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# Transnational Terrorism in the Post–Cold War Era

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The article uncovers evidence that the end of the Cold War has provided a dividend in terms of reduced transnational terrorism. Significant short-run and long-run effects are quantified with time-series analysis to be concentrated in reduced bombings and hostage-taking incidents. Presumably, this dividend is the result of less state-sponsorship of terrorism by the Commonwealth of Independent States and other states, as well as the result of measures taken by industrial states to thwart terrorist attacks. A dividend does not appear until the last three quarters of 1994, at which time moves were well under way to integrate Eastern Europe with the West. Moreover, prior to this period, significant efforts had been made among Western nations to augment cooperative efforts to curb terrorism and to bring terrorists to justice. Using data for 1970 through mid-1996, we also examine trends and cycles in terrorist modes of attack. There is virtually no evidence of an upward trend in transnational terrorism, contrary to media characterizations. All types of terrorist incidents display cycles whose duration lengthens with logistical complexity. Any change in these cycles in the post–Cold War era is concentrated in the high-frequency or short-lived cycles.

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Momentous political events in the 1990s have potential implications for transnational terrorism. Noteworthy events include the opening of the Berlin Wall on 9–10 November 1990; the start of the Gulf War on 16 January 1991; the disbanding of the Warsaw Pact on 1 July 1991; the breakup of the Soviet Union on 20 December 1991; the creation of a single European market on 1 January 1993; and the Brussels summit of NATO leaders on 10–11 January 1994. The fall of the Berlin Wall marked the start of the democratization of Central and Eastern Europe. With democracy comes an increased risk of terrorism owing to freedom of association, freedom of movement, the institution of due process, and the freedom of the press.<sup>1</sup> A free press can publicize terrorist incidents and provide the terrorists with the exposure they seek for their cause. Insofar as the legitimacy of a democracy depends, in large

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<sup>1</sup> On the relationship between terrorism and democracy see Schmid, 1992, Chalk, 1994, 1995, Eubank and Weinberg, 1994, and Sandler, 1995. Empirical exercises to establish this relationship have been suggestive but not convincing, relying primarily on analysis of variance (see, e.g., Eubank and Weinberg, 1994).

part, on its ability to protect lives and property, a terrorist threat to this ability could impose sufficient costs on a democratically elected government for it to seek an accommodation.<sup>2</sup> The Gulf War of 1991 brought a call from Saddam Hussein for terrorist groups worldwide to strike at the coalition nations (Ross, 1994; Chalk, 1996). The breakup of the Soviet Union and the Warsaw Pact removed some major state-sponsors of terrorism,<sup>3</sup> since these countries no longer had a rationale to destabilize Western countries. On the negative side, this breakup also unleashed ethnic hatreds, once held in check by authoritarian regimes, that could result in heightened terrorism. The creation of a single European market meant that potential terrorists could cross borders within the European Union (EU) with ease, thus raising the threat of transnational terrorism (Clutterbuck, 1992; Wilkinson, 1992; Chalk, 1994). Finally, the Brussels summit of 1994 is noteworthy because it launched the Partnership for Peace (PFP) intended to prepare some ex-Warsaw Pact nations for eventual membership in NATO and to promote security ties with Central and Eastern European nations.<sup>4</sup> PFP further normalized relationships between the West and the ex-Communist transitional economies and in doing so limited these nations' motives for supporting terrorism. This summit also led to the adoption of NATO's new strategic doctrine of crisis management and nonproliferation of weapons of mass destruction (Sandler, 1997b). Another political event, likely to have influenced terrorism in the post-Cold War period, is the appearance of a Palestinian state and the tumultuous peace process in the Middle East.

In the early 1990s there was also an increased effort on the part of Western nations to allocate more resources to thwarting terrorism. Terrorism-prone countries in Europe—i.e., Spain, Italy, France, Germany, the United Kingdom—did much individually to thwart terrorism by improving intelligence, infiltrating terrorist groups, securing vulnerable points, and augmenting antiterrorist forces.<sup>5</sup> As a group, the EU participated in initiatives with the Council of Europe to augment cooperation in terms of extradition, sharing intelligence, and accrediting foreign diplomats (Wilkinson, 1992; Zagari, 1992; Chalk, 1994). NATO also embarked on a program to address collectively the transnational terrorism threat, as stated in the NATO Ministers' statement following the January 1994 Brussels summit (NATO, 1994; Wilcox, 1997). In the aftermath of the November 1995 car bomb in Riyadh, Saudi Arabia, and the June 1996 bombing of the Khobar Tower near Dahrhan, Saudi Arabia, killing five and nineteen U.S. service personnel, respectively, the U.S. military redoubled its earlier efforts to protect Americans abroad and at home (U.S. General Accounting Office, 1997a, 1997b). During the last few years the Department of Defense estimates it spent over \$4 billion annually to protect civilians and the military from terrorist attacks (U.S. General Accounting Office, 1997a:2).

Since these events and efforts have potentially favorable and/or unfavorable effects on the level of transnational terrorism, their appearance raises a number of important questions. Have these political and security milestones had a significant impact on transnational terrorism in general or on specific kinds of terrorist incidents (e.g., kidnappings, bombings, assassinations)? If these milestones have had an influence, then what has been this impact both immediately and over time?

<sup>2</sup> The seminal study on the dilemma of a liberal state that must confront a terrorist threat is by Wilkinson (1986). Also see Chalk, 1995, 1996.

<sup>3</sup> The impact of the demise of the Soviet Union and the Warsaw Pact is discussed in Wilkinson, 1992, Clutterbuck, 1994, Chalk, 1996:ch. 4, and Sandler, 1997a, 1997b.

<sup>4</sup> The text of the declaration coming from this landmark summit is contained in NATO (1994) and is located on the worldwide web at: [gopher://gopher.nato.in...S/PRESS-94/sum94dec.eng](http://gopher://gopher.nato.in...S/PRESS-94/sum94dec.eng), which can be accessed on the NATO homepage at: [www.nato.int](http://www.nato.int). For the importance of this summit see Gompert and Larrabee, 1997, and Sandler and Hartley, forthcoming.

<sup>5</sup> These efforts are examined in Bremer, 1992, Cardona, 1992, Crelinsten and Schmid, 1992, Zagari, 1992, Enders and Sandler, 1993, and Chalk, 1994, 1996.

In particular, has there been a significant terrorism-reduction dividend from the breakup of the Soviet Union and the ongoing process of normalization of relations with the West during the 1990s? Have efforts to thwart terrorism produced results? The primary purpose of this article is to provide answers to these and related questions. To accomplish this task, we first employ time-series tools to identify cycles and trends in various terrorist events series for a period beginning in the first quarter of 1970 (denoted by 1970:1) and ending in the second quarter of 1996 (i.e., 1996:2).<sup>6</sup> The behavior of different terrorist events series for the entire period is compared with that of corresponding series beginning in 1970:1 but stopping in 1991:4, at the end of the Soviet Union. Next, we employ vector autoregression (VAR) analysis to pinpoint the period during which the greatest structural change in the overall transnational terrorism time series took place in the post-Cold War period.<sup>7</sup> VAR analysis has the advantage of accounting for any possible interrelationships among the different time series for alternative modes of attack. Given that terrorists must allocate their scarce resources among alternative modes of action, terrorist events series should be interrelated. Once this period of greatest structural change is identified, the individual impacts on the component time series for the major modes of attack are found.

A number of conclusions follow from our investigation. First, the cycles, associated with different types of terrorist events, do not show large changes when the series for the entire period is compared with its corresponding truncated series stopped at 1991:4. This implies that political events and security measures in the 1990s have reduced transnational terrorism, but have done little to change the underlying dynamic process that determines cycles in terrorist activities. For individual modes of terrorist attacks, bombings and threats display some change in only their short-period cyclical behavior in the aftermath of the Cold War. Second, the largest structural change to transnational terrorism comes in 1994:2, just after the NATO summit in Brussels and following Western efforts to thwart terrorism. Third, a significant terrorism-reduction dividend appears to be associated with the efforts to bring Eastern and Western Europe together and to thwart terrorism. This dividend is quantified to have resulted in a large immediate reduction in bombings and a much smaller immediate drop in hostage-taking. Insofar as hostage-taking events are often quite costly to society, even a modest reduction of four events per quarter, as recorded in the statistical analysis, is noteworthy. These declines in bombings and hostage-taking are projected to persist in the near term. Fourth, there are some modest changes in the trends noted in the expanded series from those identified in earlier studies for a shorter period of data.

The body of the article contains four sections. In the first section, preliminaries are presented that include a discussion of the timing of the underlying terrorism decision-making process. The second section presents a study of terrorism trends and cycles during the sample period 1970:1–1996:2. In the third section, a VAR analysis is applied to quantify the post-Cold War terrorism-reduction dividend. The final section draws policy and other conclusions.

### Preliminaries

Although different definitions abound in the literature, we define terrorism as the premeditated use, or threat of use, of extra-normal violence or brutality to obtain

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<sup>6</sup> Earlier time-series analyses include Cauley and Im, 1988, Enders, Sandler, and Cauley, 1990, Enders, Parise, and Sandler, 1992, Brophy-Baermann and Conybeare, 1994, and Enders and Sandler, 1995, 1996.

<sup>7</sup> On VAR modeling see Enders, 1995. The following articles apply VAR analysis to study terrorism: Enders and Sandler, 1991, 1993, 1996.

a political objective through intimidation or fear directed at a large audience.<sup>8</sup> The presence of a political motive is essential so that violence, used to extort money with no intention to bring about political results, is merely a criminal act. Political objectives of terrorists include the promotion of religious freedom, economic equality, income redistributions, nationalism, separatism, ideology (i.e., Marxism), nihilism, racism, and issue-specific causes. Extra-normal violence is often employed to capture media attention as a public becomes numb to these seemingly unending acts of violence. In a deliberate attempt to create a general atmosphere of fear, terrorists strike at a host of targets, thus making it difficult for the authorities to anticipate the location of the next attack. Even though terrorists seek political objectives and change, they frequently aim their violence and intimidation at a large audience, not *directly* involved in the policymaking process. Thus, U.S. troops are murdered in their sleep by massive car bombings in Lebanon and Saudi Arabia; air travelers are gunned down as they wait for their flights at an international airport; and innocent civilians are blown up on buses. To achieve this intimidation, terrorists employ a range of attack modes including skyjackings, kidnappings, barricade-and-hostage-taking missions, assassinations, bombings, armed attacks, and threats. The terrorists intend their targets and the public at large to apply pressures on the government to concede to their demands. Modern society's dependence on communication systems, computer networks, electrical grids, and transportation networks makes it susceptible to terrorist attacks. While terrorism is relatively cheap to engage in, it is expensive to protect against because an attack can come from almost anywhere in a variety of forms, thus making it a cost-effective tactic for the weak to use against the strong. The covert nature of terrorism makes it attractive to state-sponsors, who want to avoid detection and retaliation.

At the outset, it is important to sketch the underlying choice process taking place between the terrorists and the government.<sup>9</sup> First, the terrorists decide their allocation of resources between terrorist and nonterrorist activities. Second, they allocate their terrorism-designated resources among various modes of operation so as to equate the expected marginal gain per dollar spent on alternative operations. Since a government's terrorism-thwarting or terrorism-sponsoring policies may impact the relative price of terrorist versus nonterrorist actions, the terrorists' resource supply, or the relative prices of alternative attack modes, these policies influence the decisions of the terrorists. If, therefore, the end to the Cold War has reduced terrorist resources through decreased state-sponsorship, then all terrorist activities should drop in number. If, alternatively, government policies have made some activities more risky or expensive than others, then a substitution from these more-risky activities to others should take place, but without a necessary decrease in overall terrorism (Sandler et al., 1983; Sandler and Lapan, 1988; Enders and Sandler, 1993). Government responses in a liberal democracy are often motivated by public outrage and pressures on the authorities to protect its lives and property. Hence, public pressures constitute the third link in the chain, followed, fourth, by government action—e.g., group infiltration, new legislation, increased antiterrorism forces. Fifth, the terrorists respond to these policies. For example, they may devise clever means to circumvent government actions. This five-step sequence of actions and reactions affects the properties of the terrorism time series. Government actions may, at times, lead to a permanent fall in terrorism activities without altering the underlying dynamics behind the cycles, whenever these actions do not change

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<sup>8</sup> This definition includes the essential features identified by Schmid and Jongman (1988).

<sup>9</sup> A formal model for this choice process is given in Landes, 1978, Sandler, Tschirhart, and Cauley, 1983, and Enders and Sandler, 1996. The last article focuses, in particular, on the two-stage budgeting process, where terrorists first choose between terrorist and nonterrorist activities, and then among terrorist activities.

the timing of the action-reaction process. The timing of this dynamic process is discussed in further detail in the next section.

An important distinction concerns domestic versus transnational terrorism. Whenever a terrorist incident in one country involves victims, or targets, or institutions of another country, then the incident is characterized as transnational. Although the overwhelming number of incidents each year are domestic, transnational terrorism poses a greater concern for international relations.<sup>10</sup> For this reason, the analysis here focuses on these transnational events. State-sponsored terrorism, directed at causing instability in another country, is an example of transnational terrorism.

Data on transnational terrorist incidents were drawn from a data set, *International Terrorism: Attributes of Terrorist Events* (ITERATE), which records, among other things, the incident date and type.<sup>11</sup> ITERATE 2 covers 1968–77; ITERATE 3 covers 1978–87; and ITERATE 4 covers 1988 to mid 1996.<sup>12</sup> ITERATE uses a host of sources for its information, including the Associated Press, United Press International, Reuters tickers, the Foreign Broadcast Information Service (FBIS), and major U.S. newspapers (e.g., the *Washington Post*, *New York Times*). The *FBIS Daily Reports* draws from hundreds of world print and electronic media sources and is the single most important source for ITERATE (Mickolus, Sandler, and Murdock, 1989, vol. 1:ix–xxvi). Coding convention consistency for ITERATE 2 and its updates was maintained by applying identical criteria for defining and classifying acts of transnational terrorism. Furthermore, there was an overlap among the coders and the monitors for the various updates. Although some finer breakdowns for incident types were introduced in ITERATE 3 (e.g., suicide car bombings), this has no effect on our study, which only examines broad classes of terrorist tactics by combining subclasses of a given type of events.

We extracted five primary time series to determine the impact of the post-Cold War events on transnational terrorism. The ALL series represents the entire set of all transnational terrorist incidents; the most important component of this series is BOMBINGS, accounting for over 50 percent of all annual incidents on average. BOMBINGS combines seven types of events: explosive bombings, letter bombings, incendiary bombings, missile attacks, car bombings, suicide car bombings, and mortar and grenade attacks. The HOSTAGE series includes kidnappings, skyjackings, nonaerial hijackings, and barricade and hostage-taking, whereas ASSASSINATIONS consists of just politically based murders. Finally, the THREATS series combines two component events: threats, a promise of future actions, and hoaxes, falsely claimed past actions (e.g., a bomb allegedly planted on a plane).

We used terrorist incident “count” data computed on a *quarterly basis* for the statistical analysis so as to limit the number of zero-valued observations.<sup>13</sup> In Table 1 we list the mean, standard error, the minimum (Min) observation, and the maximum (Max) observation for each of the five quarterly time series during the sample period. On average, bombings have a quarterly mean of 59.94 incidents and account for over 50 percent of transnational events. Bombings display a large quarterly dispersion, meaning that their numbers can change quickly. In fact, much

<sup>10</sup> The frequency differences between domestic and transnational terrorism are explored in Jongman, 1992. The trend in domestic terrorism does not display the same decline in the 1990s as does that of international terrorism. Domestic terrorism figures are much more difficult to acquire compared with transnational terrorism data.

<sup>11</sup> ITERATE is described in greater detail in Mickolus, 1982.

<sup>12</sup> Mickolus, 1982, is the source for ITERATE 2, while Mickolus, Sandler, Murdock, and Fleming, 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, following ITERATE conventions developed by Mickolus et al., 1989.

<sup>13</sup> Zero values are inconsistent with the normal distribution assumption that underlies VAR analysis; see Harvey, 1989, and Enders, 1995.

TABLE 1. Quarterly Series' Characteristics, 1970:1–1996:2

<i>Series</i>	<i>Number of Observations</i>	<i>Mean</i>	<i>Standard Error</i>	<i>Min</i>	<i>Max</i>
ALL	106	103.95	39.95	27.0	316.0
BOMBINGS	106	59.94	31.09	16.0	202.0
HOSTAGE	106	13.73	5.69	0.0	33.0
ASSASSINATIONS	106	10.07	5.90	1.0	32.0
THREATS	106	12.34	10.79	0.0	64.0

ALL consists of all transnational incidents; BOMBINGS include letter bombings, incendiary bombings, explosive bombings, missile attacks, mortar and grenade attacks, and car bombings; HOSTAGE includes kidnappings, barricade and hostage-taking, skyjackings, and nonaerial hijackings (e.g., buses, ships); ASSASSINATIONS involve politically motivated murders; and THREATS consists of threats and hoaxes. Min refers to the smallest quarterly observation, while Max indicates the largest quarterly observation. All figures refer to quarterly data.

of the quarterly dispersion in the ALL series can be traced to bombings. Obviously, a policy to curb these bombings could do much to limit terrorism and its variability. Threats and hoaxes display a mean similar to hostage-taking, but indicate greater variance. The HOSTAGE and THREATS series have only one or two zero observations during the 1970:1–1996:2 sample period. In total, there are 106 quarters of observations, making it possible to study cyclical behavior and the interrelationship among time series using Spectral Analysis and VAR analysis, respectively. These techniques are data-intensive requiring a large number of observations, a requirement that has only recently been achieved as the length of the data series has grown.

In Figure 1, the quarterly time series for the ALL and BOMBINGS series are shown. Both series depict rather similar patterns of variation over the 1970:1–1996:2 sample period. Cycles appear evident, but it is difficult to discern visually the nature of any trend. Important peaks in 1986:2 and 1991:1 correspond to the U.S. retaliatory raid on Libya in April 1986 and the Gulf War in January 1991, respectively. Other peaks can be connected to other noteworthy political events, such as the various Arab-Israeli conflicts. Both series show a ratcheting down during the post-Cold War period, suggesting that changes during this period are worthy of statistical investigation. In Figure 2, the quarterly HOSTAGE and ASSASSINATIONS series are displayed. The overall level of hostage-taking appears to have been drifting up over most of the entire period, with a noticeable downward trend during some recent post-Cold War years. Some of the peaks and troughs for hostage-taking and assassinations are similar to those in Figure 1 for bombings and all events, while other peaks and troughs are 180° out of phase for two of the series, thus suggesting a substitution phenomenon. The THREATS series is displayed in Figure 3. These last three series also indicate cycles of both short and long duration.

### Trend and Cycles

Although a visual inspection of any time series is always instructive, this inspection is no substitute for statistical analysis when identifying trend, cyclical, and random or stochastic components of time series. Moreover, this analysis must be over a sufficiently long time period to satisfy statistical requirements.<sup>14</sup> Trend can be stochastic or deterministic. We can, therefore, decompose any of our five incident series into three primary components:

<sup>14</sup> Most papers in the study of terrorism identify a trend merely by looking at a few values over time—e.g., Mickolus, 1982, and Jongman, 1992. Others merely provide some tables without a statistical analysis (e.g., Hoffman, 1994).

$$y_t = z_t + x_t + \mu_t \quad (1)$$

where  $y_t$  is the number of incidents of type  $y$  in quarter  $t$ ;  $z_t$  denotes the trend component of  $y_t$  in quarter  $t$ ;  $x_t$  indicates the cyclical component of  $y_t$  in quarter  $t$ ; and  $\mu_t$  represents the irregular component of  $y_t$  in quarter  $t$ .

The trend component  $z_t$  is associated with the deterministic long-run movements in the series. If, for example, there is a sustained upward pattern in a particular incident type, we would expect to find a statistically significant trend term  $z_t$ . The cyclical component  $x_t$  is associated with a sinusoidal, or “wavelike” pattern in the series. If increases in terrorism are followed by periods of relative calm, we would then expect to find a significant cyclical component in the series. The irregular component acts as a residual accounting for all movements in the series other than those caused by the deterministic trend and/or cyclical components. It is especially important to ascertain whether the irregular component is stationary or nonstationary. If  $\mu_t$  is nonstationary, then each irregular shock results in a permanent change in the mean. If, instead,  $\mu_t$  is stationary, then random shocks to any incident type eventually decay, so that the series reverts to its pre-shock mean. An Augmented Dickey-Fuller (ADF) test is used to investigate the existence of a unit root for a series that has had its deterministic polynomial trend removed or filtered.

#### *Trend and Stationarity*

The deterministic trend,  $z_t$ , can be ascertained by simply fitting the polynomial

$$z_t = \sum_{i=1}^n \alpha_i t^i \quad (2)$$

where the  $\alpha_i$ 's are coefficients on the time,  $t$ , terms. Generally, trend is determined by including additional polynomial terms (up to  $n$ ) to the estimated equation (2) until the next coefficient is no longer significant. In Table 2, two different trend

TABLE 2. Trend Estimates for the Five Incident Series

<i>Series</i>	<i>Constant</i>	<i>t</i>	<i>t</i> <sup>2</sup>	<i>t</i> <sup>3</sup>	<i>F-statistics</i>	<i>ADF(4)</i> <sup>c</sup>
ALL	68.17 (4.39) <sup>a</sup>	1.360 (2.37)	-0.010 (-2.34)	—	2.90 [0.060] <sup>b</sup>	-3.94
ALL	115.83 (4.40)	-2.210 (-1.30)	0.058 (1.87)	-0.004 (-2.22)	3.65 [0.015]	-4.39
BOMBINGS	59.94 (19.85)	—	—	—	NA	-3.45
HOSTAGE	11.31 (9.29)	0.039 (2.21)	—	—	4.88 [0.029]	-4.51
ASSASSINATIONS	-2.22 (-1.12)	0.410 (5.60)	-0.003 (-4.71)	—	21.71 [0.000]	-4.21
THREATS	30.88 (4.71)	-1.750 (-4.13)	0.037 (4.74)	-0.0002 (-4.98)	10.29 [0.000]	-3.74

<sup>a</sup>Figures in parentheses are  $t$ -statistics.

<sup>b</sup>Figures in brackets are prob values.

<sup>c</sup> $ADF(4)$  lists the augmented Dickey-Fuller test statistics (with 4 lags) for a null hypothesis that the residuals of the filtered series have a unit root. Since the critical value at the 95% significance level is -2.90 and this critical value is -3.45 if a trend is included, we can reject the null of a unit root for all of the residual series.

NA denotes not applicable.



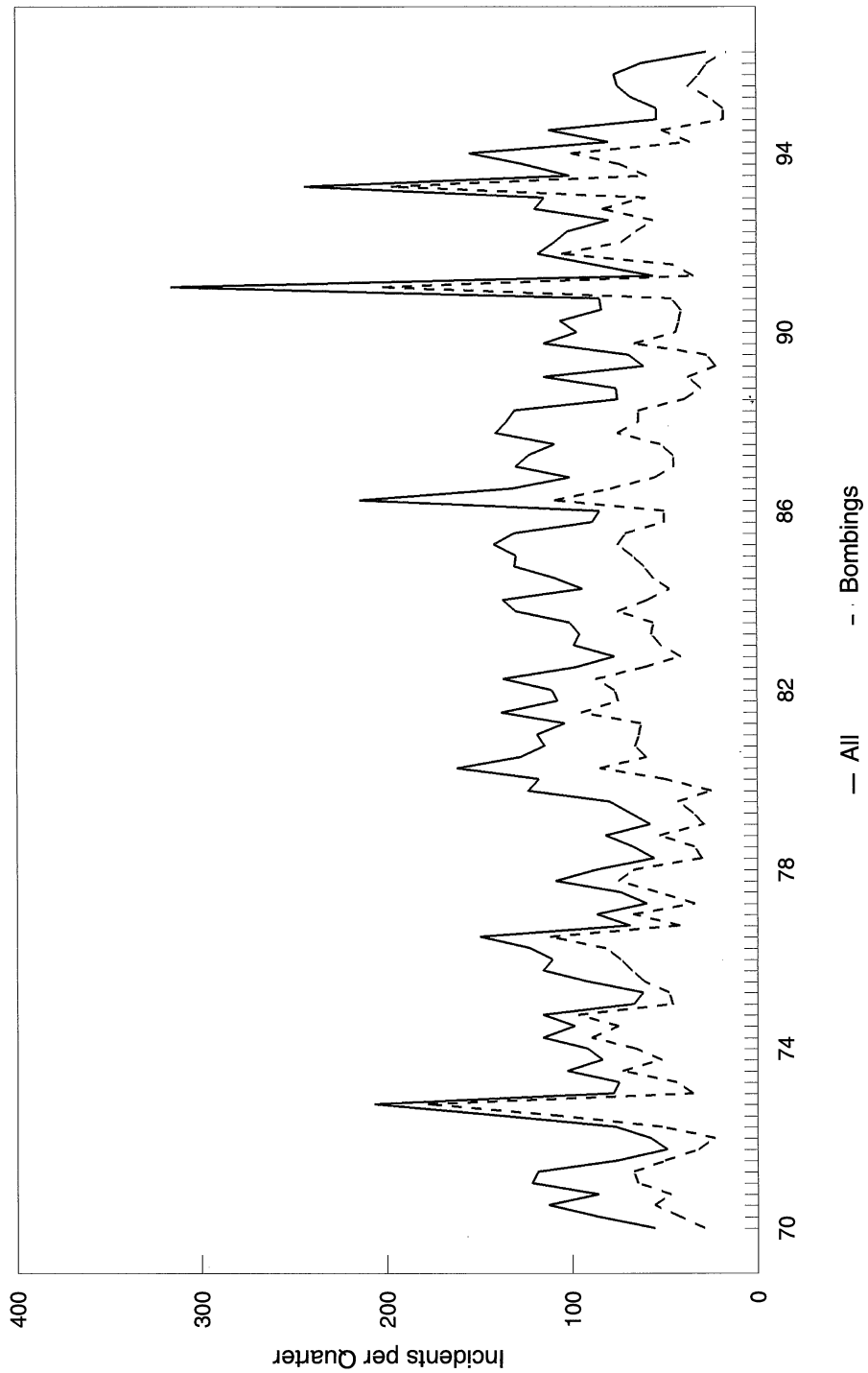


FIG. 1. All incidents and bombings.

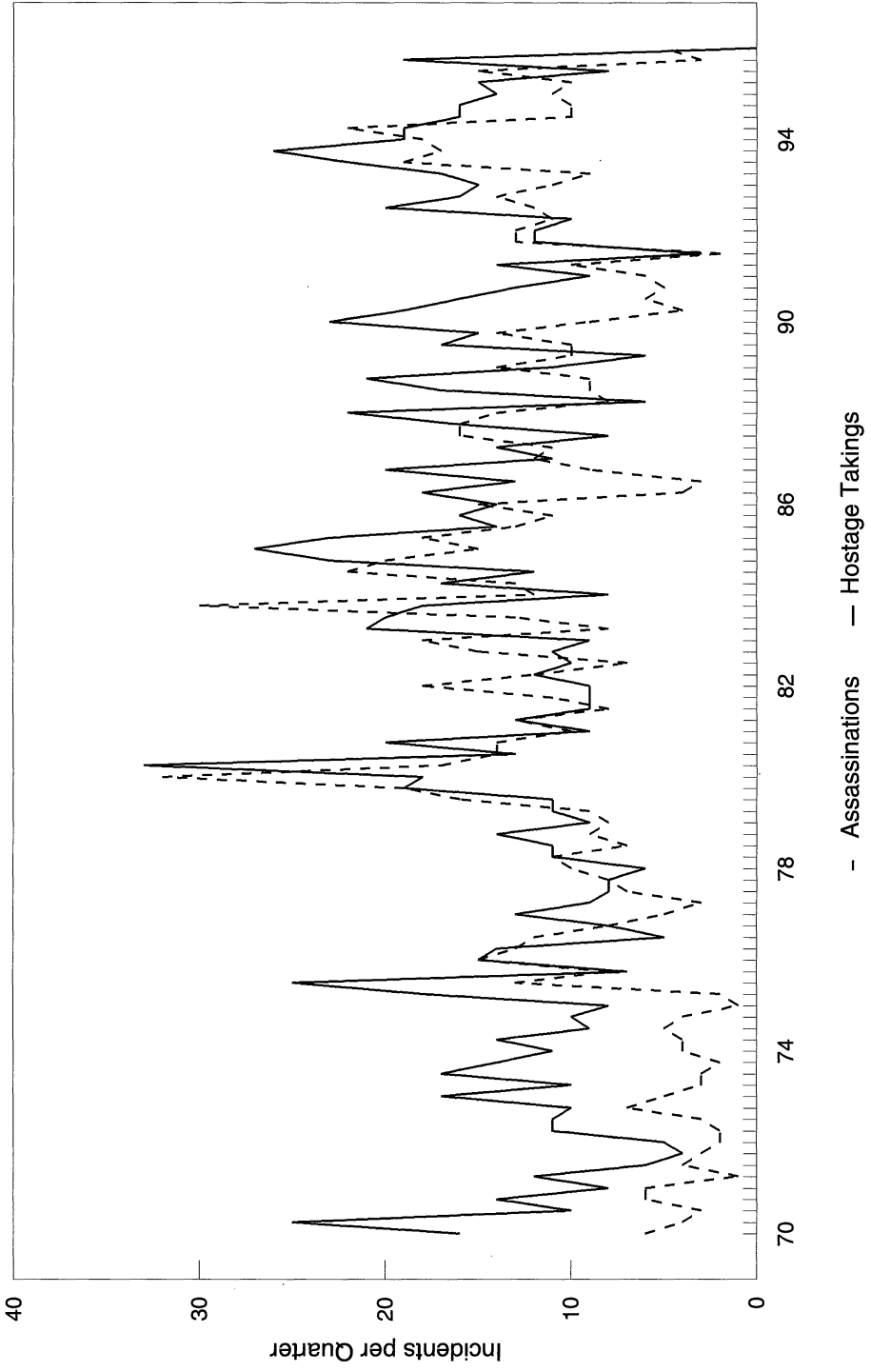


FIG. 2. Assassinations and hostage taking.

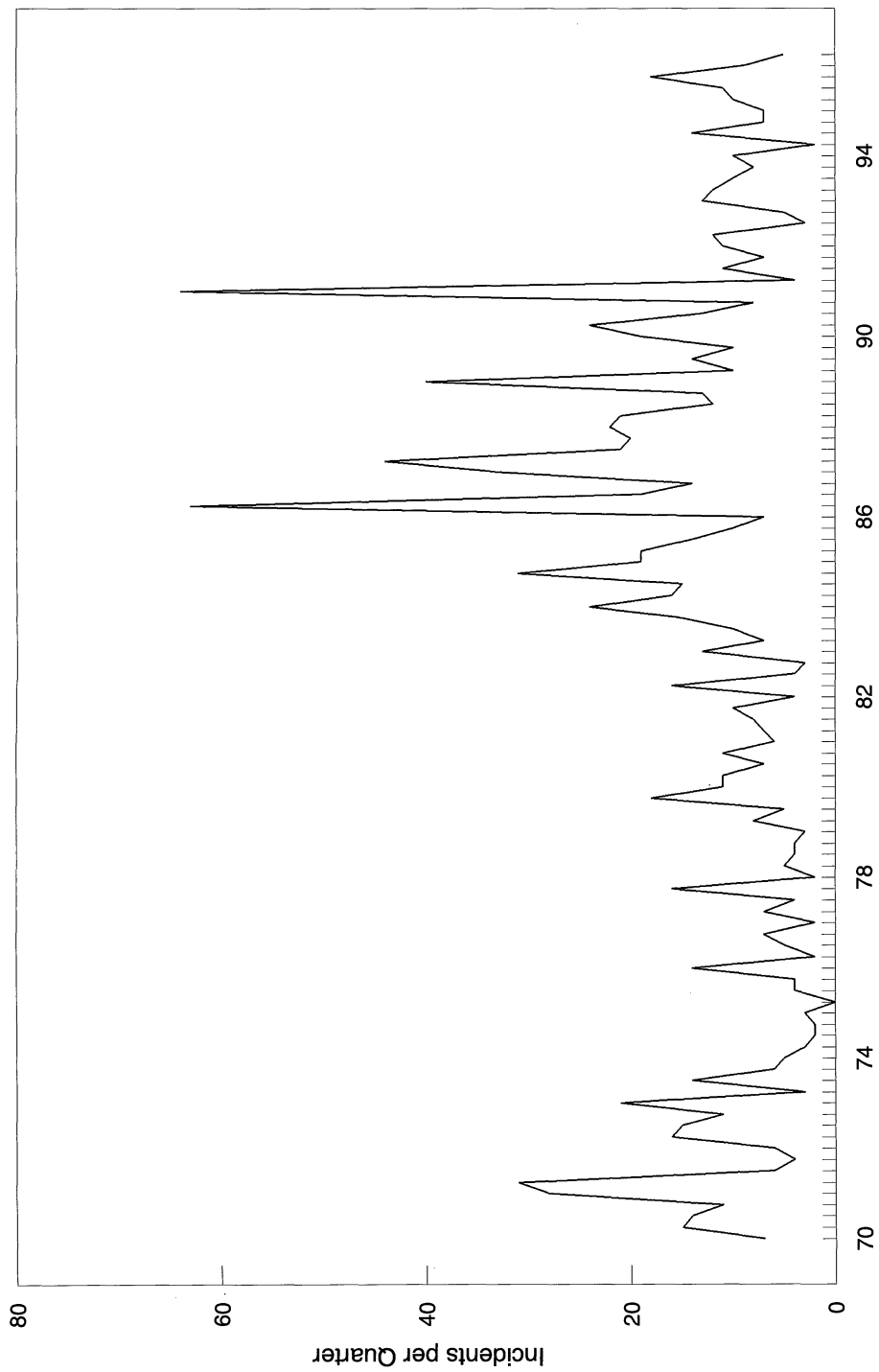


FIG. 3. Threats and hoaxes.

estimates are given for the ALL series—one based on the standard procedure, resulting in a quadratic trend, and one based on an alternative procedure, resulting in a better-fitting cubic trend. The “prob” value in brackets beneath the  $F$ -statistics, associated with each of the polynomial estimates, indicates the significance level (.06 and .015) of the fitted equation, where smaller values imply a reduced probability that the measured value occurred by chance. Even though the linear term for the second set of estimates is insignificant at the .10 level, the quadratic and cubic terms indicate that a *nonlinear* trend exists for the ALL incidents series. The remaining four estimated trends are more clear-cut. There is no trend whatsoever for BOMBINGS, a result consistent with an earlier study for the Cold War period (Enders et al., 1992:315). In contrast, the HOSTAGE series implies a very small, but significant, positive linear trend over the entire period. This finding also agrees with the earlier study of the Cold War, where this small linear trend for hostage-taking was somewhat larger—i.e., 0.0587. Thus, hostage-taking appears to be leveling off now. ASSASSINATIONS and THREATS follow a quadratic and cubic nonlinear trend, respectively, where the prob values associated with the  $F$ -statistics indicate strong fits.

When one typically reads about trend, commentators invariably have a linear trend in mind. Except for a modest linear trend for HOSTAGE in Table 2, none of the other series displays a linear trend. Thus, statements in the media and the literature about an alleged upward or downward trend in international terrorism are not borne out by the analysis here. The positive and negative coefficients associated with the higher-degree time terms indicate that the series possess oscillating trends with time, so that an observed downturn, or “trend,” can be shortly followed by an upturn, and vice versa, as seen in Figures 1–3. Thus the common practice in the terrorism literature of specifying a trend based on the observation of a few recent years is a meaningless exercise which should be resisted (e.g., Hoffman, 1994).

To test for stationarity, we removed the trend from the data using the fitted polynomial trend estimates, so that  $y_t$  is regressed on the polynomial  $z_t$  in equation (2). We then conducted an ADF test on each of these filtered series with four lags (since the data is quarterly). Based on the ADF(4) statistics listed in the last column of Table 2, we can reject the null hypothesis of a unit root for all five series at the 95 percent level, where the critical value for the ADF is  $-2.90$ . Since all ADF values are less than  $-2.90$ , we can conclude that the trend-filtered series are stationary.

### *Spectral Analysis*

Once the trend has been identified and purged from a time series, Spectral Analysis can be applied to the residual series to identify sinusoidal, or wavelike patterns in the behavior of a series,  $y_t$ . Cycles can be theoretically justified if actions or events can cause incidents to be bunched together or separated from one another on a regular basis. If, for instance, a contagion process is present, then successful incidents will stimulate, via the media, additional copycat incidents until the authorities devise an effective counter—such as metal detectors against would-be hijackers. By the same token, a thwarted attack can inhibit other similar actions. Once an effective government countermeasure is found and terrorist failures are on the rise, terrorist acts are temporarily inhibited. Such countermeasures diffuse among governments, thus reinforcing the downturn in terrorism worldwide. This diffusion may be fast or slow depending on the sophistication of the countermeasure. Terrorists then have an incentive to devise new logistics that bypass the counter. To circumvent metal detectors in airports, terrorists resorted to plastic guns, flammable liquids, and plastic explosives. In some incidents, airport ground employees planted the weapons on the plane. The effects of a contagion in producing a cycle is particularly graphic in a spate of skyjackings by Cubans, wanting

to return to Cuba from the United States during 1982 and 1983. An early incident on 2 February 1982 on Air Florida Flight 710 involved a homesick Cuban taking over the flight after claiming to have a gasoline-filled bottle (Mickolus, Sandler, and Murdock, 1989). Many others used similar tactics to bypass metal detection in 1982 and 1983, until Fidel Castro finally announced and imposed forty-year jail sentences on these skyjackers on 6 July 1983, at which time such skyjackings virtually fell to zero (Enders et al., 1990).

Cycles of different lengths are also attributable to public reaction and pressures in a liberal democracy. As terrorist incidents increase in frequency, public opinion pressures governments to curb the level of terrorism at home and abroad. In response, governments temporarily direct their attention and resources to thwarting terrorism. This renewed focus is apt to convince terrorists to ease off until which time they develop new logistical methods, or there materialize new sources of terrorist support (e.g., state sponsorship), and/or government efforts are diverted elsewhere. In other instances, authorities, motivated by public pressure, may be successful in infiltrating a group and capturing a large portion of its members, so that a new generation of terrorists must come along to carry on the struggle—e.g., the Red Army Faction (RAF), the Red Brigades, and the Båader-Meinhof group. Years may pass before a new generation is equipped to act. In the case of the third generation of the RAF, the group decreased its vulnerability by studying the court cases against the second generation, learning, for example, that authorities lifted fingerprints from the bottoms of toilet seats and the insides of refrigerators. RAF members began applying a special ointment to prevent leaving incriminating fingerprints (Hoffman, 1994:377). As terrorist incident counts fall, public pressures are relaxed, and governments reallocate scarce resources elsewhere until the next public outcry when terrorism is on an upsurge. That is, a political cycle can also impart cycles to terrorist activities; such political cycles can be in the four-to-six-year range owing to the length of office for most countries' leaders.

Cycles based on public opinion swings are anticipated to be typically long in the five-year range because it takes time for the public to unite and make its demands on officials to do something. These officials must then devise means for thwarting the terrorist threat and put these means into effect before any result follows. Chalk (1995) documents that it has taken three to five years for public opinion to induce European governments to enact antiterrorist legislation in Germany, France, the United Kingdom, and Spain. "Antiterrorist legislation first incorporated as part of the permanent laws of the Spanish state at the end of 1980 following three years of intense ETA violence between 1978–1980" (Chalk, 1995:22). It took longer still for the laws to have an effect. Efforts in the early 1990s to increase cooperation in antiterrorist activities in the EU have come only after years of public pressure (Cardona, 1992; Zagari, 1992; Chalk, 1994). When, however, an act or terrorist campaign is particularly callous or deadly, public outrage can mobilize action more quickly and, in doing so, create a shorter cycle. Following the bombing of the Alfred P. Murrah Building in Oklahoma City, antiterrorist legislation introduced in May 1995 was enacted in eleven months. The March 1985 sarin attack on the Tokyo subway, which killed twelve and injured over 5,000, brought swift action from the Japanese police and had countries worldwide preparing procedures for addressing similar threats. If terrorist incidents become on average more deadly, the high-frequency or short-cycle end of the spectrum is expected to be affected.

Terrorists may also bunch incidents together because of scale economies that lower per-incident costs by spreading fixed costs associated with planning and executing a campaign over a large number of operations. For example, bomb manufacture has scale economies, so that a terrorist group is anticipated to plant a large number of bombs in a single offensive or even during a single night rather than just a single bomb. This pattern is seen with respect to the Irish Republican

Army, Hamas, the ETA, and many others. In addition, the risks associated for the terrorists during the planning stage are often independent of the number of planned events and, as such, result in scale economies. If groups in different countries are protesting against a particular event or are coordinating activities, as was true for leftist groups in Europe (Alexander and Puchinsky, 1992), then these scale economies can result in a wave of attacks in close proximity in time. On the negative side for terrorists, government-gathered intelligence or infiltration into the group would curb a host of events if multiple events are planned together. Such governmental success can then deter other groups from carrying out their campaigns.

Waves of terrorist incidents may be stimulated by a single highly visible event or act that mobilizes terrorists. For example, the U.S. retaliatory raid against Libya in April 1986 and the Gulf War of 1991 unleashed a worldwide protest on the part of terrorist groups with anti-American orientations (Enders and Sandler, 1993). As events planned for the future are moved by terrorists to the present, a peak in incidents results, followed by a trough as previously planned future events are no longer executed. If precipitating events occur on a regular basis, then a well-defined cycle will follow.

Another factor that could induce peaks and troughs in overall terrorist activities involves policies that affect two or more terrorist tactics in a similar fashion. For example, the introduction of metal detectors on 5 January 1973 in airports impacted skyjackings, embassy takeovers, and threats and hoaxes, since this technology had multiple security applications. As a consequence, incident series tend to be interrelated and this interrelationship means that a single policy can curb or stimulate a wide range of events.

Because the attack-counterattack cycle can vary among different modes of terrorist operations, each component time series is anticipated to have its own individualized periodicity. Logistically complex modes—hostage-taking, assassinations—are expected to possess a long cycle since measures and countermeasures by the antagonists are anticipated to take time to develop. Series such as bombings, made up of both logistically complex and simple component series, are likely to display both short and long underlying cycles. The length of these cycles is an empirical question to which we now turn.

To identify underlying cycles, we use Spectral Analysis, which takes a stationary, detrended series and expresses it in terms of sinusoidal functions. Consider, for example, the simple sinusoidal function

$$x_t = \delta \sin(\omega t + \phi). \quad (3)$$

The value of  $\delta$  indicates the height or amplitude of the cycle; large values of  $\delta$  are associated with large oscillatory movements in the series. The value of  $\phi$  indicates the phase cycle; for example,  $\phi$  equals zero if the beginning of the cycle commences at the start of the data set. Moreover, the frequency of the cycle is given by  $\omega$ , while the period is given by  $2\pi/\omega$ . This follows because the value of  $x_t$  is identical for all values of  $\omega t$  equal to a given multiple of  $2\pi$ . If, for example, the frequency is 0.31, then the cyclical component will be the same every 20.27 quarters [ $2\pi/(0.31) = 20.27$ ]. The values of  $\delta$ ,  $\omega$ , and  $\phi$  are not known to the researcher and have to be ascertained from the data. Spectral Analysis makes use of the fact that equation (3) can be written as

$$x_t = A \sin(\omega t) + B \cos(\omega t) \quad (4)$$

where

$$A^2 + B^2 = \delta^2 \text{ and } \tan(\delta) = B/A.$$

The detrended value of each incident sequence can be regressed on equation (4) for each possible frequency  $\omega_i$  on the interval 1 to  $\pi$ . If a particular frequency has no explanatory power, then the values of  $A$  and  $B$  associated with that frequency should be small. If, instead, a frequency is particularly important for explaining the behavior of the  $y_t$  sequence, it will then explain a sizable proportion of the variation of the detrended value of  $y_t$ . The graph of the proportionate variation in  $y_t$  explained by each frequency is called the "spectral density function," whose largest peaks identify important frequencies.<sup>15</sup>

In order to distinguish the potential impact, if any, of the end of the Cold War on cyclical behavior, we empirically identified the primary and secondary cycles of series pairs for the five series. One series in each pair included observations for the entire sample period, 1970:1–1996:2, while the other series contained observations ending in 1991:4. This latter endpoint is intended to approximate the demise of the Soviet Union and the Warsaw Pact. It also marks the renaissance of cooperation between Western and Eastern Europe. In addition, this date corresponds to increased efforts to curb the transnational terrorist threat by Western European countries. We settled on this truncation date for the second series of each pair for a number of reasons. For example, earlier dates in 1990 or 1991 would overlap with events in Kuwait, including the start and conclusion of the Gulf War on 16 January 1991 and 9 February 1991, respectively. Although the military structure of the Warsaw Pact was dissolved on 31 March 1991, the Warsaw Pact itself was not officially disbanded until 1 July 1991.<sup>16</sup> The Soviet Union officially ceased to exist during 1991:4 on 20 December 1991 and the Commonwealth of Independent States (CIS) was born the next day on the 21st. Furthermore, the so-called Rome Declaration from NATO heads of states took place on 7–8 November 1991 during 1991:4 and pledged cooperation and normalization of relations with Central and Eastern Europe. The North Atlantic Cooperation Council (NACC) was also instituted during this summit and was intended to improve economic and security ties between Eastern and Western Europe. Finally, we had to choose a date not too near to the end of the sample period for there to be sufficient remaining duration to distinguish a potential difference between the corresponding pairs of series. If, however, the date were moved too early, then there would be no time allowed for the consequences of a structural change to be experienced.

Table 3 indicates the primary frequencies (period) and secondary frequencies (period) for the five pairs of series. For each pair, the series for the entire period is listed in the top row and the companion series for the truncated period "to 1991:4" is given on the next row. To identify the primary and secondary frequencies, we found the two highest peaks in the log of the spectral densities. These densities are displayed for three of the five time series in Figures 4 and 5, with the frequencies on the horizontal axis and the log of the spectral density on the vertical axis. The solid curves in these figures represent the spectral density for the entire period, while the dashed curves correspond to the spectral density for the truncated period to 1991:4. In two cases—the ALL series for the entire period and the THREATS series to 1991:4—there is no obvious secondary concentration of the spectral density. For illustration, we consider Figure 4 for the pair of ALL series in greater detail. Both series display an obvious peak in the spectral density at a frequency of 0.31, which translates into a rather long period of 20.27 quarters ( $=2\pi/0.31$ ). This means that it takes five years for the ALL series to complete an entire cycle, so that

<sup>15</sup> The spectral densities displayed later in Figures 4 and 5 were smoothed using a flat window of three periods and trapezoidal taper width of five periods. The spectral densities for assassinations and for threats and hoaxes were also based on the same smoothing procedure. These latter spectral density figures are available upon request from the authors.

<sup>16</sup> Dates throughout this paragraph come from NATO Office of Information and Press, 1995.

the current downturn in terrorist incidents experienced over the last couple of years is apt to be followed by an upturn around 1998, but to a lower mean level as shown in the next section. This long cycle for the ALL series is consistent with a public-opinion-based cycle taking many years to complete. Cycles based on a lumpiness of investment efforts on behalf of both the authorities and the terrorists in countering one another's efforts would also be consistent with a long five-year cycle. A secondary, shorter cycle of under two years (7.39 quarters) is associated with just the truncated ALL series. Although the spectral densities of the two series match one another at low frequencies, they tend to differ at higher frequencies, resulting in the disappearance of the shorter periodicity when the entire series is examined.

Figure 5 indicates little deviation in the spectral densities and, hence, the cyclical behavior for the HOSTAGE series when the respective series for the entire period is compared with the corresponding series for the truncated period. In Table 3, the HOSTAGE series is associated with a long primary periodicity of 18 quarters and a medium-length secondary periodicity of just over 6 quarters for both series. Similarly, the ASSASSINATIONS series possesses a long primary periodicity of about 21 or 18 quarters, depending on the series length, and a rather short secondary period of just over 3 quarters. Also, the spectral densities for the ASSASSINATIONS series (not displayed) show a close concordance between the entire period and the truncated period.

Like the ALL series, the cyclical behavior for the two BOMBINGS series match one another for low frequencies, but not for high frequencies (see top two curves in Figure 5). As shown in Table 3, both BOMBINGS series have a primary periodicity of 21 quarters and a secondary short periodicity of almost 3 quarters. It is also noteworthy that BOMBINGS for the entire period has a third periodicity at about 6 quarters, while BOMBINGS for the truncated series has a third periodicity at about 7 quarters. As anticipated, the BOMBINGS series has the most component cycles, because it is made up of the most separate component attack modes of varying logistical complexity. Incendiary bombs, which are easy to assemble and dispatch, are apt to possess a short cycle, while suicide car bombs, which are logistically complex, are likely to display a long cycle. Other kinds of bombings can have a medium-length cycle.

Finally, the THREATS series possesses two short periodicities—3.70 and 3.14 quarters—for the entire period, and a single short periodicity of 3 quarters for the

TABLE 3. Periodicities for the Five Series

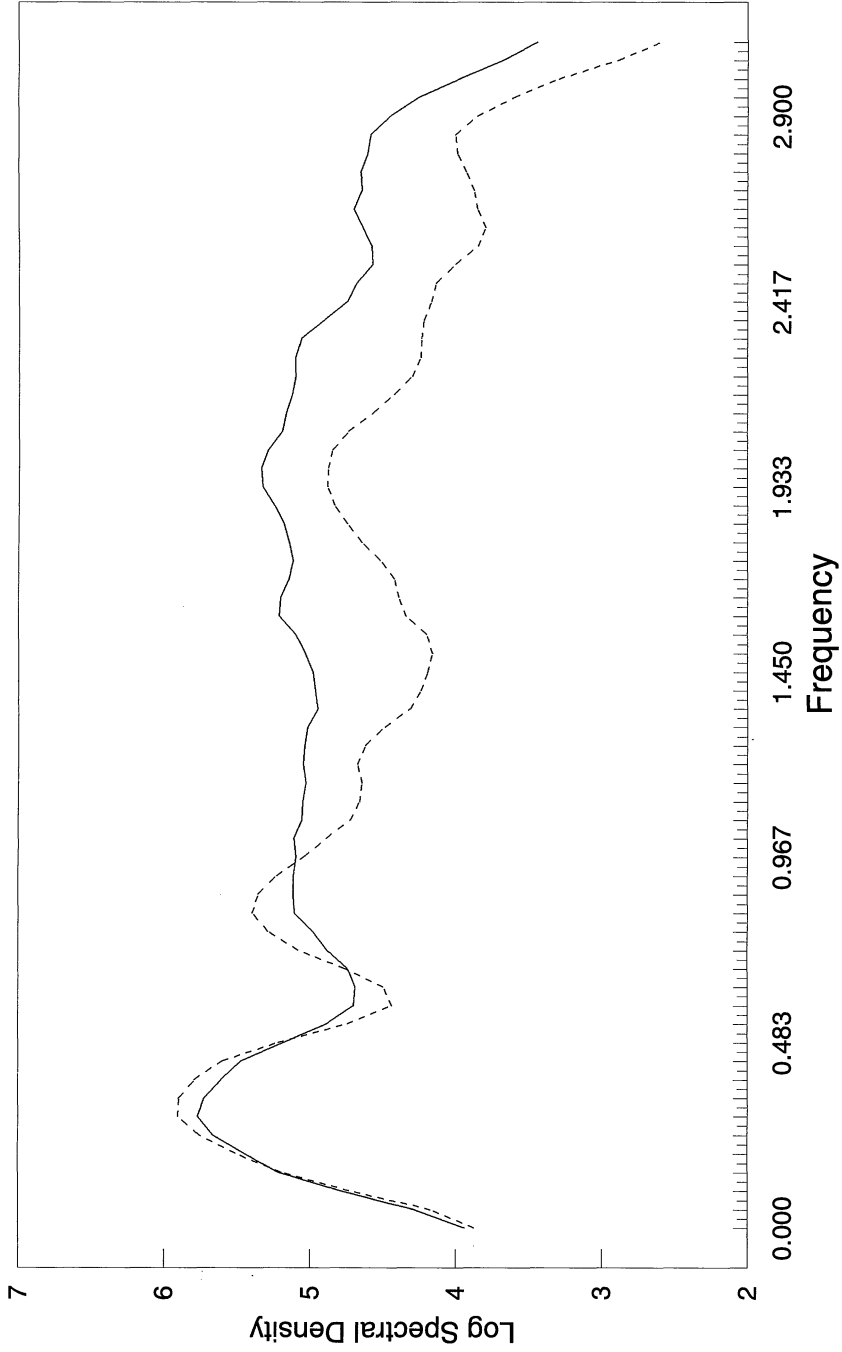
<i>Series<sup>a</sup></i>	<i>Primary Frequency</i>	<i>Period in Quarters</i>	<i>Secondary Frequency</i>	<i>Period in Quarters</i>
ALL	0.31	20.27	NA	NA
(To 1991:4)	0.31	20.27	0.85	7.39
BOMBINGS <sup>b</sup>	0.30	20.94	2.20	2.86
(To 1991:4)	0.30	20.94	2.15	2.92
HOSTAGE	0.35	18.00	1.00	6.28
(To 1991:4)	0.35	18.00	1.00	6.28
ASSASSINATIONS	0.30	20.94	2.05	3.06
(To 1991:4)	0.35	18.00	2.05	3.06
THREATS	1.70	3.70	2.00	3.14
(To 1991:4)	2.00	3.14	NA	NA

<sup>a</sup>For each pair of series, the first is the entire series from 1970:1 to 1996:4, while the second is the series from 1970:1 to 1991:4. These latter series are indicated by "To 1991:4."

<sup>b</sup>The BOMBINGS series has a third periodicity of note at 5.98 quarters for the entire series and at 6.98 quarters for the truncated series ending at 1991:4.

NA denotes not applicable.





— Entire Sample    -- Through 1991:4

FIG. 4. Spectral density for all incidents.

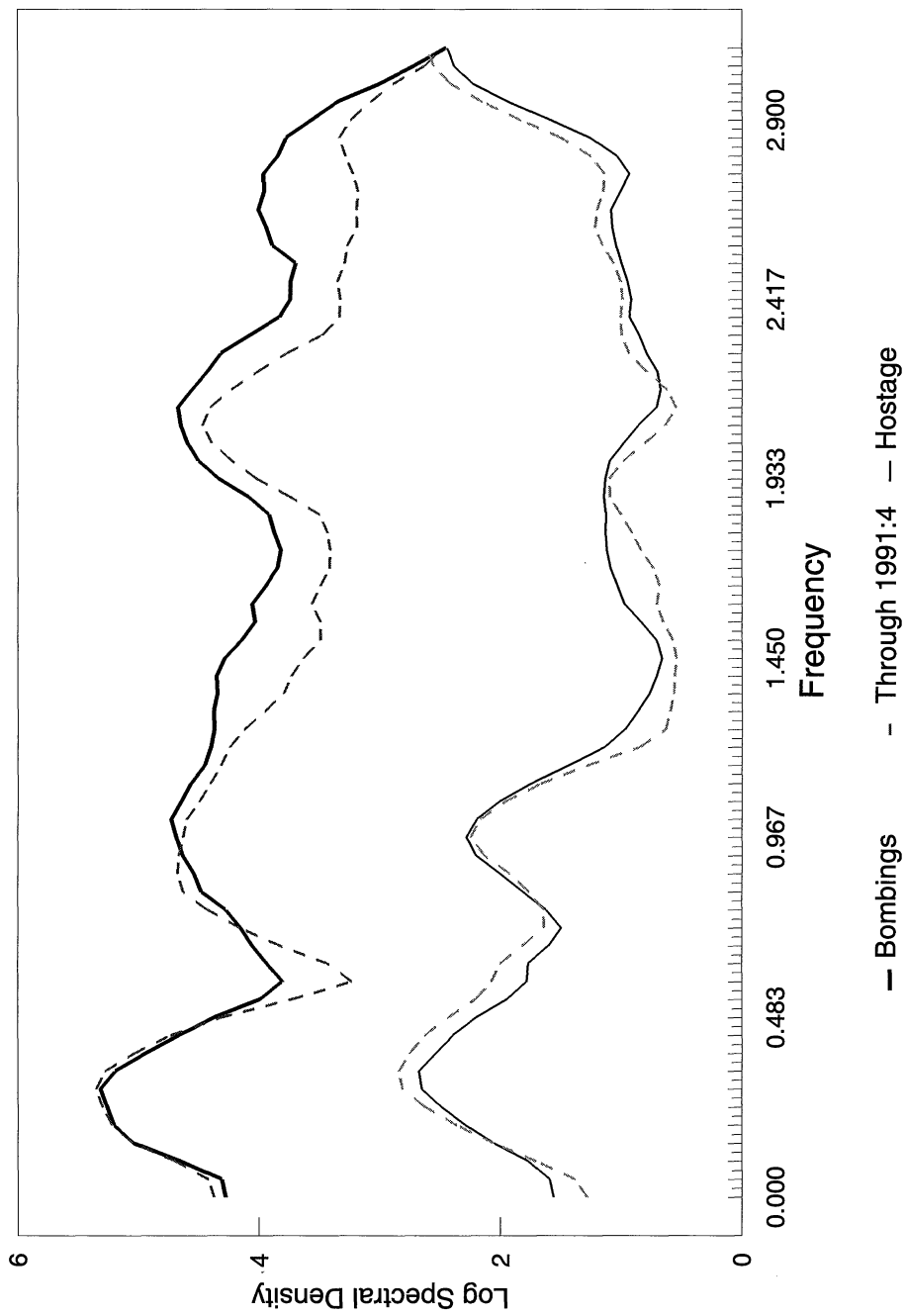


FIG. 5. Spectral densities for bombings and hostage incidents.

truncated period. The spectral densities for threats and hoaxes display a good deal of deviation between the truncated series and the entire-period series.

The results in Table 3 have a number of implications. First, the length of the underlying periodicities is related to the logistical complexity of the attack mode; the least complex mode (THREATS) has the shortest cycle, while the most complex (HOSTAGE) has no really short cycle. Second, those series, containing component events of varying complexity, possess long and short periodicities owing to the component series. Hence, BOMBINGS and HOSTAGE display two or more distinct periodicities. Third, events of the post-Cold War period have had little impact on the long cycles underlying the five time series. This suggests that the factors driving the underlying dynamics—public-opinion pressures and lumpiness of investment—have not really changed enough in recent years to have affected the long cycles characterizing the ALL, BOMBINGS, HOSTAGE, and ASSASSINATIONS series. Fourth, the primary influence of the post-Cold War era has been felt by the short cycles associated with BOMBINGS and THREATS, indicating that policymakers should be vigilant for changes in the cycles in the 7 to 3 quarters range. Fifth, the absence of a marked tendency for cycles to shorten suggests that, despite some deadly terrorist incidents in the 1990s, there has been no noticeable general push to quicker actions on the part of the authorities in recent years. As more quarters of post-Cold War data are generated, we will eventually acquire sufficient data to do separate Spectral Analyses for, say, the pre-1983 era and the post-1983 period to ascertain whether the greater carnage and severity of attacks in the latter period has shortened cycles as hypothesized.<sup>17</sup> Sixth, the logistically complex events—HOSTAGE and ASSASSINATIONS—are relatively unaffected in terms of their cyclical behavior in the recent period. These results address only cyclical changes. To examine quantitative changes in the level of terrorism in the post-Cold War period we must turn to a VAR analysis of the interrelationships of the component series to recent “shocks.”

### **Post-Cold War Terrorism-Reduction Dividend: A VAR Analysis**

Our task is to ascertain if developments in the post-Cold War period have had a net favorable or unfavorable influence on international terrorism. Because there are numerous potential shocks (i.e., events) after January 1991 that could have affected international terrorism and terrorist attack modes in alternative ways we do not prejudge the point of a structural change; rather, we will statistically determine where, if anywhere, such a change has occurred. Potential shocks include the end to the Cold War, the burgeoning cooperation between NATO and Eastern Europe, the demise of important Marxist terrorist groups (e.g., the Red Brigade, Action Direct, the Combatant Communist Cell, the Red Army Faction, the Revolutionary Cell),<sup>18</sup> reduced Middle East state-sponsorship of terrorism in the wake of the Gulf War, and increased efforts by Western nations to curb terrorism. To identify a structural break point we must also include dummies for Cold War events, identified in earlier work as important points of structural change (Enders and Sandler, 1993). These include the deployment of metal detectors in airports (1973:1), U.S. enhancement of embassy security (1976:4 and 1985:4), and the U.S. retaliatory raid on Libya (1986:2).

A VAR analysis is used that adjusts for seasonality, the earlier shocks, and the interrelationships among the component series (i.e., BOMBINGS, ASSASSINATIONS, HOSTAGE, and THREATS). These series are anticipated to be interrelated

<sup>17</sup> This increased severity of attacks is documented in Sandler, 1997b:321.

<sup>18</sup> On these terrorist groups, see Alexander and Puchinsky, 1992. Also consult Crelinsten and Schmid, 1992, Clutterbuck, 1992, Jongman, 1992, and Chalk, 1994, 1995, 1996.

because terrorists support their various operations from the same pool of resources. When designing the mix of operations in a campaign terrorists must weigh the relative costs and benefits of alternative modes of attacks. An important event—e.g., reduced state-sponsorship of transnational terrorism—can potentially affect all terrorist incident series by decreasing terrorist resources.

To explain VAR analysis we consider the following simplified system allowing for only two incident types:

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

and

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

where  $\text{Hostage}_t$  is the number of hostage incidents in time period  $t$ ,  $\text{Bombings}_t$  is the number of such incidents in time period  $t$ , and  $\varepsilon_{1t}$  and  $\varepsilon_{2t}$  are the shocks to each incident type that may be correlated. If hostage (bombing) incidents tend to cluster, then we would expect  $a_{11}$  ( $a_{22}$ ) to be large, reflecting the tendency for adjacent periods to have similar numbers of incidents. The interrelationships between the series are captured by the coefficients  $a_{12}$  and  $a_{21}$ . If, for example, an increase in hostage incidents is associated with a subsequent increase in bombings, we would expect  $a_{21}$  to be positive. Contemporaneous movements in the series are captured by the correlation between  $\varepsilon_{1t}$  and  $\varepsilon_{2t}$ .

The VAR represented by equations (5)–(6) can be extended in a number of ways. The results reported below use a four-equation model to allow for the possible complex set of interactions among the four series. In addition, sophisticated dynamics interactions are modeled by including longer lag lengths.<sup>19</sup> We also modify the intercept terms to allow for the effects of the post–Cold War period. In essence, we alter the set of VAR equations, so that the intercept term for each equation  $i$  becomes<sup>20</sup>

$$a_{i0} = \alpha_{i0} + \beta_{i0}\text{POST} \quad (7)$$

in which POST is a dummy variable equal to zero prior to the post–Cold War era and equal to unity after the start of this era. Thus, the change in POST captures the change in the level of each series resulting from events of the post–Cold War era. The value of  $\beta_{i0}$  captures the immediate or contemporaneous effect of this era on incident type  $i$ . Due to the interrelations among the series and the dynamic interactions, the long- and short-run effects can be quite different. To obtain the long-run effects, we first calculated the expected value of each series up to the intervention date for POST. We then shocked POST from zero to unity and traced out the resulting time path for each series through 1996:2 (the end of the data set). The difference between the pre-POST mean and the predicted value of the series in 1996:2 is the calculated long-run effect.

The significance of POST for any one incident type can be tested using a standard  $t$ -test for the null hypothesis  $\beta_{i0} = 0$ . It is also possible to test simultaneously the significance of POST across the entire set of equations (i.e., we can test the null hypothesis,  $\beta_{10} = \beta_{20} = \beta_{30} = \beta_{40} = 0$ ) using a chi-squared test with 4 degrees of freedom. Goodness-of-fit measures—Akaike Information Criterion (AIC) and

<sup>19</sup> We found that a four-lag model was most appropriate.

<sup>20</sup> We also used dummy variables to control for the introduction of metal detectors in 1973, U.S. embassies fortification in 1976 and 1985, and the retaliatory bombing raid on Libya in April 1986.

Schwartz Bayesian Criterion (SBC)—along with the chi-squared test for statistical significance can be used to determine the most appropriate period to select as best reflecting when during the post-Cold War events as a group had the greatest impact on terrorism.

By examining the AIC and SBC values associated with different dummy shift variables for the post-Cold War shock variable, POST, we tried to determine this impact point. All quarters between 1991:1 and 1995:2 were investigated as possible candidates, since we did not have good priors as to when these events would have the greatest impact. The best fit, as indicated by lowest values of AIC and SBC, occurs for POST set equal to 1994:2. At this point, the chi-squared goodness-of-fit statistic equals 10.99, which is significant at the .027 level. The third and fourth quarters of 1994 are also associated with high chi-squared statistics, indicative of a significant structural change at these points. The chi-squared statistics for 1994:3 and 1994:4 are significant at the .038 and .044 levels, respectively. No other quarter during the post-Cold War period is even remotely associated with a significant structural shift at standard levels of significance of .10 or better. The evidence of a structural change in the post-1990 period is clear: a significant change occurred during 1994. This finding suggests that the 1994 Brussels summit's initiatives to promote economic and security cooperation between Eastern and Western Europe may have impacted the transnational terrorist threat. An alternative explanation derives from a lag being experienced with the breakup of the Soviet Union and the communist regimes. State-financed resources in the pipeline to support terrorist groups were expended by these groups before things could become better. Also, the Gulf War of 1991 made for new grievances and terrorist attacks, which would initially go against a decline induced by an end to the superpower face-off and reduced state-sponsorship coming at the end of the Cold War. This period also followed significant efforts by the EU and individual European nations to curb the terrorist threat.

To quantify these impacts on terrorism, we ran the VAR model with an intervention point for POST set at 1994:2. We again included the seasonal dummies, the Cold War policy interventions, and four lagged values for the component series. When the influence of POST was tested for each of the individual series, the greatest immediate reduction is in bombings, where the quarterly series shifts down by 46.8 incidents in 1994:2 (see Table 4). This fall has a *t*-statistic of  $-3.064$ , corresponding to a prob or significance level of .003. The only other series that displays a significant reaction is HOSTAGE, which falls by just over four incidents in 1994:2. This drop is just significant at the .10 level with a *t*-statistic of  $-1.646$ . Neither ASSASSINATIONS nor the THREATS series displays a significant immediate reduction in 1994:2.

Next, we looked for a longer-run effect by ascertaining whether POST caused a significant difference between the series' mean for the pre-POST period and its mean predicted after 1994:2 through 1996:2, while accounting for the interrelationships among the four series. The HOSTAGE series indicates a long-run decline of 3.33 incidents per quarter, which is somewhat less than the immediate impact. In addition, the ASSASSINATIONS series displays a decline of nearly one incident (i.e.,  $-0.94$ ), while the THREATS series actually rises by almost two incidents ( $+1.97$ )

TABLE 4. Immediate Impacts Effect in 1994:2

<i>Series</i>	<i>Coefficient</i>	<i>t-statistic</i>	<i>prob value</i>
BOMBINGS	-46.81	-3.064	0.003
HOSTAGE	-4.15	-1.646	0.104
ASSASSINATIONS	-0.20	-0.093	0.926
THREATS	-3.37	-0.854	0.395

per quarter. Clearly, the fall in hostage-taking events and assassination incidents is more comforting than the tiny rise in threats and hoaxes, since the former events are more costly to society than the latter. During the long run, the BOMBINGS series continues its fall with 58.72 less incidents predicted per quarter by 1996:2 as compared to its mean-value period to 1994:2.

The immediate and longer-term impacts, associated with POST, indicate that a terrorism-reduction dividend has been experienced since mid-1994. Thus, the end to the Cold War, the improved relations between Eastern and Western Europe, and the efforts of Western powers to limit terrorism appear to have this important side benefit. Because terrorism displays cycles, the current lull in transnational terrorist activities will be followed by an upturn. The VAR analysis, however, indicates that this resurgence will be less pronounced than during the Cold War owing to the permanent drop in the mean of the BOMBINGS and HOSTAGE series associated with the post-Cold War period.

### Summary

If the superpower face-off during the Cold War led to state-sponsored terrorism, as many have speculated (Chalk, 1996), then the end of the Cold War should have resulted in a terrorism-reduction dividend. Concerted efforts by Western nations to curb transnational terrorism in the 1990s should also have bolstered this dividend. Furthermore, the peace process in the Middle East should have influenced international terrorism, since a large portion of international terrorism has had its roots in the Middle East. The direction of this latter influence is difficult to predict. To investigate the impact on international terrorism of events following the end of the Cold War, we have employed time-series analysis to uncover what, if anything, is different about the pattern of terrorism since the end of the Cold War. Our analysis shows that the underlying cycles associated with diverse terrorist events have not changed greatly in recent years. Logistically complex events—hostage-taking and assassinations—showed virtually no change in their cycles. Any cyclical differences attributable to the post-Cold War period characterized the less-demanding events of bombings and threats and hoaxes. Much of these differences in behavior affected the high-frequency (short-period) cycles. This result indicates that the underlying dynamics behind the long-period cycles have not been affected by the events of the post-Cold War period, despite a downward shift in international terrorism. Overall, there was little difference in trend behavior before and after the Cold War. Except for a very small upward trend to the HOSTAGE series, the other series displayed no upward linear trend for the 1970:1–1996:2 sample period. Any trend was nonlinear, suggestive of cycles. This result implies that statements in the media about the increasing problem of international terrorism do not hold up to scrutiny of the data.

We have also uncovered an international terrorism-reduction dividend beginning during the second quarter of 1994.<sup>21</sup> Significant immediate decreases in bombings and hostage-taking missions were identified. In the long run, these *reductions* attenuated somewhat for hostage-taking missions but intensified for bombings. A small long-run increase in threats and hoaxes and a small long-run decrease in assassinations were also identified. Although events during the post-Cold War period could have influenced international terrorism either negatively or positively, these events have, on balance, decreased terrorism through, in large part, a fall in the terrorists' favorite weapon—bombings.

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<sup>21</sup> The finding of this post-Cold War security dividend is certainly in keeping with Gurr's (1994) ISA Presidential Address where he saw more security following the Cold War, despite Bosnia and tribal conflicts in Africa.

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