_{21}^F}{D} > 0\,, \tag{15c}$$

Equations (12) through (15c) suggest the following.

Proposition 2

Home and foreign enforcement are independent of the autonomous part of aid (i.e., $A$). A rise in the subsidy rate ($\alpha$) must raise foreign enforcement, but will raise (reduce) home enforcement as the home reaction function is positively (negatively) sloped. For a given $\alpha$, a rise in $T^H$ must raise home enforcement and reduce foreign enforcement. On the other hand, a rise in $T^F$ must raise foreign enforcement and reduce home enforcement if the home reaction function is negatively sloped. Otherwise, the effect of $T^F$ on home enforcement is ambiguous.

*Comment:*

Since the autonomous part of aid has no direct effect on enforcement, its role is only to help with regime stability and it has no bearing on the war on terror. While tied aid encourages foreign enforcement, it may either raise or reduce home enforcement. This proposition captures the direct effects of the terror parameters $T^H$ and $T^F$. The total effect, however, also includes the induced effect through adjustments of the optimal subsidy ($\alpha^*$) derived in the next section. ■

Stage-1

We choose the policy variables $\alpha$ and $A$ such that home welfare ($W$) is maximized, given the functions defined above. From (7):

$$W = W(e^H, e^F, \alpha, A; T^H, T^F, R^F). \tag{16}$$

Using (8) above, [i.e., $W_1(.) = 0$], we have:

$$dW = (W_2 e_1^{F*} + W_3) d\alpha + W_4 dA \tag{17}$$

The first order conditions for the choice of $\alpha$ and $A$ are:

$$W_2 e_1^{F*} + W_3 = 0 \Rightarrow -(\alpha + T^H \delta_2^H) e_1^{F*}(.) - e^{F*}(1-\theta) - \theta R^F p_1^F = 0. \tag{18a}$$

$$W_4 = -1 + \theta(1 - R^F p_2^F) = 0 \Rightarrow -p_2^F(\alpha, A) = \frac{1-\theta}{\theta R^F} \Rightarrow A = A(\alpha; R^F),$$

$$\text{where, } A_1(\alpha, R^F) = -\frac{p_{21}^F}{p_{22}^F}, \text{ and } p_{22}^F > 0.^5 \tag{18b}$$

We assume that $\alpha$ does not have any effect on the marginal effectiveness of $A$ in reducing the probability of a regime change,

$$p_{21}^F = 0 \Rightarrow A_1(\alpha, A) = 0. \tag{18c}$$

Using (18a) one can obtain an explicit expression for the optimal $\alpha$, which contains endogenous terms on the right hand side. Using (18b) in (18a) we can implicitly define the optimal $\alpha$ as a function of the parameters only. From (18a):

$$\alpha^* = -T^H \delta_2^H - \beta, \text{ where } \beta = \frac{e^{F*}(1-\theta) + \theta R^F p_1^F(.)}{e_1^{F*}(.)} > 0. \tag{19a}$$

Noting that $\alpha^*$ cannot be negative (i.e., it is not possible to tax foreign enforcement),

$$\alpha^* = 0, \text{ if } \beta > -T^H \delta_2^H. \tag{19b}$$

Assuming that we have an interior solution (i.e., $\alpha^* > 0$), we use (18b) in (18a) to obtain:

$$\alpha^* = \alpha^*(T^H, T^F, R^F). \tag{20}$$

Using (20) in (18b), the optimal level of unconditional aid is:

$$A^* = A\left[\alpha^*(T^H, T^F, R^F), R^F\right] \equiv A^*(T^H, T^F, R^F). \tag{21}$$

Comparative Statics for the No-Altruism Case(i.e., $\theta = 0$)

Let us first note that in the no-altruism case: $W_4 = -1 \Rightarrow A = 0$. Thus, the model is one of aid that is tied to foreign enforcement only.

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[5] The second order condition $W_{44} < 0$ implies that $p_{22}^F > 0$.

(A). *Change in* $T^H$

Using the implicit function theorem:

$$\alpha_1^* = \frac{\partial \alpha^*}{\partial T^H} = -\left( \frac{\dfrac{\partial \varphi}{\partial T^H}}{\dfrac{\partial \varphi}{\partial \alpha}} \right),$$

where, $\varphi = -[\alpha + T^H \delta_2^H \{e^{H*}(.), e^{F*}(.)\}]e_1^{F*}(.) - e^{F*}(.)$

and, $\dfrac{\partial \varphi}{\partial \alpha} < 0$ from the second order condition of stage-1 optimization. (22)

Now:

$$\frac{\partial \varphi}{\partial T^H} = -\left( \delta_2^H + T^H \frac{\partial \delta_2^H}{\partial T^H} \right) e_1^{F*} - (\alpha^* + T^H \delta_2^H) e_{12}^{F*} - e_2^{F*}. \quad (23)$$

From (15b) we know that $e_2^{F*}$ is negative. Ignoring third order derivatives: $e_{12}^{F*} = \dfrac{\partial e_1^{F*}}{\partial T^H} = \dfrac{\delta_{11}^H}{D} > 0$,

and from (19): $\alpha^* + T^H \delta_2^H = -\beta < 0$. Therefore, the second term on the right hand side of (23) must be positive. The first term is positive if and only if:

$$\delta_2^H + T^H \frac{\partial \delta_2^H}{\partial T^H} < 0. \quad (24)$$

Routine substitutions yield:

$$\frac{\partial \delta_2^H}{\partial T^H} = \frac{T^F \delta_1^H (\delta_{22}^H \delta_{21}^F - \delta_{22}^F \delta_{21}^H)}{D} < 0 \ . \quad (25)$$

(25) implies that (24) holds. Thus, all three terms on the right hand side of (23) are positive, and we can therefore conclude that $\alpha_1^*$ is positive. Note that:

$$\frac{de^{H*}}{dT^H} = e_1^{H*}(.)\alpha_1^* + e_2^{H*}(.). \quad (26a)$$

$$\frac{de^{F*}}{dT^H} = e_1^{F*}(.)\alpha_1^* + e_2^{F*}(.)\,. \tag{26b}$$

Total foreign aid is:

$$\tilde{A} = \alpha^*(T^H, T^F, R^F)e^{F*}(\alpha^*, T^H, T^F)$$

$$\Rightarrow \frac{d\tilde{A}}{dT^H} = e^{F*}\alpha_1^* + \alpha^* \frac{de^{F*}}{dT^H}\,. \tag{27}$$

<u>Proposition 3</u>

A rise in the level of terror faced by the home nation ($T^H$) must raise the optimal subsidy ($\alpha^*$) and also home enforcement. Paradoxically, in spite of a higher subsidy, foreign enforcement may decline. In turn, the effect on total aid is also ambiguous.

*Proof and Comment:*

(22) through (25) establishes that a rise in $T^H$ must raise $\alpha^*$. As foreign enforcement rises, the probability that home is hit declines. The greater $T^H$ is, the greater is the marginal benefit to home ($T^H\delta_2^H$) from such a rise in foreign enforcement. This creates an incentive for home to subsidize foreign enforcement more aggressively. This primary effect is complemented by others arising out of the direct impact of $T^H$ on $\delta_2^H$, $e^{F*}$ and $e_1^{F*}$.

Using (14a) and (14b) and noting that $\alpha_1^* > 0$, we can conclude from (26a) that $e^{H*}$ must rise with $T^H$ if the home reaction function is positively sloped. From proposition 1, we know that the latter must be true when $\theta = 0$. As $T^H$ rises, there are two effects on home enforcement – a direct effect, and an indirect effect working through a change in $\alpha^*$. The direct effect works through the influence of $T^H$ on the marginal benefit of home enforcement (see equation-8). The rise in home enforcement elicits a reduction in foreign enforcement. With a positively sloped home reaction function, this tends to reduce home enforcement. However, at a stable second stage Nash equilibrium the latter effect is smaller and home enforcement must rise (see proposition-2). Now, the indirect effect works through a rise in $\alpha^*$ which raises foreign enforcement and in turn domestic enforcement, because the home reaction function is upward sloping. Therefore, both the direct effect and the indirect effect contribute to a rise in the home enforcement.

Similar to the effect of $T^H$ on home enforcement, the effect on foreign enforcement can be analyzed by focusing on a direct and an indirect effect. The direct effect is discussed in proposition-2. A rise in $T^H$ raises home enforcement, given that the foreign reaction function is negatively sloped, this reduces foreign enforcement. The indirect effect works through the increased subsidy rate which tends to raise foreign enforcement. The right hand side terms of (26b) captures these opposing effects. If the direct effect dominates, it is possible that the foreign enforcement level is reduced in spite of a higher subsidy. In this scenario, the strategic substitution effect (i.e., home enforcement substituting for foreign) dominates the subsidy enhancing effect of a rise in $T^H$.

Finally, (27) suggest that total aid may actually decline in spite of a larger subsidy rate. This is because while a higher subsidy rate expands aid at a given enforcement level, a decline in the enforcement level is possible and this may outweigh the aid expansion effect of a rise in $\alpha^*$.

■

(B). *Change in* $T^F$

Using (18a), (18b) and (20):

$$\alpha_2^* = \frac{\partial \alpha^*}{\partial T^F} = -\left( \frac{\frac{\partial \varphi}{\partial T^F}}{\frac{\partial \varphi}{\partial \alpha}} \right) \tag{28}$$

Noting that: $\frac{\partial \varphi}{d\alpha} < 0$, $\alpha_2^* > 0$ if and only if:

$$\frac{\partial \varphi}{dT^F} = -\left( T^H \frac{\partial \delta_2^H}{\partial T^F} \right) e_1^{F*} - (\alpha^* + T^H \delta_2^H) e_{13}^{F*} - e_3^{F*} > 0\,. \tag{29}$$

From proposition-1, $e_1^{F*}$ and $e_3^{F*} > 0$. Ignoring third order derivatives, $e_{13}^{F*} = \frac{\partial e_1^{F*}}{\partial T^F} = \frac{\theta \delta_{11}^F}{D} < 0$.

Using (19a), $(\alpha^* + T^H \delta_2^H) < 0$. Thus, the last two terms on the right hand side of (29) are negative. Now:

$$\frac{\partial \delta_2^H}{\partial T^F} = \delta_{21}^H e_3^{H*} + \delta_{22}^H e_3^{F*}\,. \tag{30}$$

Using (14a) and (14c), if $\theta = 0$, $e_3^{H*} > 0$, implying that the first term on the right hand side of (30) is negative, while the second is positive. If the positive effect dominates, then the first term on the right hand side of (29) is also negative and we can conclude that:

$$\frac{\partial \varphi}{\partial T^F} < 0 \Rightarrow \alpha_2^* < 0 \;\; (\text{if } \frac{\partial \delta_2^H}{\partial T^F} = \delta_{21}^H e_3^{H*} + \delta_{22}^H e_3^{F*} > 0\,). \tag{31}$$

The effect of a rise in $T^F$ on home and foreign enforcement are:

$$\frac{de^{H*}}{dT^F} = e_1^{H*}(.)\alpha_2^* + e_3^{H*}(.)\,. \tag{32a}$$

$$\frac{de^{F*}}{dT^F} = e_1^{F*}(.)\alpha_2^* + e_3^{F*}(.)\,. \tag{32b}$$

(32a) and (32b) present a similar ambiguity as (26b) above does. As $T^F$ rises, the direct effect on both home and foreign enforcement is positive. However, it may reduce the subsidy rate and thereby reduce foreign enforcement, presenting an ambiguity. As the home reaction function is positively sloped, the reduction of foreign enforcement (due to the subsidy effect) will tend to reduce it as well. Therefore, it seems possible that a rise in $T^F$ may actually reduce both enforcement levels. Finally, note:

$$\frac{d\tilde{A}}{dT^F} = e^{F*}\alpha_2^* + \alpha^* \frac{de^{F*}}{dT^F}. \tag{33}$$

In view of the ambiguity of the signs discussed above, the sign of $\frac{d\tilde{A}}{dT^F}$ is ambiguous in general.

Proposition 4

A rise in $T^F$ may reduce $\alpha^*$ and therefore foreign enforcement. In this case, home enforcement may also be reduced because a reduction in foreign enforcement will tend to elicit a reduction in home enforcement. The effect on total aid is also ambiguous.

*Proof and Comment:*

Equations (28) through (33) provide the proof. Since the intuition is partially covered above and partially obtained from the discussion of proposition 3, we skip it here. ■

Comparative Statics under Altruism (i.e., $\theta > 0$)

This section briefly deals with changes in $T^H$ and $T^F$ because we have already covered the essential insights of these cases above. The focus is on $R^F$ which assumes importance in donor policymaking when $\theta$ is non-zero.

(A). *Change in* $T^H$

Using the implicit function theorem:

$$\alpha_1^* = \frac{\partial \alpha^*}{\partial T^H} = -\left( \frac{\frac{\partial \varphi}{\partial T^H}}{\frac{\partial \varphi}{\partial \alpha}} \right),$$

where, $\varphi = -[\alpha + T^H \delta_2^H \{e^{H*}(.), e^{F*}(.)\}]e_1^{F*}(.) - (1-\theta)e^{F*}(.) - \theta R^F p_1^F \{\alpha, A(\alpha, R^F)\}$

$$\frac{\partial \varphi}{\partial T^H} = -\left( \delta_2^H + T^H \frac{\partial \delta_2^H}{\partial T^H} \right) e_1^{F*} - (\alpha^* + T^H \delta_2^H) e_{12}^{F*} - (1-\theta) e_2^{F*}. \tag{35}$$

It can be shown that all three terms on the right hand side of (35) are positive, and we can therefore conclude that $\alpha_1^*$ is positive. Using (14a) and (14b) and noting that $\alpha_1^* > 0$, we can conclude that $e^{H*}$ must rise with $T^H$ if the home reaction function is positively sloped. If not, then it is possible that home enforcement may decline. (15a) and (15b) suggest that the direct effect of $T^H$ on foreign enforcement is to reduce it, but the indirect effect through a higher subsidy will tend to raise it. The balance of these effects determines whether foreign enforcement will eventually rise or fall. If foreign enforcement falls, it is possible that foreign aid falls as well.

(B). *Change in* $T^F$

Using (18a), (18b) and (20):

$$\alpha_2^* = \frac{\partial \alpha^*}{\partial T^F} = -\left( \frac{\frac{\partial \varphi}{\partial T^F}}{\frac{\partial \varphi}{\partial \alpha}} \right) \tag{36}$$

$$\frac{\partial \varphi}{dT^F} = -\left( T^H \frac{\partial \delta_2^H}{\partial T^F} \right) e_1^{F*} - (\alpha^* + T^H \delta_2^H) e_{13}^{F*} - (1-\theta) e_3^{F*} > 0. \tag{37}$$

Using (15c), we find that there is some ambiguity regarding the sign of $e_3^{F*}$. A direct effect

($\delta_2^F W_{11}$) opposes an indirect one: ($\theta T^F \delta_1^F \delta_{21}^F$). Ignoring third order derivatives,

$e_{13}^{F*} = \dfrac{\partial e_1^{F*}}{\partial T^F} = \dfrac{\theta \delta_{11}^F}{D} < 0$. Therefore, the second term is negative. Now:

$$\frac{\partial \delta_2^H}{\partial T^F} = \delta_{21}^H e_3^{H*} + \delta_{22}^H e_3^{F*}. \tag{38}$$

The sign of $e_3^{H*}$ is ambiguous in general and therefore $\left(\dfrac{\partial \delta_2^H}{\partial T^F}\right)$ cannot be signed. Therefore,

when $\theta > 0$, there is no presumption about the sign of $\left(\dfrac{\partial \varphi}{\partial T^F}\right)$, and hence of $\alpha_2^*$. One can

therefore infer that similar ambiguity will prevail over the effects on enforcement levels and total

foreign aid $\tilde{A}$.

(C). Change in $R^F$

Using (18a), (18b) and (20):

$$\alpha_3^* = \frac{\partial \alpha^*}{\partial R^F} = -\left(\frac{\dfrac{\partial \varphi}{\partial R^F}}{\dfrac{\partial \varphi}{\partial \alpha}}\right) \tag{45}$$

Noting that: $\dfrac{\partial \varphi}{d\alpha} < 0$, $\alpha_3^* < 0$ because:

$$\frac{\partial \varphi}{dR^F} = -\theta p_1^F < 0. \tag{46}$$

From (18a) and (18b):

$$A_2 = \frac{\partial A}{\partial R^F} = -\frac{p_2^F}{R^F p_{22}^F} > 0. \tag{47}$$

Now:

$$\frac{d\tilde{A}}{dR^F} = A_2 + (\alpha^* e_1^{F*} + e^{F*})\alpha_3^* . \tag{48}$$

The direct $A_2$ is strictly positive, but the indirect effect through the optimal subsidy rate is negative.

Proposition 5

A rise in the damage from regime instability ( $R^F$ ) raises the autonomous part of foreign aid ( $A$ ) and reduces the optimal subsidy. The effect on total aid is ambiguous. It will rise if and only if the direct effect on the autonomous part dominates the indirect effect through the optimal subsidy.

*Proof and Comment:*

(45) through (47) establishes the assertions regarding the effects on $A$ and $\alpha^*$. Equation-(48) shows that the effect on total aid is composed of two effects: this first term on the right hand side of (48) is the direct effect and the other term is the indirect one. As the damage $R^F$ from regime instability rises, so does the marginal benefit from providing aid to reduce its probability. This will encourage more aid. On the other hand, from (18a) we can see that the marginal benefit from subsiding foreign enforcement is reduced as $R^F$ rises. This is because the home nation recognizes that subsidizing foreign enforcement may alienate the foreign population leading to a fall of the ally (foreign government). This is taken into account in the marginal benefit for aid function presented in (18a). When $R^F$ rises, marginal damage from this source rises (reducing the net marginal benefit from the subsidy) reducing $\alpha^*$. As the optimal subsidy falls, so does

foreign enforcement, therefore the aid tied to enforcement declines. The total aid may still rise if the direct effect dominates. ■

## 3. Conclusion

This paper is particularly relevant to the emerging literature which views foreign aid as a means of delegating the fight against terror to a source (of terror) nation. A stylized fact of international terrorism today is that it is often bred in poorer developing nations, which have traditionally received development aid. After 9/11, the focus has shifted somewhat from development aid toward aid that is given to encourage counterterrorism efforts (as in the US-Pakistan context).

We obtain several interesting results that suggest that there may not be a simple relationship between the level of the terror threat and foreign aid. For example, a rise in terror at home will raise both home enforcement and also the subsidy given to foreign enforcement. It is quite possible, however, that foreign enforcement declines in the final analysis, because the expansionary subsidy effect may be offset by the strategic substitution effect which will tend to reduce foreign enforcement. In turn, this may also reduce total aid because of the volume effect (as opposed to the rate effect from the subsidy). Overall, the message seems to be that a lot of information may be necessary for successful implementation of an appropriate aid policy geared toward counterterrorism.

An exciting literature is emerging where the link between income and terrorism is being explored (see for example, Krueger and Maleckova, 2003, and Azam and Thelen, 2008). Ideally, with complete information, aid policy can be designed appropriately to consider this issue in addition to the strategic issues that we have focused on in this paper. In our future research, we will like to build a general equilibrium model that blends features of the current analysis with that literature.

**Reference**

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***Appendix: Not for Publication (for $\theta > 0$)***

I. Change in $T^H$

From (15b) we know that $e_2^{F*}$ is negative. Ignoring third order derivatives: $e_{12}^{F*} = \dfrac{\partial e_1^{F*}}{\partial T^H} = \dfrac{\delta_{11}^H}{D} > 0$,

and from (19): $\alpha^* + T^H \delta_2^H = -\beta < 0$. Therefore, the second term on the right hand side of (35) must be positive. The first term is positive if and only if:

$$\delta_2^H + T^H \frac{\partial \delta_2^H}{\partial T^H} < 0. \tag{A1}$$

Routine substitutions yield:

$$\frac{\partial \delta_2^H}{\partial T^H} = \frac{T^F \delta_1^H (\delta_{22}^H \delta_{21}^F - \delta_{22}^F \delta_{21}^H)}{D} < 0 \ . \tag{A2}$$

(A2) implies that (A1) holds. Thus, all three terms on the right hand side of (35) are positive, and we can therefore conclude that $\alpha_1^*$ is positive. Note that:

$$\frac{de^{H*}}{dT^H} = e_1^{H*}(.)\alpha_1^* + e_2^{H*}(.). \tag{A3}$$

$$\frac{de^{F*}}{dT^H} = e_1^{F*}(.)\alpha_1^* + e_2^{F*}(.). \tag{A4}$$

Also:

$$\tilde{A} = A(\alpha^*, R^F) + \alpha^*(T^H, T^F, R^F) e^{F*}(\alpha^*, T^H, T^F)$$

$$\Rightarrow \frac{d\tilde{A}}{dT^H} = e^{F*}\alpha_1^* + \alpha^* \frac{de^{F*}}{dT^H}. \tag{A5}$$