

**ECONOMIC CONSEQUENCES OF TERRORISM IN DEVELOPED AND  
DEVELOPING COUNTRIES: AN OVERVIEW**

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## **ECONOMIC CONSEQUENCES OF TERRORISM IN DEVELOPED AND DEVELOPING COUNTRIES: AN OVERVIEW**

Terrorism is the premeditated use or threat of use of violence by individuals or subnational groups to obtain a political or social objective through the intimidation of a large audience, beyond that of the immediate victim. Although the motives of terrorists may differ, their actions follow a standard pattern with terrorist incidents assuming a variety of forms: airplane hijackings, kidnappings, assassinations, threats, bombings, and suicide attacks. Terrorist attacks are intended to apply sufficient pressures to a government so that it grants political concessions. If a besieged government views the anticipated costs of future terrorist actions as greater than the costs of conceding to terrorist demands, then a government will make some accommodation. Thus, a rational terrorist organization can, in principle, reach its goal quicker if it is able to augment the consequences of its campaign. These consequences can assume many forms including casualties, destroyed buildings, a heightened anxiety level, and myriad economic costs. Clearly, the attacks on September 11, 2001 (henceforth, 9/11) had significant costs that have been estimated to be in the range of \$80 to \$90 billion when subsequent economic losses in lost wages, workman's compensation, and reduced commerce are included (Kunreuther, Michel-Kerjan, and Porter, 2003).

Terrorism can impose costs on a targeted country through a number of avenues. Terrorist incidents have economic consequences by diverting foreign direct investment (FDI), destroying infrastructure, redirecting public investment funds to security, or limiting trade. If a developing country loses enough FDI, which is an important source of savings, then it may also experience reduced economic growth. Just as capital may take flight from a country plagued by a civil war (see Collier et al., 2003), a sufficiently intense terrorist campaign may greatly reduce capital inflows (Enders and Sandler, 1996). Terrorism, like civil conflicts, may cause spillover costs

among neighboring countries as a terrorist campaign in a neighbor dissuades capital inflows, or a regional multiplier causes lost economic activity in the terrorism-ridden country to resonate throughout the region.<sup>1</sup> In some instances, terrorism may impact specific industries as 9/11 did on airlines and tourism (Drakos, 2004; Ito and Lee, 2004). Another cost is the expensive security measures that must be instituted following large attacks – e.g., the massive homeland security outlays since 9/11 (Enders and Sandler, 2006, Chapter 10). Terrorism also raises the costs of doing business in terms of higher insurance premiums, expensive security precautions, and larger salaries to at-risk employees.

The size and the diversity of an economy have much to do with the ability of a country to withstand terrorist attacks without showing significant economic effects. Yemen's shipping industry suffered greatly after the terrorist attacks on the *USS Cole* and the *Limburg* diverted half of Yemen's port activities to competitive facilities in Djibouti and Oman due to a 300% increase in insurance premiums (US Department of State Fact Sheet, 2002). In a more diversified and developed economy, such losses may have a temporary influence as resources are reallocated to other sectors or better security measures are deployed to allay concerns. Moreover, developed economies have better monetary and fiscal capabilities to limit macroeconomic impacts of terrorist attacks than small developing countries. Thus, we should anticipate that developed countries are more likely to display sector-specific reactions to terrorism attacks, while developing countries are apt to exhibit some macroeconomic consequences to a particularly vicious attack or a sustained terror campaign.

This paper has five purposes. First and most important, the paper takes stock of the literature on the economic consequences of terrorism and evaluates the methodology used to date. The literature dates back to the early 1990s, with most of the contributions coming after 9/11. Second, macroeconomic influences of terrorism are distinguished from microeconomic

sector- or industry-specific effects. Third, terrorism impacts in developed countries are contrasted with those in developing countries. Fourth, we indicate how researchers can better account for economic consequences in developing countries. Finally, data needs are addressed.

The remainder of the paper contains eight sections. Section 1 reviews concepts and definitions that are necessary for understanding the economic consequences of terrorism. In Section 2, we investigate how the United States, representative of other developed nations, cushioned the blow and sped recovery from the unprecedented attacks of 9/11 through monetary, fiscal, and other policies. Section 3 reviews and evaluates some macroeconomic studies of the impact of terrorism, whereas Section 4 contrasts anticipated differences between how developing and developed countries are affected by terrorism. In Section 5, we review and analyze past microeconomic studies of the economic fallout from terrorism. Section 6 discusses past methodologies. In Section 7, we indicate data availability and needs. Section 8 provides future directions and conclusions.

## **1. Essential Concepts**

Studies over the last decade have established that internal conflicts can have significant economic consequences in terms of reduced growth within a conflict-ridden country (e.g., Collier and Hoeffler, 2004; Collier et al., 2003; Collier and Sambanis, 2002) and in neighboring countries (Murdoch and Sandler, 2002, 2004). But a civil war is a broader conflict than terrorism, since the former usually involves a minimum of 1000 deaths and may result in tens of thousands of casualties, while a terrorist incident results, on average, in a single death (Sandler, 2003). Thus, a country may be plagued with terrorism in, say, ten of ten years, but experience relatively few deaths and modest property damage. Civil wars may stem from an insurrection that tries to overthrow the government. In other cases, civil wars can erupt from grievances

between groups with deep-seated differences (hatreds). Terrorism is a tactic that may or may not be associated with a civil war, insurrection, or other form of political violence. As such, terrorism typically involves little loss of life and property. Naturally, there are exceptions, such as the March 11, 2004 Madrid train bombings or the December 21, 1988 downing of Pan Am flight 107, where two to three hundred people perished, respectively. But even in these cases, the loss of life, though tragic, is trivial compared with most internal conflicts so that the likely macroeconomic impact of terrorist events is not anticipated to rival civil wars.

This prediction may change under a few scenarios: a large-scale attack like 9/11, a protracted terrorist campaign with many deadly incidents, or some devastating attack on a developing country's primary sector (recall the Yemen shipping example). One should not expect that a modest number of terrorist incidents in most countries will affect the countries' income growth. This is an essential insight, because it indicates that indices of risks that *include* internal conflicts and terrorism may be merely picking up significant disruptions associated with the former. Additionally, sector-specific microeconomic influences are often the most likely consequences from terrorism.

### *Cost distinction*

There are numerous cost distinctions that could be drawn regarding terrorism losses. Direct costs, for example, involve the immediate losses associated with a terrorist attack or campaign and include damaged goods, the value of lives lost, the costs associated with injuries (including lost wages), destroyed structures, damaged infrastructure, and reduced short-term commerce. In contrast, indirect or secondary costs concern attack-related subsequent losses, such as raised insurance premiums, increased security costs, greater compensation to those at high-risk locations, and costs tied to attack-induced long-run changes in commerce. Indirect

costs may surface as reduced growth in gross domestic product (GDP), lost FDI, changes in inflation, or increased unemployment. A judgment must be made as to how to distinguish between direct and indirect costs, in which any distinction would strike some researchers as arbitrary.

Fortunately, this distinction is not really necessary to characterize the economic impact of terrorism, which can be represented in terms of some well-defined macroeconomic (e.g., real per capita GDP growth) or microeconomic variable (e.g., reduced tourist receipts). These variables then represent the consequences of terrorism in terms of aggregate or sectoral activity. If lost output, casualties, and damaged infrastructure are sufficiently large, then they will affect the economy's productive capacity with macroeconomic or microeconomic repercussions. The identification of these impacts is of greater importance than the mere tally of losses if policy is to ameliorate the economic ramifications of terrorism. Thus, we concentrate on relating terrorism to macroeconomic and microeconomic variables that policy can be designed to bolster.

### *Domestic versus transnational terrorism*

Terrorism comes in two essential types: domestic and transnational. Domestic terrorism is homegrown with consequences for just the host country, its institutions, citizens, property, and policies. In a domestic terrorist incident, the victim and perpetrators are from the host country. The Oklahoma City bombing on April 19, 1995 was a domestic terrorist event as was the kidnapping of members of Parliament by Colombian terrorists. Many ethno-nationalist conflicts (e.g., the Tamils of Sri Lanka) are associated with mostly domestic terrorism, unless the rebels desire to target citizens from other countries to publicize their cause to the world. Domestic events tend to outnumber transnational terrorist events by eight to one (Enders and Sandler, 2006).

In contrast, transnational terrorism involves more than one country. This international aspect can stem from the victims, targets, institutions, supporters, terrorists, or implications. For example, 9/11 is a transnational terrorist event because the victims were from many different countries, the mission was financed and planned from abroad, the terrorists were foreigners, and the implications of the events (e.g., financial and security) were global. A hijacking that originates in one country but terminates in another country is an instance of transnational terrorism as is the assassination for political ends of a foreigner on a city street. Transnational terrorist attacks often entail transboundary externalities: actions or authorities in one country impose uncompensated consequences on person or property in another country. Thus, spillover costs can result so that the economic impact of a terrorist event may transcend the host country. The toppling of the World Trade Center towers on 9/11 killed many British nationals and had ramifications for British financial institutions. Chen and Siems (2004, Table 2, Figures 2-3) showed that 9/11 negatively influenced average returns on stock markets globally. In fact, the 11-day cumulative average abnormal returns were larger on the London, Frankfurt, Paris, Toronto, Amsterdam, Switzerland, Italy, and Hong Kong stock markets than on the New York Stock Exchange following 9/11. The four blasts on 9/11 reverberated on capital markets worldwide.

The distinction between domestic and transnational terrorism is of utmost importance when determining the right data for calculating the economic consequences of terrorism. Suppose that we want to relate the growth in real per capita GDP to the level of terrorism. Then, for a country plagued by both domestic and transnational terrorism, it becomes imperative that all forms of terrorism are included in the terrorism measure on the right-hand side of the equation. This is also true for a country-specific study of terrorism's consequences on macroeconomic variables. If, however, one is interested in the impact of terrorism on a host

country's net foreign direct investment (NFDI), then transnational terrorist attacks are most germane, since these attacks pose a more direct risk on foreign investors' interests. If only transnational terrorist attacks are included as a determinant of GDP growth, and if, additionally, domestic attacks tend to be correlated with transnational terrorist incidents, then the coefficient on terrorism will be biased. Furthermore, the coefficient on terrorism may reveal little about the true quantitative relationship when domestic terrorism greatly exceeds the number and/or intensity of transnational terrorism.

### *Causality*

A final preliminary concern is the causal nature between terrorism and the macroeconomic variable that proxies the consequences of terrorism. If economic downturns can create grievances that result in terrorism, then economic conditions may be both a root cause of terrorism and a consequence of terrorism. Recently, researchers have established with panel estimates that economic conditions, particularly downturns, can generate transnational terrorist attacks.<sup>2</sup> Given this evidence, a researcher must be prudent to test and/or correct for a potential endogeneity bias.

## **2. Macroeconomic Effects of Terrorism**

An economy as rich and diverse as that of the United States is anticipated to withstand most terrorist events with little macroeconomic consequences. During most years, the United States experienced few terrorist events on its own soil – e.g., in 1998, 2000, and the years following 2001, there were no terrorist events in the United States (Sandler and Enders, 2004; US Department of State, 1999-2004). Moreover, the breadth of US economic activities is sufficiently diverse to absorb the impact of an attack by shifting activities to unaffected sectors.



The immediate costs of typical terrorist acts, such as kidnappings, assassinations, or bombings, are localized, not unlike ordinary crimes. Currently, crimes such as identity theft have far greater potential economic consequences than terrorism to developed countries. In most developed countries, terrorism generally causes a substitution from sectors vulnerable to terrorism into relatively safe areas and, thus, does not affect the entire macroeconomy.<sup>3</sup> If airlines become risky, factors of production will shift from the airline sector to other relatively safer sectors. Of course, a terrorist act of the magnitude of 9/11 can shake confidence and influence sufficiently many sectors to have macroeconomic repercussions. But as we show below, developed countries are positioned to take actions to limit these impacts.

This representation is in marked contrast to small economies in which terrorism is prevalent and affects daily activities as in Colombia, Israel, and the Basque region of Spain. For these economies, terrorism can reduce GDP and curb development, especially during prolonged campaigns (e.g., Israel since September 27, 2000). Protracted terrorism leads to the anticipation of future events, which create risk premiums that limit activities in terrorism-prone sectors. Investors, both at home and abroad, may decide to direct their assets to safer activities in other countries. If terrorists succeed in scaring away investments, they may be emboldened to take further actions to cause economic losses.

### *US experience in light of 9/11*

Figure 1 provides strong evidence for the view that the US economy quickly rebounded from 9/11. The vertical line in the center of each panel of Figure 1 represents the third quarter of 2001 (i.e., 2001:Q3) corresponding to 9/11. Panel 1 shows that real GDP was virtually unchanged throughout 2000 and fell slightly in the first and third quarters of 2001. The key feature is that real GDP began to grow sharply beginning in the fourth quarter of 2001 following

9/11. Panel 2 shows that the Conference Board's measure of consumer confidence plummeted right before the onset of the 2001 recession; however, immediately following 9/11, confidence actually soared. Some of this increase might be attributed to the patriotism of the American public. As displayed in Panel 3, the rebound in economic activity was buoyed by strong consumer demand for durables. These "big-ticket" items are the most volatile component of total consumption, which jumped in the fourth quarter of 2001. Panel 4 indicates that the unemployment rate was rising prior to 9/11, and rose dramatically after the attack. Because the unemployment rate is a lagging indicator of economic activity, this rate would likely have increased even without 9/11. Thus, we must wonder what would have happened to unemployment in the absence of 9/11 – i.e., the unemployment rate *may* have risen even faster.

There is an overwhelming consensus that well-orchestrated macroeconomic policymaking cushioned the shock from 9/11 in the United States. The financial markets were in disarray as bond market trading was suspended for a day and stock market trading did not resume until the following week. During uncertain times, risk-averse asset holders increase the proportion of highly liquid assets in their portfolios. As shown in Panel 5, the Federal Reserve reacted to this surge in liquidity demand by sharply cutting the Federal Funds rate, thereby keeping funds available for investment and other needs. Fiscal policy also performed a supportive role. The first tax cut since 1985 was signed into law in May 2001, months before 9/11. As a direct of 9/11, the US Congress approved a \$40 billion supplemental appropriation for emergency spending for such items as search and rescue efforts at the four crash sites and tightened security at US airports and other venues. In addition to the needed disaster relief, this surge in government spending acted as a powerful stimulus to aggregate demand. Starting on October 7, 2001, the war in Afghanistan also bolstered government spending. As shown in Panel 6, government saving (i.e., the negative of what many call the federal government's budget

deficit) plummeted from uncharacteristic surpluses to record deficits. Although the government budget deficit can have some long-term undesirable influences, US fiscal and monetary policies clearly played an essential role in restoring consumer and business confidence.

### 3. Review of Macroeconomic Literature on Terrorism Impacts

The literature on the macroeconomic consequences of terrorism only began in 2003 and involves only a handful of studies. One set of studies examines the influence of various terrorist variables on real per capita GDP growth, while a second set of studies consists of case studies of a country experiencing a long-term terrorist campaign.

Blomberg, Hess, Orphanides (henceforth BHO) (2004) examined a pooled cross section of 177 countries from 1968 to 2000. Their estimating equation is:

$$\Delta y_i = \beta_0 + \beta_1 \text{COM}_i + \beta_2 \text{AFRICA} + \beta_3 \ln y_{0i} + \beta_4 I/Y_i + \beta_5 T_i + \beta_6 I_i + \beta_7 E_i + \varepsilon_i, \quad (1)$$

where  $\Delta y_i$  is country  $i$ 's average per capita GDP growth rate,  $\beta$ s are coefficients, COM is a dummy variable for non-oil commodity exporters, AFRICA is a dummy for African countries,  $y_{0i}$  is country  $i$ 's initial income,  $I/Y_i$  is country  $i$ 's investment rate over the full sample,  $T_i$  is a transnational terrorism indicator (e.g., a dummy for terrorism occurring in a given year),  $I_i$  denotes the presence of an internal conflict in  $i$ ,  $E_i$  indicates  $i$ 's involvement in an external conflict, and  $\varepsilon_i$  is the error term. Their baseline regression indicated that non-oil commodity exporters and African nations had lower average per capita GDP growth of 1.2% and 1.36%, respectively. We are primarily interested in BHO's terrorism variable's impact on economic growth. BHO found that if a country experienced transnational terrorist incidents on its soil in *each* year of the sample period, then per capita income growth fell by 1.587 percentage points over the entire sample period. Given the definition of  $T_i$ , each year of terrorism led on average to

a fall in growth of only 0.048% ( $=1.587/33$ ). BHO's initial terrorism measure treated a year with 50 deadly incidents the same as a year with a single nonfatal incident. Moreover, these authors used *just transnational terrorism incidents* drawn from the *International Terrorism: Attributes of Terrorist Events* (ITERATE) data set (Mickolus et al., 2004). Most sample countries would have experienced a far greater amount of domestic terrorism, which was not directly controlled in the study. BHO were careful to control for internal and external conflict: internal conflict had a significant negative effect on growth for some empirical specifications, while external conflict did not have a significant influence. The internal conflict measure may be picking up some of the impact of domestic terrorism because the latter is often correlated with such conflicts.

BHO's study controlled for some endogeneity bias. An especially interesting part of their study is their panel estimates for nondemocratic countries, OECD countries, African countries, the Middle Eastern countries, and Asian countries. The panel estimates altered some right-hand side variables compared with the cross-sectional regressions – e.g.,  $COM_i$  was dropped and trade openness was added along with lagged per capita growth. Except for the African panel, BHO's terrorism indicator was not significant, which is a cause of concern. As a geographical area, Africa displayed the least amount of terrorism in an average year (see Blomberg, Hess, and Orphanides, 2004, Table 1; Enders and Sandler, 2005, Figures 5-6), yet Africa was the only panel where the estimated terrorism coefficient was significant. This rather paradoxical finding was never addressed. The full panel estimates gave a much greater impact of terrorism on growth – i.e., terrorism in a single year reduced per capita GDP growth by *over a half a percent* – compared with the cross-sectional estimates. No explanation was offered for this huge difference in the consequences of terrorism between the two estimating procedures. We find it worrying that terrorism's average influence on growth for the entire sample is not reflected in any of the panels where terrorism is the greatest concern. Moreover, their large cross-section

analysis did not discriminate between different time periods where terrorism changed in character – for example, from left-wing groups to fundamentalist groups.

In another set of panel estimates, BHO (2004) changed their terrorism indicator to terrorist incidents per capita. This change gives a significant terrorism impact on per capita GDP growth for the full sample, the nondemocratic panel, the OECD panel, and the African panel. Even though more panels displayed a significant impact of terrorism, the reader was never informed why this terrorist indicator is preferred to the earlier indicator. Moreover, the impact of terrorism *varies widely* between the full sample and the smaller cohort panels, leading one to worry that the full sample “average” picture may not be representative of how smaller cohorts or individual countries respond to terrorism.

Toward the end of the paper, BHO (2004) performed some panel estimates regarding terrorism’s influence on investment share of GDP and government spending share of GDP. These estimates are interesting because they tried to establish the pathway by which terrorism effects economic growth. BHO found that terrorism increased the government spending share, while it decreased the investment share. This reallocation can affect growth by diverting government activities away from more productive activities to security. Moreover, reduced investment will limit growth directly.

Gupta et al. (2004) focused on a sample of 66 low- and middle-income countries to ascertain the impact of armed conflict and terrorism on macroeconomic variables. For their econometric estimates, they used three structural equations, where the dependent variables are growth of real per capita income, government revenue as a share of GDP, and defense spending as a share of GDP. Unlike BHO, Gupta et al. (2004) were interested in the joint impact of internal conflict *and* terrorism on these three macroeconomic variables. For the conflict measure, they used the Internal Country Risk Guide (ICRG) rating on internal conflict. In this

study, the ICRG conflict measure did not have a significant negative *direct* impact on per capita income growth. However, this index had a significant positive influence on the share of defense spending, which, in turn, had a *significant negative influence on economic growth*. Thus, conflict indirectly reduced economic growth by increasing the defense spending share of government spending.

A real advantage of this study is that it has a cohort of developing countries unlike BHO, who included countries at all stages of development, thereby making it difficult to draw conclusions about developing countries. The main drawback of the Gupta et al. study is that it really did not measure the effect of terrorism per se on macroeconomic variables, because no direct measure of terrorism was used. The ICRG index can indicate high risk when civil conflict is high but terrorism is low or absent. Moreover, the index may point to low risk in the face of terrorism if the overall intensity of internal conflict is low.

A third cross-sectional study by Tavares (2004) examined the cost of terrorism in terms of reduced per capita GDP growth. His sample period was 1987-2001 for a large unspecified sample of countries. The estimating equation is:

$$\begin{aligned} \text{Growth } GDPpc_{it} = & \beta_0 + \beta_1 \text{Growth } GDPpc_{i,t-1} + \beta_2 GDPpc_{it} + \beta_3 \text{Terrorism}_{it} \\ & + \beta_4 \text{Natural Disaster}_{it} + \beta_5 \text{Currency Crisis}_{it} + \text{Additional Controls} + \varepsilon_{it}, \end{aligned} \quad (2)$$

where  $\text{Growth } GDPpc$  is per capita GDP growth. On the right-hand side of equation (2), there is lagged per capita GDP growth, per capita GDP, a terrorism measure, a natural disaster index, a currency index, additional controls, and an error term. The terrorism measure is either the total number of attacks per capita or the total number of casualties per capita. Tavares (2004) drew his terrorism variable from data provided by the International Policy Institute for Counterterrorism (2003). This data consist of 1427 “selected” transnational terrorist events for the 1987-2001 period.

Using instrumental variables to address the potential endogeneity between terrorism and real per capita GDP growth, Tavares found that the terrorism variable had a small but significant negative impact on GDP growth of 0.038% (Tavares, 2004, Table 4). Once additional determinants of growth (e.g., an education variable, trade openness, primary goods exports, and the inflation rate) were introduced into the estimating equation, terrorism was no longer a significant or negative influence on economic growth. This raises a concern because many of these additional variables are in standard analyses of growth, so that Tavares' earlier findings about the consequences of terrorism must be questioned. The absence of key growth variables in his earlier equations suggests that they were misspecified.

Tavares (2004) went on to compare the costs of terrorism in democratic versus nondemocratic countries. For our purposes, the key part of his regression equation is:

$$\Delta y_{it} = 0.261\Delta y_{it-1} - 0.029T_{it} + 0.121(T_{it} \times R_{it}) + \text{other explanatory variables}, \quad (3)$$

where  $\Delta y_{it}$  is country  $i$ 's growth of per capita GDP in year  $t$ ,  $\Delta y_{it-1}$  is country  $i$ 's growth of per capita GDP in year  $t - 1$ ,  $T_{it}$  is the number of terrorist attacks in country  $i$  in year  $t$ , and  $R_{it}$  is a measure of political rights in country  $i$  in year  $t$ . This last variable increases when the level of political freedom rises.

Equation (2) is a dynamic specification for which current period growth is affected by growth in the previous period. In contrast to Tavares' original specification that ignored political rights, all of the coefficients reported in equation (2) are statistically significant. The coefficient on  $T_{it}$  indicates that a single terrorist incident in country  $i$  in year  $t$  reduces annual growth for that year by 0.029%. Since the model is dynamic, this growth effect is persistent. These results are consistent in size with those of BHO. An interesting finding involves the positive coefficient on the interaction term  $T_{it} \times R_{it}$ , for which the effect of a typical terrorist attack decreases as the level

of political freedom increases. That is, democracies are better able to withstand terrorist attacks than other types of governments with less flexible institutions. Yet another interpretation is that democracies are better prepared to weathered attacks because they rely on markets to allocate resources.

### *Case studies*

To date, there are two careful macroeconomic case studies on specific terrorism-ridden economies. Both studies are careful and utilize methodologies that could be applied to other countries – e.g., Colombia – that have experienced a prolonged campaign of terrorism. For the Basque region, Abadie and Gardeazabal (2003) tried to estimate the per capita GDP losses that are attributable to a twenty-year terrorist campaign. Because the Basque region differs from other regions in Spain, the authors had to construct a “synthetic” comparison region by taking a weighted average combination of other Spanish regions. The weights were chosen to yield the values to key growth variables – e.g., real per capita GDP, investment share of GDP, population density, and human capital measures – that are nearly identical to those of the Basque region prior to its terrorism. The authors demonstrated that the Basque and synthetic regions displayed similar per capita GDP values prior to 1975 and the start of the terror campaign. Thereafter, a GDP gap opened that averaged 10% over the next twenty years. During high-terrorism episodes, the gap exceeded 10%, while, during low-terrorism episodes, the gap closed somewhat. This is a clever methodology where the synthetic region serves as the counterfactual control.

Eckstein and Tsiddon (2004) applied a vector autoregression (VAR) methodology to investigate the effects of terrorism on the macroeconomy of Israel. These authors used quarterly data from 1980 through 2003 to analyze the effects of terrorism on real GDP, investment, exports, and nondurable consumer goods. Each of these variables served as a dependent variable



in their four-equation VAR system. Their measure of terrorism was a weighted average of the number of Israeli fatalities, injuries, and noncasualty incidents. Their terrorism data included domestic and transnational attacks in Israel. They found that the initial impact of terrorism on economic activity was as short as a single quarter. Moreover, terrorism's impact on exports and investment was three times larger than on nondurable consumption and two times larger than on GDP.

Eckstein and Tsiddon (2004) also employed their VAR estimates to calculate the counterfactual time paths of the four macroeconomic variables under the assumption that all terrorism ceased at the end of 2003:Q4. In this counterfactual exercise, real per capita GDP is forecasted to grow 2.5% from the beginning of 2003:Q4 to 2005:Q3. If, however, terrorism held steady, then the estimated VAR predicted a zero rate of per capita GDP growth. Finally, if terrorism in Israel were to continue its upward trend, real per-capita GDP would fall by about 2%. The figures for investment were even more dramatic because investment would decline by 10% annually with this upward trend.

In another set of experiments, Eckstein and Tsiddon (2004) calculated the economic consequences of the Intifada. They used their data to estimate the VAR through 2000:Q3 (the beginning of the Intifada) and forecasted real GDP for quarters 2000:Q4 through 2003:Q4. Forecasts were conducted assuming either no subsequent terrorism or terrorism at the levels that actually prevailed for these three years. The differences in forecasts translated into a *per capita GDP loss of about 10%* for terrorism continuing at its prevailing elevated level, which is quite substantial.

The five key macroeconomic studies are summarized in Table 1 for ready reference. The first column indicates the study and its basic methodology,<sup>4</sup> while the second column provides a short description of the study. In the right-hand column, some key findings are indicated.

#### **4. Developed and Developing Countries Contrasts**

The macroeconomic case studies have been for two small high-income countries. In Tavares (2004) and BHO (2004), a wide range of countries have been included in the cross section making it difficult to know anything specific about developing countries. This is underscored by the failure in BHO (2004) of many of the regional panels for Asia and elsewhere to yield significant findings for the terrorist variable. Within each regional sample, there was no culling of the developed or richer countries. The cross-sectional study that investigated developing countries per se is Gupta et al. (2004), which has some key failings. First, there is no true terrorism measure, so that the ICRG index is more reflective of internal conflict than of terrorism. Second, this study combined countries with vastly different types of internal conflict; thus, the average picture that emerges may not reflect of what most developing countries suffered from terrorism. Developing countries with similar terrorist campaigns should be combined in the same panel. Third, the cross section included countries with diverse political and economic institutions. Developed institutions should enable a country to better absorb terrorist attacks. To date, there is no cross-sectional study of the consequences of terrorism on developing countries.

There are a number of anticipated differences between how developed and developing countries are able to handle terrorism. Developed countries possess more capable governmental institutions that can apply monetary, fiscal, and other policies to recover from either a large-scale attack or a prolonged campaign. The United States case, discussed above, is instructive. For example, the insurance crisis caused by 9/11 was addressed by the US Congress approving emergency insurance legislation to cover catastrophic terrorism losses in the short run (Kunreuther, Michel-Kerjan, and Porter, 2003). Markets are better able in developed, than in

developing, countries to respond to terrorism-induced changes in risk. Developed countries are also better equipped than developing countries to monitor their economies to determine the need for monetary or fiscal stimuli following terrorist attacks. In addition, developed countries can take decisive and effective security measures to restore confidence. Many less-developed countries lack this capacity. Such security measures can speed recovery. Because developing countries are more dependent on the rest of the world for demands for their products and services, these countries are more vulnerable than richer countries to terrorism shocks in neighbors and important trading partners. Compared with their richer counterparts, developing countries are less diversified and more apt to experience a larger impact from a sector-specific attack. The earlier Yemen shipping example illustrates this insight. Finally, the presence of internal conflicts in many developing countries compromises their ability to address terrorist attacks, which may resonate with other forms of internal strife.

These differences between developed and developing countries have implications for panel studies. Such differences raise real issues with the information encapsulated in the average picture given by large-scale panels that combine countries at all stages of development. Moreover, these differences indicate that controls are needed for neighboring conflicts, corruption, and internal conflicts. To date, only the last control is included in past panel studies. Future studies of developing countries should take two forms: (i) case studies of specific developing countries and (ii) panel studies of a homogeneous set of developing countries.

## **5. Microeconomic Consequences of Terrorism**

There have been studies dating back to the early 1990s that have investigated the microeconomic consequences of sector-specific attacks. In particular, studies have covered tourism, trade, and financial sectors.

### *Tourism*

Attacks against tourist venues (e.g., airports, hotels, or attractions) or tourist mode of transportation (e.g., airplanes) make a tourist consider the risks involved with their vacation plans. Even a single heinous act at a popular terrorist venue can cause tourists to alter plans by either vacationing at home or else going to a terrorism-free country for a holiday. Time-series analysis has been used in a number of tourism studies to gauge the impact of terrorism in the target country or region. A *transfer function* analysis is particularly suited to estimate the short- and long-run effects of a terrorist attack on a country's tourist industry. A very simple transfer function for, say, the effect of terrorism on Spanish tourism is:

$$y_t = a_0 + b_1 y_{t-1} + c_0 x_t + \varepsilon_t, \quad (4)$$

where  $y_t$  is the number of tourists visiting Spain in period  $t$ ,  $x_t$  is the number of terrorist incidents in Spain in period  $t$ , and  $\varepsilon_t$  is the error term. This equation reflects that the number of tourists visiting Spain in any period is affected by its own past,  $y_{t-1}$ , as well as the number of terrorist events in Spain. Because periods with high versus low levels of tourism tend to cluster, we expect  $b_1$  to be positive; a large  $y_t$  tends to follow a large  $y_{t-1}$ . In (4),  $c_0$  measures the contemporaneous effect of a terrorist incident on tourism; a negative  $c_0$  means that terrorism negatively impacts tourism. Suppose that  $c_0 = -3$  and there are four terrorist incidents during a particular period (i.e.,  $x_t = 4$ ), then the contemporaneous influence of terrorism on tourism is then  $-12$ . If the unit of measurement is a thousand, then terrorism has lost the country 12,000 tourists following the attacks. If, moreover,  $b_1$  is not zero, then there is persistence in the system and effects on terrorism could be long-lasting.

Equation (4) can be used to estimate the indirect effects on terrorism. To perform the

desired counterfactual analysis, a researcher would estimate equation (4) to obtain the magnitudes of  $a_0$ ,  $b_1$ , and  $c_0$  for a particular country. Once these values are ascertained, what each value of  $y_t$  would have been in the absence of terrorism (i.e.,  $x_t = 0$ ) can be calculated. The difference between this counterfactual value and the actual value of  $y_t$  is then due to the effect of terrorism. This analysis can be generalized in a number of directions: (i) additional lagged values of the dependent variable; (ii) lagged values of the terrorism variable; and (iii) more complicated causality between  $y_t$  and  $x_t$ . The first generalization allows for a more complex autoregressive (AR) process where persistence can be long-term, while the second generalization permits alternative impact patterns where terrorism may affect the dependent variable with a lag. The third generalization can permit terrorism to affect tourism and vice versa, so that an equation is required for each of these variables. In this case, a VAR methodology applies and causality tests can fix the direction of dependency. A fourth generalization can allow for lagged values to the error terms, so that a moving average (MA) process applies.

Enders and Sandler (1991) applied a VAR methodology to Spain for the 1970-91 period, during which Euzkadi ta Askatasuna (ETA) and other groups had terrorist campaigns. During 1985-87, ETA directed its bombs and threats against the Spanish tourist trade and even sent letters of warning to travel agents in Europe. Using monthly data, we showed that the causation was unidirectional: terrorism affected tourism but not the reversed. Each transnational terrorist incident was estimated to dissuade over 140,000 tourist after all monthly impacts were included. This can translate into a sizable amount of lost revenue when multiplied by the average spending per tourist. Transnational terrorist attacks denote the appropriate terrorism measure, because we were interested in the costs to the foreign tourist trade.

In a follow-up study, Enders, Sandler, and Parise (1992) used an autoregressive integrated moving average (ARIMA) analysis with a transfer function to investigate the impact

of transnational terrorism on tourism in Austria, Spain, and Italy for 1974-88 – three countries with highly visible transnational terrorist attacks during this period. The dependent variable was the share of tourist receipts from the region. These authors found that terrorism had a significant negative lagged influence on these tourism shares that varied by country: two quarters for Italy, three quarters for Greece, and seven quarters for Austria. Since it takes time for tourists to revise plans, the lags are understandable. Losses varied by country: Austria lost 3.37 billion special drawing rights (SDRs); Italy lost 861 billion SDRs; and Greece lost 472 million SDRs. The authors also showed that some of the lost revenues left a sample of European countries for safer venues in North America.

Drakos and Kutan (2003) applied the Enders-Sandler-Parise methodology to Greece, Israel, and Turkey for 1991-2000. These authors used monthly transnational terrorism data, drawn from ITERATE. In addition to the home-country impacts, Drakos and Kutan were interested in cross-country or “spillover” effect – both positive and negative – that may arise if, say, an attack in Israel shifts would-be Israeli tourists to safer venues in Italy, Greece, or elsewhere. Their ARIMA model with a transfer function had an equation for each country’s tourist shares, where, say, the share of tourism in Greece depends on: past tourist shares in Greece; current and past terrorist attacks in Greece; current and past terrorist attacks in Israel; and current and past terrorist attacks in Turkey. There was also an equation for tourist shares of Italy, which was a relatively safe haven. Owing to transnational terrorist attacks, these authors calculated that Greece lost 9% of its tourism market share; Turkey lost over 5% of its tourism market share; and Israel lost less than 1% of its tourism market. Close to 89% of lost tourism due to terrorism in Europe flowed to safer tourist venues in other countries.<sup>5</sup> Drakos and Kutan also uncovered significant spillover effects – low-intensity terrorist attacks in Israel reduced Greek tourism revenues.

### *Net foreign direct investment*

Foreign investors must be aware of all kinds of risks, including those posed by terrorism. This risk is especially germane when a terrorist campaign specifically targets net foreign direct investment (NFDI). Terrorist risks raise the costs of doing business as expensive security measures must be deployed and personnel must be duly compensated, both of which reduce the returns to NFDI. As these risks rise, investors will redirect their investments to safer countries. Enders and Sandler (1996) provided estimates of the effects of terrorism on NFDI in two relatively small European countries – Greece and Spain. Large countries – e.g., France, Germany, and the United Kingdom – draw their foreign capital inflows from diversified sources and are able to endure attacks without a measurable diversion of inflows. Large countries are also better equipped to take defensive measures after an attack to restore confidence. Greece and Spain were selected as case studies insofar as both experienced numerous transnational terrorist attacks aimed at foreign commercial interests during the 1968-91 sample period.

For Spain, we applied an ARIMA model with a transfer function that associated NFDI to its past values and to terrorist attacks; for Greece, we applied a VAR model that related NFDI to its past values and to terrorist attacks. Once again, we modeled a counterfactual exercise, analogous to those for tourism, to compute the terrorism-induced losses in NFDI in these two economies. For Spain, there was a long delay of 11 quarters between the advent of a terrorist incident and the response in NFDI. A typical transnational terrorist incident in Spain was estimated to reduce NFDI by \$23.8 million. On average, transnational terrorism reduced *annual* NFDI in Spain by 13.5%. For Greece, the story was similar, transnational terrorism curbed annual NFDI by 11.9%. These are sizable losses for two small economies that were heavily dependent on NFDI as a source of savings during the sample period. We also investigated the

influence of terrorism on NFDI in a number of large economies, such as France and the United Kingdom, and found no significant terrorism influence on these countries' NFDI.

### *Trade influence*

In a recent contribution, Nitsch and Schumacher (2004) estimated the effects of transnational terrorism on bilateral trade flows using a standard trade-gravity model. In their model, trade flows between trading partners depend on terrorist attacks, the distance between the two countries, an income variable, an income per capita variable, and a host of dummy variables. They formally estimated the effects of terrorism within each country on all of the nation's trading partners. The data set consists of 217 countries and territories over the 1968-79 period. Their terrorism data were drawn from ITERATE and only included transnational attacks, even though domestic terrorism would have also affected trade flows. The authors found that the first transnational terrorist attack reduced bilateral trade by almost 10%, which is a very sizable influence that may be picking up the effect of domestic terrorism. At times, transnational terrorism is highly correlated with domestic terrorism. Nitsch and Schumacher also found that a doubling of the number of terrorist incidents reduced bilateral trade by 4%; hence, high-terrorism nations had a substantially reduced trade volume. Although more recent terrorism data are available, the authors only examined this historical period, which is not reflective of current-day terrorism.

### *Financial markets*

Chen and Siems (2004) applied an event-study methodology to investigate changes in average returns of stock exchange indices to 14 terrorist and military attacks that dated back to 1915. An event study computes abnormal returns – negative or positive – following some shock



or occurrence, such as the downing of Pan Am flight 107 or 9/11. These authors showed that the influence of terrorist events on major stock exchanges, if any, is very transitory, lasting just one to three days for most major incidents. The sole exception is 9/11 where DOW values took 40 days to return to normal. These authors also showed that this return period varied according to the stock exchange – exchanges in Norway, Jakarta, Kuala Lumpur, and Johannesburg took longer to rebound, while those in London, Helsinki, Tokyo, and elsewhere took less time to rebound. Most terrorist events had little or no impact on major stock exchanges.

Eldor and Melnick (2004) applied time-series methods to ascertain the influence of the Israeli terror campaign following September 27, 2000 on the Tel Aviv 100 Stock Index (TA 100). Given the continual nature of these terrorist attacks, the time-series method is clearly appropriate. Analogous to the other time-series studies, they performed a counterfactual exercise to determine losses to the value of the TA 100 index by using the *estimated* time-series equation for returns but substituting a zero value in for terrorist attacks. Their analysis estimated that the TA 100 was 30% lower on June 30, 2003, owing to the terrorist campaign. When these authors investigated specific types of terrorist attacks, they found that only suicide attacks had a significant impact. Their article also related the Israeli terrorist campaign to exchange rate fluctuations.

By way of summary, Table 2 indicates the microeconomic studies, their methods, study description, and major findings.

## **6. Methodology Discussion**

To date, two basic methodologies have been applied to estimate macroeconomic and microeconomic consequences of terrorism: panel estimates with large cross sections of countries and time-series estimates with one or more equations. Each methodology has its advantages and

disadvantages as displayed in Table 3.

Our own view favors the time-series methods, which have been effectively used to come up with estimates of tourism losses, NFDI losses, and stock market declines. The Eckstein and Tsiddon (2004) study of Israel also illustrates that the same method can be employed to estimate the consequences of terrorism on macroeconomic variables such as consumption per capita and GDP per capita. Not only can time-series analyses lend themselves to counterfactual exercises, but also they can be used for forecasting purposes. Although most time-series estimates do not have antecedent behavioral models, the Eckstein and Tsiddon (2004) article shows that this need not be the same, since their estimating equations stemmed from a dynamic theoretical model. By incorporating a VAR analysis with multiple equations (i.e., one for each country), a researcher can examine cross-border spillovers. This is demonstrated by Drakos and Kutan's (2003) analysis of tourism in the Mediterranean region.

Our concerns about cross-sectional studies involve the reliance on large samples, where countries with wide-ranging incomes, security capacities, institutions, and terrorist experiences are thrown into the same sample. This extreme heterogeneity for key variables means that the "average" picture provided by the coefficient estimates may not be descriptive of the experience of many of the sample countries. We believe that more insight is gained by doing the panel estimates for a homogenous cohort of countries. Regarding the BHO (2004) study, we are concerned that the geographical cohorts usually did not yield significant terrorism impacts for the authors' first terrorism measure, *except* for the region with the *least* terrorism; however, the entire panel did yield significant consequences of terrorism. The logic of this finding is difficult to accept. For this particular study, cohorts should have corresponded to countries with similar income, institutions, and terrorism experience.

We are also concerned that so many different terrorism measures have been used. At

times, more than one measure is employed in the same study. Table 4 lists alternative measures and the associated study. The most natural measure of terrorism is something that reflects the frequency of attacks – e.g., the number of terrorist attacks, the number of casualties, or some index of these measures (e.g., the index used by Eckstein and Tsiddon, 2004). The number of casualties is a better measure than the number of events if attack intensity is to be captured. The temporal nature (i.e., daily, monthly, quarterly, or annual) of the attack measure depends on data availability and econometric considerations. That is, researchers often relied on quarterly totals to eliminate zero or near-zero observations that would violate the underlying normal distribution, associated with many time-series methods. Because time-series techniques require many data points, monthly or daily values may be used to expand the number of observations. If zero values becomes a problem, estimates can then be based on a discrete Poisson distribution.

The use of a dummy to measure the occurrence of terrorism in a given year loses a lot of useful information. In addition, a per capita measure of terrorism implies that an incident in a country with a large population has a smaller influence than in a country with a smaller population. In fact, the impact of a large-scale event such as 9/11 is, we believe, independent of the population size. In fact, the impact of terrorist events in general may actually be greater for countries with larger populations, because there are then more people to intimidate. The logic of normalizing terrorist incidents by population has never been adequately explained in the literature. This process is especially worrying for the BHO (2004) study because terrorism was not significant for most panel cohorts until terrorism was normalized by population. Why this was the case was never explained. As mentioned earlier, the ICRG measure of internal conflict does not really capture terrorism per se, and thus, serves as a poor measure.

## **7. On Terrorism Data**

To date, much of the literature has relied on the ITERATE data set of terrorist events. Based on newspaper and media accounts, ITERATE records many variables – e.g., incident date, incident location by country, type of events, number killed, groups claiming responsibility, and demands made – for transnational terrorist events from 1968:Q1 through 2004:Q4. ITERATE does not classify incidents as transnational terrorism that relate to declared wars or major military interventions by governments, or guerrilla attacks on military targets conducted as internationally recognized acts of belligerency. However, ITERATE classifies attacks against civilians or the dependents of military personnel as terrorist acts when such attacks are intended to create an atmosphere of fear to foster political objectives. A number of judgments must be made in terms of what ITERATE includes as a transnational terrorist event. For example, Irish Republican Army (IRA) attacks in Northern Ireland are not included as transnational terrorist acts. IRA attacks in England are, however, included.

ITERATE variables are grouped into four files: the COMMON file on incident characteristics, terrorist characteristics, victim characteristics, and life and property losses; the FATE file on the fate of the terrorists and extradition; the HOSTAGE file on target of terrorist demands, negotiation behavior, results of negotiations, and other nations involved in incidents; and the SKYJACK file on incident characteristics, airline information, location of the incident, and the number of individuals involved. ITERATE allows a researcher to match terrorist incidents with countries so as to compute losses from transnational terrorist campaigns. These losses would have to be inferred from macroeconomic and microeconomic data drawn from other sources, because ITERATE's loss variable consists of mostly missing values. ITERATE does not record domestic events, which are essential when computing the macroeconomic consequences of terrorism if targeted countries are plagued by both transnational and domestic terrorist events.

Tavares (2004) drew his terrorism incidents from data provided by the International Policy Institute for Counterterrorism (IPIC) (2003), whose data set is located online. IPIC describes its 1427 terrorist incidents for 1987-2001 as “selected” transnational terrorist incidents. The data source does not, however, give its criteria for classifying an incident as a transnational terrorist event. Moreover, IPIC does *not* provide its selection criterion; ITERATE records many times the number of incidents during the same period. The IPIC selection criterion is particularly important for judging potential biases. When sampling the incidents, we found many that would not have satisfied ITERATE’s transnational criterion – e.g., some Palestinian incidents in Israel.

Until this year, the US Department of State (various years) maintained a transnational terrorism data set that was released annually as *Patterns of Global Terrorism*. Except for a few aggregate totals (e.g., total events, events by region, casualties by region, type of target, and type of event), this data set is not in a form that can be used by researchers because the data files are not available. The annual reports also contain short descriptions of “significant” attacks that could be coded for a few variables. Nevertheless, many other events are not reported as significant events, but could have important economic consequences. Bombs left near foreign corporate offices may be insignificant if they caused damage but no injuries, but they could still reduce NFDI.

The National Memorial Institute for the Prevention of Terrorism (MIPT) (2005) also maintains an online data set on terrorism. From 1968 through 1997, the data consists of transnational terrorism. Thereafter, MIPT tallies both domestic and transnational terrorist events. The website makes it easy to make graphs and other displays. A researcher would have to expend much effort to put the data in a form that would relate incidents by countries so that statistical analysis on the economic consequences can be accomplished. The addition of domestic events is very useful but there are only seven years of domestic events. A researcher

must be careful not to use the 1968-2004 data without purging the domestic incidents; otherwise, there will be a huge inconsistency in data coverage in the post-1997 period.

There are a few data sets available for conducting specific country studies, which is illustrated by the Abadie and Gardeazal (2003) study of Spain and the Eckstein and Tsiddon (2004) study of Israel. In the latter case, the Israeli terrorism data came from the International Policy Institute for Counterterrorism (2003) at the Interdisciplinary Center Herzliya (<http://www.ict.org.il>). On a monthly basis, this data set includes the number of incidents, causality figures, types of events, and other variables of interest. Domestic and transnational events are included, a necessary inclusion for any country-specific study. We are, however, not clear how this Israeli data set differs from the IPIC data used by Tavares (2004) for allegedly just transnational terrorist attacks. Country-specific data sets are available for Colombia, Spain, and few other countries (e.g., United Kingdom) that have faced significant terrorist campaigns.

The availability of country-specific data sets poses a real problem for panel studies, because it will be a massive task to assemble sufficient domestic and transnational terrorist incidents for a cohort of countries. The best alternative is to group together some terrorism-ridden countries, where such data exist, for a small panel estimate. It would be interesting to compare these countries' terrorism-induced declines in real GDP per capita to the experience in a cohort of rich countries whose terrorism is mostly transnational in character. When combining country-specific data from different sources, coding consistency is an ever-present worry.

## **8. Concluding Remarks**

Table 5 lists some of the main principles that we have gleaned regarding the economic consequences of terrorism. A few of these principles are worth highlighting. Given the low intensity of most terrorist campaigns, the economic consequences of terrorism are generally very

modest and short-lived. Terrorism is not on par with civil or guerilla wars and, in general, should have very localized economic effects. The likely candidate countries for noticeable macroeconomic impacts are either developing or small countries that experience a protracted terrorist campaign. In general, the economic influence of terrorism is anticipated to surface in specific sectors that face an enhanced terrorism risk, such as the tourist industry or foreign direct investment.

Except for a couple of case studies, we do not view any of the current macroeconomic studies as providing convincing quantification of the economic impact of terrorism. Future studies need to include domestic and transnational terrorist incidents for a homogeneous panel, for which sample countries are at analogous stages of development and confront similar kinds of terrorist campaigns. Domestic terrorist data must satisfy consistent criteria when pulled from different sources. We also support the need for additional case studies, especially of developing countries. We see the need to extend VAR analysis to a few countries confronting terrorist campaigns in the same region to capture cross-border influences. Spatial econometric estimation can identify the dispersion of the economic consequences.

We view the microeconomic estimates of terrorism consequences as being quite successful and informative. The methodology can be extended to other countries, especially developed countries, as case studies and small panels. More effort should be expended to identify sector-specific, cross-border spillovers – e.g., in the case of foreign direct investment. In addition, the methods can be applied to vulnerable sectors previously unexamined.

**Footnotes**

1. For civil conflicts, these spatial spillovers are measured by Murdoch and Sandler (2002, 2004).

2. Studies include Blomberg, Hess, and Orphanides (2004), Blomberg, Hess, and Weerapana (2004), Li (2005), and Li and Schaub (2004). These studies investigated causes beyond economic conditions – e.g., globalization, democracy, and government restraint.

3. On terrorism-induced substitution, see Enders and Sandler (1993, 2004, 2005).

4. Some studies utilized additional methodologies. For example, BHO (2004) also presented a VAR analysis. Abadie and Gardeazabal (2003) did an event study of abnormal returns of two portfolios of stocks: one for firms with business interests in the Basque region and one for firms with business interests elsewhere. The performance of the former portfolio was tied to terrorist events in the Basque region.

5. Sloboda (2003) also used a transfer function to analyze the effects of terrorism on tourism revenues for the United States following the Gulf War of 1991.



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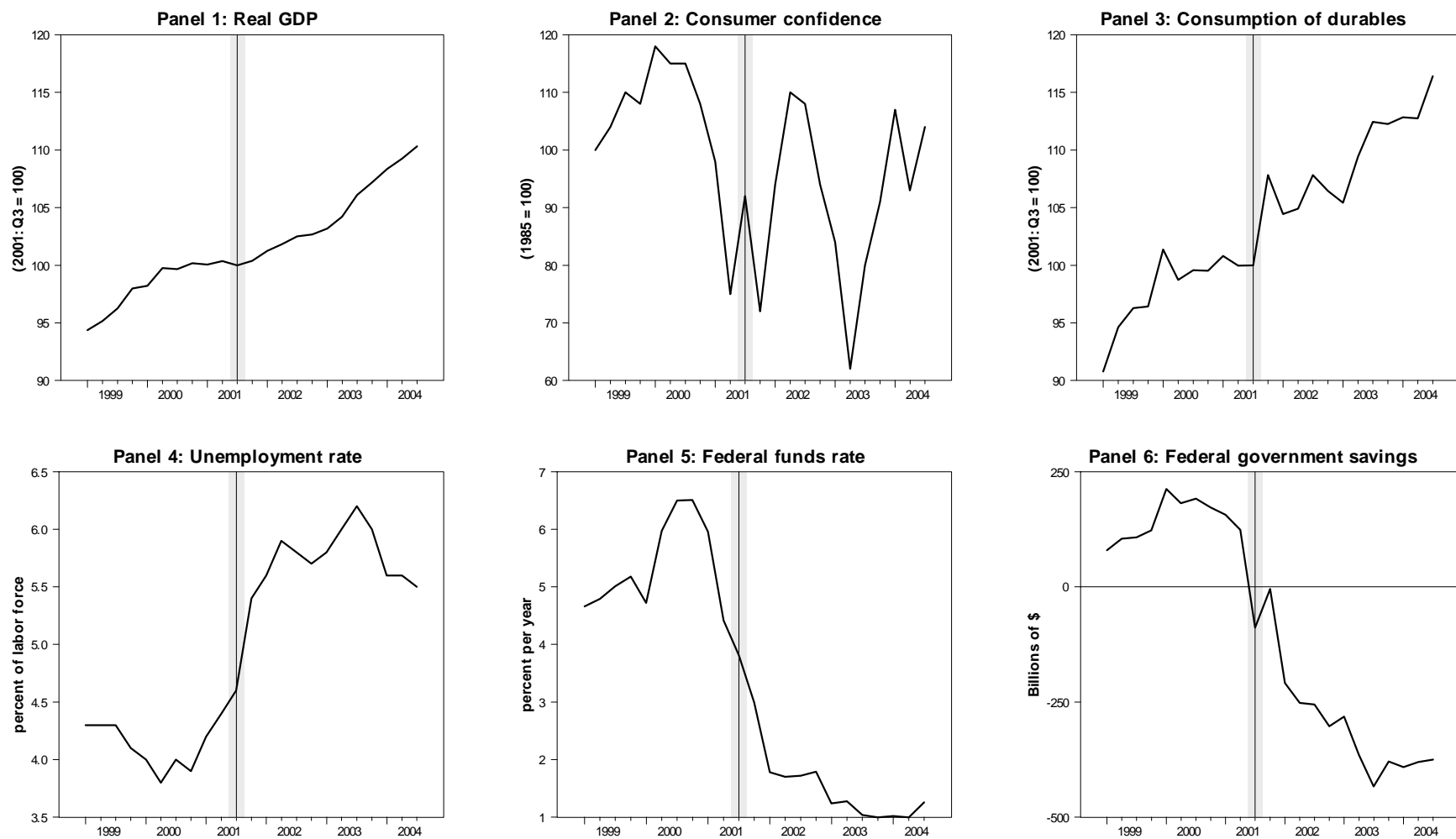
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# Figure 1. Macroeconomic variables and 9/11



**Table 1. Macroeconomic studies of the impact of terrorism**

Study and method	Description	Findings
Blomberg, Hess, and Orphanides (2003) <i>Cross section and panel</i>	Growth in per capita income as a function of conflict, terrorism, and standard growth variables. Some runs control for endogeneity concerns. Entire sample and select cohorts are analyzed.	Terrorism has a small effect on per capita income growth for entire sample, but not for most cohorts. Terrorism reduces $I/Y$ , while it increases $G/Y$ .
Gupta, Clements, Bhattacharya, and Chakravarti (2004) <i>Three-equation cross-section structural model.</i>	Eq. (1) is for the determinants of real per capita GDP growth; eq. (2) is for the determinants of governmental revenue as a share of GDP; and eq. (3) is for the determinants of defense spending as a share of GDP. A conflict-terrorism index is a dependent variable in each equation.	The conflict index has no direct effect on economic growth; it has an indirect effect by increasing the defense spending share, which lowers economic growth.
Tavares (2004) <i>Cross section</i>	Growth in real per capita GDP is a function of logged growth in real per capita GDP, terrorism, other crises, and growth variables. Some runs account for simultaneity bias. Introduces an interactive term between terrorism and political rights as a determinant of growth in per capita GDP.	Terrorism has a small effect on growth when standard growth variables are left out. When these variables are included, terrorism has no influence. Evidence that countries with well-developed democratic institution can withstand terrorism attacks
Abadie and Gardeazabal (2003) <i>Case study for Spain</i>	Contrast the Basque region with terrorism and a “synthetic” region without terrorism. The latter is based on a weighted composite of other peaceful regions in Spain.	Finds a 10% average gap in per capita GDP that they attribute to terrorism over a twenty-year period
Eckstein and Tsiddon (2004) <i>VAR for Israel</i>	The four interactive time series include per capita GDP, investment, exports, and nondurable consumption.	Terrorism has a significant negative impact on per capita GDP, investment, and exports. Terrorism’s influence on investment and exports is three times its effect on per capita GDP. Counterfactual exercise shows that the high recent levels of terrorism resulted in a 2% annual decline in per capita GDP.

*VAR* denotes vector autoregression

**Table 2. Microeconomic studies of the impact of terrorism**

Study and method	Description	Findings
Enders and Sandler (1991) <i>VAR</i>	Using monthly data for 1970-99, the study relates terrorism and tourism for Spain. A causality test establishes that terrorism affects tourism, but not the reverse.	A typical terrorist incident is estimated to scare away just over 140,000 tourists when all monthly impacted are combined.
Enders, Sandler, and Parise (1992) <i>ARIMA with a transfer function</i>	Relates share of tourist receipts to lagged shares of tourist receipts and lagged terrorist attacks. Focuses on Austria, Spain, and Italy for 1974-88. Other continental countries included to investigate out-of-region losses.	During sample period, tourist losses varied: Austria lost 3.37 billion SDRs; Italy lost 861 million SDRs; and Greece lost 472 million SDRs. The sample of Europe countries lost 12.6 billion SDRs of tourist receipts to North America.
Drakos and Kutan (2003) <i>ARIMA with a transfer function</i>	Using monthly data for 1991-2000, the study relates a country's share of tourist receipts to terrorism. Focuses on Greece, Israel, and Turkey. Allows for terrorist-induced substitutions within and among regions.	Greece lost about 9% of its tourism market shares due to terrorism; Israel lost less than 1% of its tourism market share due to terrorism; and Turkey lost just over 5% of its tourism market share due to terrorism. About 89% of lost European tourism flowed to safer regions.
Enders and Sandler (1996) <i>ARIMA with transfer function for Spain VAR for Greece.</i>	Employs time-series methods to ascertain losses in net foreign direct investment (NFDI) due to terrorism. The sample period is 1968-91.	On average, terrorism reduced annual NFDI in Spain by 13.5%, while it lowered annual NFDI in Greece by 11.9%. There was a long lag between an incident and its impact on NFDI. Large rich countries weathered terrorism without displaying a loss in NFDI.
Nitsch and Schumacher (2004) <i>Trade-gravity model</i>	Terror attacks are added to a gravity model to ascertain their impact on bilateral trades for over 200 countries for 1960-93. Independent variables include a language dummy, a colonizer dummy, common border, and other controls.	Terrorist incidents in a trading partner reduce bilateral trade by almost 10%, compared with terrorism-free trading partners.

Table 2. continued

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Chen and Siems (2004) <i>Events-study methodology</i>	This study applies the events-study methodology to uncover how many days are required for stock markets to recover their value after a large-scale terrorist attack.	For the Dow, market value is recovered in 1 to a few days following large-scale terrorist attacks. For 9/11, the Dow recovered in 40 days. Major conflicts are associated with long recovery periods.
Eldor and Melnick (2004) <i>Time-series methods</i>	Relies on time-series methods to display the influence of terrorist attacks on the Israeli stock market. Daily observations are utilized.	The terrorist campaign beginning on September 27, 2000 lowered stock values on the Tel Aviv exchange by 30%. Only suicide attacks had a significant influence. The size of the attack in terms of casualties was a significant determinant of financial market losses.

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VAR denotes vector autoregression and ARIMA is autoregressive integrated moving average.



**Table 3. Measurement of economic consequences of terrorism: panel versus time series**

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**Panel estimation**

➤ *Advantages*

- A wide variety of countries can be considered.
- Variation in key variables (e.g., per capita GDP) is larger.
- Degrees of freedom are large.
- The influence of terrorism on cohorts can be compared and contrasted.

➤ *Disadvantages*

- The estimation's average picture may not be descriptive of many (any) sample countries, especially when the panel includes vastly diverse countries.
- Data problems may arise from using different sources.
- The dynamic effect of terrorism on key variables are not displayed.
- Cross-border spillovers are difficult to identify.

**Time-series estimation**

➤ *Advantages*

- There is no need to construct a behavioral model with explicit exogenous and endogenous variables.
- Dynamic processes can be readily identified; i.e., can evaluate shocks and the pattern of adjustment over time.
- Forecasts can be provided.
- Microeconomic impacts can be readily identified.
- Cross-border spillovers can be estimated.

➤ *Disadvantages*

- The estimated model may be atheoretical with no antecedent behavioral model.
  - The number of countries examined is severely limited.
  - A large number of observations are required.
  - A generalized picture across nations is not given.
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**Table 4. Alternative measures for terrorism**

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*Number of terrorist attacks*

Drakos and Kutan (2003): monthly totals  
Eldor and Melnick (2004): daily totals  
Enders and Sandler (1991): monthly totals  
Enders and Sandler (1996): quarterly totals  
Enders, Sandler, and Parise (1992): quarterly totals  
Nitsch and Schumacher (2004): annual totals and totals for entire 1968-79 period  
Tavares (2004): annual totals

*Occurrence of terrorism in a given year (dummy variable)*

Blomberg, Hess, and Orphanides (2004)  
Nitsch and Schumacher (2004)

*Terrorism incidents per capita*

Tavares (2004): annual total attacks per capita  
also broken down according to target, organization, and casualties.  
Blomberg, Hess, and Orphanides (2004)

*International Country Risk Guide ratings on international conflict*

Gupta, Clements, Bhattacharya, and Chakravarti (2004)

*Specific terrorist events*

Abadie and Gardeazabal (2003)  
Chen and Siems (2004)

*Terrorism index*

Eckstein and Tsiddon (2004): equally weights the number of attacks, the number of deaths, and the number of injured.

*Number of deaths from terrorism*

Abadie and Gardeazabal (2003)

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**Table 5. Economic impact of terrorism: summarizing principles**

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- For most economies, the economic consequences of terrorism are generally very modest and of a short-term nature.
  - Large diversified economies are able to withstand terrorism and not display adverse macroeconomic influences. Recovery is rapid even from a large-scale terrorist attack.
  - Developed countries can use monetary and fiscal policies to offset adverse economic impacts of large-scale attacks. Well-developed institutions also cushion the consequences.
  - The immediate costs of most terrorist attacks are localized, thereby causing a substitution of economic activity away from a vulnerable sector to relatively safe areas. Prices can then reallocate capital and labor quickly.
  - Terrorism can cause a reallocation from investment to government spending.
  - The effects of terrorism on key economic variables – e.g., net foreign direct investment – are anticipated to be greatest in small economies confronted with a sustained terrorist campaign.
  - Some terrorist-prone sectors – e.g., tourism – have displayed substantial losses following terrorist attacks.
  - Small countries, plagued with significant terrorist campaigns, display macroeconomic consequences in terms of losses in GDP per capita.
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