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

by

Todd Sandler*
School of International Relations
University of Southern California
Von Kleinsmid Center 330
Los Angeles, CA 90089-0043
USA
tsandler@usc.edu
213-740-9695
323-256-7900 (fax)

Walter Enders
Department of Economics, Finance
and Legal Studies
University of Alabama
Tuscaloosa, AL 35487
USA
wenders@cba.ua.edu
205-348-8972
205-348-0590 (fax)

Final Draft: September 2005

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 the government will grant some accommodation. Thus, a rational terrorist organization can, in principle, obtain some of 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). The cumulative costs of 9/11 was a small percentage of US gross domestic product (GDP), which exceeded $10 trillion.

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.[1] 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, 2006a, 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 in terms of GDP *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). This diversion resulted in a loss of $3.8 million per month to Yemen's shipping industry. Such losses have a greater potential economic impact in a country with a smaller GDP, because they represent a greater share of GDP. Although the same number of people may lose jobs, the percentage of the work force affected is greater for smaller than for larger countries. The degree of diversification of the impacted economy also matters. In a more diversified and developed economy, such shipping losses may have a temporary influence as resources (capital and labor) are reallocated to other industries (including those in the export sector) or better security measures are deployed to allay concerns. When a small country's export sector is tied to a few activities (e.g., shipping), an attack that affects one of these activities will have a significant impact on the country's foreign exchange earnings. The ability for released resources to bolster

other exporting activities is limited if there are few alternatives.

This paper has four 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.

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. Section 7 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). 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 at least one terrorist incident in, say, ten of ten years, but experience relatively few deaths and modest property damage. 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 small 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 export sector (recall the Yemen shipping example). One should not expect that a modest number of terrorist incidents in most countries will greatly affect the countries' income growth. 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 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 most consequences for 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 transnational. 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 countries' *level of terrorism*. For a country plagued by both domestic and transnational terrorism, it is necessary that *all* terrorist events are included if the estimated coefficient on the terrorist term is to be properly interpreted. If, for example a country has just one transnational terrorist event, but twenty domestic terrorist incidents, and if, moreover, *only* transnational terrorist events are included, then the terrorism coefficient is going to attribute its impact to one event when there are twenty one events. When, instead, a country has no transnational terrorism but is plagued by domestic terrorism, a drop in growth will be attributed to nonterrorism causes, even though domestic

terrorism may be the culprit. The argument that transnational terrorism can serve as a proxy for all terrorism is not necessarily valid, because no one really knows whether the two types of terrorism are correlated. There are countries (e.g., Sri Lanka) with lots of domestic terrorism and little transnational terrorism and other countries with lots of transnational terrorism and little domestic terrorism. Even if the two types of terrorism were perfectly correlated, the magnitude of the terrorism coefficient must be interpreted with care when domestic terrorist incidents are excluded. Moreover, the potential correlation between domestic terrorist incidents and other independent variables remains a concern. The exclusion of domestic terrorism is an issue for cross-section and country-specific studies of the consequences of terrorism on macroeconomic variables.

This problem can be partly circumvented if an internal conflict measure is introduced as an independent variable (see Blomberg, Hess, and Orphanides, 2004), because domestic terrorism is anticipated to be somewhat correlated with internal conflict. The latter can then control for the influence of domestic terrorism. The terrorism coefficient would thus reflect the impact of transnational terrorism and not terrorism per se.

In the case of net foreign direct investment (NFDI), transnational terrorism is the appropriate terrorism variable when terrorist attacks have been directed at foreign investments or their personnel and there is little or no domestic terrorism (Enders and Sandler, 1996). If foreign tourism is being investigated, then transnational terrorist attacks is appropriate when such attacks are against tourist venues or infrastructure serving tourism. Moreover, any domestic terrorism must be far from these tourists so that they do not feel threatened.

On terrorism data

To date, much of the literature has relied on the *International Terrorism*: *Attributes of*

Terrorist Events (ITERATE) data set (Mickolus et al., 2004) of transnational terrorist events. Based on newspaper and media accounts, ITERATE records many variables – e.g., incident date, incident location by country, type of event, number killed, groups claiming responsibility, and demands made – for transnational terrorist events from 1968 through 2004. ITERATE does not classify incidents as terrorism that relate to declared wars or major military interventions by governments, or guerrilla attacks on military targets conducted as internationally recognized acts of belligency. 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. 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.

The International Policy Institute for Counterterrorism (IPIC) (2003) maintains an online data set. 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 bias. When sampling the incidents, we found many incidents that would not have satisfied ITERATE's transnational criterion – e.g., some Palestinian incidents in Israel. In fact, IPIC data include a disproportionate number of incidents from the Middle East. This is not surprising since IPIC is put together by the Interdisciplinary Center Herziliya in Israel (http://www.ict.org.il).

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 must expend much effort to put the data in a form that would relate incidents by countries so that statistical analysis on the economic consequences of terrorism can be accomplished. The addition of domestic events is very useful but there are only seven years of data.

There are a few data sets available for conducting specific country studies – see Abadie and Gardeazabal (2003) on Spain and Eckstein and Tsiddon (2004) on Israel. In the latter case, the Israeli terrorism data came from IPIC. Country-level data are also available for Colombia and a few other countries.

Causality

A final preliminary concerns 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.[2] 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. A mature market economy generates signals (i.e., prices and profits) to direct resources to where returns are the greatest. These signals also help channel resources to where rebuilding and other responses are required. If an impacted sector has a slow recovery, then some resources will leave for better short-term prospects and will return when prospects improve.

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.[3] 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 macroeconomics 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 a 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 reaction to 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 appear to have

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. Two basic findings derive from these

studies: (i) the effects of terrorism on reduced growth is on average, quite small, and (ii)

countries with sustained terrorist campaigns may lose over 10% of their GDP.

Blomberg, Hess, Orphanides (henceforth BHO) (2004) examined a pooled cross section

of 177 countries from 1968 to 2000. Their estimating equation is:

$$\Delta y_i = \beta_0 + \beta_1 COM_i + \beta_2 AFRICA + \beta_3 \ln y_{0i} + \beta_4\, I/Y_i + \beta_5 T_i + \beta_6 I_i + \beta_7 E_i + \varepsilon_i, \tag{1}$$

where Δy_i is country i's average per capita GDP growth rate, βs 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 ε_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. As such, this

measure does not indicate the growth impact of either the level or intensity (i.e., how deadly is

the campaign) of terrorism; thus, the impact of an average terrorist incident on growth cannot be

ascertained from this specification. Moreover, these authors used *just transnational terrorism*

incidents drawn from the ITERATE data set. Some sample countries would have experienced a

far greater amount of domestic terrorism, which was not directly controlled in the study. BHO,

were, however, 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 should be picking up some of

the impact of domestic terrorism because the later is anticipated to be correlated with such

conflicts.

BHO's study controlled for some endogeneity bias. An especially interesting part of their

study is their panel estimates for nondemocractic 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 BHO, 2004, Table 1;

Enders and Sandler, 2006b, Figures 5-6), yet Africa was the only panel where the estimated

terrorism coefficient was significant. This rather surprising finding is consistent with less

diversified economies experiencing a larger impact from terrorism. However, there are many

undiversified economies in the Middle East and nondemocratic samples that did not display the

same influence. 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. It is curious

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 to fundamentalist groups. Previous studies showed that terrorism

became more deadly with the rise of fundamentalist terrorism in the 1980s and beyond (Enders

and Sandler, 2000). As a consequence, the increased intensity of an "average" terrorist incident

may have a greater economic impact in the latter half of the sample period.

In another set of panel estimates, BHO (2004) changed their terrorism indicator to

terrorist incidents per capita. This new measure indicates the prevalence of terrorism in terms of

the likelihood that incidents will affect someone in the population. The per capita measure also

accounts for the level of terrorism. 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. Moreover, the impact of terrorism *varies widely* between the full sample and the

smaller cohort panels, leading one to conclude 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 of the share investment to GDP and the share of government spending to GDP. These estimates are quite useful because they 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.

A second 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:

$$\text{Growth } GDPpc_{it} = \beta_0 + \beta_1 \text{Growth} GDPpc_{i,t-1} + \beta_2 GDPpc_{it} + \beta_3 \text{Terrorism}_{it}$$
$$+ \beta_4 \text{Natural Disaster}_{it} + \beta_5 \text{Currency Crisis}_{it} + \text{Additional Controls} + \varepsilon_{it}, \tag{2}$$

where GrowthGDP_{pc} is per capita GDP growth. On the right-hand side of (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 IPIC (2003) 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), on par with BHO's (2004) initial set of estimates. 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:

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

where Δy_{it} is country' i's growth of per capita GDP in year t, Δy_{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 (3) 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 (3) 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 has some persistent. 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. By not including R_{it} as an additional argument in (3), the coefficient of the interaction term is probably biased in an upward fashion.

Case studies

To date, there are two 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) estimated the per capita GDP losses 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. Their synthetic region is required to provide a counterfactual "Basque region," whose growth in the absence of terrorism can be compared to the growth in the Basque region in the presence of 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 equaled 12%, while, during low-terrorism episodes, the gap closed to 8-9%.

To address a possible "placebo" influence, the authors also instigated the growth of another Spanish region – i.e., Catalonia – that was similar to the Basque region but did not experience terrorism. A synthetic region was also constructed for Catalonia. The authors then showed that there was little gap in real per capita GDP over time for Catalonia and its synthetic region, both of which had no terrorism. The Abadie and Gardeazabal (2003) methodology is very clever and could be applied for a country study, *provided* that a synthetic country can be constructed. Their exercise is probably easier within a country than for an entire country.

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 noncasuality 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 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.

The four key macroeconomic studies are summarized in Table 1 for ready reference. The first column indicates the study and its basic methodology,[4] 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

Past macroeconomic studies have given limited insight on how developing countries' economies have weathered terrorist attacks. The two case studies have been for small *high-income* countries. The precise sample of the Tavares (2004) study was never made clear but included developed and developing countries; hence, terrorism's impact on developing countries was not isolated. BHO (2004) provided some insights for developing countries owing to their

African and nondemocratic panels, where many countries are less developed. For Africa, there is evidence – significant at just the .10 level – that the presence of terrorism (i.e., one or more attacks in a year) reduced per capita growth. This evidence is much stronger for Africa when terrorist incidents per capita are used. A concern, however, arises because the −3.856 coefficient is rather large given the average growth level of African countries. Moreover, this coefficient also exceeds that for internal conflicts. In BHO's base runs, the nondemocratic countries displayed no terrorism effect on per capita growth, but this was not the case for terrorist incidents per capita.

To better quantify the influence of terrorism on the economies of developing countries, we suggest two approaches. First, the Abadie and Gardeazabal (2003) and Eckstein and Tsiddon (2004) methods should be applied to specific developing countries. Other appropriate case-study methods should be engineered. Second, cross-section and panel analysis, along the lines of BHO (2004), should be used on a cohort of developing countries. A broad sample of developing countries should first be assembled for a set of estimates. Next, some cohorts can be examined that experienced similar terrorist campaigns. Regional groupings of developing countries represent other appropriate cohorts.

There are a number of anticipated differences between how developed and developing countries are able to weather 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. Debt also hinders many developed countries from applying monetary policy to cushion the consequence of a large-scale terrorist attack. 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 demand 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.

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. Because many of these studies are country specific, methods other than cross-section estimates have been used.

Tourism

Attacks against tourist venues (e.g., airports, hotels, or attractions) or tourist modes 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. 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:

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

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 ε_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.

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

desired counterfactual analysis, a researcher estimates (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 and the actual value of y_t is then due to the effect of terrorism. This analysis can

be generalized to permit terrorism to affect tourism and vice versa, so that a VAR methodology

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 reverse. Each transnational terrorist

incident was estimated to dissuade over 140,000 tourists 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 much of the ETA terrorist campaign was transnational attacks to chase away foreign tourists and FDI. Domestic terrorist attacks were performed with precision and away from tourist venues.

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 against foreign tourists during this period. The dependent variable was the country's 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, a transnational 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. Based on transnational terrorist attacks,[5] 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.[6] Drakos and Kutan also uncovered significant spillover effects – low-intensity terrorist attacks in Israel reduced Greek tourism revenues.

Net foreign direct investment (*NFDI*)

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 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 NDFI 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 many sources and appeared to endure attacks without a measurable aggregate 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.

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 depended 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. 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 Lampur, 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. The appropriate method depends on the question at hand and data availability.

Time-series methods have been effectively used for microeconomic 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 within-country consequences of terrorism on macroeconomic variables such as consumption per capita and GDP per capita. Not only can a time-series analysis lend itself to counterfactual exercises, but it can also be used for forecasting purposes. Although most time-series estimates do not have antecedent behavioral models, the Eckstein and Tsiddon (2004) article indicates that this need not be the case, 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, as in Drakos and Kutan (2003).

Panel studies also have advantages and disadvantages as indicated in the bottom half of Table 3. A crucial variable (e.g., real per capita GDP growth) may display little variation for a country so that identification becomes a problem To circumvent this difficulty, cross-section and panel estimates introduce sufficient variation to enhance identification. Hence, such estimates have a real role to play in identifying the impact of terrorism on various GDP growth measures. To limit extreme heterogeneity that may arise from diverse samples, cohorts can be constructed. Moreover, independent variables can control for some heterogeneity – e.g., democratic institutions or stage of development. If, however, the sample is too heterogeneous, then the "average" picture provided by the coefficient estimates may not be descriptive of the experience

of many sample countries. Even some dynamic factors can be introduced by lagging a variable; however, the amount of dynamic interaction is limited compared with time-series estimates.

Different measures of terrorism have been used by alternative studies. A dummy for the presence of terrorism in a given year may be appropriate if terrorist campaigns differ greatly among sample countries and outlier problems are to be avoided. Incidents per capita captures the prevalence of terrorism relative to the population base, thereby indicating the likelihood that individuals will be affected by an attack. The number of incidents indicates the extent of the campaign and may be particularly appropriate for a country study. If the intensity of terrorism is to be captured, then the number of incidents with casualties (i.e., a death or injury) is a useful measure. For time-series studies, the time dimension of the incident series (i.e., daily, monthly, quarterly, or annual) is an important consideration. For example, researchers often rely on quarterly totals to eliminate zero or near-zero observations that violate the underlying normal distribution, associated with many time-series methods. Because time-series techniques require many data points, monthly or daily incident series maintains a large number of observations. If zero values then become a concern, estimates can be based on a discrete Poisson distribution.

Some studies use more than one terrorism measure (e.g., BHO, 2004; Tavares, 2004). For these studies, the robustness of the economic consequences to alternative measures become a relevant consideration.

7. Concluding Remarks

Table 4 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 macroeconomic consequences of terrorism are generally 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.

Both macroeconomic case studies applied clever methods to display substantial economic losses – in the range of 10% of GDP per capita – stemming from protracted terrorist campaigns. Cross section and panel estimates have shown modest impacts of terrorism on per capita GDP growth. These studies should incorporate both domestic and transnational terrorism data to better gauge the impact of terrorism for cohorts that include just developing countries. There is also a need for additional case studies, especially of developing countries. VAR analysis can be applied to a few countries confronting terrorist campaigns in the same region to capture cross-border influences. In addition, spatial econometrics can identify the dispersion of economic consequences. Microeconomic estimates of terrorism consequences have been informative. The associated 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 FDI. These methods can also 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, 2006b).

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.   In the case of Israel, the exclusion of domestic terrorism presents a potential bias because domestic terrorist attacks would surely influence tourism to Israel.

6.   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.

References

Abadie, Alberto and Javier Gardeazabal (2003), "The Economic Cost of Conflict: A Case Study of the Basque Country," *American Economic Review*, 93(1), 113-32.

Blomberg, S. Brock, Gregory D. Hess, and Athanasios Orphanides (2004), "The Macroeconomic Consequences of Terrorism," *Journal of Monetary Economics*, 51(5), 1007-32.

Blomberg, S. Brock, Gregory D. Hess, and Akila Weerapana (2004), "Economic Conditions and Terrorism," *European Journal of Political Economy,* 20(2), 463-78.

Chen, Andrew H. and Thomas F. Siems (2004), "The Effects of Terrorism on Global Capital Markets," *European Journal of Political Economy,* 20(2), 249-66.

Collier, Paul, V. L. Elliott, Håvard Hegre, Anke Hoeffler, Marta Reynal-Querol, and Nicholas Sambanis (2003), *Breaking the Conflict Trap: Civil War and Development Policy* (Washington, DC: World Bank and Oxford University Press).

Collier, Paul and Anke Hoeffler (2004), "Greed and Grievance in Civil War," *Oxford Economic Papers*, 56(4), 563-95.

Collier, Paul and Nicholas Sambanis (2002), "Understanding Civil Wars: A New Agenda," *Journal of Conflict Resolution*, 46(1), 3-12.

Drakos, Konstantinos (2004), "Terrorism-Induced Structural Shifts in Financial Risk: Airline Stocks in the Aftermath of the September 11th Terror Attacks," *European Journal of Political Economy,* 20(2), 436-46.

Drakos, Konstantinos and Ali M. Kutan (2003), "Regional Effects of Terrorism on Tourism in Three Mediterranean Countries," *Journal of Conflict Resolution,* 47(5), 621-41.

Eckstein, Zvi and Daniel Tsiddon (2004), "Macroeconomic Consequences of Terror: Theory and the Case of Israel," *Journal of Monetary Economics*, 51(5), 971-1002.

Eldor, Rafi and Rafi Melnick (2004), "Financial Markets and Terrorism," *European Journal of*

Political Economy, 20(2), 367-86.

Enders, Walter and Todd Sandler (1991), "Causality between Transnational Terrorism and Tourism: The Case of Spain," *Terrorism*, 14(1), 49-58.

Enders, Walter and Todd Sandler (1993), "The Effectiveness of Anti-Terrorism Policies: A Vector-Autoregression-Intervention Analysis," *American Political Science Review*, 87(4), 829-44.

Enders, Walter and Todd Sandler (1996), "Terrorism and Foreign Direct Investment in Spain and Greece," *Kyklos*, 49(3), 331-52.

Enders, Walter and Todd Sandler (2000), "Is Transnational Terrorism Becoming More Threatening? A Time-Series Investigation," *Journal of Conflict Resolution*, 44(3), 307-32.

Enders, Walter and Todd Sandler (2004), "What Do We Know About the Substitution Effect in Transnational Terrorism?," in Andrew Silke (ed.), *Research on Terrorism*: *Trends, Achievements and Failures* (London: Frank Cass), 119-37.

Enders, Walter and Todd Sandler (2006a), *The Political Economy of Terrorism* (Cambridge: Cambridge University Press), forthcoming.

Enders, Walter and Todd Sandler (2006b), "Distribution of Transnational Terrorism among Countries by Income Class and Geography after 9/11," *International Studies Quarterly,* 49(4), forthcoming.

Enders, Walter, Todd Sandler, and Gerald F. Parise (1992), "An Econometric Analysis of the Impact of Terrorism on Tourism," *Kyklos*, 45(4), 531-54.

International Policy Institute for Counterterrorism (2003), Terrorism Database [http://ict.org.il], accessed May 19, 2005.

Ito, Harumi and Darin Lee (2004), "Assessing the Impact of the September 11 Terrorist Attacks

on U.S. Airline Demand," unpublished manuscript, Brown University, Providence, RI.

Kunreuther, Howard, Erwann Michel-Kerjan, and Beverly Porter (2003), "Assessing, Managing and Financing Extreme Events: Dealing with Terrorism," Working Paper 10179, National Bureau of Economic Research, Cambridge, MA.

Li, Quan (2005), "Does Democracy Promote Transnational Terrorist Incidents?," *Journal of Conflict Resolution*, 49(2), 278-97.

Li, Quan and Drew Schaub (2004), "Economic Globalization and Transnational Terrorism," *Journal of Conflict Resolution,* 48(2), 230-58.

Mickolus, Edward F., Todd Sandler, Jean M. Murdock, and Peter Flemming (2004), *International Terrorism: Attributes of Terrorist Events*, *1968-2003* (ITERATE) (Dunn Loring, VA: Vinyard Software).

Murdoch, James C. and Todd Sandler (2002), "Economic Growth, Civil Wars, and Spatial Spillovers," *Journal of Conflict Resolution*, 46(1), 91-110.

Murdoch, James C. and Todd Sandler (2004), "Civil Wars and Economic Growth: Spatial Spillovers," *American Journal of Political Science*, 48(1), 138-51.

National Memorial Institute for the Prevention of Terrorism (2005). *MIPT Terrorism Database* [http://www.mipt.org], accessed May 19, 2005.

Nitsch, Volker and Dieter Schumacher (2004), "Terrorism and International Trade: An Empirical Investigation," *European Journal of Political Economy*, 20(2) 423-33.

Sandler, Todd (2003), "Collective Action and Transnational Terrorism," *World Economy*, 26(2), 779-802.

Sandler, Todd and Walter Enders (2004), "An Economic Perspective on Transnational Terrorism," *European Journal of Political Economy,* 20(2), 301-16.

Sloboda, Brian W. (2003), "Assessing the Effects of Terrorism on Tourism by the Use of Time
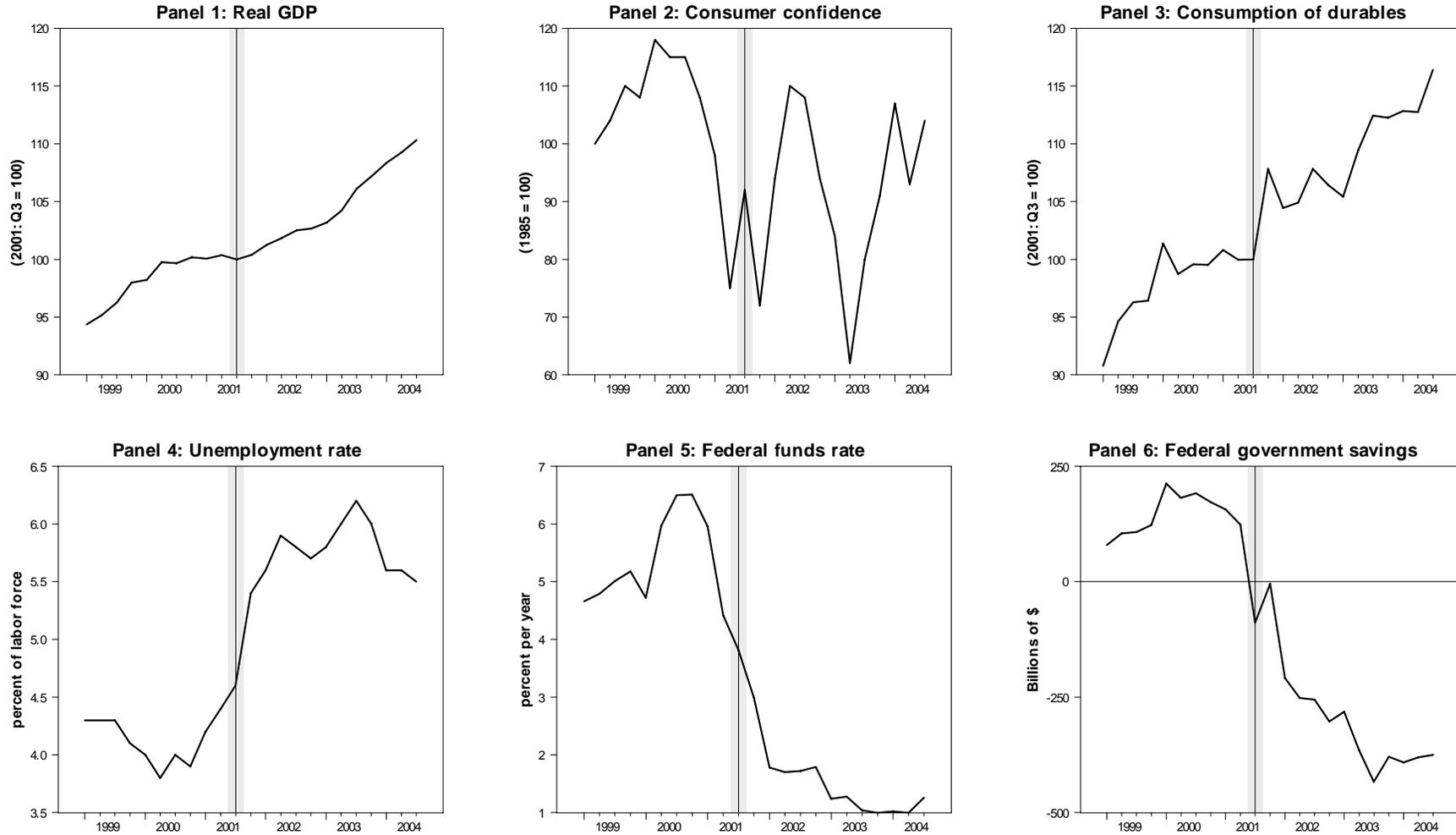
Series Methods," *Tourism Economics*, 9(2), 179-90.

Tavares, Jose (2004), "The Open Society Assesses its Enemies: Shocks, Disasters and Terrorist Attacks," *Journal of Monetary Economics*, 51(5), 1039-70.

United States Department of State (various years), *Patterns of Global Terrorism* (Washington, DC: US Department of State).

United States Department of State Fact Sheet (2002), "Yemen: The Economic Cost of Terrorism," [http://www.state.gov/s/ct/rls/fs/2002/15028.htm], accessed 12 December 2004.

Figure 1. Macroeconomic variables and 9/11

Panel 1: Real GDP

Panel 2: Consumer confidence

Panel 3: Consumption of durables

Panel 4: Unemployment rate

Panel 5: Federal funds rate

Panel 6: Federal government savings

Table 1. Macroeconomic studies of the impact of terrorism

Study and method	Description	Findings
Blomberg, Hess, and Orphanides (2003) *Cross section* and *panel*	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.
Tavares (2004) *Cross section and panel*	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 on par with that of BHO when standard growth variables are left out. When these variables are included, terrorism has no influence. Evidence is provided that countries with well-developed democratic institution can withstand terrorism attacks
Abadie and Gardeazabal (2003) *Case study for Spain*	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) *VAR* for Israel	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 two times its effect on per capita GDP. Counterfactual exercise shows that the high recent levels of terrorism resulted in a 10% 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) *VAR*	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) *ARIMA with a transfer function*	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) *ARIMA with a transfer function*	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) *ARIMA with transfer function* for Spain *VAR* for Greece.	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) *Trade-gravity model*	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

Chen and Siems (2004) *Events-study methodology*	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) *Time-series methods*	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.

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

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

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.

Panel estimation

➤ *Advantages*
- A wide variety of countries can be considered.
- Variation in key variables (e.g., per capita GDP growth) is larger; hence, identification is enhanced.
- 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 sample countries, especially when the panel includes vastly diverse countries. This heterogeneity is a problem when it is not controlled.
- Data problems may arise from using different sources.
- The dynamic effect of terrorism on key variables are often not displayed.
- Cross-border spillovers are difficult to identify.

Table 4. Economic impact of terrorism: summarizing principles

- For most economies, the macroeconomic consequences of terrorism are generally 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. In the absence of further attacks, these sectors rebound rather quickly.

- Small countries, plagued with significant terrorist campaigns, display macroeconomic consequences in terms of losses in GDP per capita.