Is Transnational Terrorism Becoming More Threatening?

A TIME-SERIES INVESTIGATION

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This study applies time-series techniques to investigate the current threat posed by transnational terrorist incidents. Although the number of incidents has dropped dramatically during the post–cold war period, transnational terrorism still presents a significant threat. In recent years, each incident is almost 17 percentage points more likely to result in death or injuries. Three alternative casualties series (incidents with injuries and/or deaths, the proportion of incidents with casualties, and incidents with deaths) are investigated. These series increased in November 1979 with the takeover of the U.S. embassy in Tehran and again after the fourth quarter of 1991. The growth of religious terrorism appears to account for the increased severity of terrorist attacks since the last quarter of 1991. All three casualties series displayed more deterministic factors than the noncasualties series, which is largely random after detrending. Cycles in the aggregate incident series are solely attributable to the underlying casualties series.

After two decades of showing no signs of permanent abatement, transnational terrorism has fallen significantly in the post–cold war period due to reduced state sponsorship, increased efforts to thwart terrorism, and the demise of many leftist groups[1] (*The Economist* 1998; U.S. Department of State 1997). Much of this decrease in terrorist events with international consequences is concentrated in a reduced number of bombings (the favorite mode of operation of terrorists) to approximately 50 fewer incidents

1. On the reduction in state sponsorship, see Chalk (1996) and Clutterbuck (1994); on increased efforts to thwart terrorism, see Bremer (1992), Crelinsten and Schmid (1992), and Wilcox (1997); and on the demise of leftist groups, see Chalk (1996), Clutterbuck (1992), and Jongman (1992).

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per quarter (Enders and Sandler 1999).[2] Hostage-taking missions also show a decline, whereas less harmful events—for example, threats and hoaxes—show no significant drop. Even though transnational terrorism is down greatly, can we conclude that its threat to safety has ameliorated in the post–cold war period? If transnational terrorist incidents have decreased so dramatically, then why is such terrorism in the news so often these days? There is a clear perception by the media and others (e.g., *The Economist* 1998; Hoffman 1997, 1998) that transnational terrorism poses an even greater threat to lives and property despite its recent drop, thus suggesting that casualties are more associated with current terrorist events. A few recent events underscore this increased carnage: the 7 August 1998 simultaneous bombings of the U.S. embassies in Nairobi, Kenya (247 killed, 5,500 injured) and Dar es Salaam, Tanzania (11 killed, 57 injured); the 20 March 1995 Sarin attack on the Tokyo subway (12 killed, 5,500 injured); and the 26 February 1993 truck bombing of the World Trade Center in New York City (6 killed, about 1,000 injured).

To date, there has been no systematic analysis with the tools of statistical inference to ascertain whether the post–cold war period is characterized by a more lethal form of transnational terrorism. By constructing and analyzing three alternative casualties time series (i.e., incidents with injuries and/or deaths [denoted as casualties], the proportion of incidents with casualties, and incidents with deaths) from the first quarter of 1970 (i.e., 1970:1) to the second quarter of 1996 (i.e., 1996:2), our primary purpose is to determine whether transnational terrorism poses a greater danger to life and limb during the post–cold war period despite the decrease in the number of such incidents. A secondary purpose is to quantify this heightened threat, if found, for both the short run and long run, based on a vector autoregressive (VAR) analysis. A third purpose is to apply spectral analysis to distinguish the cyclical nature of the casualties series from that of the noncasualties series. A final purpose is to investigate whether an increased severity of attacks had its roots in a prior period or with a watershed event and, if so, to pinpoint this turning point and its impact. In particular, we want to ascertain if there is evidence, consistent with Hoffman's (1998) view, that the rise in religious-based terrorism marked such a turning point.

We uncover that a significant increase in severity characterizes the casualties series in the post–cold war period. Furthermore, the takeover of the U.S. embassy in Tehran on 4 November 1979 appears to mark the heightened danger point of transnational terrorism prior to the further ratcheting up in the severity of attacks in the 1990s. In contrast, incidents without casualties decline precipitously in the post–cold war era, thus suggesting a substitution of more deadly incidents for less lethal ones in recent years. Terrorists appear to be getting "more bang for their buck" by trying to achieve a greater impact from fewer events. Another interesting finding is that two of the three casualties series contain a primary cycle of 18.57 quarters and a secondary, much shorter, cycle of more than 7 quarters. The incident series involving one or more deaths displays two very long cycles: a primary cycle of 58.18 quarters and a secondary cycle of just less

2. Unlike the current study, Enders and Sandler (1999) do not distinguish the CASUALTIES and NONCASUALTIES series. This earlier study focuses on the impact of the post–cold war era on all incidents and selected modes of attacks.

than 6 years. By decomposing the series of all incidents into casualties and noncasualties series, we are able to conclude that the various casualties series impart the cyclical behavior to the entire series so that cyclical predictions are best made with respect to the casualties series.

The remainder of the article contains four sections. In the first section, important preliminaries concerning the changing nature of terrorism in the 1980s and 1990s are indicated. Other preliminaries include a discussion of the terrorist choice problem, the underlying causes of cycles, the data set, and the time series considered. An analysis of trends and cycles for the requisite time series follows in the next section. A VAR analysis is used in the third section to investigate the impact that the end of the cold war, the decline of left-wing terrorism, the export of religious fundamentalism, and other noteworthy developments have had on the casualties and related time series. Conclusions and policy implications are presented in the final section.

PRELIMINARIES

Terrorism is the premeditated use or threat of use of extranormal violence or brutality by subnational groups to obtain a political, religious, or ideological objective through intimidation of a large audience, usually not directly involved with the decision making.[3] Key ingredients include the political, religious, or ideological motive and the creation of a general atmosphere of fear from which popular pressures may be placed on government officials to reach an accommodation with the terrorists. Liberal democracies are especially susceptible to terrorism because elected officials are expected to protect the lives and property of their electorate or face defeat in a subsequent election.[4] In a liberal democracy, terrorists are more likely to receive the media attention that they seek. This access to the media is one factor that causes terrorist grievances from other countries to spill over to a liberal democracy that is not party to the grievances. Thus, Western Europe has served as a venue for terrorism from other regions, such as the Middle East.

When a terrorist act (e.g., a kidnapping, bombing, skyjacking, assassination) has ramifications that transcend a national boundary, it is an instance of transnational terrorism. An act can be transnational owing to the foreign ties of its perpetrators, the nature of its institutional or human victims, the target of its demands, or the execution of its logistics (Mickolus, Sandler, and Murdock 1989). Events that start in one country and end in another (e.g., the skyjacking of an international flight, a cross-border raid) are transnational. An event planned in one country that attacks the citizens or property of a second country but on the soil of a third country is also an act of transnational terrorism. Such tri-country events characterize a number of the transnational terrorist attacks in the 1990s attributable to Osama bin Laden (e.g., the bombing of the U.S.

3. This definition combines key features of definitions in the literature; see Hoffman (1998, chap. 1), Mickolus (1982), and Schmid and Jongman (1988).

4. The dilemma confronting a liberal democracy is explained in the seminal work by Wilkinson (1986).

embassies in Kenya and Tanzania in 1998) and other fundamentalist leaders. To examine the international implications of world events (e.g., the end of the cold war, the rise of fundamentalism) on the threat of terrorism, transnational rather than domestic terrorist incidents are the more relevant concern.[5] Moreover, the alarm expressed in the media about the threat of terrorism has been with respect to transnational events.

From the late 1960s until the late 1980s, transnational terrorism has been primarily motivated by nationalism, separatism, Marxist ideology, racism, nihilism, and economic equality (Wilkinson 1986). In the 1990s, the motivation of terrorism has changed with "the emergence of either obscure, idiosyncratic millennium movements" or religious-based groups (Hoffman 1997, 2; 1998, 185-99). When religion provides the dominant objective of a group that employs terrorist tactics, it is identified as a religious terrorist group (e.g., Hamas, Algerian Armed Islamic Group [GIA], Hezbollah, Egyptian Gamat al-Islamiya).[6] Since the start of 1980, the number of religious-based groups has increased as a proportion of the active terrorist groups: 2 of 64 groups in 1980, 11 of 48 groups in 1992, 16 of 49 groups in 1994, and 25 of 58 groups in 1995 (Hoffman 1997, 3).[7] In 1995, one quarter of transnational terrorist incidents in the RAND-St. Andrews University Chronology were religiously-motivated events, and more than half of them resulted in one or more deaths (Hoffman 1998, 93). This increase can be attributed to a growth of religious fundamentalism worldwide, the diffusion of the Islamic revolution from Iran, and the approach of the millennium. With this motivational change, Hoffman (1997, 1998) and Juergensmeyer (1997) view the new generation of terrorists as posing a more deadly threat than earlier terrorist groups that wanted to win over the people and, in so doing, did not want to leave massive casualties. During these earlier decades, precision attacks were directed at well-defined targets of the establishment.

The demise of many leftist groups in the late 1980s and 1990s is attributable to at least three factors: (1) domestic efforts by some terrorism-prone countries (e.g., France, Germany, Spain, the United Kingdom) to capture and bring to justice group members,[8] (2) reduced state sponsorship of left-wing groups by East European and Middle Eastern countries (Chalk 1996; Clutterbuck 1994; Jongman 1992), and (3) the reduced interest in Marxism following the collapse of so many communist regimes. These factors were bolstered by collective initiatives by the European Union (EU) to foster cooperation in terms of extradition, shared intelligence, and accrediting foreign diplomats (Chalk 1994; Wilkinson 1992; Zagari 1992). In recent years, NATO also has begun a program to address collectively the risks posed by transnational terrorism (Wilcox 1997).

5. Differences between the trend in domestic and transnational terrorism are studied by Jongman (1992). A worldwide time series of domestic events does not currently exist.

6. Political demands are made by these groups to further a religious imperative (Juergensmeyer 1997; Rapoport 1984), such as a holy war against another country.

7. These group figures indicate that it is not only the decline in leftist terrorism but also the increase in religious terrorism that is behind the relative increase in the latter.

8. Terrorist groups on the left that either have disappeared or almost disbanded include Action Direct, the Red Brigade, Red Army Faction, Fighting Communist Cells, Popular Forces 25 April, and the Revolutionary Cells (Alexander and Pluchinsky 1992; Chalk 1996). Leftist groups that remain active include First of October Anti-Fascists Resistance Group (GRAPO), Revolutionary Organization 17 November, and Dev Sol.

Another recent development in terrorism has been the increase in more amateurist groups that are less disciplined and have less leadership and structure than groups in earlier decades (Hoffman 1997, 1998). The IRA splinter group responsible for the Omagh bombing in Northern Ireland on 15 August 1998 is a case in point. The group did not follow standard IRA procedures and issued a warning that herded people nearer to the subsequent blast. Some days later, the group apologized and ceased operations. If members' actions are not constrained, then a few fanatical individuals can cause great carnage. Some of the new groups appear determined to lash out at Western interests to make a statement rather than to seek political change.

The greater prevalence of religious groups can increase the lethal aspect of post–cold war terrorism because such groups view civilians as legitimate targets of a "decadent" society. Religious groups that declare a Jihad or holy war against another nation consider its people, not just its officials, the enemy. Moreover, religious terrorist groups act out of a desire to satisfy their own goals (e.g., ascend to heaven) rather than win favor with an external constituency. Violence may be viewed as a purifying act. Although it is tempting to attribute the increased casualties per incident documented below to better technology available to terrorists, incidents have not really relied on new technologies. Old-fashioned bombs were used at the World Trade Center, Oklahoma City, Nairobi, and elsewhere. The difference today is that these bombs are often planted to explode where and when maximum carnage would result.

The nature of the choice-theoretic decision confronting religious terrorist groups *may result* in a different outcome than the one anticipated with more traditional groups, which are more risk averse.[9] A terrorist group must first decide its allocation of resources between terrorist and nonterrorist activities. Next, the group must allocate its terrorism-designated resources among various modes of attack so as to equate the expected marginal gain per dollar spent on alternative operations.[10] Both of these allocative decisions involve uncertain outcomes, which are influenced, in part, by the group's attitude toward risk. A risk-loving group will attempt more risky operations, whose expected payoffs in terms of their impact on the targeted audience are greater and whose prices are also higher to the perpetrators than those executed by a risk-averse group. Although the terrorists of the 1970s and 1980s engaged in some risky operations, most of their attacks were logistically simple and relatively riskless (Sandler, Tschirhart, and Cauley 1983). The increased proportion of fundamentalist religious groups and fanatical groups that are not averse to risks among the active terrorist groups in the post–cold war period is expected to increase the proportion of risky and logistically complex incidents undertaken.[11]

9. We ascribe to the view that terrorists act in a rational way by responding to risks and opportunity cost considerations. If we were to discount terrorists' rationality, their behavior would be random and, thus, unpredictable.

10. On choice-theoretic models of terrorist behavior, see Enders and Sandler (1995, 1996), Islam and Shahin (1989), Landes (1978), and Sandler, Tschirhart, and Cauley (1983).

11. The nature of the data allows us to look at outcomes (e.g., casualties or no casualties) but not at the terrorists' true intention for any given event. Although we acknowledge this limitation, a statistically significant increase in casualties coming at a hypothesized turning point still serves to support our hypothesis. Some casualties can be unintentional, but then there should not be a statistically significant jump to such unintentional random outcomes.

Another implication of the new mix of terrorist groups concerns the effectiveness of government policies that attempt to influence terrorist choices between terrorist and nonterrorist activity and among alternative terrorist modes of attack. Government policies that make some acts more risky or expensive than others (e.g., hardening a target) may not induce the intended substitution away from such activities if terrorists seek risks. When combating groups that like risks or place a high (infinite) value on reaching heaven through martyrdom, the authorities must be aware that standard policies to thwart terrorism may be ineffective in deterring these groups (Sandler and Lapan 1988). Policies that were successful in curbing terrorist activities in earlier decades may be less effective with the new brand of terrorists. This implies that antiterrorism policy must now be directed at annihilating such groups and their offshoots through infiltration and subsequent raids. If the 1990s have meant less state sponsorship, then the implied reduction in terrorist resources would result in fewer terrorist incidents. Unfortunately, the changing character of the terrorists and their proclivity for risks and lethalness should imply that incidents should on average display more casualties. This hypothesis is later tested.

DATA

Data on transnational terrorist incidents are drawn from International Terrorism: Attributes of Terrorist Events (ITERATE), a data set that records the incident date, location, type, number of people killed, number of people wounded, and other variables.[12] Three ITERATE data sets are strung together to provide observations from 1970:1 to 1996:2: ITERATE 2 covers 1968 to 1977; ITERATE 3 covers 1978 to 1987; and ITERATE 4 covers 1988 to 1996:2.[13] By applying identical criteria and maintaining continuity among coders, ITERATE preserves its coding consistency over the various updates. ITERATE relies on the world's news print and electronic media for its data, with particular reliance on the Foreign Broadcast Information Service (FBIS) *Daily Reports*, which survey hundreds of the world's newspapers and related sources. Versions of ITERATE after 1996:2 do not rely on FBIS and may not be picking up the small incidents; but because we do not use data after this date, this is not a concern here. There is also the issue of incidents that were either aborted or stopped at the plotting stage. Such incidents are not in ITERATE. Because this study focuses on the various casualties series, this potential selection bias is not relevant for our study—that is, an aborted event could not *ex post* result in casualties.

A time series in Figure 1 for the number killed per quarter during transnational terrorist incidents from the start of 1970 to mid-1996 indicates that such casualties ratcheted up in the 1980s, where the horizontal axis denotes the time period. Moreover,

12. ITERATE attempts to record evidence of state sponsorship but only after 1977. Unfortunately, the source write-ups used for coding purposes provide almost no information about state sponsorship, and, hence, this variable was seldom coded. Because it is an unreliable variable, it is not included in our analysis.

13. ITERATE is described in greater detail in Mickolus (1982) and Mickolus, Sandler, and Murdock (1989). Mickolus (1982) is the source for ITERATE 2, and Mickolus et al. (1989) is the source for ITERATE 3. ITERATE 4 is contained in Mickolus et al. (1993). From written descriptions of international events from 1992:1 to 1996:2 provided by Mickolus we coded the most recent events, using ITERATE conventions.

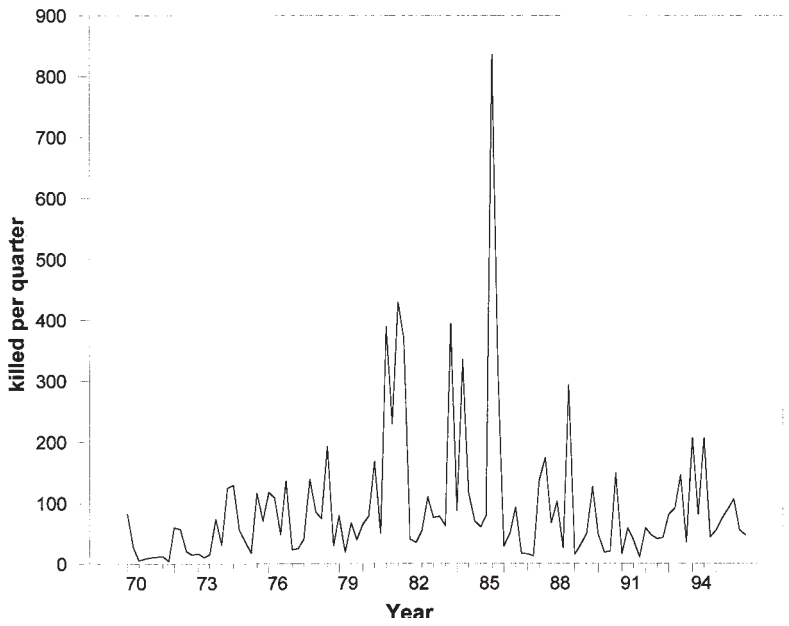

Figure 1: Number Killed

the 1990s do not appear to differ in terms of the *absolute* number killed as compared with the preceding quarters in the late 1980s. An alternative times series in Figure 2 for the number wounded per quarter during terrorist incidents for the same sample period shows that such casualties increased in the 1980s as compared with the 1970s; in contrast to the earlier series, the wounded series reveals a heightened threat in the 1990s as compared with the latter 1980s. Although these series provide some useful information, they are not really the appropriate time series to tests our hypotheses because they do not adjust for the changing number of incidents over the sample period.[14] One incident with a large body count (i.e., the downing of Air India Flight 182 on 23 June 1985) can have a dominant influence on the properties of the series, leading to outlier problems. Another statistical concern involves what should be classified as casualties. Incidents that resulted in injuries or deaths would indicate a greater cost and threat to society than those without any casualties.

A CASUALTIES series is constructed for the sample period (1970:1 to 1996:2) and consists of terrorist incidents per quarter that ends in one or more injuries, deaths, or both. In putting together this series, we count an incident with both injuries and deaths as a single incident with casualties. By accounting for incidents with casualties, this

14. As one referee pointed out, casualties do not adequately measure the human misery associated with terrorism. To date, there are no data on this important variable. In any time-series study, the researcher must resort to some count measure as a proxy.

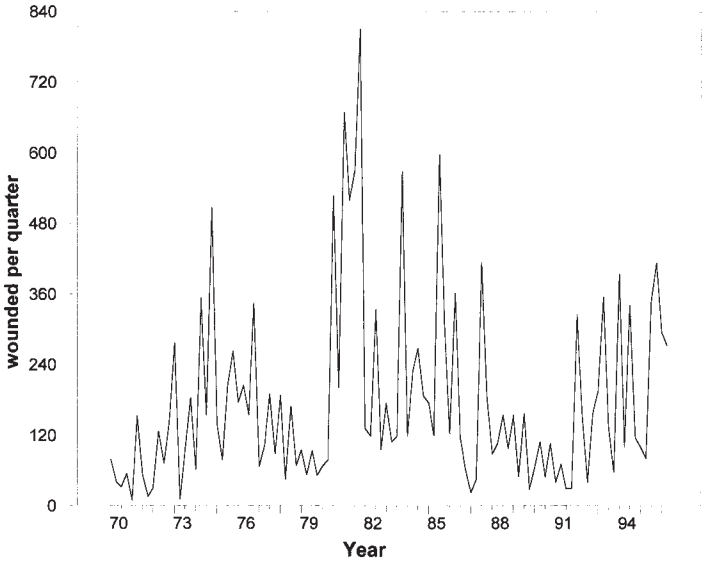

Figure 2: Number Wounded

series gives an incident-specific measurement of casualties but does not adjust for the declining number of incidents. To address this problem, we construct a second casualties series consisting of the proportion of incidents with casualties per quarter, henceforth called PROPORTION. If incidents were on average becoming more life threatening, then the proportion of incidents ending in casualties should increase. In Figures 3 and 4, the CASUALTIES and PROPORTION series are displayed, respectively. Although each series shows peaks and troughs, both series appear to shift up in the 1990s, with a more marked increase characterizing the PROPORTION series. Moreover, the behavior of both series suggests greater casualties in the 1980s as compared with the 1970s. As a crosscheck, we also construct a third casualties series, denoted by DEATH EVENTS, which includes only those incidents in which one or more individuals died. This new series reflects a more heightened consequence than the CASUALTIES series, which contains many incidents with just injuries. In Figure 5, the DEATH EVENTS series has a very similar pattern to the more encompassing CASUALTIES series, because incidents with deaths also increased in number in the late 1970s and again in the 1990s. Although visual inspection is instructive, a rigorous time-series analysis is always required to quantify the significance, if any, of these changes.

Two additional time series prove useful when quantifying either the influence of the post–cold war era or the exportation of fundamentalist religions. Insofar as terrorists must allocate between alternative events, the CASUALTIES series and its component

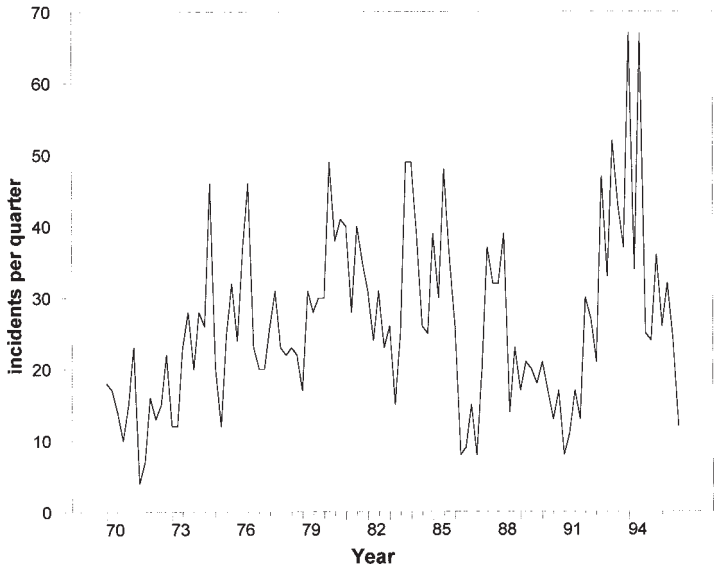

Figure 3: Incidents With Casualties

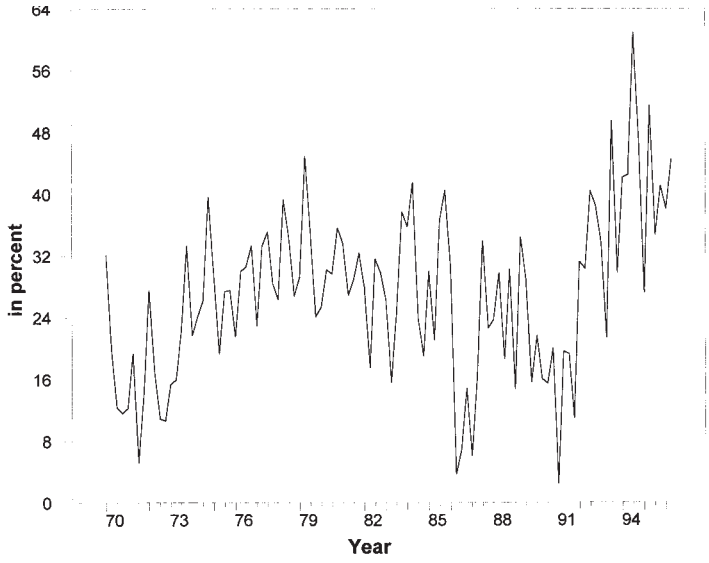

Figure 4: Proportion of Incidents With Casualties

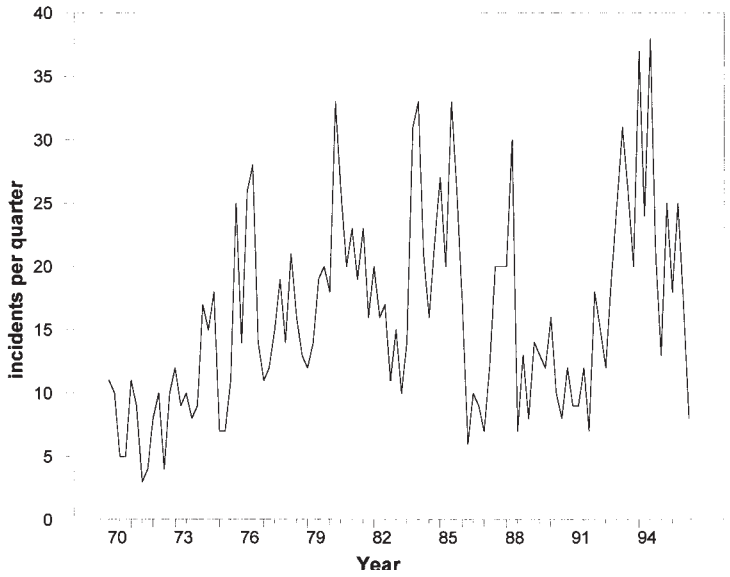

Figure 5: Incidents With Deaths

series are apt to be related to the NONCASUALTIES series; hence, the latter is also extracted from the data. An INCIDENTS series, which includes all incidents, proves helpful for comparison purposes with earlier studies.[15] The NONCASUALTIES and INCIDENTS series in Figures 6 and 7, respectively, indicate a shift up in the 1980s followed by a shift down in the 1990s. All five time series are quarterly to eliminate zero-valued observations, inconsistent with the normal distribution assumption underlying the VAR analysis in the third section.

In Table 1, we list the characteristics of the time series, including the number of observations, mean, standard error, minimum (MIN) observation, and maximum (MAX) observation. In total, there are 106 quarters of observations, sufficient to use data-intensive spectral analysis and VAR analysis to investigate cycles and the interrelationship among series, respectively. On average, incidents with any form of casualties comprise about one quarter of the terrorist events in the INCIDENTS series, whereas those with deaths comprise about 16% of terrorist events. The NONCASUALTIES series displays a much larger dispersion than the CASUALTIES or the DEATH EVENTS series over the entire sample period, suggesting a greater randomness. The MIN values indicate that these quarterly time series have no zero observations, thus supporting the underlying assumption of normally distributed distur-

15. This earlier literature includes Enders, Parise, and Sandler (1992); Enders and Sandler (1993, 1995); and Im, Cauley, and Sandler (1987). See Brophy-Baermann and Conybeare (1994) for a time-series intervention analysis of Israeli antiterrorist policies. A pioneering study by Midlarsky, Crenshaw, and Yoshida (1980) represents the first use of the autocorrelation function to investigate the time series of terrorist incidents.

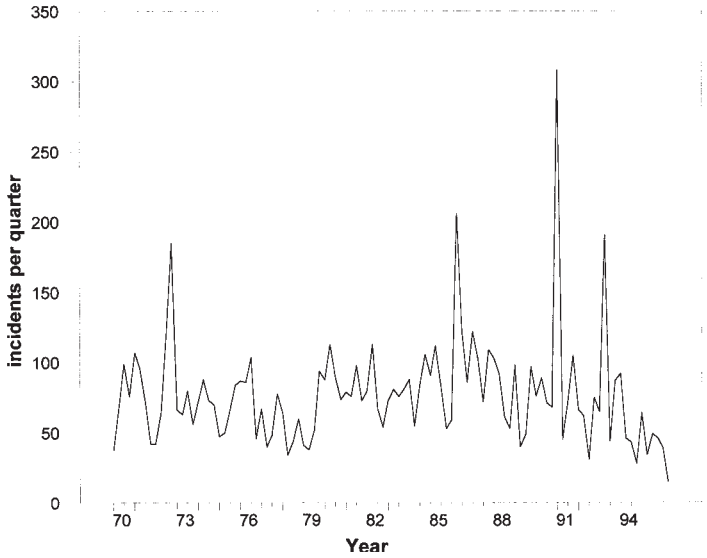

Figure 6: Incidents Without Casualties

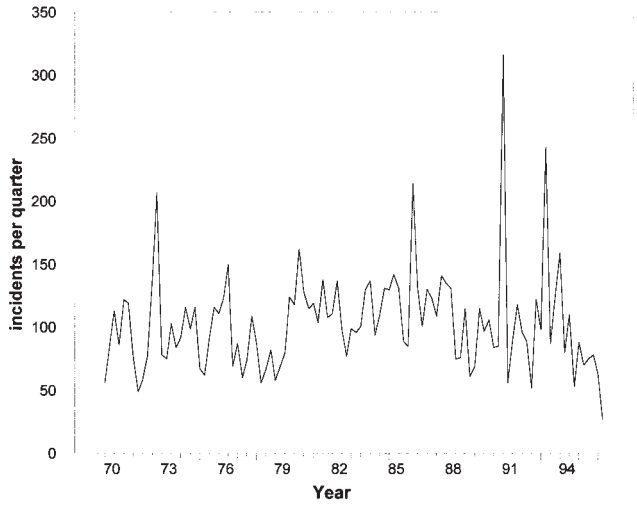

Figure 7: All Incidents

bances. The PROPORTION series possesses a dispersion to mean ratio almost identical to the CASUALTIES series.

Two structural break points prove of interest for the VAR analysis. First, the start of the post–cold war era is set at 1991:4 to coincide with the official demise of the Soviet Union (20 December 1991) and the Warsaw Pact (1 July 1991). This date also corre-

TABLE 1
Quarterly Series' Characteristics (1970:1 to 1996:2)

Series	*Number of Observations*	*Mean*	*Standard Error*	*Minimum*	*Maximum*
INCIDENTS	106	103.51	39.97	27.0	316.0
CASUALTIES	106	26.33	12.25	4.0	67.0
NONCASUALTIES	106	77.18	38.43	15.0	308.0
PROPORTION	106	0.27	0.11	0.03	0.6
DEATH EVENTS	106	16.12	7.23	3.0	38.0

NOTE: INCIDENTS consists of all transnational incidents; CASUALTIES includes all transnational incidents for which one or more individuals were killed and/or wounded; NONCASUALTIES concerns all transnational incidents for which no one was injured or killed; PROPORTION consists of the proportion of all incidents ending in a casualty (i.e., CASUALTIES/INCIDENTS); and DEATH EVENTS includes all transnational incidents for which at least one person died.

sponds to the decline in state sponsorship of terrorism by countries in Eastern Europe and elsewhere. A recent study indicates that much of the structural change in the INCIDENTS series is concentrated at this date rather than at 1989 or 1990 at the very start of the transition from communism in Eastern Europe (Enders and Sandler 1999). This structural break point allows a little time for the changes caused by the transition from communism to impact terrorist operations. Moreover, it is important not to choose a date in 1990 or early 1991 that overlaps with events in Kuwait, which sparked a good deal of terrorism. Visual inspection of the series also suggests that a structural impact is taking place around the end of 1991. Second, a structural break point for the exportation of religious fundamentalist regimes is needed. In this case, we let the data identify any structural shift point at or around the takeover of the U.S. embassy in Tehran. Thus, the 1978:1 quarter and thereafter are examined to identify the quarter with the largest significant structural change for the various series. We begin at the start of 1978, because it marked the beginning of U.S. difficulties in Iran. The last quarter of 1979 is propitious for a rise in fundamentalism, not only because of the U.S. embassy takeover but also the Soviet invasion of Afghanistan on 27 December 1979. Our method of examining alternative points for a structural change allows for a test of Hoffman's (1998) characterization of the end of 1979 as the time of a shift to a more lethal form of terrorism.

TREND AND CYCLES

To distinguish stochastic from deterministic components, we decompose each of the five incident series into three components:[16]

16. Equation 1 is the standard decomposition equation used in time-series analysis. Although it is linear, its component parts need not be linear, as shown in the text.

TABLE 2
Trend Estimates for the INCIDENTS Series

Series	*Constant*	t	t^2	t^3	F *Statistics*	*ADF(4)*[a]
INCIDENTS	68.17	1.360	–0.010	—	2.90	–3.94
	(4.39)	(2.37)	(–2.34)		[0.060]	
CASUALTIES	6.49	1.43	–0.027	0.00016	7.16	–3.37
	(1.43)	(3.91)	(–3.45)	(3.19)	[0.0002]	
NONCASUALTIES	93.63	–2.58	0.071	–0.00049	20.03	–5.11
	(6.33)	(–2.17)	(2.76)	(–3.11)	[0.000]	
PROPORTION	7.24	1.69	–0.038	0.00024	18.59	–4.36
	(2.03)	(5.37)	(–6.06)	(6.26)	[0.000]	
DEATH EVENTS	1.91	0.94	–0.017	0.0010	10.53	–3.80
	(0.69)	(4.25)	(–3.56)	(3.22)	[0.000]	

NOTE: Figures in parentheses are *t* statistics; figures in brackets are prob values.
a. ADF(4) lists the Augmented Dickey-Fuller test statistics (with four lags) for a null hypothesis that the residuals of the filtered series have a unit root. Because the critical value at the 95% significance level is –2.90, we can reject the null of a unit root for all of the residual series.

$$y_t = z_t + x_t + \mu_t, \tag{1}$$

where y_t is the number or proportion of incidents (depending on the time series investigated) in quarter t; z_t represents the series' trend component in quarter t; x_t denotes the series' cyclical component in quarter t; and μ_t indicates the series' random component. When present, trend can be linear or nonlinear; earlier studies uncovered nonlinear trends for most terrorist series (Enders and Sandler 1995). The cyclical component corresponds to "wavelike" or sinusoidal patterns of peaks and troughs that derive from reoccurring spacing of high activity and relative calm. The irregular component, μ_t, is a stochastic residual. If μ_t is nonstationary (stationary), then each irregular shock to the series results in a permanent (nonpermanent) change in the mean. Nonstationarity is investigated with an Augmented Dickey-Fuller (ADF) unit-root test on the residual series with deterministic trend removed.

TREND AND STATIONARY

The standard procedure for ascertaining trend is by fitting a polynomial,

$$z_t = \sum_{i=0}^{n} \alpha_i t^i, \tag{2}$$

where the α_is are the coefficients on the time terms. Procedurally, additional trend terms are added until the subsequent coefficient is no longer statistically significant. Table 2 indicates the trend estimates for the five incident series, all of which are characterized by a nonlinear trend in which the aggregate series of all incidents follows a quadratic trend and the other four series display a cubic trend. This cubic trend is

consistent with earlier breakdowns of the INCIDENTS series into finer categories (i.e., bombings, hostage-taking missions, assassinations); however, the CASUALTIES, NONCASUALTIES, and DEATH EVENTS series have never before been investigated. The next-to-the-rightmost column depicts the *F* statistics and their "prob" values in brackets, representing the statistical significance of the *F* statistics. These significance levels are at the .06 level or better for the polynominal-fitted trend equations. Such prob values are strongly supportive of the fitted equation for trend. The presence of a nonlinear trend cautions against simple statements about an upward or downward trend to an underlying time series. In fact, the positive and negative coefficients of higher-degree polynomials terms imply an oscillating trend, not unlike cycles to which we turn shortly.

To test for stationarity, we remove the trend from the data using the fitted polynomial estimates and regress y_t on the polynomial z_t. An ADF test is then conducted on each of the fitted series with four lags to account for seasonality. In the right-hand column of Table 2, all of the ADF statistics are insignificant at the 95% level so that all five trend-filtered series are stationary.

SPECTRAL ANALYSIS AND THE PRESENCE OF CYCLES

Once trend has been purged from the series, spectral analysis can then be applied to this residual series to identify regular cycles (or the time interval between two peaks) of a given period.[17] Cycles in terrorism data can be theoretically justified if actions of terrorist groups or government authorities cause incidents to be bunched together or separated from one another at a regular interval. A standard explanation of this clustering can be attributed to a contagion process in which successful incidents stimulate via the media copycat incidents (Enders and Sandler 1999). This process culminates with a public outcry that actions be taken in terrorism-plagued countries to address heightened terrorism levels. In response to this public pressure, the authorities allocate more resources to thwart terrorism and fund effective counters to prevalent modes of attacks such as the installation of metal detectors in airports. If such counters can be used in a wide range of events (e.g., metal detectors could also protect embassies), then a general fall in transnational terrorism results. In some instances, antiterrorism policies (e.g., improved intelligence) have a negatively impact on multiple terrorist groups (Alexander and Pluchinsky 1992). Just as terrorists copy effective new means of attack, authorities quickly adopt effective measures devised abroad (e.g., metal detectors were placed in airports worldwide following their introduction in U.S. airports). Successful counters diffuse rapidly. The resulting terrorist failures signal other terrorists to refrain from attacks and devise more effective modes of operations, leading to a lull in attacks. The attack-counterattack cause of cycles can be motivated by swings in public opinion, which are anticipated to result in long cycles in the 3- to 5-year range (Chalk 1995). This follows because it takes time for the public to unite in their outrage

17. To properly identify cyclical behavior using spectral analysis, the deterministic trend components must be first removed from the series (Gottman 1981).

and make their demands on officials who may be more responsive during periodic elections. Terrorist attacks with little consequence to the public—that is, those without injuries—are not expected to have cycles motivated by public opinion.

The attack-counterattack cycles can vary among different modes of terrorist operations so that each component time series is expected to have its own individualized periodicity. Logistically complex events (e.g., skyjackings, large car bombings, assassinations) are expected to possess longer cycles than less sophisticated events (e.g., small explosive bombings, threats), because it takes longer for the antagonists to develop measures and countermeasures for the more complex modes of attack. Past studies have borne out this anticipated difference in cycle length for alternative kinds of incidents (Enders and Sandler 1999; Enders, Parise, and Sandler 1992).

Cycles may also be due to political events that mobilize either the terrorists or the authorities to act. For example, past Arab-Israeli conflicts and the Gulf War of 1991 unleashed a wave of transnational terrorism directed at U.S. interests. The same outpouring of anger can follow a retaliatory action of the authorities such as the U.S. retaliatory raid against Libya in April 1986. As terrorist events that were originally planned for the future were shifted to the present to air a protest, a peak in incidents occurred followed later by a trough as terrorists built back their resources. If large numbers of groups share a common ideology—for example, leftist views or a hatred of America—then they are apt to respond in unison to such precipitant events even though the groups do not operate together. If these mobilizing events follow an election cycles or some other periodic occurrence, then regularity to the cycle can result.

Cycles also may result if terrorists bunch incidents together because of scale economies that reduce per-incident costs by spreading fixed costs associated with planning and executing incidents over a large number of operations occurring at the same time. An examination of the data confirms that groups such as the Irish Republican Army, Hamas, the ETA, and most others do launch a campaign of similar attacks close together in time. If, moreover, these attacks spark other groups with similar ideologies to act, a wave of terrorism results, followed by a lull. If terrorists' financing derives from similar sources, such as state sponsors or individual backers (e.g., Osama bin Laden), then this can reinforce this clustering from scale economies.

The underlying theory can justify the presence of cycles in terrorist attacks even at the international level. However, the precise periodicity of cycles associated with alternative time series is an empirical question to which we now turn.

To uncover the underlying cycles for the five time series, spectral analysis expresses the stationary, detrended series in terms of an underlying sinusoidal function,

$$x_t = \delta \sin(\omega t + \varphi). \tag{3}$$

In Equation 3, δ represents the amplitude of the cycle and ω is the frequency of the underlying cycle, so that the period is $2\pi/\omega$. The φ denotes the phase displacement from the start of the data; a φ of zero means that the cycles commence immediately, whereas a positive φ means a delay before the cycles commence. The value of x_t in

TABLE 3
Periodicities for CASUALTIES and PROPORTION Series

Series[a]	*Primary Frequency*	*Period in Quarters*	*Secondary Frequency*	*Period in Quarters*
CASUALTIES	0.338	18.57	0.822	7.65
PROPORTION[b]	0.338	18.57	0.870	7.22
DEATH EVENTS	0.108	58.18	0.262	23.98

a. The NONCASUALTIES series is not reported because all frequencies appear to contribute about equally to the variance.
b. The PROPORTION series had two noteworthy high frequencies, not reported in the table, at 1.69 (3.72 quarters) and at 2.37 (2.65 quarters).

Equation 3 is identical for all values of ωt equal to a multiple of 2π so that a frequency of, say, 0.338 implies a cycle of 18.57 (= $2\pi/.338$) periods. Spectral analysis is able to transform count data into the frequency domain with the following formula:

$$x_t = A\sin(\omega t) + B\cos(\omega t), \tag{4}$$

where $A^2 + B^2 = \delta^2$ and $\tan(\delta) = B/A$ (see Gottman 1981). The detrended values for each of the five series are regressed on Equation 4 for all frequencies ω_i on the interval $[1, \pi]$. The theory of Fourier series allows a wide class of continuous and discontinuous functions to be expressed in terms of sine and cosine components. Small values of A and B are indicative that a particular frequency has little or no power in explaining the underlying y_t series. If, however, these A and B values are large, then the associated frequency can explain a sizable proportion of the variation of the detrended y_t series. A graph depicting the proportionate variation of y_t explained by each frequency is the spectral density function, whose largest peaks represent the crucial underlying frequencies.

Based on the spectral density functions, we identify the primary and secondary cycles for three of the five time series in Table 3. Because each series is made up of component time series (e.g., skyjackings, bombings) that have their own cyclical behavior of varying periodicities, we should expect both long and short cycles for the series under investigation. Both the CASUALTIES and PROPORTION series have an identical long-term primary cycle of 18.57 quarters (0.338 frequency). Each series also displays a medium-run secondary cycle of 7.65 quarters for CASUALTIES and 7.22 quarters for PROPORTION. The latter series has two short-run cycles of 3.72 and 2.65 quarters. The long-term cycle identified for these two casualties series is near in length to the primary periodicity of 20.27 quarters for the INCIDENTS series reported in Enders and Sandler (1999). Moreover, the medium-term cycles of the casualties series also are close in length to the secondary periodicity found earlier for the INCIDENTS series. The DEATH EVENTS series has two very long cycles: a primary cycle of 58.18 quarters and a secondary cycle of 23.98 quarters. Thus, the shorter

cycles associated with the overall CASUALTIES series can be traced, in part, to shorter cycles characterizing incidents with just injuries.

It is quite noteworthy that the NONCASUALTIES series has all frequencies contributing approximately equally to variance so that *there is no identifiable underlying cycle*, thus implying that the detrended series is like white noise. This observation, when combined with the cycles identified for the CASUALTIES and INCIDENTS series, indicates that the underlying cycles reported in the aggregate terrorism series are *solely attributable* to those incidents with casualties. If public opinion is an engine of governments' periodic counterattacks that temporarily creates a lull in terrorism, as hypothesized in the literature, then it makes intuitive sense that those incidents with casualties are the ones most likely to solicit this government reaction and result in cycles. Such downturns are then followed by countermeasures and recruitment by the terrorists as they regroup for a new offensive. The 4.5-year cycle of two of the series involving casualties in Table 3 is consistent with a long public opinion cycle anticipated by our earlier discussion and the literature (Chalk 1995). The randomness of the NONCASUALTIES series suggests that forecasts of terrorist behavior at the transnational level are best directed at the casualties part of the series of all incidents.

Drawing from earlier studies that disaggregated the INCIDENTS series into bombings, hostage-taking missions, assassinations, and threats (Enders and Sandler 1995, 1999), we can relate the primary cycle of 18.57 quarters for two of the casualties series to those found for hostage-taking missions, assassinations, and some kinds of bombings. Furthermore, the secondary cycle for these two casualties series corresponds closely to the periodicity of less sophisticated bombings. Because the denominator of the PROPORTION series involves all kinds of terrorist incidents, it is noteworthy that the short tertiary cycles agree with those identified previously with threats.

POLICY IMPLICATIONS

A few policy implications follow immediately from these findings. First, the detrended CASUALTIES or DEATH EVENTS series are much more predictable than the detrended NONCASUALTIES series, which is mainly white noise, so that conscious policy is better directed to the former two series. Second, authorities should focus on anticipating upturns in incidents involving casualties following fairly lengthy lulls of greater than 2 years. Increased vigilance should not be reactive only after a spate of horrific attacks, such as the bombings of the U.S. embassies in Kenya and Tanzania or the downing of Pan Am Flight 103. These upturns should be anticipated by instituting safeguards so as to ameliorate their consequences. Downturns in incidents with casualties do *not* mean the end to the terrorist threat; authorities must, and certainly do, take a longer run, *proactive* policy stance. Proactive policies include infiltrating groups, intelligence gathering, preemptive strikes, and limiting terrorists' resource supplies. Methods aimed at eliminating a group and its resources, rather than making some kinds of incidents more difficult, may be the only means to counter a terrorist threat from fanatical terrorists who stop at nothing. Finally, any policy or view-

point that characterizes terrorist operations as either increasing or decreasing in a linear fashion is doomed to failure.

POST–COLD WAR AND FUNDAMENTALIST THREATS: A VAR ANALYSIS

A VAR analysis is now applied to quantify whether transnational terrorist incidents have become more injurious and deadly during the post–cold war period identified as the period beginning in 1991:4. A second concern is to pinpoint an earlier jump in the series of casualties from around the time of the 4 November 1979 takeover of the U.S. Embassy in Iran. To identify these structural break points, we must also include dummies for earlier events established as significant shocks in Enders and Sandler (1993, 1995) that include the installation of airport metal detectors (1973:1), U.S. enhancement of embassy security (1976:4 and 1985:4), and the U.S. retaliatory raid on Libya (1986:2). The latter is used because of the peak in events in 1986:2 that can be seen in the previously presented figures.

The analysis of this section complements rather than contradicts our investigation of cycles and trends in the earlier section. A study of cycles and trends examines a single time series, whereas a VAR analysis studies multiple series and their interactions. Autoregressive results can be entirely consistent with underlying cycles of the time series.

METHODOLOGICAL CONSIDERATIONS

When analyzing the impacts of interventions such as the post–cold war period, we first consider the CASUALTIES and NONCASUALTIES series. Because these series are potentially interdependent owing to terrorists' allocation choices among various kinds of incidents, a VAR analysis is appropriate. A highly simplified version of the equation system serves to illustrate the methodology:[18]

$$\text{CASUALTIES}_t = a_{10} + a_{11}\text{CASUALTIES}_{t-1} + a_{12}\text{NONCASUALTIES}_{t-1} + \varepsilon_{1t} \quad (5)$$

$$\text{NONCASUALTIES}_t = a_{20} + a_{21}\text{CASUALTIES}_{t-1} + a_{22}\text{NONCASUALTIES}_{t-1} + \varepsilon_{2t}, \quad (6)$$

where CASUALTIES_t is the number of incidents with casualties in period t, CASUALTIES_{t-1} is the number of incidents with casualties in period $t-1$, and so on. In Equations 5 and 6, a_{10} and a_{20} are constants, and ε_{1t} and ε_{2t} are the shocks to each incident type. If, for CASUALTIES (NONCASUALTIES), there is a tendency for activities of a given kind in the preceding period to influence the number of events of the same type in the subsequent period, then the coefficient a_{11} (a_{22}) should be significant, thus reflecting an autoregressive process.[19] A clustering of events results when this

18. In terms of past values of the series itself and other series, this VAR representation is the standard one used throughout the literature. See Enders (1995) on VAR analysis and the form of these equations.

19. In a single-series study, Midlarsky, Crenshaw, and Yoshida (1980) equate first-order autocorrelation as evidence of a contagion effect.

coefficient is positive and large. The interrelationships between the series are captured by the coefficients a_{12} and a_{21}, which indicates the presence of Granger-casuality where the past values of one series determine the current value of another series. Contemporaneous movements in the series are associated with correlation of the error terms in Equations 5 and 6.

The simplified VAR system can be extended in a number of ways. First, adjustments for seasonality can be made. Second, more dynamic interactions can be permitted by including additional lagged values of the two incident types. To allow for interventions to capture the influence of the post–cold war period and other important changes (e.g., metal detectors in airports), we modify the intercept terms of equation *i* as follows:

$$a_{i0} = \alpha_{i0} + \beta_{i0}\text{POST}, \tag{7}$$

in which POST denotes a dummy variable equal to zero prior to 1991:4 and to unity at 1991:4 and thereafter. In Equation 7, α_{i0} is a constant, and β_{i0} is the immediate or short-run impact of this intervention on incident type *i*. In the presence of series interrelationships and dynamic interactions, the short-run and long-run impacts can differ greatly. If, for example, the CASUALTIES series depends on its own lagged value but not on the lagged value of the NONCASUALTIES series, then the long-run impact equals $\beta_{i0}/(1 - a_{ii})$. More complex formulas are needed to compute long-run effects when interrelationships between the series exist.[20] Of course, the significance of POST for incident type *i* can be tested with a standard *t* test for a null hypothesis that β_{i0} is zero. To test for its significance across interrelated equations, we use a chi-squared test with two degrees of freedom on the null hypothesis that $\beta_{10} = \beta_{20} = 0$. Third, additional interventions can be allowed. Consider Equation 8, in which a second dummy is included to represent the possible impact of Islamic fundamentalism (FUND):

$$a_{i0} = \alpha_{i0} + \beta_{i0}\text{POST} + \gamma_{i0}\text{FUND}, \tag{8}$$

in which FUND is a dummy variable equal to zero prior to a certain date and to unity thereafter. In the case of FUND, we do not presume a specific intervention point but examine quarters starting in 1978:1 as possible candidates. Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) are goodness-of-fit measures, which with the chi-squared likelihood ratio test can determine the most appropriate period to select for FUND having the greatest impact on the two series.[21] Fourth, additional dummies for other interventions can be added to Equation 8.

20. There is no reason to consider these more complex formulae for this article because such interrelationships did not characterize our system when tested. The long-run multiplicative terms for β_{i0} are found for more complex interactions among series by setting all time indices to the same value to represent a steady-state system. Cramer's rule can then be used to find the influence of a dummy on the *i*th series in the long run.

21. The multivariate AIC and SBC are calculated as

$$\text{AIC} = T \cdot \log|\Omega| + 2k$$

$$\text{SBC} = T \cdot \log|\Omega| + k \cdot \log T,$$

where T is the number of usable observations; $|\Omega|$ is the determinant of the variance/covariance matrix of residuals; and k is the number of parameters estimated.

The dynamics represented by Equations 5 and 6 are overly simplified because terrorist attacks may contain a seasonal component, and events in one quarter may be influenced by events staged several quarters in the past. Our first step in estimating the VAR is to determine the appropriate lag length and whether to include seasonal dummy variables. The AIC, SBC, and likelihood ratio test all selected a model without any seasonal effects containing only one lag. For example, in the absence of any seasonal dummy variables, the multivariate AIC is 1225.7 when four lags are included in the model and only 1211.3 when one lag is included. This suggests that terrorist activities are not sensitive to the season (thus, there are no large changes at the time of the winter solstice, when many religions have holy days, and tourism is up) and that current incidents respond primarily to the number of incidents in the very recent past.

Next, we search for the most likely starting date for FUND. Toward this end, nine different VAR models are estimated using starting dates ranging from 1978:1 to 1982:1. Both the multivariate AIC and SBC selected a starting date of 1979:4. For example, the AIC values are 1245.3, 1244.8, 1243.8, 1245.3, and 1246.3 in seriatim for the quarters 1979:2 to 1980:2. This is strong evidence that FUND begins in 1979:4. The further the starting date from 1979:4, the poorer the fit of the model.

The interaction of the two variables is simple to interpret. It is not surprising that Granger-causality tests indicate that CASUALTIES is not Granger-caused by NONCASUALTIES (the t statistic for a_{12} is 0.03). Because incidents without casualties tend to use relatively small amounts of the terrorists' resources, they have no significant predictive power on the number of events with casualties. We also find that the NONCASUALTIES series is not Granger-caused by either of the variables (the t statistics for a_{21} and a_{22} are –0.74 and 0.19, respectively). This is consistent with the notion that the spectrum for the NONCASUALTIES series shows no important cyclical behavior, as shown in the last section.

As a complementary analysis, we also examine the PROPORTION series for significant intervention effects. Because this series is made up of both the CASUALTIES and NONCASUALTIES series, with the former in the numerator and the sum of the two series in the denominator, a single series needs to be evaluated. Only a single lag of the PROPORTION series is needed to capture the dynamic nature of the series. The t statistic for the first lag is 2.45 and any additional lags have t statistics that are insignificant at conventional levels. The first-order autocorrelation coefficient is 0.216, implying that 21.6% of any given innovation in the PROPORTION series carries over into the subsequent period.

STRUCTURAL SHIFTS

We first consider structural shifts for the CASUALTIES and NONCASUALTIES series, which are independent of one another based on Granger-causality tests just reported. The VAR estimates for these series are displayed in Table 4. The CASUALTIES series follows a first-order autoregressive process, whereas the NONCASUALTIES series depends significantly on only the intervention variables (see Table 4). With FUND and POST set at 1979:4 and 1991:4, respectively, FUND has an immediate effect on incidents involving casualties of 7.75 (t = 2.11) incidents

TABLE 4
Estimated VAR Model for CASUALTIES Series

	$CASUALTIES_t$	$NONCASUALTIES_t$
Intercept	10.151	90.655
	(2.63)	(6.68)
$CASUALTIES_{t-1}$	0.287	–0.247
	(3.01)	(–0.74)
$NONCASUALTIES_{t-1}$	0.0008	0.019
	(0.03)	(0.19)
METAL DETECTORS	8.825	–13.255
	(2.17)	(–0.92)
EMBASSY 76	–2.463	–21.160
	(–0.63)	(–1.54)
EMBASSY 85	–9.904	1.358
	(–3.16)	(0.12)
LIBYA RAID	–13.87	118.870
	(–1.36)	(3.31)
FUND	7.75	34.868
	(2.11)	(2.70)
POST	9.90	–22.936
	(2.88)	(–1.89)

NOTE: *t* statistics are in parentheses.

per quarter, whereas POST has an immediate effect on these incidents of 9.90 (t = 2.88) per quarter. Both impacts are significant at the 95% level or better. It is noteworthy that POST has a larger and more significant causality impact than FUND. The long-run effects are even greater: FUND is associated with 10.86 more incidents with casualties per quarter, and POST is associated with 13.89 more incidents with casualties per quarter. These results are a clear indication that transnational terrorism, although down in numbers, is more life-threatening from 1991:4 on. Also, the takeover of the U.S. embassy in Tehran is a watershed event, marking the exportation of fundamentalism-based terrorism, which has ratcheted up the threat of transnational terrorism. This finding supports Hoffman's (1998, 186) view that this takeover marked the start of an era of more deadly terrorism. Other short-run significant interventions for the CASUALTIES series are metal detectors (an increase of 8.83 [t = 2.17] incidents per quarter) and embassy enhancement in 1985 (a decrease of –9.9 [t = –3.16] incidents per quarter). These impacts suggest that metal detectors had an unintended consequence of causing a substitution into events in which people got hurt, whereas the opposite was true for embassy fortification in 1985:4. The findings for these two interventions agree qualitatively with earlier work on their impact when a vastly different disaggregation of the INCIDENT series was used (Enders and Sandler 1993).

Next, we investigate the influence of pre- and post–cold war interventions on the NONCASUALTIES series (see Table 4). FUND is associated with 34.87 (t = 2.70) more incidents per quarter, and POST is associated with 22.94 (t = 1.89) less incidents

per quarter. Insofar as the NONCASUALTIES series has no autoregressive terms, there is no distinction between short-run and long-run effects. Clearly, FUND increases incidents without casualties to a larger extent than those with casualties. The 1 to 4 change ratio of casualties to noncasualties is a little less than the 1 to 3 ratio in Table 1 for all incidents. Notably, the large reduction in incidents without casualties during the post–cold war era indicates that much of the drop in transnational terrorism in recent years, previously uncovered, is attributable to less harmful events. This finding supports the view that terrorist incidents are now more deadly—a conclusion that will be subsequently supported by an examination of the PROPORTION series. Only one additional intervention affected the NONCASUALTIES series. The U.S. retaliatory raid on Libya gave a short-run increase of 119 (t = 3.31) more incidents in the quarter immediately after the April 1986 action.[22]

If the typical terrorist incident is becoming more lethal, we also should observe an increase in the ratio of casualties to all incidents. The single-equation analysis of the PROPORTION series provides corroborating evidence on the increased threatening nature of transnational terrorism after 1991:4. FUND had an insignificant effect on the ratio of casualties to all incidents. This is in keeping with the small change in this ratio just reported above following 1979:4. POST is, however, associated with a coefficient of 12.98 (t = 4.51) indicative of a little smaller than a 13 percentage point short-run increase in the proportion of attacks ending in casualties. The long-run influence is an increase of 16.94 percentage points, which gives further support that terrorist events at the international level are now more dangerous. Three other interventions display significant impacts on the PROPORTION series: metal detectors increased this proportion by 9.25 percentage points (t = 2.83), the U.S. raid on Libya decreased the proportion temporarily by 19.59 percentage points (t = –2.37), and the 1985 embassy security enhancement decreased the proportion by 5.75 percentage points (t = –2.34). All three findings are consistent with other results reported here. The findings concerning the Libya raid agree with the terrorism sparked by the raid as being more bluster than substance.

To focus on more severe attacks than those with just injuries, the CASUALTIES series is decomposed into a series with deaths (DEATH EVENTS) and one with only injuries (WOUNDED). If an incident had both deaths and injuries, it is assigned to the DEATH EVENTS series, so that there is no overlap between the series. We then estimate a three-variable VAR with the NONCASUALTIES series as the third variable. As in the two-variable case, there was no evidence of seasonality, and a lag length of one quarter is sufficient to capture the dynamic adjustments. In this three-variable VAR, the most likely starting date for FUND remains 1979:4. The AIC values are 1505.19, 1503.97, 1503.96, 1505.21, and 1505.54 in seratim for the quarters 1979:2 to 1980:2. This is corroborating evidence that FUND begins in 1979:4.

The results of the Granger causality tests show that the NONCASUALTIES series is not Granger-caused by any other variable so that the greater decomposition of the overall incident series confirms the randomness found earlier. Moreover, the NONCASUALTIES series does not Granger-cause any other variable. The DEATH

22. The dummy for the Libyan raid is 1 for the period of the raid only.

TABLE 5
Estimated VAR Model for DEATH EVENTS and WOUNDED Series Breakdown

	DEATH EVENTS$_t$	*WOUNDED*$_t$	*NONCASUALTIES*$_t$
Intercept	4.037	8.90	89.044
	(1.77)	(3.22)	(6.65)
DEATH EVENTS$_{t-1}$	0.406	0.377	0.071
	(3.22)	(2.46)	(0.10)
WOUNDED$_{t-1}$	–0.103	–0.161	–0.252
	(–0.94)	(–1.21)	(–0.39)
NONCASUALTIES$_{t-1}$	0.016	0.003	0.020
	(0.96)	(0.18)	(0.21)
METAL DETECTORS	5.62	7.32	–14.24
	(2.28)	(2.45)	(–0.99)
EMBASSY 76	–0.26	–4.51	–21.97
	(–0.11)	(–1.57)	(–1.57)
EMBASSY 85	–5.92	–7.20	3.686
	(–3.20)	(–3.21)	(0.34)
LIBYA RAID	–7.93	2.07	117.02
	(–1.30)	(0.28)	(3.26)
FUND	4.17	5.22	33.851
	(1.89)	(1.96)	(2.62)
POST	6.77	9.71	–27.322
	(3.19)	(3.78)	(–2.20)

NOTE: *t* statistics are in parentheses.

EVENTS series is only predicted by its own past values, whereas the WOUNDED series is Granger-caused by the past values of the DEATH EVENTS series but not by its own past values. In Table 5, the VAR estimates for the three series are presented. The influences of the structural changes and the interventions on the NONCASUALTIES series are virtually identical to those associated with the two-variable model in Table 4. The noteworthy difference of the three-variable model involves FUND and POST. When incidents with deaths are distinguished from those with only injuries, there is a reduced significance associated with the increased severity of attacks coming with the rise of fundamentalism in 1979. However, the effect of the post–cold war period on the severity of the component casualties series is now more significant. Overall, this more detailed VAR model provides results entirely consistent with the other runs.

SUMMARY AND FURTHER POLICY IMPLICATIONS

Despite a decline in transnational terrorism of nearly 50 incidents per quarter during some of the post–cold war era, terrorism still presents a formidable threat to targets. This conclusion follows because each incident is almost 17 percentage points more likely to result in death or injury compared with the previous two decades.

Hoffman's (1997, 1998) conjecture about the increased deadliness of the new brand of terrorism with its greater share of religious groups and amateurs is borne out by rigorous time-series techniques. This shift toward greater religious-based terrorism is traced to a structural change in the casualties series at the time of the takeover of the U.S. Embassy in Tehran. From this point, terrorism became more casualty prone and dangerous. We also uncover evidence with respect to the installation of metal detectors that a policy can have unintended consequences as terrorists substitute to less-protected targets with more deadly consequences.

The rise of religious terrorism in which massive civilian casualties are the goal poses a potential dilemma for government counterterrorism policy. If a government responds by tightening security at official sites (e.g., embassies and government buildings) as is currently being done by the United States, its civilian targets (e.g., hotels, marketplaces, parks) will become *relatively* less secure and attractive. Some thought must then be given to protecting these targets too. To provide security for all potential targets, a government must embark on proactive antiterrorist campaigns to infiltrate terrorist groups or destroy their resource base. A religious or amorphous terrorist group must be annihilated completely. Destroying even a large portion of a group may not ameliorate the dangers for long, because remaining fanatical members may attack with even greater resolve and vengeance. Because some religious terrorist organizations are associated with extreme elements that splinter off, the threat posed by such groups may grow over time unless the group is neutralized. This heightened and more encompassing threat means that even more targets may require protecting, and this, in turn, spells the need for ever greater resource allocations to thwart terrorism. Ironically, even though transnational terrorist incidents have been reduced in number, the remaining threat may be even more costly for society to protect against. There is no question that terrorism provides a cost advantage to the weak in their struggle over the strong.

The spectral analysis shows that incidents without casualties display no cycles, whereas those with casualties impart a long-term and a medium-term cycle to transnational terrorist incidents. Downturns in incidents with casualties have been followed at just less than 2½ years by upturns. Authorities should apply time-series techniques to anticipate overall patterns to protect against new campaigns before they occur. Antiterrorist actions should not just be reactive following horrific acts of carnage that catch authorities by surprise. Of course, time-series analysis cannot predict where attacks will occur; only other forms of intelligence and group infiltration can do this.

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