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ECONOMIC IMPACTS OF GLOBAL TERRORISM:

From Munich to Bali

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Capital Studies

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Executive Summary

Terrorism has been most succinctly defined as “the intentional use of, or threat to use violence against civilians or against civilian targets, in order to attain political aims.”¹ During the past 35 years, the world has witnessed nearly 20,000 terrorist incidents, ranging from the hostage takeover during the 1972 Munich Olympics to the 2002 and 2005 tourist bombings in Bali. These incidents have resulted in more than 90,000 casualties worldwide.² This paper, which examines the impact of terrorism on economic growth and capital formation, finds that terrorism is associated with adverse effects on overall economic activity.

Previous research on the success of attacks that seek to physically destroy productive assets and redirect resources away from productive uses shows mixed findings. Terrorist incidents can trigger short-lived adverse reactions in financial markets (Chen and Siems, 2004; Eldor and Melnick, 2004), but the evidence for the long-run impact of terrorism is less compelling (Becker and Murphy, 2001; Abadie and Gardeazabal, 2003 and 2005; Blomberg, Hess, and Orphanides, 2004).

¹ Ganor .1998. “Defining Terrorism: Is One Man’s Terrorist Another Man’s Freedom Fighter?” <http://www.ict.org.il/articles/define.htm>.

² For purposes of this paper, terrorism is defined more broadly as follows: “Terrorism is violence, or the threat of violence, calculated to create an atmosphere of fear and alarm. These acts are designed to coerce others into actions they would not otherwise undertake, or refrain from actions they desired to take. All terrorist acts are crimes. Many would also be violation of the rules of war if a state of war existed. This violence or threat of violence is generally directed against civilian targets. The motives of all terrorists are political, and terrorist actions are generally carried out in a way that will achieve maximum publicity. Unlike other criminal acts, terrorists often claim credit for their acts. Finally, terrorist acts are intended to produce effects beyond the immediate physical damage of the cause, having long-term psychological repercussions on a particular target audience. The fear created by terrorists may be intended to cause people to exaggerate the strengths of the terrorist and the importance of the cause, to provoke governmental overreaction, to discourage dissent, or simply to intimidate and thereby enforce compliance with their demands” (MIPT 2005). Our paper focuses on the time period from 1968 to 2004, covering 16,730 terrorist incidents in 149 countries.

Using terrorism data from the 2005 MIPT Terrorism knowledge database,, which integrates more than 20,000 terrorism incidents from various sources, researchers made several empirical estimations based on cross-sectional and period fixed-effects regressions with White-heteroskedasticity consistent standard errors. The main findings, below, are categorized by four specifications that include a set of control variables and four different measures of terrorism.

Real GDP per Capita Growth

- The greater the number of terrorist incidents per million population, the lower the real GDP per capita growth.
- The higher the number of terrorist incidents per \$U.S. billion GDP, the lower the real GDP per capita growth.

Capital Formation to GDP

- The higher the number of terrorist incidents per million population, the lower the capital formation as a percentage of GDP.
- The higher the number of terrorist incidents per \$U.S. billion GDP, the lower the capital formation as a percentage of GDP.
- The higher the fatalities and injuries per \$U.S. billion GDP, the lower the capital formation as a percentage of GDP.

Number of Incidents by Target

- More terrorist attacks at private citizens and property per million population is related to lower capital formation/GDP.
- More terrorist attacks at airlines, airports, transportation, utilities and telecommunication targets is related to both lower real GDP per capita growth and capital formation to GDP.

Our results show that terrorism is indeed associated with adverse economic effect. In general, terrorist incidents have a negative and significant impact on economic growth.

Our results also show that targets matter. Terrorist incidents targeting private properties are negatively associated with both growth and capital formation. This is particularly important given the recent increased focus on private targets.

I. Introduction

Terrorism has been most succinctly defined as “the intentional use of, or threat to use violence against civilians or against civilian targets, in order to attain political aims.”³ During the past 35 years, the world has witnessed nearly 20,000 terrorist incidents, ranging from the hostage takeover during the 1972 Munich Olympics to the 2002 and 2005 tourist bombings in Bali.. Terrorist incidents worldwide during this time period have resulted in more than 90,000 casualties or injuries (Table 1)⁴. Although the basic objectives of terrorism have remained largely unchanged over the years, technological progress has allowed terrorists to employ more sophisticated and, at times, devastating tactics. This, along with the increasingly global scope of terrorism, has raised important questions about its economic impacts in countries around the world.

A number of terrorist groups make damaging their targets’ economies a priority. Such groups may seek to physically destroy productive assets as well as redirect resources away from productive uses. The evidence for the success of such attacks is mixed. Terrorist incidents can trigger short-lived adverse reactions in financial markets (Chen and Siems, 2004; Eldor and Melnick, 2004), but the evidence for the long-run

³ Ganor .1998. “Defining Terrorism: Is One Man’s Terrorist Another Man’s Freedom Fighter?” <http://www.ict.org.il/articles/define.htm>.

⁴ For purposes of this paper, terrorism is defined more broadly as follows: “Terrorism is violence, or the threat of violence, calculated to create an atmosphere of fear and alarm. These acts are designed to coerce others into actions they would not otherwise undertake, or refrain from actions they desired to take. All terrorist acts are crimes. Many would also be violation of the rules of war if a state of war existed. This violence or threat of violence is generally directed against civilian targets. The motives of all terrorists are political, and terrorist actions are generally carried out in a way that will achieve maximum publicity. Unlike other criminal acts, terrorists often claim credit for their acts. Finally, terrorist acts are intended to produce effects beyond the immediate physical damage of the cause, having long-term psychological repercussions on a particular target audience. The fear created by terrorists may be intended to cause people to exaggerate the strengths of the terrorist and the importance of the cause, to provoke governmental overreaction, to discourage dissent, or simply to intimidate and thereby enforce compliance with their demands” (MIPT 2005). Our paper focuses on the time period from 1968 to 2004, covering 16,730 terrorist incidents in 149 countries.

impact of terrorism is less compelling (Becker and Murphy, 2001; Abadie and Gardeazabal, 2003 and 2005; Blomberg, Hess, and Orphanides, 2004).

This paper examines the impact of terrorism on economic growth and capital formation. Section II provides a selected review of empirical studies focusing on the impact of terrorism on various measures of economic activity. Section III discusses the terrorism data used in our study and provides an overview of cross-country differences in terrorist incidents, fatalities and injuries. Section IV describes our model, methodology, specifications and empirical results. Section V is our conclusions.

II. Impacts of Terrorism on Economic Activity

Most research on various types of conflicts and their economic effects tend to focus on conventional forms of war and, to a much lesser extent, on terrorism per se (see Table 5). The recent literature investigating the economics of terrorism can be divided broadly into two groups: studies analyzing the economic and socioeconomic factors behind terrorism and those examining the economic impacts resulting from terrorist attacks. For purposes of this paper, we are primarily pursuing a similar strategy to the latter group of studies.

II.A Impact on Economic Growth

Although studies investigating the impact of terrorism on economic activity are relatively new, they are rapidly gaining popularity following the devastating events in the United States on Sept. 11, 2001. Blomberg, Hess, and Weerapana (2004) developed a theoretical model demonstrating that the probability of terrorist activity is higher in more democratic, high-income countries during recessions. Blomberg, Hess and Orphanides

(2004) estimate a number of models in an attempt to gauge the economic consequences of terrorism. Using panel regressions controlling for country-fixed effects, they find the incidence of terrorism is negatively and significantly related to GDP growth. Their study indicates that a terrorist attack in a country in a given year, on average, reduces its GDP growth by 0.57 percentage points. In addition, the paper indicates that regressing GDP growth on the number of terrorist incidents per 100,000 persons in a country--controlling for country-fixed effects, variables measuring external and internal conflicts, among other variables--yield similar results, but with a smaller impact of terrorism at 0.3 percentage points slower growth.

Abadie and Gardeazabal (2003) assess the impacts of terrorism on GDP per capita in Spain's Basque Country – a region that has been beset by terrorism since the 1970s. They construct a synthetic region that consists of a weighted combination of different Spanish regions that is designed to act as a “counterfactual” Basque region sans terrorism. It is meant to reflect an economic profile of the region before the onset of terrorism. The authors find that for the pre-terrorism period of 1955 to 1975, the actual and “synthetic” Basque regions behaved similarly in their growth dynamics. However, from 1975 on, these paths diverge with the actual region's per-capita GDP lagging the “synthetic” Basque region by 12 percentage points. Testing whether this gap is accounted for by terrorism, they find that “terrorist activity explains the GDP gap almost perfectly.”

Tavares (2003) investigates the determinants and costs of terrorism at the aggregate level, determined by GDP growth. He suggests that the “economic cost of a terrorist attack is, all else equal, less severe in countries with better developed institutions.” In the simplest specification, terrorism indicators are found to have a

negative and significant impact on growth in real GDP per capita. However, when taking into account other determinants of growth, such as exports, size of government, and spending on education, terrorism is no longer significant.

An increasing number of terrorist incidents may indicate increased political instability in a country. In this regard, a number of cross-country empirical studies have found that political instability has a negative impact on economic growth (Alesina and Perotti, 1996; Barro, 1991; and Mauro, 1995). Other cross-country studies have found that political instability also has a negative impact on investment and savings (Alesina and Perotti, 1996; and Venieris and Gupta, 1986).

If terrorism persists, economic costs can be permanent. Saxton (2002) argues that the economic cost of terrorism is similar to a “security” or “terrorism tax” due to the additional cost of security. These various costs constitute a supply side shock to an economy and can be very large. For example, a study by the World Bank (2002) on the Palestinian-Israeli conflict estimates that its cost on the Israeli economy is about 4 percent of GDP. Another study by the World Bank (2003) estimated that the Palestinian territories suffered as much as a 50 percent decline in GDP from 1992 to 2004 due to conflicts. Furthermore, Gupta, Clements, Bhattacharya and Chakravarti (2004) find that terrorism has a significant positive effect on the government budget in low- and middle-income countries. This additional fiscal cost for security contributes to both direct and indirect adverse effects on growth.

II.B Impact of Terrorism on Investments

II.B.1 Destruction of capital stock

Terrorist incidents have an immediate and direct economic impact on a nation's capital stock—both physical and human. While the terrorist attacks in the United States on Sept. 11 spurred new research to quantify the economic loss, some results indicated relatively little destruction of capital stock. For instance, Becker and Murphy (2001) find quite a small direct cost of terrorism, estimating that the terrorist attacks destroyed just 0.06 percent of the capital stock in the U.S. Frey, Lüchinger and Stutzer (2004) note that the attack's destruction of the World Trade Center and surrounding buildings resulted in the loss of just 4 percent of Manhattan office space while Lenain, Bontari and Koen (2002) find that the Sept. 11 rescue operations and subsequent physical clean-up cost some \$11 billion – a mere 0.1 percent of 2001 U.S. GDP. The International Monetary Fund (2001) estimates the direct costs of Sept. 11 as equal to \$21.4 billion (or 0.22 percent of GDP), while Navarro and Spencer (2001) indicate that the loss of capital stock was \$50 billion to \$53 billion (or 0.51 to 0.54 percent of GDP). While these impacts are relatively small, they suggest that terrorism may have an adverse impact on growth insofar as these attacks represent a negative shock to capital formation.

Blomberg, Hess and Orphanides (2004) estimate the impact of terrorism on the ratio of investment to GDP using cross-country regressions and find that the number of terrorist incidents is significantly and negatively related to this ratio. Furthermore, they find that the negative effect of terrorism on investment is matched by a positive effect on government spending, suggesting that terrorism redirects resources from investment to less socially enhancing government spending.

II.B.2 Deterring foreign direct investment

Abadie and Gardeazabal (2005) examine the impact of terrorism on foreign direct investment (FDI) which, they hypothesize, may be greater than its impact on economic growth. Unlike other studies, which use either the number of fatalities or the number of terrorist attacks as their measure of terrorism, the authors use an index that is based on “expert ratings of the motivation, presence, scale, efficiency, and prevention of terrorism at a country level.” This Global Terrorism Index is used, controlling for several political, demographic and economic variables, in a number of cross-country regressions with the ratio of net FDI to GDP as the dependent variable. In 25 of the 28 models, the Global Terrorism Index is found to be negatively related to net FDI over GDP at the 10 percent level of significance or higher. Moreover, in 17 of the 28 models, this measure of terrorism is significant at the 5 percent level. The effect of terrorism is not insubstantial; insofar as a one standard deviation increases in terrorism leads – on average – to a decrease in the ratio of net FDI to GDP of between 4.16 and 6.54 percentage points.

Enders and Sandler (1996) also study the impact of terrorism on FDI using a vector autoregression model. Their results are fairly consistent with those of Abadie and Gardeazabal (2005), although – using data for Greece and Spain – they find a greater adverse impact of terrorism and conclude that it has a negative 13.5 percent impact on FDI in Spain from 1976 to 1991 and a negative 11.9 percentage point impact on FDI in Greece from 1975 to 1991.

II.B.3 Depressing stock market valuation

Chen and Siems (2004) measure the impact of terrorism on equity indices using an event study methodology. Abnormal returns (deviations of post-event index values

from the pre-event average) and cumulative abnormal returns are the dependent variables and the number of military and terrorist actions is the events. Using abnormal and cumulative abnormal returns on the Dow Jones Industrial Average equity index, the authors find that of the eight terrorist incidents⁵ studied, just two – the Sept. 11 attacks and the 1985 bombing of an Air India jetliner—were followed by statistically significant negative abnormal returns on the day of the attacks. More surprisingly, the Sept. 11 attacks were the only ones that had significantly negative six-day cumulative abnormal returns. None of the terrorist attacks studied had significant 11-day abnormal returns.

These results are augmented by an event-study analysis of the impact of the Sept. 11 attacks on 33 equity indices around the world. The authors find that though the effect of disruptive incidents varies from country to country, it generally yields negative and significant abnormal returns. Interestingly, none of the U.S. equity indices displayed 11-day cumulative returns that were significantly different from the pre-event mean.

Eldor and Melnick (2004) use equity data from the Tel Aviv Stock Exchange's TSE100 index to study the effects of terrorism on equity prices in Israel. They first use a Chow test to examine whether there was a structural break in TSE100 index values on Sept. 27, 2000 (a day identified as “the beginning of the massive terror attacks”) and find, indeed, such a structural break exists. They then test the impact of various types of terrorist attacks on the TSE100 index's value and find that all significant effects have the expected (negative) sign. They also find that, while not all types of attacks have significant effects, attacks inside the “Green Line” that demarks Israel's 1967 border and suicide attacks are significant in all the estimated equations. Moreover, they find that

⁵ Including the bombing of the U.S. Marine Corps barracks in Beirut in 1983, the bombing of the World Trade Center in 1993, the Oklahoma City bombing of 1995, the bombing of the U.S. embassy in Nairobi in 1998 and the Sept. 11 attacks of 2001.

only suicide attacks have a “permanent impact” on the TSE100, whereas the effects of attacks inside the Green Line are transitory.

Berrebi and Klor (2005) find “that terrorism has no significant impact on the average stock-market valuation of Israeli companies vis-à-vis (a) ... control group”—using data on non-Israeli equities and Israeli ADRs with similar characteristics that are traded on the Amex, NYSE and Nasdaq exchanges. Specifically, they measure the abnormal return of each Israeli stock relative to its U.S. control counterpart following terrorist attacks. While they find that the impact of terrorism on the average return is not significantly different from zero, they do find that this is due to a *positive* effect on defense stocks that offsets a *negative* effect on non-defense stocks.

II.C Impact of Terrorism on Trade and Tourism Industry

II.C.1 Impact on trade

The costs of terrorism as an impediment to trade are discussed in Nitsch and Schumacher (2004). They find, using an augmented gravity model of bilateral trade and annual data covering 200 countries from 1960 to 1993, that countries subject to terrorism trade less with each other. Furthermore, a 100 percent increase in the number of terrorist incidents is found to reduce bilateral trade by about 4 percent. The Organization for Economic Cooperation and Development (2002) notes that terrorism acts as a frictional cost and, unlike increased taxes or tariffs, does not provide public revenue. As an upper bound to these frictional costs, they may account for between 0.5 and 3 percent of the value of traded goods. Thus, for the U.S. (which exported goods worth \$819 billion and imported goods worth \$1,526 billion in 2004), these frictional costs may be as high as \$70 billion.

II.C.2 Impact on the tourism sector

A number of papers have sought to calculate the impact of terrorism on the tourism sector. These studies have found that the costs of terrorism are not insubstantial. Enders and Sandler (1991) construct a VAR model using monthly data from 1970 to 1988 and find that a terrorist attack decreases the number of visitors to Spain by 140,000. Enders, Sandler and Parise (1992) estimate an ARIMA model using data for a number of European countries and find that for Austria, Italy and Greece, the impact of terrorism in foregone tourism revenues is considerable. Specifically, between 1974 and 1988, Austria suffered \$4.5 billion in lost revenue, Italy lost \$1.1 billion and Greece lost \$0.8 billion, while continental Europe as a whole suffered losses of \$16.1 billion. Drakos and Kutan (2003) study the effects of terrorism on the tourism industries of Greece, Israel, Italy and Turkey with special attention to the possible existence of both a substitution effect among the three “risky” countries of Greece, Israel, and Turkey (whereby terror attacks in Greece, for example, increases tourism to Turkey) and a substitution effect from these risky countries to Italy. They find that terrorism in Greece has a significant and negative relationship with Greece’s share of total tourist visits (reducing it by 9.02 percent) for the four countries and a significant and positive relationship with the shares of both Turkey and Israel. However, while terrorism in Turkey has a significant and negative relationship to Turkey’s share of visits (reducing it by 5.21 percent), it has no impact on Israel’s share and an ambiguous effect on Greece’s share (incidents with one to three fatalities increase tourism to Greece while those with more casualties decrease it). Finally, they find that terrorist attacks on Israel have a negative and significant relationship with Israel’s share of tourist visits (albeit a small one at only 0.67 percent), no impact on Turkey’s share,

and an ambiguous (mostly negative) effect on Greece's share. Further evidence on the costs of terrorism to Israel's tourism sector is provided by Fleischer and Buccola (2002) who find that while local demand for hotel rooms is inelastic with respect to terrorism, foreign demand for hotel rooms in Israel decreases in response to terrorism. This result may account for the overall small affect of terrorism on the Israeli tourist industry that is found in Drakos and Kutan's study (2003).

III. Global Terrorism Incidents

The terrorism data used in our analysis are from the MIPT Terrorism knowledge database (2005), which integrates more than 20,000 terrorism incidents from various sources, including the RAND Terrorism Chronology and RAND-MIPT Terrorism Incident databases; the Terrorism Indictment database, and DFI International's research on terrorist organizations. To assemble these data into annual figures for each country, we weigh each incident by its initial date and the remaining days in a given year. Then we sum all of these prorated incidents to arrive at an annual figure. For example, an incident that occurs on July 1 of a given year is weighted as half in a given year and another half in the following year.

Some summary information on the dataset is provided. Table 1 shows the annual number of incidents and total fatalities and injuries for the 149 countries in the sample period 1968 to 2004. Over this period, the average number of terrorist incidents is 112 per country. Most of the incidents are highly concentrated in a few countries. Thirty-two countries had more than 100 incidents, of which four countries—Colombia, India, Israel and Turkey—have more than 1,000 incidents. The number of incidents during this period

ranges from one in many countries to a high of 1,724 incidents in Israel. Similarly, the total number of fatalities and injuries ranges from zero in many countries to 10,048 in Israel. On average, the number of fatalities and injuries (or the “intensity” of terrorism) is 631 per country.

Table 2 ranks the Top 10 countries by each of our terrorism measures. It shows that over the past 35 years, Israel had not only the highest number of incidents, but also the highest number of injuries and fatalities, in terms of absolute number and per population. In fact, with the exception of fatalities and injuries per terrorist incident, Israel appears in the Top 10 for every terrorism measure, indicating there is a high frequency of incidents and injuries, but not large fatalities and injuries *per* incident relative to other countries. Similarly, Lebanon appears among the Top 10 for each measure except fatalities and injuries per terrorist incident. Although it has a small total number of incidents, Kenya lands in the Top 10 for its percent of total fatalities and injuries, for the number of fatalities/injuries per incident, and for the number of incidents and fatalities/injuries relative to GDP. This method of classifying the data depicts wide differences among countries when the data is categorized by our terrorism measures.

Charts 1.1, 1.2, and 1.3 depict the changing trends in types of terrorist targets over time and show an increased focus on those targets that will have, as Ganor (2003) writes, “effects beyond the immediate physical damage of the cause, having long-term psychological repercussions on a particular target audience.” Incidents are classified into one of seven target categories. Chart 1.1 shows a marked recent increase in private targets, defined as targets that specifically impact private citizens (e.g., homes). It also shows an increase in governmental and other targets and a reduction in diplomatic

targets, indicating a shift towards those targets that will have a larger impact on the greater population at large, both directly and indirectly. Chart 1.2 supports this pattern, indicating a trend towards a greater number of fatalities and injuries in all target types, except military and diplomatic, since the year 2000. Chart 1.3 provides a different view of the same pattern – whereas earlier decades were marked by attacks on diplomatic targets, later decades have suffered attacks on private and other targets in greater numbers.

Chart 2 shows that while terrorist incidents, fatalities and injuries remained fairly stable prior to 1990, the subsequent decades have shown remarkable spikes in incidents, fatalities and injuries, reaching their highest peak at the end of the time period.⁶ Together with Tables 3.1 to 3.3, which rank the Top 10 terrorist incidents by fatalities, injuries or both, Chart 2 identifies specific events responsible for the spikes. The overall message from the chart is that terrorism incidents, as well as the fatalities and injuries they cause, are increasing.

Tables 4.1 and 4.2 classify terrorist incidents, fatalities, and injuries by region and by income group. Not surprisingly, the Middle East and Persian Gulf areas have the highest percentages of incidences and fatalities/injuries. Western Europe is next, with about 15 percent fewer incidents. However, as suggested in Table 2, Africa ranks highest in the percentage of fatalities and injuries per incident. Table 4.2 shows the number of incidents by income groups. The highest percentage of incidents, fatalities and injuries occurred in the high-income group, followed by those in the lower-middle income group.

⁶ Prior to 1998, MIPT data included all international terrorist incidents and only some domestic incidents. This explains the significant increase in the number of incidents, fatalities and injuries after the inclusion of domestic incidents in 1998.

However, the highest percentage of fatalities and injuries per incident is in the low-income group.

Simple cross-country correlations between the terrorism measures and selected other variables show that GDP (real and per capita) are positively and significantly correlated with the number of terrorist incidents, indicating that the higher a country's GDP, the higher the number of terrorist incidents. The two terrorism measures which have negative and significant relationships with real GDP per capita are the number of incidents per million population and fatalities and injuries per billion \$ GDP. Based upon simple correlations, these metrics of terrorism do not have statistically significant relationships with real GDP per capita growth. Furthermore, significant negative correlations are reported between our terrorism measures and political risk indices published by in the International Country Risk Guide (March 2003), which predict a country's risk of attack using a series of indicators. The results indicate that the lower the scores of law and order, religious tension, internal conflict and ethnic tensions, the higher the number of terrorism incidents, fatalities, and injuries. This is not surprising given that a low score on any of these indices indicates a high political risk for the country.

IV. Empirical Estimations and Results

There is no consensus regarding an appropriate theoretical framework to guide a cross-country empirical study on economic growth and capital formation. However, although empirical work explaining variation in these types of variables is quite diverse in terms of the particular specifications used, they do use a similar set of control variables. Using panel data on terrorism and employing some of these same control variables, we seek to determine whether there is any relationship between our measures of terrorism and in real GDP per capita growth and the ratio of gross capital formation to GDP.

The set of control variables for real GDP per capita growth includes capital formation as a percent of GDP, trade from the previous period as a percent of GDP, real GDP per capita from the previous period, population growth and the inflation rate. Because initial income and secondary education are time invariant, they were dropped from our fixed-effects regressions. The set of control variables for capital formation as a percent of GDP is similar to that of growth, except that we exclude CAPGP from the set of independent variables.

The empirical estimations are based on cross-sectional and period fixed-effects regressions with White-heteroskedasticity consistent standard errors. There are seven basic specifications for each dependent variable. The first four specifications include a set of control variables and four different measures of terrorism (terrorism incidents to population, fatalities and injuries to population, terrorism incidents to GDP, and fatalities and injuries to GDP). The next two specifications also include the same control variables

and two alternating terrorism measures with population and GDP.⁶ The last specification includes terrorism incidents with the private property target to population as the terrorist variable. Main findings are reported below.

IV.A Real GDP Per Capita Growth

- The greater the number of terrorist incidents per million population, the lower the real GDP per capita growth.
- The higher the number of terrorist incidents per \$U.S. billion GDP, the lower the real GDP per capita growth.

IV.B Capital Formation to GDP

- The higher the number of terrorist incidents per million population, the lower the capital formation as a percentage of GDP.
- The higher the number of terrorist incidents per \$billion GDP, the lower the capital formation as a percentage of GDP.
- The higher the fatalities and injuries per \$billion GDP, the lower the capital formation as a percentage of GDP.

IV.C Number of Incidents by Target

- More terrorist attacks at private citizens and property per million population is related to lower capital formation/GDP.
- More terrorist attacks at airlines, airports, transportation, utilities and telecommunication targets is related to lower both real GDP per capita growth and capital formation to GDP.

⁶ Though the panel data correlations between the number of incidents and the number of fatalities and injuries when divided by both GDP and population are positive and statistically significant, they are not perfectly correlated.

V. Conclusions

Terrorism can produce a sub-optimal allocation of resources and therefore inhibit economic growth and capital formation. In this paper, we examined the impact of terrorism on these variables using annual panel data from 1970 to 2003. Our results show that terrorism is indeed associated with adverse economic effect. In general, terrorist incidents have a negative and significant impact on economic growth.

Our results also show that targets matter. Terrorist incidents targeting private properties are negatively associated with both growth and capital formation. This is particularly important given the recent increased focus on private targets.

In summary, terrorism is associated with adverse effects on overall economic activity. In 2001, for illustrative purposes only, Israel had 47 terrorist incidents per million people. In this particular year, the high level of incidents is associated with a 4 percentage point drop in real GDP per capita growth, based on the first model found in Table 10.1. Similarly, in 2003, Russia had 0.97 terrorist incidents per million population. This is associated with a 0.08 percentage point decline in real GDP per capita growth. These illustrations and others found in our models show the potential types of adverse economic effects associated with terrorism.

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Table 1. Terrorism Measures by Country

Country	Total Number of Terrorist Incidents (1968-2004)	Total Fatalities and Injuries (1968-2004)	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
Albania	25	21	8	7	6	5	1
Algeria	159	1,917	5	60	3	31	12
Angola	69	573	5	42	6	52	8
Argentina	273	691	7	19	1	3	3
Armenia	5	2	2	1	2	1	0
Australia	35	20	2	1	0	0	1
Austria	58	108	7	13	0	1	2
Azerbaijan	2	72	0	9	0	10	36
Bahamas, The	2	1	6	3	0	0	1
Bahrain	14	22	20	31	2	3	2
Bangladesh	68	1,735	1	13	1	32	26
Barbados	2	73	7	270	1	29	37
Belgium	110	197	11	19	1	1	2
Benin	1	3	0	0	0	1	3
Bolivia	61	40	7	5	7	5	1
Bosnia and Herzegovina	62	36	15	9	12	7	1
Botswana	3	6	2	4	1	1	2
Brazil	43	57	0	0	0	0	1
Bulgaria	9	2	1	0	1	0	0
Burundi	13	53	2	7	18	73	4
Cambodia	44	261	3	20	11	62	6
Canada	28	357	1	11	0	1	13
Central African Republic	1	7	0	2	1	8	7
Chad	10	202	1	24	5	108	20
Chile	223	42	14	3	3	1	0
China	10	157	0	0	0	0	16
Colombia	1,042	2,981	23	67	12	33	3
Congo DR	1	6	0	2	0	2	6
Congo RP	8	4	0	0	2	1	1
Costa Rica	39	31	10	8	2	2	1
Cote d'Ivoire	3	3	0	0	0	0	1
Croatia	9	36	2	8	0	2	4
Cuba	19	6	2	1	n.a.	n.a.	0
Cyprus	68	91	88	118	7	9	1
Czech Republic	7	1	1	0	0	0	0
Denmark	27	60	5	11	0	0	2
Dominican Republic	28	5	3	1	1	0	0
Ecuador	56	68	4	5	3	4	1
Egypt	118	774	2	12	1	7	7
El Salvador	115	136	18	21	8	10	1
Eritrea	5	79	1	18	7	110	16
Estonia	6	36	4	27	1	6	6
Ethiopia	67	401	1	6	10	57	6
Fiji	2	0	2	0	1	0	0
Finland	1	0	0	0	0	0	0
France	892	1,494	15	25	1	1	2
Gabon	1	2	1	2	0	0	2

Table 1. Terrorism Measures by Country (Continued)

Country	Total Number of Terrorist Incidents (1968-2004)	Total Fatalities and Injuries (1968-2004)	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
Georgia	55	185	11	36	15	50	3
Germany	476	819	6	10	0	0	2
Ghana	1	0	0	0	0	0	0
Greece	484	656	44	60	4	5	1
Guatemala	107	118	9	10	5	6	1
Guinea	1	0	0	0	0	0	0
Haiti	19	31	2	4	5	8	2
Honduras	73	107	11	15	11	17	2
Hong Kong	1	1	0	0	0	0	1
Hungary	5	11	1	1	0	0	2
Iceland	1	0	4	0	0	0	0
India	1,110	7,723	1	7	2	14	7
Indonesia	133	1,655	1	8	1	10	12
Iran	90	188	1	3	1	2	2
Iraq	969	8,834	39	358	n.a.	n.a.	9
Ireland	21	15	5	4	0	0	1
Israel	1,724	10,048	258	1,502	15	87	6
Italy	357	501	6	9	0	1	1
Jamaica	8	0	3	0	1	0	0
Japan	64	5,124	1	40	0	1	80
Jordan	68	56	13	11	7	6	1
Kazakhstan	2	2	0	0	0	0	1
Kenya	11	5,486	0	172	1	504	499
Korea, South	37	59	1	1	0	0	2
Kuwait	44	224	18	94	1	6	5
Kyrgyzstan	7	36	1	7	5	23	5
Laos	14	17	3	3	7	9	1
Latvia	6	0	3	0	1	0	0
Lebanon	618	3,282	137	730	35	186	5
Lesotho	2	2	1	1	2	2	1
Liberia	8	12	2	4	19	29	2
Libya	15	11	3	2	n.a.	n.a.	1
Lithuania	2	1	1	0	0	0	1
Luxembourg	5	0	11	0	0	0	0
Macedonia	36	25	18	12	10	7	1
Madagascar	3	37	0	2	1	9	12
Malaysia	10	118	0	5	0	1	12
Mali	2	0	0	0	1	0	0
Malta	12	11	30	28	3	3	1
Mauritania	8	38	3	13	8	36	5
Mexico	68	28	1	0	0	0	0
Moldova	1	3	0	1	1	2	3
Morocco	27	69	1	2	1	2	3
Mozambique	36	52	2	3	8	11	1
Myanmar	19	169	0	3	n.a.	n.a.	9
Namibia	3	53	2	26	1	14	18
Nepal	194	315	8	13	33	53	2
Netherlands	71	63	4	4	0	0	1

Table 1. Terrorism Measures by Country (Continued)

Country	Total Number of Terrorist Incidents (1968-2004)	Total Fatalities and Injuries (1968-2004)	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
New Zealand	5	1	1	0	0	0	0
Nicaragua	44	105	8	19	11	25	2
Niger	1	0	0	0	1	0	0
Nigeria	9	16	0	0	0	0	2
Norway	9	6	2	1	0	0	1
Oman	1	7	0	3	0	0	7
Pakistan	478	6,157	3	42	6	76	13
Panama	23	55	8	18	2	4	2
Papua New Guinea	5	4	1	1	1	1	1
Paraguay	7	6	1	1	1	1	1
Peru	342	552	13	20	6	10	2
Philippines	286	2,139	4	26	3	25	8
Poland	12	10	0	0	0	0	1
Portugal	50	21	5	2	1	0	0
Puerto Rico	21	6	5	2	n.a.	n.a.	0
Qatar	1	2	2	3	n.a.	n.a.	2
Romania	4	4	0	0	0	0	1
Russia	411	5,812	3	41	1	19	14
Rwanda	5	19	1	2	2	9	4
Saudi Arabia	57	1,962	3	87	0	10	34
Senegal	1	0	0	0	0	0	0
Serbia and Montenegro	105	202	13	25	11	21	2
Sierra Leone	20	21	4	4	27	28	1
Singapore	5	0	1	0	0	0	0
Slovakia	6	2	1	0	0	0	0
Somalia	62	181	6	19	n.a.	n.a.	3
South Africa	55	203	1	4	0	2	4
Spain	801	1,449	20	35	1	2	2
Sri Lanka	91	3,002	5	156	5	170	33
Sudan	34	120	1	4	2	8	4
Suriname	6	1	14	2	6	1	0
Swaziland	4	16	4	15	3	11	4
Sweden	36	41	4	5	0	0	1
Switzerland	80	118	11	16	0	1	2
Syria	19	477	1	27	1	24	25
Tajikistan	28	85	4	14	21	65	3
Tanzania	9	88	0	3	1	8	10
Thailand	211	515	3	8	2	4	2
Togo	3	6	1	1	2	4	2
Trinidad and Tobago	1	3	1	2	0	0	3
Tunisia	15	59	2	6	1	3	4
Turkey	1,020	2,364	14	33	5	11	2
Turkmenistan	1	2	0	0	0	0	2
Uganda	46	870	2	34	7	124	19
Ukraine	10	9	0	0	0	0	1
United Arab Emirates	9	5	2	1	0	0	1
United Kingdom	604	708	10	12	0	1	1

Table 1. Terrorism Measures by Country (Continued)

Country	Total Number of Terrorist Incidents (1968-2004)	Total Fatalities and Injuries (1968-2004)	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
United States	523	7,360	2	25	0	1	14
Uruguay	22	3	7	1	1	0	0
Uzbekistan	9	55	0	2	1	4	6
Venezuela	115	112	5	4	1	1	1
Vietnam	2	1	0	0	0	0	1
Yemen	100	391	5	20	9	37	4
Zambia	8	36	1	4	2	10	5
Zimbabwe	26	185	2	14	4	30	7

Summary Statistics:

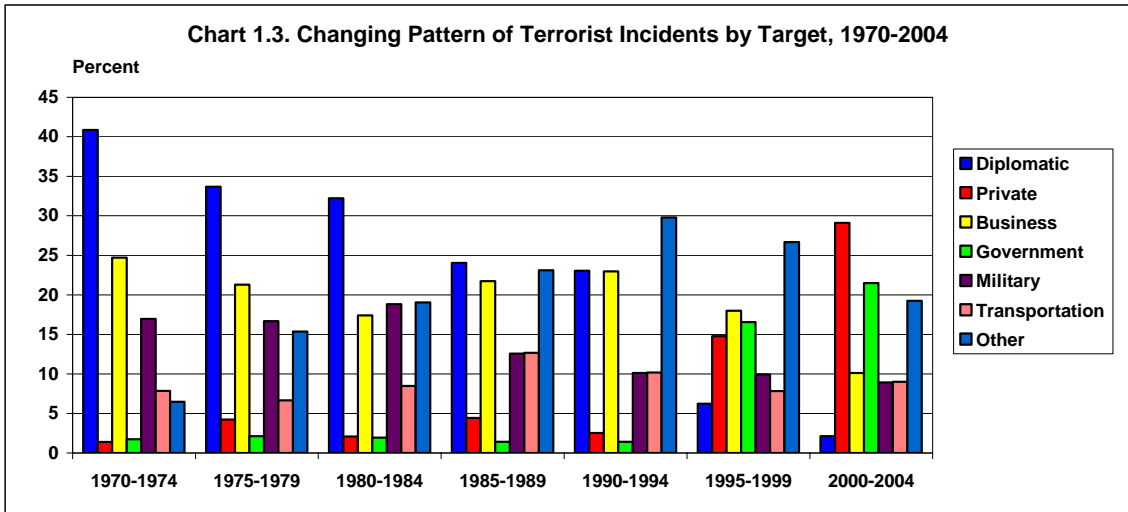
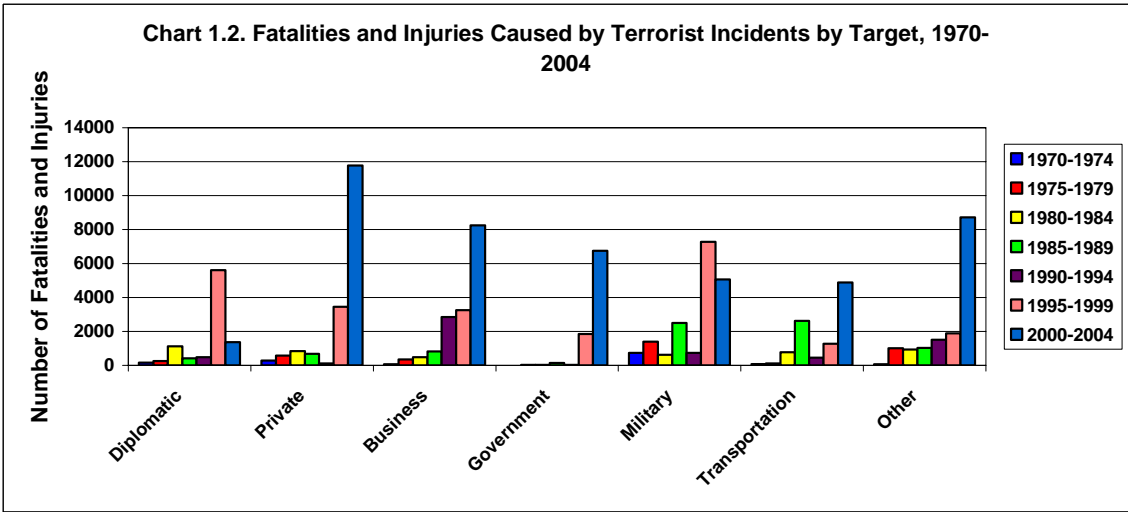
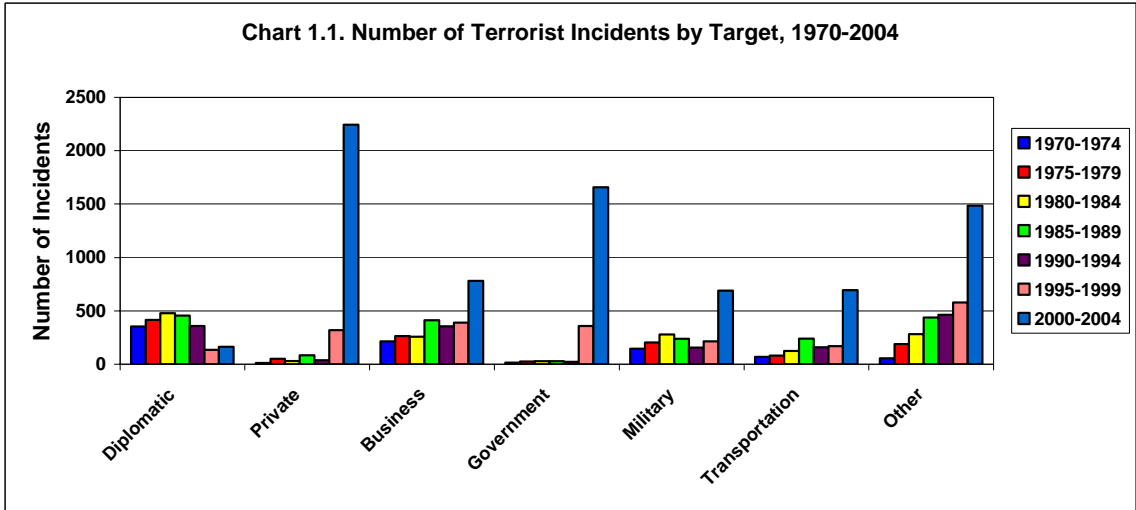
	Total Number of Terrorist Incidents (1968-2004)	Total Fatalities and Injuries (1968-2004)	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
Total	16,730	94,628	-	-	-	-	-
Mean	112	631	8	32	3	18	8
Median	20	42	2	4	1	2	2
S.D.	253	1,686	25	141	6	51	41
Maximum	1,724	10,048	258	1,502	35	504	499
Minimum	1	0	<1	0	0	0	0

Source: MIPT (2005) and Milken Institute.

Table 2. Ranking of Top Ten Countries by Terrorism Measures

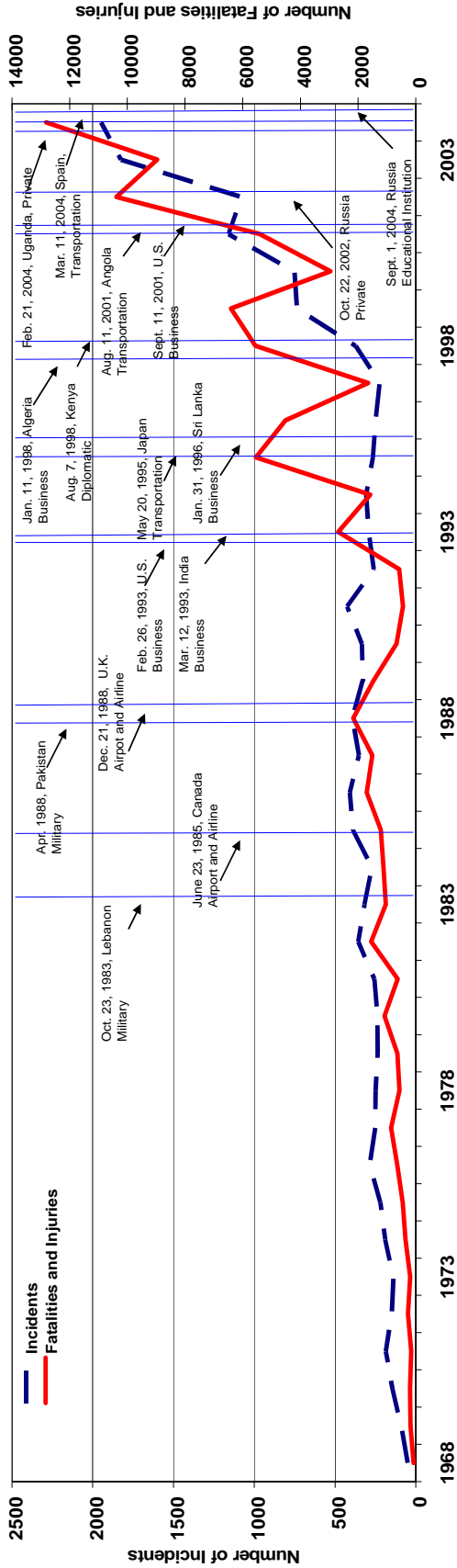
Top Ten Countries Ranking	Total Number of Terrorist Incidents (1968-2004): Percent of Total 16,730 Incidents	Total Fatalities and Injuries (1968-2004): Percent of Total 94,628 Fatalities and Injuries	Number of Terrorist Incidents/ Million Population	Fatalities and Injuries/ Million Population	Number of Terrorist Incidents/ GDP (USD Billions)	Fatalities and Injuries /GDP (USD Billions)	Fatalities and Injuries per Terrorist Incident
1	Israel (10.3%)	Israel (10.6%)	Israel (258)	Israel (1502)	Lebanon (35)	Kenya (504)	Kenya (499)
2	India (6.6%)	Iraq (9.3%)	Lebanon (137)	Lebanon (730)	Nepal (33)	Lebanon (186)	Japan (80)
3	Colombia (6.2%)	India (8.2%)	Cyprus (88)	Iraq (358)	Sierra Leone (27)	Sri Lanka (170)	Barbados (37)
4	Turkey (6.1%)	United States (7.8%)	Greece (44)	Barbados (270)	Tajikistan (21)	Uganda (124)	Azerbaijan (36)
5	Iraq (5.8%)	Pakistan (6.5%)	Iraq (39)	Kenya (172)	Liberia (19)	Eritrea (110)	Saudi Arabia (34)
6	France (5.3%)	Russia (6.1%)	Malta (30)	Sri Lanka (156)	Burundi (18)	Chad (108)	Sri Lanka (33)
7	Spain (4.8%)	Kenya (5.8%)	Colombia (23)	Cyprus (118)	Israel (15)	Israel (87)	Bangladesh (26)
8	Lebanon (3.7%)	Japan (5.4%)	Bahrain (20)	Kuwait (93)	Georgia (15)	Pakistan (76)	Syria (25)
9	United Kingdom (3.6%)	Lebanon (3.5%)	Spain (19)	Saudi Arabia (87)	Bosnia and Herzegovina (12)	Burundi (73)	Chad (20)
10	United States (3.1%)	Sri Lanka (3.2%)	Kuwait (18)	Colombia (67)	Colombia (12)	Tajikistan (65)	Uganda (19)

Source: MIPT (2005) and Milken Institute.



Source: MIPT (2005) and Milken Institute.

Chart 2. Selected Major Terrorist Incidents Over Time



Source: MIPT (2005) and Milken Institute.

Table 3.1. Top 10 Terrorist Incidents Ranked by Fatalities

Description	Fatalities
Al-Qaeda attacked Business target (Sept. 11, 2001, United States)	2,749
Armed Islamic Group attacked Business target (Jan. 11, 1998, Algeria)	400
Riyad us-Saliheyn Martyrs' Brigade attacked Educational Institution target (Sept. 1, 2004, Russia)	331
Other Group attacked Airport & Airline target (June 23, 1985, Canada)	329
Other Group attacked Business target (Mar. 12, 1993, India)	317
Al-Qaeda attacked Diplomatic target (Aug. 7, 1998, Kenya)	291
Other Group attacked Airport & Airline target (Dec. 21, 1988, United Kingdom)	270
UNITA attacked Transportation target (Aug. 11, 2001, Angola)	252
Hezbollah attacked Military target (Oct. 23, 1983, Lebanon)	241
Lord's Resistance Army (LRA) attacked Private Citizens & Property target (Feb. 21, 2004, Uganda)	239

Table 3.2. Top 10 Terrorist Incidents Ranked by Injuries

Description	Injuries
Al-Qaeda attacked Diplomatic target (Aug. 7, 1998, Kenya)	5,000
Aum Shinri Kyo attacked Transportation target (Mar. 20, 1995, Japan)	5,000
Al-Qaeda attacked Business target (Sept. 11, 2001, United States)	2,261
Liberation Tigers of Tamil Eelam (LTTE) attacked Business target (Jan. 31, 1996, Sri Lanka (Ceylon))	1,400
Other Group attacked Business target (Mar. 12, 1993, India)	1,200
Other Group attacked Military target (Apr. 10, 1988, Pakistan)	1,100
Liberation Army Fifth Battalion attacked Business target (Feb. 26, 1993, United States)	1,042
Riyad us-Saliheyn Martyrs' Brigade attacked Educational Institution target (Sept. 1, 2004, Russia)	727
Movsar Baryayev Gang attacked Private Citizens & Property target (Oct. 24, 2002, Russia)	650
Abu Hafs Al-Masri Brigade attacked Transportation target (Mar. 11, 2004, Spain)	600

Table 3.3. Top 10 Terrorist Incidents Ranked by Fatalities and Injuries

Description	Fatalities and Injuries
Al-Qaeda attacked Diplomatic target (Aug. 7, 1998, Kenya)	5,291
Aum Shinri Kyo attacked Transportation target (Mar. 20, 1995, Japan)	5,012
Al-Qaeda attacked Business target (Sept. 11, 2001, United States)	5,010
Other Group attacked Business target (Mar. 12, 1993, India)	1,517
Liberation Tigers of Tamil Eelam (LTTE) attacked Business target (Jan. 31, 1996, Sri Lanka (Ceylon))	1,496
Other Group attacked Military target (Apr. 10, 1988, Pakistan)	1,200
Riyad us-Saliheyn Martyrs' Brigade attacked Educational Institutions target (Sept. 1, 2004, Russia)	1,058
Liberation Army Fifth Battalion attacked Business target (Feb. 26, 1993, United States)	1,048
Movsar Baryayev Gang attacked Private Citizens & Property target (Oct. 24, 2002, Russia)	812
Abu Hafs Al-Masri Brigade attacked Transportation target (Mar. 11, 2004, Spain)	791

Source: MIPT (2005) and Milken Institute.

Table 4.1. Terrorist Incidents, Fatalities and Injuries by Region, 1970-2004

Region	Number of Incidents	Fatalities and Injuries	Fatalities and Injuries per Incident
Middle East / Persian Gulf	34.6%	36.2%	5.8
Western Europe	21.0%	5.9%	1.5
South Asia	15.6%	20.9%	7.3
Latin America & the Caribbean	13.7%	4.8%	13.2
Africa	4.4%	10.6%	33.1
Eastern Europe	4.2%	5.9%	7.6
Southeast Asia & Oceania	2.9%	4.0%	14.0
North America	2.7%	6.8%	7.7
East & Central Asia	0.8%	4.9%	1.9

Source: MIPT (2005) and Milken Institute.

Table 4.2. Terrorist Incidents, Fatalities and Injuries by Income Group, 1970-2004

Income Group	Number of Incidents	Fatalities and Injuries	Fatalities and Injuries per Incident
Low Income	17.7%	28.1%	9.0
Lower-Middle Income	34.7%	34.5%	5.6
Upper-Middle Income	8.8%	6.8%	4.4
High Income	38.8%	30.6%	4.5

Source: MIPT (2005) and Milken Institute.

Table 5. Summary of Selected Empirical Studies

Authors (Year)	Variables				Time Period	Cross Section	Frequency	Dataset for Terrorist Events	Number of Incidents under Study	Result
	Dependent Variables	Control Variables	Terrorism Variable	Dummy Variables						
Bloomberg, Hess and Orphanides (2004)	Per-capita GDP growth in PPP adjusted exchange rates	Investment/GDP, log of initial GDP	Number of incidents; number of incidents per capita	Non-oil commodity exporters, Africa, time dummy	1968-2000	177 countries	Yearly	ITERATE dataset	12164	Incidences of terrorism may have a significant negative effect on growth, although smaller and less persistent than that associated with external wars or internal conflict. The negative influence of terrorist incidents on growth is smaller in non-OECD countries.
Abadie and Gardeazabal (2001)	Estimated GDP gap; excess return on Basque portfolio	Real per capita GDP, investment ratio, population density, sectoral shares over total production; human capital over working-age population			1968-2000	Spain	Yearly	Spanish Ministry of Interior		Per capita GDP in the region under study declined about 10 percent relative to synthetic control region. Terrorist conflicts have negative effect on the region's economy. Stocks of firms with a significant part of their business in the region show a positive relative performance as the trace became credible, and a negative relative performance at the end of cease-fire.
Drakos and Kuan (2003)	Relative market share (number of tourists to total market)	Relative market share of Italy	Number of incidents; intensity of the attacks	Urban dummy	1991-2000	Greece, Israel and Turkey	Monthly	International Terrorism Database	214	Significant own and spillover effects of terrorism (incidence but not intensity) on tourism market shares in the Mediterranean region
Eldor and Mélnick (2004)	The log of the exchange rate; the log of stock market index	Interest rate spread for foreign exchange market; log difference of the S&P500 for stock market	Location, type of attack and target, number of casualties, and the number of attacks per day	Dummy for 09/27/2001; interaction of the dummy with the dummy for change in the S&P500 index	1990-2003	Israel	Daily	n.a.	639	Suicide attacks have a permanent effect on both the stock market and foreign exchange market, as did the numbers of victims, while location of a terrorist attack had no effect on either market
Nitsch and Schumacher (2004)	The log of bilateral trade	Distance, real GDP, population, measure of internal instability (assassinations, guerrilla activities, purges, riots, revolutions), defense expenditures to GDP, external conflict measure	Yearly number of terrorist events between 1968 and 1979	Language, border, colonizer, nation, colony, time dummy for terrorist events, dummy for countries involved in external war	1968-1979	217 countries	Yearly	Mickolus (1960)		Terrorism and large-scale violence have a negative effect on international trade. Terrorist actions reduce the volume of bilateral trade.
Berbeli and Kbr (2005)	Difference in abnormal returns for every pair of stocks		Monthly attacks; weekly attacks	Dummy for defense and security companies	1998-2001	Israel	Daily	RAND-MIPT database; RAND Terrorism Chronology; Israeli Foreign Ministry, the National Intelligence Institute, the Israeli Defense Forces and the archives of two newspapers		Terrorism has no significant impact on the average stock-market valuation of Israeli companies vis-a-vis the valuation of the control group's stocks. Terrorism does have a significant positive impact on defense or security companies, and a significant negative impact on the rest of the companies.
Abadie and Gardeazabal (2005)	Net FDI Position over GDP	Log GDP per capita, FDI restrictions, country risk, corrected country risk, population structure, net primary enrolment, political risk, economic risk, legal risk, tax risk, operational risk, security risk, governance factors, credit over GDP, real effective exchange rate range, government consumption, standard deviation of growth rate, earthquake risk index	Terrorist risk ratings	Regional dummy	2003	110 countries	Yearly	WMRC Global Terrorism Index	-	Terrorist risk depresses net foreign investment positions
Chen and Siems (2004)	Abnormal return	Actual observed rate of return; mean of stock index's past daily returns	n.a.	n.a.	1915-2004	Capital markets: NY, London, Tokyo, Frankfurt, Paris, Toronto, Amsterdam, Singapore, Italy and HK	Daily	n.a.	14	U.S. capital markets are more resilient than in the past and recover sooner from terrorist attacks than other global capital markets.
Karolyi and Martell (2005)	Abnormal return	Market capitalization, democracy index, education spending, GNI per capita	Number of attacks, Dummy variables (kidnapping, U.S. firm, responsibility)	Kidnapping, U.S. Firm, Responsibility	1995-2002		Daily	Counterterrorism Office of the U.S. Department of State	75	Evidence shows a statistically significant negative stock price reaction of -0.83%; the impact of terrorist attacks differs according to the home country of the target firm and the country in which the incident occurred; attacks in countries that are wealthier and more democratic are associated with larger negative share price reactions; human capital losses are associated with larger negative stock price reactions than physical losses.

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