Conciliation, Commitment, and Counter-Terrorism: A Formal Model[1]

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Abstract

What causes the increase in terrorism that reportedly often follows government concessions? And given this pattern, why do governments ever conciliate terrorists? I propose a model in which terrorist organizations become more militant following concessions because only moderate terrorists accept them, leaving extremists in control. Governments nonetheless are willing to make concessions because their counter-terror capabilities improve due to the collusion of former terrorists. Former terrorists undertake this collusion to insure the credibility of government promises. The model also yields hypotheses regarding the level of government investment in counter-terror, the terms of negotiated settlements, the duration of terrorist conflicts, incentives for moderate terrorists to radicalize their followers, and incentives for governments to encourage extremist challenges to moderate terrorist leaders. The explanatory power of the model is illustrated through a case study of the Israeli/Palestinian conflict.

[1]Professor Ehud Sprinzak, who died an untimely death on November 8, 2002, first introduced me to the study of terrorism. He is greatly missed. I received valuable comments from Scott Ashworth, Bob Bates, Mia Bloom, Bruce Bueno de Mesquita, Charles Cohen, Eric Dickson, Orit Kedar, David Lake, Macartan Humphries, Matthew Price, Todd Sandler, Ken Shepsle, David Andrew Singer, Alastair Smith, and Matthew Stephenson.

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One of the most puzzling facts reported by scholars of terrorism is that after governments make concessions to terrorists the level of terrorist violence often increases (Hewitt 1984, Wilkinson 1999).[1] For instance, beginning in 1979, the Basque separatist group ETA engaged in a massive campaign of terror despite the fact that the newly democratized Spanish government granted partial autonomy to the Basque Country in 1978. Between 1968 and 1977, ETA killed a total of 73 people. In the 3 years from 1978-1980 there were 235 fatalities resulting from ETA terrorism and for the entire 1980s and well into the 1990s the death tolls never returned to the relatively low levels of the 1960's to mid-1970's (Clark 1986). Similarly, following the signing of the 1993 Oslo agreement between the Palestinians and the Israelis, a wave of Palestinian terror shook the Middle East causing more fatalities in the 4 years after Oslo than in the 15 years prior to it (Kydd and Walter 2002). The infamous bombing of Omagh, the most deadly attack in the past thirty years of the Troubles in Northern Ireland, occurred on August 15, 1998, just a few months after the historic Good Friday accords were signed (Silke 1999, Cusack 2001). Cases such as these raise two puzzles. First, what causes the increased militancy that seems to follow government concessions. Second, why do governments make such concessions?

In this paper I present a formal model of the interactions between terrorist or-

[1] Although I will not engage in a lengthy definitional discussion in this paper, it is important that I am describing domestic-level terror that happens more or less within the target country, as opposed to transnational or international terrorism. For a thorough discussions of definitional issues in terrorism studies, see Crenshaw (1995), Gibbs (1989), Hoffman (1998), and Laqueur (1977).

ganizations and governments that successfully accounts for both of these puzzles. Importantly, I do not assume that terror groups are unitary actors. Rather, they are organizations made up of ideologically heterogeneous cells, factions, and individuals. This is consistent with the actual structure of most terror organizations (Chai 1993, Crenshaw 1981).

Two factors drive the model. First, the increase in militancy that follows concessions is due to the fact that the moderates accept concessions, leaving the extremists in control. This leads to an increase in attempted violence. Second, as has been noted by others, governments face a commitment problem when offering concessions to armed insurgents (Crenshaw 2000, Fearon 1998, Walter 1997). Terrorists may not believe that, once they have laid down their weapons, the government will honor its promises. I explicitly model this problem and suggest an endogenous solution. Terrorists who accept concessions use their knowledge of the inner-workings of the terrorist organization as bargaining leverage. They do so by withholding valuable counter-terrorism aid if the government reneges on concessions. Similarly, the government can withhold concessions if former terrorists do not aid in counter-terror. Such dynamics can be observed, for instance, in the back and forth between Israelis and Palestinians regarding the relationship between increased autonomy and suppression of extremist violence.

This commitment problem has two implications. First, it may be difficult for a government to end a conflict by offering concessions to all terrorist factions. This is because such concessions are not credible in the absence of ongoing violence. Second, it provides an endogenous account of why governments are willing to make concessions despite the increased militancy they engender. The benefits of counter-terror aid from

former terrorists may outweigh the costs of heightened militancy.

Indeed, there are empirical cases in which governments, with the help of former terrorists, have succeeded in thwarting the efforts of residual extremists. Such cases include the destruction of the Quebec separatist FLQ in the 1980s (Ross 1988), the combined British and Hagannah efforts to prevent Irgun and LEHI terrorism in the 1940s in British-Mandate Palestine (Bell 1977), the Italian use of former terrorist informants to infiltrate left-wing terrorist organizations (della Porta 1995), and the crack-down on the radical Real IRA undertaken by both the police and the Provisional IRA after the bombing of Omagh (Toolis 2001, Dingley 199). Each of these collusions was undertaken in exchange for government concessions of one sort or another.

The analysis generates additional hypotheses. I allow the government to choose its level of investment in counter-terrorism endogenously and explore how both the expected level of violence and the aid of former terrorists affects this investment decision. I also discuss hypotheses regarding the terms of negotiated settlements between governments and terrorists, the effect of concessions on the duration of terrorist conflicts, the incentives for moderate terrorists to radicalize their followers, reasons for governments to encourage radicals within a terrorist organization to challenge the moderate leadership, and changes in moderate control over extremists before and after negotiated settlement. I illustrate the model through a discussion of the conflict between Israelis and Palestinians.

The Extant Literature

Others have noted the division between extremists and moderates. In his groundbreaking formal study of political violence, DeNardo (1985) demonstrates how gov-

ernment willingness to make concessions can lead to a split within a revolutionary movement between pragmatists and purists, though he does not develop the increased-militancy argument I present here. Sandler and Arce (2003) provide a model in which government uncertainty over terrorist types leads to adverse selection. Both Stedman (1997) and Kydd and Walter (2002) argue that extremists ("spoilers" in Stedman's terminology) may attempt to prevent compromise and peace by engaging in terror that undermines the government's confidence in ongoing negotiations. This argument is complementary to my account. They predict that the "spoiler" effect is short-term, lasting only through the period of negotiations. Thus, an extra spike in violence might be expected during a peace process. The increased militancy effect that I propose is longer term. It has to do with a change in the composition of the terrorist movement rather than a shift in short-term incentives. Consequently, while the spoiler effect will produce a short-term spike and then a drop in terrorist violence, the increased militancy effect (contingent on the failure of counter-terror) is expected to produce a long-term increase in the base level of terrorist violence that can be distinguished from a short-term, strategic spike in violence.

A variety of explanations have been offered in the literature for the increase in terrorist violence that sometimes follows government concessions. Discussing the ETA, Shabad and Llera Ramo (1995) argue that the cause of the increase in terror following the granting of Basque autonomy was a "culture of violence" that prevented ETA from abandoning violent tactics. Darby (2000) argues that violence erupts during negotiations because of a combination of nervousness over the coming decrease in terrorist activity and demobilization of the security forces responsible for counter-terror. Ross and Gurr (1989) suggest that violence may increase after concessions because

compromise constitutes an existential threat to terror organizations. Lapan and Sandler (1988) present a game theoretic model in which they show that, when there is uncertainty regarding a government's resoluteness, the government may be concerned that concessions will lead to an increase in violence by signaling governmental weakness.

Several formal models of terrorism focus on different empirical puzzles than those addressed here, but nonetheless suggest interesting ways in which my model could be extended. In Lapan and Sandler (1993) and Overgaard (1994) the government is uncertain regarding the terrorist group's type (in particular, its level of resources). My approach differs from theirs in that there are actually multiple types of terrorists within the terror organization in my model (which makes possible the increased militancy dynamics), whereas in the other models the terror organization is a unitary actor with an uncertain type.

Clearly, a fuller understanding of the politics of terrorism would incorporate all of these factors and many others. The model developed here does not constitute a complete description of the complex and nuanced politics underlying terrorism. Rather, I have attempted to isolate two important feature of these politics – increased militancy following concessions and the commitment problem – and explore their implications before adding additional complexity or attempting a richer theoretical synthesis.

The Model

Consider a model of the interaction between a terrorist organization and a government, G. The terrorists attempt to defeat the government (e.g., overthrow the regime

or force them off a piece of land) and to extract concessions, while the government tries to defeat the terrorists, minimize the amount of terror inflicted on society, and limit concessions. Further, the terrorist movement is made up of two factions: moderates (m) and extremists (e).

The game is played as follows. The government makes makes an offer of concessions to the moderate terrorist faction. These terrorists can decide whether to accept the government's offer or not. Accepting involves laying down weapons and coming out of hiding. Once the moderates have concluded their negotiations with the government, the extremist faction decides whether or not to accept concessions. If a terrorist faction chooses not to accept the government's offer it continues to engage in terror in an attempt to defeat the government. If a terrorist faction accepts concessions it becomes unable to engage in terror because it demilitarizes and the government knows its whereabouts. Factions that accept concessions must then decide whether or not to aid the government in its counter-terror efforts. The government simultaneously chooses whether or not to honor promised concessions. The still-active terrorist factions then choose a level of terror in which to engage and finally, the government chooses how much to invest in its counter-terror program. Once all of these decisions are made outcomes are realized. These outcomes take two forms. First, the success of government counter-terror efforts are determined. If the remaining terrorist factions survive government crack-downs, then the success of terrorist violence is determined. The game is repeated until one side or the other defeats its opponent.

In round τ the government offers concessions $k^\tau \geq 0$. I assume that an exogenously determined amount ($\beta \in (0, 1)$) of these concessions are public goods, such as a grant of political autonomy, the benefits of which are reaped by all terrorists whether or

not they accept the concessions. Then $(1-\beta)$ of the concessions constitute private goods that can only be accessed by those terrorists who accept concessions.

The government also attempts to eradicate the terror organization through counter-terrorism. The government's probability of successfully defeating the terrorists is a function of two variables: the amount the government invests in counter-terrorism in round τ ($a^\tau \in [0, \bar{a}]$) and whether former terrorists are helping the government ($h^\tau \in \{\underline{h}, \bar{h}\}$), where $\bar{h}$ represents the former terrorists providing aid. The government has probability $\sigma(a, h)$ of defeating the terrorists. I assume that the probability of success is increasing in the level of government effort ($\frac{\partial \sigma}{\partial a} > 0$) and that the probability of success is higher if former terrorists aid the government ($\sigma(a, \bar{h}) > \sigma(a, \underline{h})$, for all $a \in \mathbb{R}^+$). I also assume that the help of former terrorists increases the efficiency of government counter-terror efforts by focusing government efforts in the proper place. That is, an increase in government counter-terror has a greater marginal impact if the government has received aid from former terrorists. Formally this implies that for all $a', a'' \in \mathbb{R}^+$, if $a' > a''$, then $\sigma(a', \bar{h}) - \sigma(a'', \bar{h}) > \sigma(a', \underline{h}) - \sigma(a'', \underline{h})$. Government counter-terror efforts are also costly. The government bears cost $\gamma(a)$, where $\gamma(\cdot)$ is increasing and convex. If the government defeats the terrorists, it receives a payoff of W which represents the time discounted utility associated with governing in peace.

Denote the total amount of terror attempted in round τ by T^τ. The probability that the terrorists defeat the government in round τ is given by $\pi(T^\tau)$, where $\pi(\cdot)$ is increasing and concave. If the government is defeated it receives a payoff of 0 forever. The government bears cost k for concessions and a cost T for terrorism perpetrated. Finally, the government receives a benefit B for each round in which it is not defeated by the terrorists.

In any given round, there are three possible outcomes. The government wins the conflict with probability σ in which case it receives a payoff of W and the game ends. The government loses the conflict with probability $(1-\sigma)\pi$ in which case it receives a payoff of 0 and the game ends. Neither side wins the conflict with probability $(1-\sigma)(1-\pi)$ in which case the government receives a payoff of $B-\gamma-T-k$ and the game continues. Denote a history of the game up to round τ by H^τ and let $V_G(H^\tau)$ be the government's continuation value for the game, given H^τ and neither side winning the conflict in round τ. I assume that $W > B + V_G(H^\tau)$ for all H^τ and all τ. That is, the government would always prefer to win the conflict rather than having it continue. Further, I assume that $B + V_G(H^\tau) - \gamma(\bar{a}) - R - \hat{k} > 0$ for all H^τ, where $\hat{k}$ is the amount of concessions that will be offered in equilibrium (to be shown later) and R is the maximum amount of terror that can be perpetrated. This assumption simply implies that the government always prefers to continue the game rather than lose the conflict. If this were not true, presumably the government would surrender. The government's expected utility is given by:

$$EU_G^\tau = \sigma(a^\tau, h^\tau)W + \big(1-\sigma(a^\tau, h^\tau)\big)\big(1-\pi(T^\tau)\big)\big(B-\gamma(a^\tau)-T^\tau-k^\tau+V_G(H^\tau)\big)$$

The terrorist movement is endowed with resources R in each round. Those terrorists who do not accept an offer from the government must choose an amount of the movement's resources to expend on terror. Terrorist faction i's preferred amount of violence in round τ is t_i^τ.

A terrorist i derives utility θ_i from defeating the government. This represents the time discounted utility of winning the conflict. The relative "extremism" of a terrorist faction is parameterized by θ_i, $i \in \{m, e\}$, where $\theta_e > \theta_m$. That is, the

difference between extremist and moderate terrorists, in this model, is the extent to which they value defeating the government. This is a reasonable description of the difference between, for example, Hamas and the PLO, the extremist ETA-militar and the more moderate ETA-politico militar, or the radical members of the Tamil LTTE as compared to more moderate Tamil separatists. If the terrorist organization is defeated, the terrorists receive a payoff of 0 forever.

Each terrorist faction benefits from the possibility of defeating the government as well as from any resources that the organization does not invest in terror. This latter benefit may be because they expropriate resources not utilized for terror or spend them on other valuable activities.[2] The utility to a terrorist faction for resources not devoted to terror in round τ is $v\left(R-T^{\tau}\right)$. I assume that $v\left(0\right)=0$ and that $v\left(\cdot\right)$ is increasing ($v'\left(\cdot\right)>0$) and strictly concave ($v''\left(\cdot\right)<0$).

There are three potential events that could occur in any given period. The terrorists win the conflict with probability $(1-\sigma)\pi$ in which case they receive a payoff of θ_i. The terrorists lose the conflict with probability σ in which case they receive a payoff of 0. Neither side wins with probability $(1-\sigma)(1-\pi)$, in which case the terrorists receive a payoff of $v(R-T^{\tau})+\beta k(H^{\tau})$ and the game continues. $k(H^{\tau})=0$ if no concessions are accepted by any terrorists and $k(H^{\tau})=k^{\tau}$ if some terrorists accept concessions. This is because active terrorists only gain the public goods portion of governmental

[2] Hamas, for instance, has an extensive network of social welfare and health care organizations (Mishal and Sela 2000), the IRA provides vigilante police services for the Catholic population (Silke 1999), and the Irgun smuggled Jews from Europe into Palestine (Bell 1977), all costly, non-terrorist activities.

concessions if concessions are actually made. Let $V_i(H^\tau)$ be a terrorist faction i's continuation value of the game. I assume that $\theta_i > V_i(H^\tau) + \beta k(H^\tau) + V_i(H^\tau)$ for all H and all τ. That is, the terrorists would prefer to defeat the government rather than having the conflict continue. A terrorist faction i has expected utility for engaging in terror given by:

$$EU_i^\tau = \big(1-\sigma(a^\tau, h^\tau)\big)\pi(T^\tau)\theta_i + \big(1-\sigma(a^\tau, h^\tau)\big)\big(1-\pi(T^\tau)\big)\big[v(R-T^\tau)+\beta k(H^\tau)+V_i(H^\tau)\big]$$

If a terrorist faction accepts an offer of concessions k, and those concessions are honored by the government, then its members gain utility k. If they are not honored by the government or if the government is defeated, the former terrorists receive a payoff of 0.

Within a terrorist organization, the moderates and the extremists will disagree over how much terror in which to engage. I assume that each group has an exogenously given level of power or influence within the movement. If only one group remains active (because the other group accepted concessions), then that remaining group has all the power. If both groups remain active, then the extremists have influence $\lambda \in (0, 1)$ and the moderates have influence $(1 - \lambda)$.

A terror organization with both moderates and extremists will choose to engage in a level of terror given by $T_{m,e}^\tau = \lambda t_e^\tau + (1 - \lambda)\, t_m^\tau$. Note that this decision rule does not necessarily represent voting within the terror movement. The relative power might represent the number of cells that each faction controls, the size of each faction, or their influence with donors. For this reason, I assume that terrorists within an organization cannot strategically misrepresent the amount of terror that they would prefer as this would allow them artificially to inflate their influence within the orga-

nization. Thus, it is each terrorist's sincere preference (t_i) that is used to determine the movement's behavior.

A terrorist faction that has accepted concessions enters into a commitment game with the government. The terrorists choose whether or not to aid the government in its counter-terror efforts (at cost c) and the government chooses whether or not to honor promised concessions. The stage game of the commitment sub-game is represented in Figure 1.

Figure 1: Stage Game of the Commitment Sub-game

		Government	
		Concessions	No Concessions
Terrorists	Aid	$k^\tau - c$, $EU_G(\sigma(a^\tau, \bar{h}^\tau)) - k^\tau$	$-c$, $EU_G(\sigma(a^\tau, \bar{h}^\tau))$
	No Aid	k^τ, $EU_G(\sigma(a^\tau, \underline{h}^\tau)) - k^\tau$	0, $EU_G(\sigma(a^\tau, \underline{h}^\tau))$

The full game is played as shown in Figure 2.

(Insert Figure 2 about here)

Equilibrium

Multiplicity and Equilibrium Concepts

Because this game is repeated, there are a multiplicity of equilibria. I will restrict attention to a class of focal equilibria. It has been argued that there are conditions, in repeated games, under which it is natural to examine "history dependent" equilibria in which players are able to achieve higher payoffs by conditioning play on non-payoff dependent histories of the game and conditions under which it is not natural. The "problem" with conditioning future play on non-payoff dependent strategies is

that the players have to coordinate perfectly on the punishment mechanism they are using. The standard argument, based on the intuition of the Coase theorem, is that players who have a relationship in which they can communicate with one another should be able to coordinate on the use of non-payoff relevant histories to achieve an equilibrium that assures them a payoff on the Pareto frontier. Players who are unable to communicate are more likely to fail to coordinate on such an equilibrium and, rather, play equilibria that are only dependent on payoff-relevant histories (Maskin and Tirole 2001).

I will apply these criteria to the analysis of this model. In most of the sub-games I analyze, the players are enemies. As such, in these sub-games I solve for Markov Perfect equilibria — equilibria in which players condition only on payoff relevant histories. Restricting the equilibrium concept in this way rules out equilibria in which the government agrees not to engage in very much counter-terror and the active terrorists agree, in exchange, to limit the amount of terror in which they engage. Such an equilibrium could only be sustained by perfect coordination on complex punishment strategies in which governments threaten to revert to high levels of counter-terror and terrorists threaten to revert to high levels of violence.

There is one part of the game in which a communicative relationship exists. This is the commitment sub-game. The former terrorists and the government have already engaged in negotiation and communication. Thus, it is natural to think that these players could use communication to coordinate on a mutually beneficial outcome. Consequently, in this sub-game I solve for sub-game perfect, history dependent equilibria that achieve payoffs on the Pareto frontier.

Level of Counter-Terror

The government will choose a level of counter-terror to maximize its expected utility, given the concessions it has made, the expected level of attempted terror, and whether former terrorists are aiding it. Given these payoff relevant pieces of information about earlier stages of the game, no other facts about the history of the game impact the government's decision. As such, I drop the round-of-play indicator (τ). Contingent on the level of concessions, the expected level of terror, and the aid of former terrorists, the government will play the same strategy in each round. The maximization problem is given by:

$$\max_{a} \Big\{ \sigma(a,h)W + \big(1-\sigma(a,h)\big)\big(1-\pi(T)\big)\big(B-\gamma(a)-T-k+V_G^{\tau}(H)\big) \Big\}$$

The solution is characterized by the first order condition:

$$\frac{\partial \sigma(a,h)}{\partial a}\Big[W-\big(1-\pi(T)\big)\big(B-\gamma(a)-k-T+V_G(H)\big)\Big] = \big(1-\sigma(a,h)\big)\big(1-\pi(T)\big)\gamma'(a) \tag{1}$$

Equation (1) implicitly defines the optimal level of counter-terror (a^*). The left-hand side represents the marginal benefit that an increase in counter-terror has on the government's likelihood of defeating the terrorists. The right-hand side represents the marginal costs in terms of resources devoted to counter-terror.

There are two facts that can be gleaned from the optimization decision. They are summarized in the following remark.

Remark 1 *At an interior solution, the level of counter-terror the government chooses is increasing in the expected level of attempted terror (T) and is greater if the government receives counter-terror aid from the terrorists.*

The proof is given in the appendix. The remark has a clear intuition. First, the more violence the government expects, the greater its need to prevent attacks. Consequently the government invests more in counter-terror when it faces a more violent opponent. Second, when the government receives aid from former terrorists its counter-terror is more efficient because it can use the intelligence from former terrorists to direct its efforts productively. This implies that the marginal benefit of an increase in counter-terror is greater when the government receives counter-terror aid, while the marginal costs remain the same. Consequently, the government chooses a higher level of investment in counter-terror when it is aided by former terrorists.

Level of Violence

Recall that when a terrorist organization determines the level of terror in which it will engage (T^τ) it does so with reference to the sincere preferences of the various factions (t_i^τ, for all i). The sincere preference of a terrorist faction i that does not accept an offer from the government is determined by maximizing that faction's expected utility as though its preferred level of terror (t_i) will be the level of terror ultimately chosen by the terrorist. Again, only payoff relevant histories are considered, which implies that the terrorists will solve the same maximization problem in every round so I drop the time indicators:

$$\max_{t_i} \Big\{ \big[1-\sigma\big(a^*(t_i)\big)\big]\pi(t_i)\theta_i + \big[1-\sigma\big(a^*(t_i)\big)\big]\big(1-\pi(t_i)\big)\big(v(R-t_i)+\beta k(H)+V_i^\tau(H)\big) \Big\}$$

The first-order condition characterizes the optimal choice. For the sake of readability I drop the arguments of functions and define $P = v(R-t_i) + \beta k(H) + V_i(H)$, which

is the terrorists' payoff if neither side wins or loses. The first order condition is:

$$\frac{d\pi}{dt_i}(1-\sigma)(\theta_i - P) - \frac{\partial\sigma}{\partial a^*}\frac{\partial a^*}{\partial t_i^*}\big(\pi\theta_i + (1-\pi)P\big) = (1-\sigma)(1-\pi)v'(R-t_i) \qquad (2)$$

Increasing the level of resources invested in terror has three effects on the expected utility of a terrorist. The first term $((1-\sigma)\frac{d\pi}{dt_i}(\theta - P) > 0)$ represents the direct impact on the probability of defeating the government of an increase in resources devoted to terror. The second term $(-\frac{\partial\sigma}{\partial a^*}\frac{\partial a^*}{\partial t_i}(\pi\theta_i + (1-\pi)P < 0)$ represents the fact that an increase in resources devoted to terror has the indirect effect of increasing the level of counter-terror the government engages in, which increases the probability of the terrorists being defeated. The third term, $(-(1-\sigma)(1-\pi)v'(R-t_i^*) < 0)$ represents the opportunity costs of using scarce resources for violence rather than some other purpose.

From equation (2) it can be determined how different terrorist factions will behave. This result is stated in the following remark.

Remark 2 *At an interior solution, t_i^* is increasing in θ_i.*

The proof is in the appendix. Intuitively, the more extreme a terrorist faction (higher θ_i) the more terror in which that faction wishes to engage.

I can now characterize the level of violence that a terrorist movement will choose. If a terror organization is made up of both moderates and extremists it will choose a level of terror given by $T_{m,e} = \lambda t_e^* + (1-\lambda)\, t_m^*$. If a terror organization is comprised only of extremists it will choose a level of terror given by $T_e = t_e^*$.

Note that it is an immediate consequence of remark (2) that $T_e > T_{m,e}$. A terror group composed exclusively of extremists engages in more terror than one composed of both moderates and extremists.

Commitment

As is clear from Figure 1, the commitment sub-game is a prisoner's dilemma. The government would prefer to extract aid from the terrorists without making concessions and the terrorists would like to extract concessions without providing counter-terror aid. However, in this sub-game I allow for history-dependent strategies. Further, the equilibrium concept (appealing to the Coase theorem) requires, if possible, that the players arrive at an outcome on the Pareto frontier. There are a multiplicity of such equilibria (with different punishment strategies). It is not necessary for the analysis to choose a particular such equilibrium. Any equilibrium in which cooperation is sustained will support the relevant equilibrium path in the larger game. The existence of this multiplicity means that the game does not have a unique equilibrium, however all the equilibria will be of the same class, in the sense of having the same equilibrium path.

I will refer to the players having *solved the commitment problem* if they are playing an equilibrium of the commitment sub-game in which concessions are honored and counter-terror aid is provided. Thus, we have the following lemma.

Lemma 1 *There exist sub-game perfect equilibria of the commitment sub-game in which cooperation is sustainable if the level of concessions is neither too small nor too large relative to the probability of the game ending. Moreover, if any such equilibria exist, then all sub-game perfect equilibria with outcomes on the Pareto frontier solve the commitment problem.*

Proof. Since the commitment problem being solved is the Pareto dominant outcome of the stage game, it is clear that all equilibria on the Pareto frontier must solve the

commitment problem if doing so is possible.

I provide a proof of the existence of such an equilibrium by constructing one.

The simplest example of such an equilibrium involves trigger strategies. Consider the following profile of strategies for this sub-game. The former terrorists provide counter-terror aid in every period unless the government has ever not honored concessions. If the government has ever not honored concessions, the former terrorists do not provide aid ever again. Similarly, the government honors concessions in every period as long as the former terrorists have always provided aid. If the former terrorists have ever failed to provide aid, the government never again honors concessions. To see the conditions under which this set of strategies forms an equilibrium in which the commitment problem is solved I have to check that neither player has an incentive to engage in a one-shot deviation.

The former terrorists' expected utility from these strategies is given by:

$$EU_m(\text{aid}) = \sum_{j=0}^{\infty} \left[(1-\sigma)(1-\pi)\right]^j (k-c) = \frac{k-c}{\sigma + (1-\sigma)\pi}$$

If the former terrorists deviate they receive a payoff of:

$$EU(\text{no aid}) = k + \sum_{j=1}^{\infty} 0 = k$$

Thus, the former terrorists will play this cooperative strategy as long as

$$\frac{k-c}{k} > \sigma + (1-\sigma)\pi$$

Note that the right-hand side of the equation is the probability that either the government or the terrorists win the conflict. Thus, for the former terrorists to be willing to provide aid to the government, the probability of the government or the terrorists begin defeated can not be too large relative to the size of the concessions.

I now turn to the government's actions. Label the probability of the government succeeding in counter-terror when it is aided by former terrorists as $\bar{\sigma}$ and the probability when it is not aided by former terrorists as $\underline{\sigma}$. Similarly, label the amount invested in counter-terror with aid $\bar{\gamma}$ and without counter-terror aid $\underline{\gamma}$. It is an immediate consequence of remark (1) that $\bar{\sigma} > \underline{\sigma}$ and $\bar{\gamma} > \underline{\gamma}$. Finally, label the amount of terror when the government has the aid of the moderates T_a and when it does not have the aid of the moderates T_{na}. The government's expected utility from the cooperative strategies is:

$$\sum_{j=0}^{\infty} \left[(1-\bar{\sigma})\,(1-\pi(T_a)) \right]^j \left[(1-\bar{\sigma})(1-\pi(T_a))(B-\bar{\gamma}-T_a-k)+\bar{\sigma}W \right]$$
$$= \frac{(1-\bar{\sigma})(1-\pi(T_a))(B-\bar{\gamma}-T_a-k)+\bar{\sigma}W}{\bar{\sigma}+(1-\bar{\sigma})\pi(T_a)}$$

The government's payoff from deviating is:

$$\bar{\sigma}W + (1-\bar{\sigma})(1-\pi(T_{na}))\left[B-\bar{\gamma}-T_{na}+\frac{\underline{\sigma}W+(1-\underline{\sigma})(1-\pi(T_{na}))(B-\underline{\gamma}-T_{na})}{\underline{\sigma}+(1-\underline{\sigma})\pi(T_{na})}\right]$$

Some algebra shows that the government will play the cooperative strategy as long as

$$k < \frac{\bar{\sigma}W+B-\bar{\gamma}-T_a}{\bar{\sigma}+(1-\bar{\sigma})\pi(T_a)} - \left(\frac{1-\pi(T_{na})}{1-\pi(T_a)}\right)\frac{\underline{\sigma}W+B-\underline{\gamma}-T_{na}}{\underline{\sigma}+(1-\underline{\sigma})\pi(T_{na})}$$

Thus, the government will play the cooperative strategy as long as the concessions it makes are not too large relative to the increase in expected utility the government realizes by increasing its probability of defeating the terrorists. ■

The former terrorists will not act cooperatively if they believe that the probability of the conflict ending quickly is sufficiently high. This has two implications. First, moderates are unlikely to abandon particularly strong terrorist organizations because they do not want to forgo the opportunity to defeat the government. Second, moderates are unlikely to strike a deal with overwhelmingly strong governments because

they believe those governments will not honor concessions in the long-run since the government is likely quickly to win the conflict outright.

Importantly, the need to sustain cooperation places both an upper and a lower bound on the level of concession. Label these bounds $\bar{k}$ and $\underline{k}$ respectively.

There are two further points worth noting. First, in addition to the cooperative equilibria discussed in the lemma, there are also sub-game perfect equilibria of this sub-game in which concessions are not honored and aid is not given. However, such equilibria do not achieve payoffs on the Pareto frontier. As such, as discussed above, the Coase theorem suggests that equilibria of the sort I have described are focal. Further, it is clear that in any equilibrium of the whole game (as opposed to just the commitment sub-game) in which concessions are made, the commitment problem must be solved. No terrorist will accept concessions if he or she knows that the government will not honor them. Nonetheless, the existence of non-Pareto efficient equilibria of the commitment sub-game in which the commitment problem is not solved means that if the equilibrium concept were relaxed not to require Pareto efficiency in this sub-game, then the larger game would have equilibria in which concessions are never accepted.

The second point to note is that this sub-game demonstrates that if both terrorist factions accept concessions, so that no terrorist movement remains, the government will not honor its concessions. Consequently, there cannot be an equilibrium of the larger game in which both terrorist factions accept concessions. This result is summarized in the following remark.

Remark 3 *There does not exist an equilibrium of the larger game in which both*

terrorist factions accept concessions.

Proof. The proof follows from the argument in the text. ■

Since concessions can only be accepted by one faction, once concessions have been offered and accepted, the still remaining terrorists can no longer hope to achieve concessions. Nonetheless, they are willing to continue fighting because of the chance of defeating the government through terrorism.

Accept or Reject

A terrorist faction will only accept concessions if the commitment problem is solved and the expected utility from the concessions is greater than the expected utility from engaging in violence.

The probability that the terrorists defeat the government or the government defeats the terrorists in any given round is given by $\sigma + (1-\sigma)\pi$. Consequently, the probability that the game continues to the next round is given by one minus this probability or $(1-\sigma)(1-\pi)$. Thus, the expected utility to terrorist faction i if both moderates and extremists engage in terror is given by:

$$\begin{aligned} &EU_i(T_{m,e}) = \\ &\sum_{j=0}^{\infty} \left[(1-\sigma_{m,e})(1-\pi_{m,e})\right]^j \left[(1-\sigma_{m,e})\pi_{m,e}\theta_i + (1-\sigma_{m,e})(1-\pi_{m,e})v(R-T_{m,e})\right] \\ &= \frac{(1-\sigma_{m,e})\pi_{m,e}\theta_i + (1-\sigma_{m,e})(1-\pi_{m,e})v(R-T_{m,e})}{\sigma_{m,e} + (1-\sigma_{m,e})\pi_{m,e}} \end{aligned} \tag{3}$$

Similarly, the expected utility to a faction i when the other faction accepts a deal is

given by:

$$
\begin{aligned}
&EU_i(T_i) = \\
&\sum_{j=0}^{\infty} \left[(1-\sigma_i)(1-\pi_i)\right]^j \left[(1-\sigma_i)\pi_i\theta_i + (1-\sigma_i)(1-\pi_i)\big(v(R-T_i)+\beta\tilde{k}\big)\right] \\
&= \frac{(1-\sigma_i)\pi_i\theta_i + (1-\sigma_i)(1-\pi_i)\big(v(R-T_i)+\beta\tilde{k}\big)}{\sigma_i + (1-\sigma_i)\pi_i}
\end{aligned}
\tag{4}
$$

The following remark will play an important role in developing the equilibria.

Remark 4 *There exists a level of concessions that is acceptable to the moderates but not to the extremists.*

The proof is given in the appendix. The intuition is that a terrorist faction i will consider accepting a deal if $k \geq EU_i(T)$. Moderate terrorists derive less expected utility from the possibility of defeating the government. Consequently, the moderates are willing to give up the possibility of complete victory for a lower level of concessions than are the extremists.

There are two cases to consider in determining whether the two terrorist factions will accept concessions in equilibrium: $k < EU_m(T_{m,e})$ and $k \geq EU_m(T_{m,e})$. If $k < EU_m(T_{m,e})$, then no terrorists have an incentive to accept concessions. If $k \geq EU_m(T_{m,e})$, then moderate terrorists have an incentive to accept concessions. Once the moderates have accepted, the extremists will not accept because the concessions will not be honored if both factions accept, as demonstrated in remark (3). Note that the sequential structure of the terrorists' decision process is not particularly important. The result would be unchanged if the extremists had the first opportunity to accept or reject. This is because, as shown in remark (4), the moderates are willing to accept a smaller level of concessions than the extremists. Consequently, assuming

it is in the range that solves the commitment problem, the smallest offer that the government can make that will be acceptable to a terrorist faction is $k = EU_m(T_{m,e})$, which is acceptable to the moderates but not the extremists.

At this point, it will simplify matters to add a little notation. The following results have been established: (1) the level of investment in counter-terror is increasing in the amount of attempted terror and (2) the amount of attempted terror is greatest when the extremists control the organization, next greatest when both extremists and moderates control the organization, and least when only the moderates control the organization. These results jointly imply that the investment in counter-terror, the probability of preventing terror attacks, and the amount of attempted terror are highest when the extremists control the terror organization. I will label the equilibrium level of investment in counter-terror when the extremists control the terror organization a_e and when both groups control the terror organization $a_{m,e}$, where $a_e > a_{m,e}$. Similarly, I will label the equilibrium probabilities of successful counter-terror σ_e and $\sigma_{m,e}$, where $\sigma_e > \sigma_{m,e}$. The costs of counter-terror are labeled γ_e and $\gamma_{m,e}$, where $\gamma_e > \gamma_{m,e}$. Finally, the probabilities of the government being defeated (given that government counter-terror fails) are labeled π_e and $\pi_{m,e}$, where $\pi_e > \pi_{m,e}$.

Level of Concessions

Given the terrorists' best responses, the government can determine what concessions to offer. If $k < \min\{EU_m(T_{m,e}), \underline{k}\}$, then no terrorists accept the offer. Total attempted terror in this case is $T_{m,e}$, which implies that the government's expected

utility is:

$$EU_G\left(k < \min\{EU_m(T_{m,e}), \underline{k}\}\right) =$$
$$\sum_{j=0}^{\infty}\left[\left(1-\sigma_{m,e}\right)\left(1-\pi_{m,e}\right)\right]^j\left[\left(1-\sigma_{m,e}\right)\left(1-\pi_{m,e}\right)\left(B-\gamma_{m,e}-T_{me}\right)+\sigma_{m,e}W\right] \tag{5}$$
$$= \frac{\left(1-\sigma_{m,e}\right)\left(1-\pi_{m,e}\right)\left(B-\gamma_{m,e}-T_{me}\right)+\sigma_{m,e}W}{\sigma_{m,e}+(1-\sigma_{m,e})\pi_{m,e}}$$

The government can also make an offer of concessions that is acceptable to the moderates but not to the extremists. If the government makes such an offer, it will make the lowest possible such offer (since the government is trying to minimize the amount of concessions). Consequently, in this circumstance the government will offer $k = \hat{k} \equiv \max\{EU_m(T_{m,e}), \underline{k}\}$. The total attempted terror in this case is T_e. Using similar algebra, it is clear that the government's expected utility in this case is:

$$EU_G\left(\hat{k}\right) = \frac{\left(1-\sigma_e\right)\left(1-\pi_e\right)\left(B-\gamma_e-\hat{k}\right)+\sigma_e W}{\sigma_e+(1-\sigma_e)\pi_e} \tag{6}$$

The government never has an incentive to offer concessions greater than $\hat{k}$, since the moderates will accept any offer at least as large as $\hat{k}$. Consequently, the government chooses to "buy" the moderates at the lowest level of concessions possible.

Depending on parameter values either of these outcomes can arise in equilibrium. The key features of the equilibria of this game are characterized in the following proposition.

Proposition 1 *In an equilibrium of the sort described above, if it is not feasible for the commitment problem to be solved, then no concessions are offered, the government chooses a level of counter-terror given by equation (1), and the terrorists choose a preferred level of violence according to equation (2).*

If it is feasible to solve the commitment problem, then the government chooses whether to make concession by comparing the expected utilities in equations (5) and

(6). If the latter is larger and $\hat{k} < \bar{k}$, then the government offers concessions $\hat{k}$, honors the concessions if they are accepted, and chooses a level of counter-terror according to equation (1). The moderates accept any offer of concessions greater than or equal to $\hat{k}$ and provide counter-terror aid. The extremists never accept an offer along the equilibrium path. Terrorists who do not accept concessions choose a preferred level of violence according to equation (2).

Proof. If concessions will not be honored, then no terrorist has an incentive to accept them. Given this, the optimality of the government's and terrorists' actions follow from equations (1) and (2).

If the commitment problem can be solved, then sub-game perfection requires that the government make those concessions if the expected utility of a deal is greater than the expected utility of no deal. That the level of concessions will be $\hat{k}$ follows immediately from the government's objective function. That concessions will only be made if $\hat{k} < \bar{k}$ follows from Lemma (1). The optimality of the players' behavior then follows from equations (1) and (2). ■

Of primary importance for this analysis are the outcomes associated with two different equilibrium paths and the parameter values that lead to them. These are summarized in the following corollary.

Corollary 1 *There are 2 equilibrium paths of this game when cooperation occurs in the commitment sub-game.*

1. *The "No Deal" path occurs if $k < \hat{k}$ concessions are offered. The total level of attempted terror in this case is $T_{m,e}$.*

2. *The "Buying the Moderates" path occurs when an offer of $\hat{k}$ concessions is made. In this case the moderates accept, the extremists reject, and the total level of attempted terror is T_e.*

Proof. The results follow directly from Proposition (1). ■

Analysis

Level of Violence

The first point of interest is the level of terrorist violence with and without concessions. As demonstrated in remark (2), the level of terrorism in which the terrorist organization engages is higher after concessions: $T_e > T_{m,e}$. When the government offers concessions, only the moderates are willing to accept. This leaves the extremists in control of the terrorist organization. Once the influence of the moderates is removed, the extremists choose to direct more of the available resources toward terrorist activities. The government faces a trade-off when making concessions. On the one hand, the probability of succeeding at counter-terror increases. On the other hand, the amount of violence increases because the terrorist movement is composed exclusively of the extremists who refused to accept concessions.

Duration of Conflict

This trade-off also allows for a comparison of the expected duration of a terrorist conflict as a function of whether or not a compromise settlement has been reached. The probability that a conflict continues in any given round is $(1-\sigma)(1-\pi)$. Thus,

the expected duration of a conflict is:

$$\sum_{j=0}^{\infty}((1-\sigma)(1-\pi))^j = \frac{1}{\sigma+(1-\sigma)\pi} \tag{7}$$

This function is clearly decreasing in both σ and π. Since $\sigma_e > \sigma_{m,e}$ and $\pi_e > \pi_{m,e}$, terrorist conflicts are expected to have a shorter duration if a negotiated settlement has been reached. Thus, conflicts in which the government negotiates with terrorists are, in expectation, shorter but more violent. These results are summarized in the following proposition.

Proposition 2 *The level of terror is higher following concessions to the moderates. However, the expected duration of the conflict is shorter following concessions to the moderates.*

Proof. The results follow from remark (2) and equation (7). ■

This result has testable implications for the empirical study of terror. First, it provides a theoretical understanding for the frequently observed, but somewhat perplexing, phenomenon of increases in terrorist activity following concessions: when moderates accept concessions the extremists are left in control of the terrorist organization. The model also explains why governments nonetheless are sometimes willing to make concessions. The probability of government victory increases and the duration of the conflict decreases. This is due to two factors. First, the former terrorists aid the government in its counter-terror efforts in order to insure the credibility of government concessions. Second, due to the increase in attempted terror and the increased efficiency of its counter-terror efforts, the government increases its investment in counter-terrorism.

Terms of the Settlement

The model also lends some insight into the terms of negotiated settlements between governments and terrorists. Assuming that the minimal level of concessions that can sustain cooperation in the commitment sub-game is greater than $EU_m(T_{m,e})$, if the government makes concessions to the moderates, those concessions will be worth:

$$\hat{k} = EU_m(T_{m,e}) = \frac{(1-\sigma_{m,e})\pi(T_{m,e})\theta_m + (1-\sigma_{m,e})(1-\pi(T_{m,e}))v(R-T_{m,e})}{\sigma_{m,e} + (1-\sigma_{m,e})\pi(T_{m,e})} \quad (8)$$

which is equal to the moderates' expected utility from remaining active terrorists.

First, notice that the level of concessions is decreasing in the probability of the government winning the conflict.

$$\frac{\partial \hat{k}}{\partial \sigma_{m,e}} = -\frac{\pi_{m,e}\theta_m + (1-\pi_{m,e})v(R-T_{m,e})}{(\sigma_{m,e} + (1-\sigma_{m,e})\pi_{m,e})^2} < 0$$

The more likely the terrorist organization is to lose the conflict, the more attractive it is to the moderates to strike a deal with the government.

Further, recall that $T_{m,e} = \lambda t_e^* + (1-\lambda)t_m^*$. Since equation (8) represents the moderates' objective function, it is clear that it would be maximized if the amount of terror chosen was the moderates' preferred amount, t_m^*. That is, the level of concessions would be maximized if $T_{m,e} = \lambda t_e^* + (1-\lambda)\, t_m^*$ were to equal t_m^*. This leads to several implications for factors that would improve the offer made to the moderates.

The more radical the moderates are (the higher θ_m) the better the offer made by the government. Hence, strategic moderate leaders may have an incentive to recruit and indoctrinate members into the moderate faction with relatively extreme preferences. By shifting the preferences of the moderates towards the extreme, they

create a bargaining tool that compels the government to make more concessions if it wishes to strike a deal. This helps shed light on the puzzling phenomenon of moderate terrorists leaders engaging in behavior that radicalizes their supporters to the point where those "supporters" may no longer be willing even to endorse the positions of the moderate leaders who recruited them. Of course, to fully explore this phenomenon one would want to model a strategic relationship between the moderate leadership and the moderate rank-and-file explicitly. But this comparative static suggests an intuition about strategic moderate leaders' incentives.

Another implication of this line of reasoning is that the more control the moderates have over the terrorist organization (low λ) the better the offer from the government. Thinking of this intuition within a more dynamic framework yields the prediction that moderate leaders will be particularly interested in seeking out a deal with the government when they believe their control over their organization is beginning to decline. This is because if they wait too long and the extremists take control (high λ), then the deal they will ultimately strike with the government will not be as favorable. This suggests an intuition for why governments might aid extremist challengers to moderate terrorist groups. By doing so the government both increases the moderates' incentives to accept concessions before their power slips away and decreases the ultimate level of concessions granted. Such a strategy was followed, for instance, by the Israeli government during the first Intifada when it lent support to the emerging extremist Islamic movement, which gave rise to groups such as Hamas and Islamic Jihad, in order to encourage an internal challenge to the PLO (Wilkinson 1993). And, indeed, the result was that the PLO's control over Palestinian terrorism was weakened and, eventually, this brought the relatively moderate PLO to the negotiating table.

Finally, coupling this intuition with the commitment problem between the moderate terrorists and the government yields another result. For the reasons just elucidated, while moderates are actively engaged in terrorism they have an incentive to limit the power of the extremists within the organization. However, once the moderates accept a deal, the continued existence of extremists helps to insure the credibility of government concessions. As such, the model suggests that moderate terrorists might demonstrate an ability to control extremists within their ranks while they are still actively engaged in terror, yet be reluctant to do as much to eradicate those extremists after accepting concessions.

An Application to the Palestinian/Israeli Conflict

A full empirical treatment is beyond the scope of this paper. However, it is instructive to see how the fundamental workings of the model map onto a real world case of government concessions to the moderate factions of a terrorist organization.

The first peace negotiations between Palestinians and Israelis took place in 1991 in Madrid. These negotiations eventually led to the signing of the first Oslo accord in September of 1993, followed by a series of interim peace agreements. The basic framework for negotiations revolved around land for peace. The Israelis agreed to withdraw gradually from occupied lands and grant the Palestinian Authority increasing levels of autonomy in exchange for demilitarization, the cessation of violence, and the PLO's recognition of Israel's right to exist. Further, one of the conditions for the implementation of Israeli concessions was a Palestinian Authority crack-down on extremist violence (Hermann and Newman 2000, Shlaim 1996). That is, consistent with the model, the PLO's ability to help the Israelis prevent terror was intended to

serve as a guarantor of the credibility of Israel's promises.

The Oslo accords created a split among Palestinian nationalists. Extremist factions, including the Popular Front for the Liberation of Palestine, Hamas, Islamic Jihad, and the al Aqsa Martyr's Brigade have rejected the agreement. As Article 13 of the Hamas Charter states:

> [Peace] initiatives, the so-called peaceful solutions, and international conferences to resolve the Palestinian problem all contradict the beliefs of the Islamic Resistance Movement. Indeed, giving up any part of Palestine is tantamount to giving up part of its religion. The nationalism of the Islamic Resistance Movement is part of its religion, and it instructs its members to [adhere] to that and to raise the banner of Allah over their homeland as they wage their Jihad (translated in Mishal and Sela 2000).

As recent events have demonstrated, the Israelis seem to have concluded that they overestimated the helpfulness of the Palestinians in counter-terror. This has led them to renege on promised concessions, which, as predicted in the commitment sub-game, has led the Palestinians to reduce their aid in counter-terror. In this scenario, in which the increase in counter-terror following concessions is less than anticipated, the model predicts that there will be an increase in violence, due to the increased militancy of the terrorist movement. Importantly, this must not have been Israel's expectation. But the government's subsequent behavior indicates that Israeli leaders have concluded that their expectations were incorrect.

Consistent with the model, an increase in violence did occur concomitant with the relatively moderate PLO's decision to negotiate with the Israelis, leaving the terror

campaign in the hands of more extreme factions. As resources given by donors who support armed resistance and control of terrorist activity and recruitment shifted to the still-active factions, the extremists were able to increase the level of violence. The number of annual fatalities from Palestinian terrorism are reported in Figure 3.

(Figure 3 about here)

An important alternative explanation for this increase is the spoiler effect suggested by Kydd and Walter (2002). The radicals wanted to undermine the peace process and so engaged in more terrorism than they otherwise would have. The key challenge, in order to assess the validity of my model, is to separate out violence due to the spoiler effect.

Spoiler violence is only expected to occur prior to major agreements and perhaps just after those agreements. The key spoiler opportunities in the Israeli/Palestinian conflict are summarized in Table 1. Following Kydd and Walter, I have classified Palestinian and Israeli elections, in addition to important negotiations, as spoiler opportunities. I consider a larger set of spoiler opportunities than did Kydd and Walter, leading to somewhat different conclusions.

(Table 1 about here)

Figure 4 gives monthly fatalities from Palestinian terror for the time period between Oslo and the onset of the second Intifada in September of 2000 and Figure 5 from the beginning of the second Intifada through December 2002.[3] I separate these

[3]The full data are available from the author's website. These data are collected from the International Policy Institute on Counter-Terrorism in Herzliya, http://www.ict.org.il. I have counted any person that was killed directly by a Palestinian terrorist attack (other than the terrorist him or her-

two graphs because there has been a qualitative increase in the amount of violence since the advent of the second Intifada. Combining the data makes it difficult to see spikes in violence - which constitute evidence of the spoiler effect - because the level of post-second Intifada violence dwarfs pre-second Intifada numbers. Separating the data in this way gives the spoiler model the benefit of the doubt. As can be seen in Figures 4 and 5, while there were spikes in violence prior to the signing of the Cairo agreement, the Israel-Jordan peace accord, and the Palestinian elections, there were not spikes before Oslo II, the Israeli elections of 1996 or 1999, the first Taba negotiations, the Wye Accords, the Sharm el-Sheik Memorandum, or the Camp David negotiations. Because they fall near the beginning of the increase associated with the second Intifada, it is debatable whether there was a spike prior to the joint statement from Taba in January of 2001 and the Israeli elections in February of 2001. While some of the increase in violence that followed Oslo was likely the result of the spoiler effect, much of it occurred during periods when there were not significant spoiler opportunities. This suggests that other factors, such as the increased militancy that resulted from groups such as Hamas and Islamic Jihad taking control of the terrorist movement, also play a role in explaining the increase in violence.

(Figures 4 and 5 about here)

The evidence for this claim can be further solidified by a simple statistical test to determine whether the average level of monthly fatalities is greater during spoiler

self) in the Occupied Territories or in Israel proper. This includes accidental killings of sympathetic Palestinians as well attacks on Israeli military personnel. It does not include innocent by-standers (whether Israeli or Palestinian) caught in the cross-fire and killed by Israeli forces. While inherently mired in political debates, I do not intend this codification to carry a particular political message. Changing the coding rules would not qualitatively alter the results.

opportunities than during other time periods. It is unclear how long a period constitutes the spoiler opportunity surrounding a negotiation or election. The periods around major events that Kydd and Walter examine range from a couple of weeks (prior to the Israel-Jordan Peace Accord) to several months (prior to Wye). The typical period they look at is approximately a month. Following their lead, I treat the month of, as well as the month prior to and after, a major strategic event as a spoiler opportunity. I partition the monthly data into two groups: violence that occurred during a spoiler opportunity and violence that occurred when there was not a spoiler opportunity. The summary statistics for these data are given in Table 2.

(Table 2 about here)

Surprisingly, the mean level of violence during spoiler opportunities (5.1) was lower than during periods where there were not spoiler opportunities (10.2), contradicting the spoiler model. This anomalous result can be explained by the fact that there have not been spoiler opportunities since early 2001, while there has been a significant increase in violence due to the advent of the second Intifada. Of course, this increase in violence in the absence of spoiler incentives is itself evidence that factors in addition to spoiler effects are at work. And in support of my model, it has been the extremists that have stoked the flames of violence.

Nonetheless, it is worthwhile to examine whether the spoiler effect explains most of the increase in violence that occurred after Oslo prior to the second Intifada or whether there is room for additional explanatory theories, such as increased militancy. To examine this, I consider the same partition of the data but only look from September 1993 through September 2000 (when the second Intifada began). The summary

statistics for this procedure are shown in Table 3.

(Table 3 about here)

In this more limited set of data the level of violence is now slightly higher during spoiler opportunities than during other periods, as the spoiler model predicts. However, a t-test demonstrates that the difference in levels of violence with and without spoiler opportunities is not statistically significant.[4] Thus, the data support the contention that factors beyond the spoiler effect, such as increased militancy, contribute to the increase in violence experienced since the signing of the Oslo accord. Further, the historical events conform to the two main causal claims of the model. First, the increase in violence coincided with the moderate accepting concessions, leaving the terrorist campaign in the hands of the extremists. Second, the concessions were made contingent on Palestinian counter-terror aid and the ability to withhold that aid has been used by the Palestinians to try to insure the credibility of Israeli promises.

Potential Extensions

The application to the conflict between Israelis and Palestinians also suggests avenues for extension of the model. The comparative statics regarding the terms of the negotiated settlement led to the intuition that moderates want to appear to have control over the extremists prior to an agreement but then, after concessions, might be reluctant to crack-down too strongly for fear of undermining their bargaining leverage. This pattern seems to have occurred in the Israeli/Palestinian case. While the current

[4]The null hypothesis is that the two means are equal and the alternative hypothesis is that there are more fatalities during spoiler opportunities. The t-statistic is 0.052, while the critical value for rejection of the null at the 95% confidence level is approximately $t > 1.67$.

model provides an intuition about the incentives for such behavior, a extension would offer a more nuanced understanding.

I have assumed that the government knows whether or not the former terrorists have provided counter-terror aid and can reward or punish them accordingly. In reality, the Israelis are uncertain of the extent to which the Palestinian Authority is trying to reign in militants. Further, the Israelis may be uncertain of the Palestinian Authority's *ability* to control extremists. Hence, there is both a moral hazard and a learning problem. Explicitly modeling these dynamics might yield insight into when the government will give up on negotiated settlement as well as when former terrorists are likely to exert significant effort (perhaps when the government is close to giving up on them) and when they are likely to shirk. Thus, building on the current model along these lines might shed further light on the dynamics underlying the Israeli/Palestinian conflict and others like it.

Another extension that the application suggests relates to the strategic interaction between terrorist factions. Extremists can respond to moderates who negotiate with the government in a variety of ways. They might attempt to make a counter-offer to persuade the moderates not to accept concessions. They might also engage in violence against the former terrorists to prevent them from aiding the government in counter-terror. Indeed, empirical cases of terrorism reveal a range of outcomes along these lines. While extremists within some insurgent groups have explicitly decided not to take action against moderate factions – such as Hamas' refusal to engage in violence against the PLO (Abu-Amr 1993) or the Irgun's decision not to fight back against the Hagannah (Bell 1976) – in other cases violence amongst terrorist factions is quite extreme – as in the case of the Sri Lankan LTTE's (also known as the Tamil

Tigers) brutal attacks against competing and moderate Tamil groups (Saravanamuttu 2000). An interesting extension of this model would allow terrorist cells to invest effort in anti-government violence and internal violence and would attempt to deduce the conditions under which internal violence will occur.

Conclusion

The model developed above yields three key results. First, it suggests an explanation of the observation that government concessions often lead to an increase in the militancy of terrorist organizations. Namely, concessions draw moderate terrorists away from the terrorist movement, leaving the organization in the control of extremists. Second, it provides an answer to the question of why governments make concessions in light of the increased militancy they engender. The government's probability of succeeding in counter-terrorism improves following concessions due to the help of former terrorists which directly improves counter-terror and leads the government to invest more resources in its counter-terror efforts. Thus, terrorist conflicts in which concessions have been made are more violent but shorter. Third, it demonstrates how the ability of former terrorists to provide counter-terror aid to the government can solve the credible commitment problem that government's face when offering concessions.

The model also yields hypotheses regarding the level of government investment in counter-terrorism, the effect of negotiated agreements on the duration of terrorist conflicts, the impact of government counter-terrorism capabilities on the sustainability of a negotiated agreement, the terms of negotiated settlements between governments and terrorists, the incentives for moderate terrorists to radicalize their followers, reasons for governments to encourage radical wings that challenge the moderate leadership

of terrorist organizations, and changes in moderate willingness to control extremists before and after negotiated settlement.

Appendix

Proofs of Remark, Lemmas, and Propositions

Proof of Remark 1 To show that at an interior solution a^* is increasing in T note that

$$\frac{\partial^2 U_G}{\partial T \partial a} = \frac{\partial \sigma}{\partial a}\frac{\partial \pi}{\partial t}(B - \gamma - T - k + V_G(H)) + \frac{\partial \sigma}{\partial a}(1-\pi) + (1-\sigma)\gamma'\frac{\partial \pi}{\partial t}$$

The first term is positive by assumption ($B + V_G(H) - \gamma(\bar{a}) - R - \hat{k} > 0$), otherwise the government would surrender. The other two terms are clearly positive. Thus, the whole expression is positive, so U_G is supermodular in T and a which means that Edlin and Shannon's (1998) Monotonicity Theorem implies that a^* is increasing in T.

yTo show that $a^*(h = 1) > a^*(h = 0)$ notice that the government's expected utility function can be rewritten as follows:

$$U_G = \sigma(a,h)\,[W - (1-\pi)(B - \gamma(a) - T - k + V_G(H)] + (1-\pi)(B - \gamma(a) - k + V_G(H))$$

Since $W > B + V_G(H)$ it is clear that the first term is strictly positive. Further, it then follows that from the fact that $\sigma(a,h)$ has increasing differences that U_G has increasing differences in a and h. Thus, Topkis' Monotonicity Theorem implies that a^* is increasing in h (see Vives 1999, theorem 2.3). ■

Proof of Remark 2

To see that t_i^* is increasing in θ_i notice that,

$$\frac{\partial^2 U_i}{\partial t_i \partial \theta_i} = (1 - \sigma(a^*(t_i), h)) \frac{d\pi(t_i)}{dt_i} - \frac{\partial \sigma(a^*, h)}{\partial a^*} \frac{\partial a^*}{\partial t_i^*} \pi(t_i) \tag{9}$$

Recall that the first order condition is:

$$(1 - \sigma) \frac{d\pi}{dt_i}(\theta_i - P) - \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*}(\pi\theta_i + (1 - \pi)P) - (1 - \sigma)(1 - \pi)v'(R - t_i) = 0$$

Note that if the first term of this first order condition is not larger than the second term, then the whole condition is strictly negative. This is because, in that scenario, the actual level of terror is decreasing in the amount of resources devoted to terror because the positive effect of resources on terror is swamped by the indirect effect of an increase in counter-terror by the government. This leads to a corner solution in which the terrorists choose $t_i^* = 0$. Thus, at an interior solution the first term must be larger than the second term. Formally this implies that:

$$(1 - \sigma) \frac{d\pi}{dt_i}(\theta_i - P) > \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*}(\pi\theta_i + (1 - \pi)P),$$

which can be rewritten

$$(1 - \sigma) \frac{d\pi}{dt_i}(\theta_i - P) > \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*} \pi(\theta_i - P) + \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*} P$$

The right-hand side of this equation is strictly greater than:

$$\frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*} \pi(\theta_i - P)$$

Thus, the first order condition implies that

$$(1 - \sigma) \frac{d\pi}{dt_i}(\theta_i - P) > \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*} \pi(\theta_i - P)$$

which implies that

$$(1 - \sigma) \frac{d\pi}{dt_i} > \frac{\partial \sigma}{\partial a^*} \frac{\partial a^*}{\partial t_i^*}$$

Given this, equation (9) is strictly positive, so U_i is supermodular in t and θ, which, by Edlin and Shannon's Monotonicity Theory, implies that t^* is increasing in θ_i at an interior solution. ■

Proof of Remark 4

I need to show that there exists a k such that $EU_m(T^*_{m,e}) \leq k < EU_e(T^*_{m,e})$. If this is true then the moderates would like to accept but the extremists would not.

The existence of such a k can be confirmed by direct comparison of equation (3) for moderates and extremists. The claim is true if:

$$\frac{(1-\sigma_{m,e})\pi_{m,e}\theta_e + (1-\sigma_{m,e})(1-\pi_{m,e})v(R-T_{m,e})}{\sigma_{m,e} + (1-\sigma_{m,e})\pi_{m,e}} >$$
$$\frac{(1-\sigma_{m,e})\pi_{m,e}\theta_m + (1-\sigma_{m,e})(1-\pi_{m,e})v(R-T_{m,e})}{\sigma_{m,e} + (1-\sigma_{m,e})\pi_{m,e}}$$

which is clearly true since $\theta_e > \theta_m$ ■.

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