Challenge Paper

The Challenge of Terrorism

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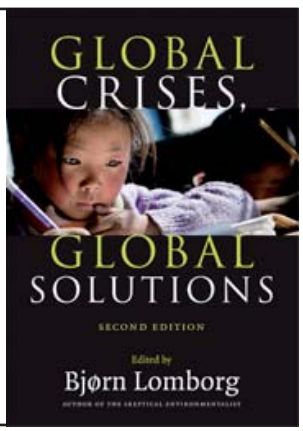

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Copenhagen Consensus 2008 Challenge Paper

Terrorism

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Introduction

Major terrorist campaigns date back to the Jewish Zealots' struggle against the Roman Empire from 48 AD to 70 AD; the Hindu Thugs' brutal attacks against innocent travelers in India from 600 AD to 1836 AD; and the Assassins' actions against the Christian crusaders in the Middle East from 1090 AD to 1956 AD (Bloom, 2005; Rapoport, 1984). In fact, the Thugs may have murdered over eight hundred people a year during their twelve-century existence (Hoffman, 2006, 82-83), making them twice as deadly on an annual basis as the modern era of terrorism (1968-2006). Some form of terrorism has characterized civilization for the last two thousand years. Each of the two recent globalization periods has been associated with transnational terrorism that has international implications. In the earlier era of globalization starting in 1878 and ending in 1914, the anarchists waged a terrorist campaign that culminated in World War I. More recently, leftists and fundamentalists utilized transnational terrorism to capture headlines during the current era of globalization from the last third of the twentieth century to the present day.

During the modern era of transnational terrorism, terrorists crossed borders and, in some instances, staged incidents in foreign capitals to focus world attention on their cause or grievance. Some high-profile attacks – e.g., Black September's abduction of Israeli athletes during the 1972 Munich Olympics, Hezbollah's suicide bombing of the US Marine barracks in Beirut on 23 October 1983, Hindu extremists' downing of Air India flight 182 on 23 June 1985, the downing of Pan Am flight 103 on 21 December 1988, the truck bombing of the World Trade Center on 26 February 1993, and the near-simultaneous hijackings on 11 September 2001 (henceforth, 9/11) – made the world acutely aware of the potential threats posed by today's resourceful terrorists. The attacks on 9/11 struck at the financial and security symbols of

America and, in so doing, highlighted the vulnerability to terrorism of even the most powerful nation on earth. Because it is human nature to overspend on unlikely catastrophic events, it is likely that terrorists have succeeded in getting the world to overspend on counterterrorism, while ignoring much more pressing problems for a world besieged with exigencies involving health, the environment, conflict, and governance. Terrorism is a tactic of asymmetric conflict, deployed by the weak for a strategic advantage against a strong opponent.

Transnational terrorism presents a unique challenge that differs fundamentally from the other global crises studied by the Copenhagen Consensus. First, the number of lives lost or ruined by transnational terrorism is rather minor compared with other challenges considered by the Copenhagen Consensus. On average only 420 people are killed and another 1249 are injured each year from transnational terrorist attacks. Nevertheless, the public in rich countries views transnational terrorism as one of the greatest threats. This is rather ironic since over 30,000 people die on US highways annually, yet highway safety is not as much of a public concern. Second, protective or defensive counterterrorism measures may merely deflect attacks to softer targets. For example, the installation of metal detectors in airports in January 1973 decreased skyjackings, but increased kidnappings and other hostage missions; the fortifications of US embassies reduced embassy assaults, but increased assassinations of diplomatic officials (Enders and Sandler, 1993, 2006a). Unlike other challenges, countermeasures may have unintended harmful consequences: strong offensive measures against terrorists can lead to backlash attacks as new grievances are created. Third, guarding against transnational terrorism can utilize resources at an alarming rate without greatly reducing the risks. In contrast, terrorists require moderate resources to create great anxiety in a targeted public. Fourth, transnational terrorism poses a real dilemma for liberal democracies: responding too fully compromises democratic

principles and gains support for the terrorists, whereas responding too meekly loses constituency support and exposes the government's failure to protect lives and property (Wilkinson, 1986, 2001). Thus, government actions can become the root of future attacks. Fifth, terrorism can assume more deadly forms involving chemical, biological, radiological, and nuclear attacks. The signs of such threats are beginning to emerge (Ivanova and Sandler, 2006, 2007). Sixth, evaluating solutions or actions against terrorism is particularly difficult owing to counterfactuals – e.g., the incidence of terrorism without these actions – that are hard to identify. Typically, only the benefit or cost side of a solution is readily known.

Basic Messages

This chapter has a number of basic messages that are troublesome and, perhaps, surprising. Unlike many challenges, there is no solution to transnational terrorism because it is a cost-effective tactic of the weak against a more formidable opponent. Very cheap terrorist attacks can create significant anxiety – the material cost of a suicide attack may be as little as $150 and on average kills twelve people (Hoffman, 2006; Pape, 2006). Some rogue nations utilize terrorism as an inexpensive means to destabilize or harm other nations. Even effective antiterrorism campaigns will only temporarily work until the terrorists either find new leaders or sources of resources. Even if a terrorist group is annihilated, a new group may surface for some other cause. Thus, terrorism can be put into remission but it cannot be eliminated. Granting terrorist concessions will signal to future terrorists that terrorism pays, so that compromise may fuel future terrorist campaigns (Sandler and Arce, 2003).

Three of the five "solutions" proposed here – business as usual, increased proactive responses, and enhanced defensive measures – have very adverse benefit-cost ratios (BCRs)

under a wide range of scenarios, *even when the most promising assumptions are invoked*. The most effective solutions are the cheapest, but they must overcome the greatest obstacles that require either greater international cooperation or more sensitive and farsighted policymaking. Such qualities seldom characterize rich countries' actions. When it comes to security, nations are especially loath to sacrifice much autonomy. The BCRs associated with some of our solutions are driven by two primary considerations: the costs of counterterrorism and the losses in the gross domestic product (GDP) in countries experiencing terrorist attacks. Estimates of both of these factors are in the billions of US dollars. Unlike many challenges, lives lost and damaged by transnational terrorism – though tragic – are relatively modest in number. Thus, our Disability-Adjusted Life Years (DALYs) values for annual terrorism-related deaths and injuries under various solutions are in the millions of US dollars. As a consequence, expenditures on counterterrorism on the cost side and saved GDP on the benefit side become the essential determinants of the BCRs of some solutions.

Both of these determinants are exceedingly difficult to calculate. Most countries do not publish counterterrorism spending, because this information may be of strategic value to the terrorists – the United States is an exception. Moreover, relevant expenditures may be in myriad places in a government's budget and difficult to allocate to antiterrorism per se. We must, therefore, devise a means to estimate these expenditures based on what is observable. Because the application of analytical techniques to the study of terrorism is still in its infancy, there are only a few studies that have tried to estimate GDP consequences of terrorism. Two recent studies are Blomberg, Hess, and Orphanides (2004) and Tavares (2004). The former study allows us to estimate the consequences of transnational terrorism on reduced per capita GDP growth, which can then be translated into GDP losses. Although today's terrorists are bent on

causing great economic harm, the past influence of transnational terrorist attacks on economic growth has been fortunately small. While this may not be true of a terrorism-ridden region (the Basque Country in Spain) or a small country (Israel) experiencing a sustained campaign (Abadie and Gardeazabal, 2003; Eckstein and Tsiddon, 2004), it is generally true of most diversified countries where economic activities from terrorism-prone sectors shift to more secure sectors (Sandler and Enders, 2007). Given this limited influence of terrorism on GDP, homeland security costs of some solutions swamp GDP savings from fewer attacks, thus resulting in adverse BCRs. We demonstrate that the "war on terror" following 9/11 did reduce transnational terrorism during the ensuing two years as the al-Qaida network was greatly stressed; nevertheless, the associated BCR is much less than one.

A study like this one requires many heroic assumptions that obviously affect the BCRs attached to the solutions. At every decision juncture in the estimates for our enhanced security solutions, we chose calculation methods that give greater weights to benefits and smaller weights to costs so as to keep the BCRs as high as possible. Thus, our adverse BCRs for these three security solutions are robust to alternative assumptions. Even the use of value of life calculations, which are more in keeping with rich countries' practices, does not alter our qualitative conclusions.

Primer

Terrorism is the premeditated use or threat to use violence by individuals or subnational groups against noncombatants in order to obtain a political or social objective through the intimidation of a large audience beyond that of the immediate victim. Two essential constituents of the definition are violence and the presence of a political or social motive. Violent acts for extortion

purposes are crimes but are not terrorism. Similarly, violence for revenge or sociopathic reasons, such as the shootings at Columbine High School or Virginia Tech, are crimes that create much fear and anguish, but are not terrorism since there is no political motive. Without violence or its threat, terrorists cannot induce a political decision maker to respond to their demands. Even with the violence, concessions are often not granted. Terrorists broaden their audience beyond their immediate victims by making their attacks appear to be random, so that everyone feels at risk. Unlike some criminal acts in large cities, terrorist incidents are not random but well-planned and often well-executed attacks, where terrorists weigh the risks, costs, and payoffs carefully.

Terrorism definitions contain at least three other key ingredients: the victim, the perpetrator, and the audience. The identity of the victims is the most controversial. Some definitions require the victim to be a noncombatant, so that an attack against a soldier of an occupying force is not considered to be terrorism even when the attackers are asking for political change – e.g., the pullout of the forces. However, the US Department of Defense's definition of terrorism drops the noncombatant distinction. Virtually all definitions consider politically motivated attacks against civilians as terrorism. The data set *International Terrorism: Attributes of Terrorist Event* (ITERATE) includes terrorist actions against peacekeepers, but not against an occupying army, as acts of terrorism (Mickolus et al., 2006).[1] Though less controversial, the identity of the perpetrator also presents difficulty. Most definitions exclude state terror where a state or government uses terror tactics against its own citizens (e.g., China's actions during the Cultural Revolution). Our definition follows this practice by characterizing the perpetrators as individuals or subnational groups but not the state itself. States can, however, sponsor terrorists through funding, training, intelligence, equipment, safe haven, freedom from prosecution, or other means (Mickolus, 1989). State-assisted terrorism is known as state-sponsored terrorism

and is included in ITERATE. The downing of Pan Am flight 103 is considered to have been state sponsored by Libya, since a Libyan intelligence agent has been found guilty of the attack. Evidence gathered following the La Belle discotheque bombing in West Berlin on 4 April 1986 pointed to Libyan sponsorship. In reaction, the United States launched a retaliatory raid on Libya on 15 April 1986. The US Department of State (2003) included Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria on a list of state sponsors of terrorism. More recently, Iraq and Libya have been removed from the list (US Department of State, 2007). Finally, the audience refers to the target group that the terrorist campaign is meant to intimidate. The 9/11 attacks were intended to cause anxiety in the flying public and people who work in large cities. Thus, the audience extended beyond those killed and injured on 9/11. In many ways, 9/11 had a global audience.

Terrorists desire the widest possible audience so that their demands and horrific events become known. Their campaign seeks to circumvent the normal political process through threats and violence. By intimidating a target population, terrorists want this audience to feel sufficiently vulnerable to apply pressure on decision makers to give into terrorist demands. Political decision makers must weigh the anticipated costs of conceding, including possible counter-grievances from other interests, against the expected costs of future attacks. When the consequences of future incidents outweigh the costs of concessions, the government may grant the terrorist demands. Traditionally, terrorists pose a greater problem for liberal democracies than for autocracies (Eubank and Weinberg, 1994, 2001; Weinberg and Eubank, 1998). This follows because liberal democracies must be restrained in their reaction, while autocracies can be unrestrained. Many characteristics of liberal democracies – freedom of association, rights of the accused, freedom of movement, funding opportunities, periodic elections, and information

availability – provide the perfect environment for terrorists to plan and execute their actions. Most important, liberal democracies have press freedoms that allow terrorists to seek the media attention that they crave. Eubank and Weinberg (1994) showed that incipient democracies, as in some developing countries, are especially prone to terrorist events.

Domestic versus Transnational Terrorism

Another crucial distinction is between domestic and transnational terrorism. Domestic terrorism is homegrown and has consequences for just the host country, its institutions, citizens, property, and policies. In a domestic incident, the perpetrators, victims, and audience are all from the host country. Moreover, there is no foreign sponsorship or involvement in a domestic terrorist event. Timothy McVeigh's bombing of the Alfred P. Murrah Building in Oklahoma City in April 1995 was the deadliest domestic terrorist event in US history. Civil wars are often associated with domestic terrorism that an insurgency can direct at the ruling government or general population. The government may respond with state terror (e.g., death squads) against a population of potential supporters of the insurgency.

Targeted liberal democracies have frequently employed the right balance of defensive and proactive policies against *domestic* terrorist threats. In Italy, the Red Brigades was brought to justice; in France, Action Direct members were captured; and in Belgium, Combatant Communist Cells members were also apprehended. Although these groups engaged in some transnational terrorist attacks, their biggest threat was to the host country. When confronted with domestic terrorism, a country cannot sit back and hope that another country will dispose of the threat, since no other country is at risk. A targeted country has no choice but to confront the threat with appropriate counterterrorism measures.

Transnational terrorism involves incidents where the perpetrators, victims, or audience are from two or more countries. If an incident begins in one country but terminates in another, then the incident is a transnational terrorist event, as is the case of a midair hijacking of a plane that leaves Athens bound for Cairo and is made to fly to Algiers. The kidnappings of foreign workers in Iraq in 2004 are transnational terrorist events. The toppling of the World Trade Center towers on 9/11 was a transnational terrorist incident because the victims were from ninety different countries, the mission had been planned and financed abroad, the terrorists were foreigners, and the targeted audience was global. An attack against a multilateral organization is a transnational terrorist incident owing to its multicountry impact and victims, as in the case of the suicide car bombing of the UN headquarters in Baghdad on 19 August 2003. The Popular Front for the Liberation of Palestine (PFLP) seizure of eleven Organization of Petroleum Exporting Countries (OPEC) ministers in Vienna on 21 December 1975 is another instance of transnational terrorism. Most terrorist events directed against the United States and its people and property do not occur on US soil and, hence, are transnational terrorist events. In fact, 40% of all transnational terrorism is directed at US interests (Enders and Sandler, 2006a).

[Figure 1 near here]

Based on data from the (National) Memorial Institute for the Prevention of Terrorism (MIPT)(2006), Figure 1 displays annual amounts of domestic and transnational terrorism. The domestic terrorism time series starts in 1998 because MIPT only began gathering statistics on such incidents at that time. The rise in domestic terrorist events is due, in part, to MIPT's augmented capability over time in collecting the data. Domestic terrorism is much more prevalent than transnational terrorism; nevertheless, we focus on transnational terrorism as the challenge since we are interested in putting this transfrontier problem into perspective with

respect to the other transfrontier challenges studied by the Copenhagen Consensus. Moreover, the civil war chapter indirectly includes the consequences of domestic terrorism in its casualty and economic consequences. Transnational terrorism is a global concern because grievances or issues in one country can cause a terrorist attack in another country as the perpetrators seek the maximum media coverage. As rich countries institute tighter security measures at home, this action can alter the geographical distribution of these events so that prime-target countries' assets are hit at softer foreign venues (Enders and Sandler, 2006b).

Terrorism must also be distinguished from some related concepts, such as war, guerrilla warfare, and insurgencies. War is generally more discriminating than terrorism in its targeting. In a war, civilians are typically not taken hostage or targeted.[2] War also abides by certain conventions with respect to the treatment of prisoners and the observance of diplomatic immunity (Hoffman, 2006). In contrast, terrorists make their own rules and go after civilians because they are easy targets that create maximum anxiety for the population. War is on a much grander scale than terrorism and involves much greater casualties and damages. In many wars, especially guerrilla wars, terrorism is one tactic of many deployed by adversaries to weaken the enemy. Guerrilla warfare involves large paramilitary groups that control territory from which to launch attacks against targets that often include the host country's military. In Colombia, Fuerza Armadas Revolucionarias de Colombia (FARC) is a paramilitary force that numbers in the thousands and employs terrorism and other methods (e.g., armed attacks) in its confrontation with the government. Although FARC has conducted some transnational terrorist attacks in Colombia on foreign interests, FARC relies on domestic terrorism and other operations. Finally, an insurgency intends to overthrow a government through the use of irregular military operations that may include terrorism (Hoffman, 2006). Insurgencies are used against occupying forces and

unpopular governments. As a winning strategy, insurgencies try to gain popular support through propaganda aimed at exposing the alleged injustices of the government. Civil wars are often associated with insurgencies and guerrilla warfare.

On Terrorist Rationality

From an economist's viewpoint, rationality is not determined on the basis of the desirability of an agent's objective or tactics. We consider terrorists to be rational actors who respond in an appropriate and predictable fashion to changes in their constraints as they optimize their objective while confronting an adversary who is trying to outwit and defeat them. Consequently, we must anticipate that terrorists will try to minimize the impact of counterterrorism actions of the government. Thus, actions by governments to protect their officials shifted attacks to business people and others – tourists and ordinary citizens – as the terrorists accounted for the augmented security afforded to officials. Such reactions underscore terrorist rationality. As shown below, terrorists are better adept at making collective decisions than targeted governments, which often work at cross-purposes with one another (Enders and Sandler, 2006a; Sandler, 2005). For the analysis of this challenge, terrorist rationality and anticipated reactions are crucial in evaluating the stream of benefits and costs, associated with the solutions later offered to this challenge.

Causes of Transnational Terrorism

Terrorism can stem from various causes that include: ethno-nationalism, separatism, social injustice, nihilism, single issues (e.g., animal rights), fundamentalist beliefs, religious freedom, anticapitalism, and leftist ideology. Often, terrorist campaigns, fueled by ethno-nationalism or

separatism, are domestic in orientation as attacks are directed at weakening the government or else in forcing it to overreact so as to lose popular support. David Rapoport (2004) characterizes four waves of terrorism since the late 1870s. The first wave was the anarchists whose campaign had a strong transnational orientation as they tried to internationalize their struggle by exporting it to other countries including the labor movement in the United States. During the second wave, the anti-colonialists were active in gaining independence during the 1950s and 1960s – e.g., Algeria and Cyprus. Some of these anti-colonial campaigns had transnational implications through the use of the foreign press to make their grievances known more broadly. The left-wing terrorists were the dominant influence during the third wave from the late 1960s. This wave marked the emergence of modern transnational terrorism as terrorists routinely took their attacks to foreign airports and capitals to get noticed. This was particularly true of the left-wing Palestine Liberation Organization (PLO) and its offshoots such as the PFLP that sought an independent Palestinian state. To get the attention of Israel and its supporters, Palestinian terrorist groups staged some spectacular incidents abroad. Within Europe, leftist terrorist groups attacked symbols of capitalism and imperialism, which at times included foreign corporations, foreign military personnel, and multilateral organizations. The fourth, and current, wave consists of fundamentalist terrorism, which began with the Soviet invasion of Afghanistan and the Iranian students' takeover of the US embassy in Tehran in November 1979[3]. Currently, half of the active transnational terrorist groups are fundamentalist in orientation (Hoffman, 2006). Elements of past waves remain as a new wave ensues. Although the fundamentalists are the main influence today, representative groups from the first three waves – especially, the leftists – are present today (Hoffman, 2006). Today's leftists carry on anti-globalization campaigns that attack multilateral and capitalist institutions.

Fundamentalist terrorism has foundations in all of the major religions – for example, Hindu extremists brought down Air India flight 182 on 23 June 1985, and a Jewish extremist assassinated Israeli Prime Minister Yitzhak Rabin in November 1995. Nevertheless, Islamic fundamentalists are by far the main influence on transnational terrorism today. Their demands range from an Islamic fundamentalist state to the United States leaving the Gulf states. In other instances, Islamic fundamentalists call for the destruction of Israel. An al-Qaida loosely affiliated network includes groups such as al-Qaida Iraq, Abu Sayyaf, Jemaah Islamiyah, al Jihad (Egyptian Islamic Jihad), al-Qaida Saudi Arabia, and others in many countries such as Tunisia, Pakistan, Jordan, Egypt, Indonesia, Kuwait, the Philippines, Yemen, Kenya, and Saudi Arabia (Hoffman, 2003; US Department of State, 2003).

[Table 1 near here]

Table 1 indicates some primary contrasts between the two main terrorist influences today. Obviously, the fundamentalists present the much greater threat as they target more indiscriminately and consider any nonbeliever, even women and children, as a legitimate target. Indeed, even the unintentional death of Muslim bystanders can be tolerated (Wright, 2006, 174-175). The attacks on 9/11 demonstrate that some of these groups will go to extreme measures to maximize carnage. Those attacks are estimated to have caused $80-90 billion in costs (Kunreuther, Michel-Kerjan, and Porter, 2003). Faced with such destructive attacks and the desire of al-Qaida to employ chemical, biological, radiological, and nuclear attacks (Hoffman, 2006), the huge increases in homeland security expenditures following 9/11 may be easily understood from the viewpoint of a prime-target nation, such as the United States. Moreover, Scheuer (2006, 20-21) contends that al-Qaida is unique because it poses a direct national security threat to America, has more growth potential, and is more religiously motivated than any other

organization associated with the current wave of terrorism. The contrasts in Table 1 underscore that the fundamentalists are bent on killing people and can be anticipated to escalate the carnage by employing ever more deadly means of attacks. Their use of suicide bombing has proven deadly – twelve times more deadly than conventional terrorism (Pape, 2006).

In contrast to left-wing terrorists, Michael Scheuer (2006, 5) states that, "the United States and the West have little useful context in which to try to understand Osama bin Laden." Scheuer blames the rise of fundamentalist terrorism on failed US foreign policy, including the stationing of troops in Saudi Arabia, economic sanctions against Iraq, and other actions in the Middle East and the Muslim world. Scheuer and others (see, e.g., Bloom, 2005) argue that the Islamic world hates US foreign policy (e.g., support of Muslim world's absolutist kings and denial of Palestinian human rights). Bin Laden is able to tap into this hatred in his fatwa and call to arms. Scheuer's message is that the United States and its allies can do much to defuse the terrorism threat by applying a different mindset to its policy that impact Islamic countries so as to minimize the humiliation that some of their citizens feel. For starters, the United States must realize that ideas and values must be exploited to US advantage to stem the current wave of fundamentalist terrorism. Western values do not apply universally and may import poorly to countries with little experience with democracy. In addition, the war on terror must eschew overly harsh proactive measures, such as the excesses of Abu Ghraib Prison, that initiated a kidnapping campaign against foreigners in Iraq. Detentions without trials in Guantánamo Bay tarnish the principles of American liberty and justice, and create new grievances that can result in future terrorist attacks. This is a lesson that should have been learned from the French experience in Algeria and Indochina.

Statistical Overview

We now present a brief statistical overview of terrorism drawing data from ITERATE, MIPT, and the non-defunct US Department of State (1989-2004) *Patterns of Global Terrorism*.[4] The available data are events data that are coded from media accounts of terrorist events. For example, ITERATE relies on a host of sources for its information, including the Associated Press, United Press International, Reuters tickers, the Foreign Broadcast Information Services (FBIS) *Daily Reports*, and major US newspapers. Mickolus (1982) first developed ITERATE for the period running from 1968 through 1977. The data set now covers 1968-2005 (Mickolus et al., 2006). Coders use the descriptions of the various terrorist events to construct time-series data for forty key variables common to all transnational terrorist incidents. Coding consistency for the data is achieved by applying identical criteria and maintaining continuity among coders through the use of overlapping coders and monitors. ITERATE excludes guerrilla attacks on military targets of an occupying force and all terrorist incidents associated with wars or major military interventions. MIPT also uses these conventions and is jointly gathered by RAND and researchers at St. Andrews University, Scotland. US Department of State data also apply a nearly identical operational definition for transnational terrorism.

[Table 2 near here]

In Table 2, the number of transnational terrorist incidents per year is listed for 1968 through 2006, complete with the number of deaths and injuries. The primary source of this data is the US Department of State (various years), with figures for 2004-2006 coming from MIPT (2006). There are some things to note about the data – e.g., on average only 420 persons are killed and another 1249 are injured annually by transnational terrorism. Thus, transnational terrorism is associated with relatively few casualties compared with other challenges studied by

the Copenhagen Consensus. Regarding the number of incidents, the peak of transnational terrorism occurred in the 1980s, which was the era of state sponsorship. The number of deaths and injuries varies by year, with some years displaying greater totals. Except for 2001, injuries show more variability than deaths. Enders and Sandler (1995) show that transnational terrorism goes through cycles. The figures in Table 2 prove important for our counterfactual exercise, since they will enable us to identify likely influences of increases in either proactive or defensive measures that followed 9/11. The variability in casualty totals is due in part to the presence of large-scale attacks (i.e., "spectaculars") that can greatly affect yearly totals. In 2001, 9/11 had the main influence on deaths, while, in 1998, the simultaneous bombings of the US embassies in Kenya and Tanzania had the primary influence on deaths and injuries. Compared with everyday events such as automobile accidents, transnational terrorism kills and maims relatively few individuals.

[Table 3 near here]

In Table 3, domestic incidents and their casualty values are indicated for 1998 and beyond. The much higher totals in 2005 and 2006 are due to two factors: the insurgency in Iraq and its many car bombings and MIPT's improved capability in recording these events over time. Domestic events are also tabulated by the National Counterterrorism Center, established after 9/11. Table 4 lists some spectacular terrorist events. The date, the event, the perpetrator, and the number of deaths are indicated in the four columns beginning with the Zionist bombing of the King David Hotel, which housed the British military headquarters in Jerusalem. This event was a large factor in the British deciding to give Israel its independence. With the exception of the Beslan school seizure, bombings and the downing of airplanes are the primary spectacular events. Fundamentalist terrorists have figured prominently in the spectaculars, thus concurring

with the lessons drawn from Table 1. Moreover, Table 4 shows that conventional attacks are capable of killing relatively large numbers of people. Nonetheless, with the exception of 9/11, the death tolls tend to be in the hundreds for such large-scale incidents.

[Table 4 and Figure 2 near here]

To give a fuller picture of transnational terrorism, Figure 2 indicates the time series plots of incidents per quarter for bombings and all transnational terrorist incidents, based on ITERATE data for 1968-2005. A number of features are worth highlighting. First, both series display peaks and troughs, indicative of cycles. Some large peaks followed key events such as the peak in the middle of 1986 after the US retaliatory raid on Libya or the peak in early 1991 after the US-led Gulf War. US foreign policy can instigate waves of terrorist attacks. Second, bombings are the favorite tactic of terrorists, accounting for about half of all attacks. The bombing series imparts its general shape to the all-incident series. Third, from the early 1990s to about 2002, there is a downward trend to both series owing to less state sponsorship during the post-Cold War era (Enders and Sandler, 2000, 2002; Hoffman, 1998). The fall of the communist regimes also meant that left-wing ideology lost some of its appeal to potential terrorists and their supporters. Fourth, there has been some upward drift in attacks in the last couple of years, following a lull after the war on terror began. Figure 3 displays the proportion of transnational terrorist incidents with casualties – i.e., attacks with a death or an injury – on a quarterly basis. This time series also displays peaks and troughs. The key feature is the clear upward drift from the early 1990s – the time at which fundamentalist terrorists became the dominant force. As Table 1 implies, the rise of fundamentalist terrorists resulted in more carnage, which came at a time when transnational terrorist attacks were fewer in numbers. This increase in lethality of transnational terrorism is what worries the world, particularly prime-target rich nations. The use

of domestic terrorism in large-scale car bombings in the emerging civil war in Iraq also feeds this anxiety as some countries fear that such attacks may be eventually employed in transnational terrorist incidents in major capitals.

[Figure 3 near here]

Economic Consequences of Terrorism

Terrorists are intent to cause economic hardship on targeted economies. Terrorism can impose costs on a targeted country through a number of avenues. Terrorist incidents have economic consequences by diverting foreign direct investment (FDI), redirecting public and private funds to security, or limiting international trade. If a developing country loses sufficient FDI – an important source of savings – from terrorism, then it may 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 (Abadie and Gardeazabal, 2007; Blomberg and Mody, 2005; Enders and Sandler, 1996; Enders, Sachsida, and Sandler, 2006). In some instances, terrorism may impact specific industries as 9/11 did on airlines and tourism (Drakos, 2004; Enders, Sandler, and Parise, 1992; Ito and Lee, 2004). Other growth-reducing impacts from terrorism can come from investment being redirected to government expenditure in terms of homeland security (Blomberg, Hess, and Orphanides, 2004). In general, transnational terrorism increases the costs of doing business in a country and this can have economic ramifications.

Although the study of the economic consequences of terrorism is not well-researched, some general principles are emerging from recent studies.[5] Given the low intensity of most transnational terrorist campaigns in a given country, the macroeconomic consequences of

terrorism are generally modest and short-lived. Transnational terrorism is not on par with civil or guerrilla wars and, in general, has fairly localized economic effects. The likely candidate countries for discernible GDP losses are either developing or small countries that experience a protracted terrorist campaign. A spectacular attack, like 9/11, can affect GDP in any country. Generally, rich diversified economies are able to endure terrorism with limited GDP influences because activities will shift to less risky sectors. Moreover, rich countries can apply monetary and fiscal policies to ameliorate the impact. Such countries can regain citizens' confidence by augmenting homeland security, which has some GDP implications. Most of the impact of transnational terrorism will be to specific sectors that confront enhanced terrorism risks. Surprisingly, most large-scale terrorist incidents have had little effect on stock markets. The noteworthy exception is 9/11 where stock market took 30 to 40 days to recover from the initial and large sell-off (Chen and Siems, 2004).

Why Is Transnational Terrorism So Difficult to Eradicate?

Transnational terrorism is so difficult to eradicate because it is so cheap and effective in capturing the world's attention. In essence, terrorists require minimal resources to mount attacks. A terrorist group can, at times, be annihilated, but new groups will surface, lured by the power of taking actions against a much more formidable enemy. Moreover, actions to kill a group's leaders may result in more ruthless leaders replacing them, as the Israelis discovered with respect to Black September and Hamas. In Table 5, the size of some of the primary terrorist groups is listed, based on figures from the US Department of State (2003). A couple of observations are noteworthy. Despite its huge expenditures on intelligence, governments are ill-informed about the strength of terrorists. In April 2001, the US Department of State (2001, 69)

estimated al-Qaida numbers as "several hundreds to several thousands" – far below subsequent estimates following the US-led invasion of the Taliban in Afghanistan on 7 October 2001. Although some countries' armies number in the hundreds of thousands, most terrorist groups are small and number in the hundreds. An insurgent group, such as FARC, numbers in the thousands, but this is very unusual.

[Table 5 near here]

The operational budget of al-Qaida was put at $30 million prior to 9/11 (National Commission on Terrorist Attacks upon the United States, henceforth 9/11 Commission, 2004, 170) with much of the money going into training camps and infrastructure. Generally, terrorist attacks are inexpensive and create much more damage to the targeted society than they cost. In Table 6, we present the damage inflicted compared to the material costs of operation for seven major terrorist attacks. The right-hand column gives the "damage exchange ratio,"[6] which indicates the payback per dollar of operation. These ratios range from 3,200:1 (African embassies bombings) to 1,270,000:1 (London transportation bombing), thus showing that some terrorist incidents have an amazing payback in damages relative to the costs of the operation. Of course, such ratios only include the variable costs of the action and do not put a value on the lives of any terrorists killed. Even if fixed costs are proportioned to an operation and the terrorists' lives are valued, the damage exchange ratios are still huge. In a recent study, Enders, Sachsida, and Sandler (2006) show that on average each US-directed transnational terrorist incident in OECD countries reduced US foreign direct investment stock in the targeted country by $1 million, yet cost very little to execute.

[Table 6 near here]

Given the small costs of such operations, targeted countries have a difficult time in doing

away with transnational terrorism, because terrorists need to shift very little money to fund a particular operation. Thus, terrorists can transfer their money in small transactions – under $5,000 – because only transfers above this ceiling must be reported under current guidelines. In addition, terrorists can use the *hawala* system of informal cash transfers, where bookkeeping balances are held and settled among a network of balance holders at a later time through a wire transfer or an exchange of commodities. Terrorists have engineered means – e.g., trade in precious commodities – to transfer funds following efforts after 9/11 to limit the funding of missions. Transnational terrorism is virtually impossible to eradicate because terrorists need minimal resources and little manpower to set up shop.

Asymmetries between Terrorists and Targeted Governments

There are many asymmetries between transnational terrorists and their targeted governments that, unfortunately, work to the terrorists' advantage. Perhaps, the most essential asymmetry involves how the terrorists are able to cooperate, thereby solving their collective action problem, while governments are less able to cooperate. Dating back to the late 1960s, transnational terrorist groups have collaborated in loose networks (Hoffman, 1998). Terrorist cooperation assumes many forms, including training, intelligence, safe haven, financial support, logistical assistance, weapon acquisition, and exchange of personnel (Alexander and Pluchinsky, 1992). By contrast, governments place a huge value on their autonomy over security matters and this limits their cooperation, except following an exigency such as 9/11. What other factors explain this difference in achieving collective action by terrorists and targeted governments? Sandler (2005) attributes this difference to three asymmetries. First, governments' strength provides a false sense of security, thereby blindsiding them to their need for cooperation to be more

effective against the transnational terrorist threat. By contrast, terrorists' relative weakness, compared to the formidable governments that they attack, means that terrorists must pool resources to augment their modest arsenals. Second, governments often do not agree on which groups are terrorists – e.g., until recently, the European Union (EU) did not view Hamas as terrorists. Despite different agendas, supporters, and goals, many groups agree on similar opponents – the United States and Israel. The Palestinian terrorists and European left-wing terrorists shared similar ideologies and enemies. Third, governments and terrorists make decisions with different time horizons. In liberal democracies, government officials display interests that only extend to the next election period unless they are certain of reelection. Because governments turn over, past agreements to combat terrorism may not be honored by new leaders, thus limiting the anticipated gains from such agreements. For example, in reaction to the 3/11 Madrid train bombings, Spanish Prime Minister Zapatero withdrew his country's strong support of Bush's war on terror following Zapatero's win in the 2004 national elections. Government officials tend to show little patience when making counterterrorism policies – i.e., they display a high discount rate. Terrorist leaders demonstrate much greater patience because they are usually tenured for life, so they view intergroup cooperative arrangements as continual. As such, terrorists place more weight on future benefits than targeted governments. Terrorist groups know that reneging on pledged cooperation with another group will not only lead to retribution with that group withholding support in the future, but it also tarnishes the group's reputation, thus jeopardizing its ability to cooperate with other groups.

Through successful collective action, terrorists gain an advantage over governments. With the formation of global networks, terrorists can identify and exploit softer targets wherever they appear. Given the smaller cooperation among governments, softer targets or weak links are

ever present for terrorists to exploit. Moreover, terrorists can dispatch their best-equipped cell to the most opportune target.

Other asymmetries work to the terrorists' advantage. Liberal democracies present terrorists with target-rich environments. In contrast, terrorists take a low profile and hide among the general population, thus they offer a target-poor environment to the government. Governments have to protect everywhere, while terrorists can focus on vulnerable targets. Another asymmetry involves the adversaries' responses: liberal democracies must typically be restrained in their response, while terrorists – especially, fundamentalists – can be unrestrained. A targeted government can be less restrained when faced with an incident such as 9/11 where thousands die. Governments utilize a hierarchical structure, while terrorists employ a nonhierarchical structure. Enders and Su (2007) show that rational terrorist groups will select a loosely linked cell structure so that infiltrating one cell may yield little useful intelligence on the organization. While a cellular structure limits terrorist groups' vulnerability, it also inhibits their ability to acquire chemical, biological, radiological, and nuclear substances. Governments are not well-informed about terrorist groups' strength as Table 5 illustrated, while terrorists are reasonably knowledgeable about the government's strength as some parts of a government budgets are often a matter of public record. Terrorists have a second-mover advantage, while the governments have a first-mover disadvantage, because terrorists can observe how governments harden potential targets and then attack accordingly. This was true of 9/11 where Logan, Newark, and Dulles airports were viewed as poorly screened. In Table 7, crucial asymmetries are summarized. These asymmetries give terrorists an advantage that makes eradicating terrorism very difficult.

[Table 7 near here]

Other Considerations

There are numerous factors other than asymmetries that make it difficult to either eradicate transnational terrorism or address it effectively. For instance, "weakest-link" countermeasures represent major impediments to international cooperation when target nations differ greatly by income. Counterterrorism policies abide by weakest link when the overall level of security attained depends on the smallest effort expended by targeted countries. Consider actions to eliminate a transnational terrorist group's safe haven, where it trains, plans missions, recruits operatives, and dispatches teams. If all but a single country denies terrorists a safe haven on their soil, the one holdout undercuts the efforts of the others. For international airports, the airport instituting the most lax security essentially determines the overall safety of the flying public, insofar as a vulnerable airport is apt to attract the terrorists. Measures to freeze terrorist assets also represent weakest-link countermeasures, since the least vigilant countries influence disproportionately the ability of terrorists to maintain their assets. There is, thus, a need to "shore up" the weakest link – i.e., bring their effort level up to an acceptable standard. This shoring-up process faces a collective action problem as nations wait for others to augment the efforts of the weakest link(s). Consequently, free riding characterizes steps taken to bring up effort levels in weakest links. A prime-target country typically does not have sufficient means to shore up all weakest links so that cooperation is necessary.

Transnational terrorism offers rogue nations, which operate outside of acceptable norms, a means to destabilize another nation while hiding behind a cloak of secrecy as they sponsor terrorist attacks abroad. Such actions can be cost effective with a large damage exchange ratio. Even if the state sponsor is discovered, countries confront a collective action problem in

retaliating against the sponsor. This follows because countries are inclined to hold back their response so as to benefit from any response by the country enduring the terrorist incident. Why put one's soldiers in harm's way when some other nation may do so? Retaliation also runs the risk of condemnation by the world community if the proof of sponsorship is not completely convincing or else the retaliation kills some innocent people. The latter is likely when terrorists purposely live within the general population.

Technological advances are also providing terrorists with means that they tailor and exploit for new atrocities. Thus, terrorists use the internet to augment anxiety with videos of beheadings. The internet also allows terrorists to spread propaganda, while communicating with other operatives. Terrorists also utilize the internet to claim credit for events by posting videos. Since the late 1960s, terrorists are quick to adopt advances in explosive devices – e.g., plastic explosives, novel timing devices, and innovative detonators. Authorities must view terrorism as a dynamic threat whose forms and methods are ever morphing. Anticipating novel forms of attacks can be more challenging than stopping planned conventional attacks.

Another factor promoting terrorism are past successes. In 1983, the departure of the multinational forces (MNF) from Beirut following the near-simultaneous suicide bombing of the US Marine barracks and the French Paratroopers sleeping quarters encouraged future terrorist campaigns. These two suicide truck/car bombings became the prototype for suicide truck bombings in Sri Lanka, Iraq, Turkey, Saudi Arabia, and elsewhere. Proven methods create a demonstration effect, copied by terrorists worldwide. The news media unwittingly disperse terrorist innovations globally in a short period of time. The so-called "Blackhawk down" al-Qaida attack on US forces in Somalia gave the terrorists a victory as the United States left in defeat. Any concessions, including withdrawing forces or paying ransoms to kidnapping,

encourage future terrorism. This poses a real weakest-link problem as the country least able to resist making concessions or paying ransoms changes the terrorists' priors about how resistant other nations will be. As nations cave in, terrorists become more optimistic that others will follow suit if the right hostage is abducted or spectacular event is executed.

Transference of Terrorist Attacks

Transference is policy-induced changes in terrorist behavior and represents another impediment in limiting transnational terrorism. This phenomenon again highlights that terrorists are rational actors who respond to changes in risks in an appropriate manner that, unfortunately, may limit gains from counterterrorism policies. Actions by governments to guard one venue cause the terrorists to shift to another venue. Following 9/11, there was an increase in homeland security in the United States, Canada, and European countries. A recent study shows that since 9/11 there has been a clear transference of attacks against US interests to the Middle East and Asia (Enders and Sandler, 2006b). Today's fundamentalist terrorism is shifting to those countries, where large support populations exist and terrorists do not have to transcend fortified borders to attack US and Western assets. With transference, a counterterrorism policy that raises the price of one mode of attack will induce terrorists to switch to now relatively cheaper modes of attack. Based on ITERATE data and statistical analyses, Enders and Sandler (2006a) show that the installation of metal detectors in airports on 5 January 1973 led to an immediate and prolonged drop in skyjackings. At the same time, there was a significant and large increase in hostage and other incidents. Unfortunately, metal detectors also resulted in a substitution into more deadly incidents, an unintended consequence of the policy (Enders and Sandler, 2006a, 81-82). In another transference, Enders and Sandler (1993) find that securing embassies led to more

assassinations and attacks against embassy officials in nonsecure venues. The policy message is simple: counterterrorism measures must either make all modes of attack more difficult or else reduce terrorist resources if transference is to be avoided. The latter require *proactive measures* in which terrorists and their assets are targeted, as the United States and its allies did in Afghanistan in October 2001.

Transference can also have a temporal nature in response to terror alerts or temporarily enhanced security. If these actions are announced or visible, then the terrorists will merely shift an intended attack from the present to the future once the authority's guard is down. The homeland security alert system provides terrorists with information that is to their advantage. Moreover, terrorists can manipulate the system by increasing internet "chatter" or threats to cause wasteful security enhancements and decreasing chatter or threats when they really intend to strike. Repressive actions by a targeted government that closes off political means – rallies and election of representatives – will cause terrorists to rely more on violent attacks. Thus, the policy message is not to close off legitimate political channels of expression owing to an undesirable transference (also see Frey, 2004). Very harsh proactive measures can either cause a backlash attack by sympathetic groups or greater recruitment of terrorists (Rosendorff and Sandler, 2004; Siqueira and Sandler, 2007). This recruitment can result in a spectacular incident where greater manpower and resources are needed. The Madrid train bombings on 11 March 2007 and the London transport bombings on 7 July 2005 are backlash attacks by groups sympathetic to al-Qaida.

Thus, proactive responses have a downside that must be weighed against the likely fall in terrorism. We show later that the war on terror at the end of 2001 not only decreased the number of incidents, but also resulted in incidents with more casualties on average. Terrorists responded

to the higher risks by going after incidents with potentially greater payoffs, which is a rational response. Moreover, such antiterrorism campaigns lead to a short-term lull in attacks as terrorists find new hiding places and regroup. Quite simply, transnational terrorism is not so easy to address.

Geographical Transference

Transference of terrorist attacks can also be geographical, in which heightened security in one part of the world transfers transnational terrorist incidents to less secure countries. To show the pattern of transnational terrorist attacks over time, we apply the regional classifications given in the US Department of State (2003) *Patterns of Global Terrorism*, where six regions are characterized. These regions are the Western Hemisphere (North, Central, and South America), Africa (excluding North Africa), Asia (South and East Asia, Australia, and New Zealand), Eurasia (Central Asia, Russia, and the Ukraine), Europe (West and East Europe), and the Middle East (including North Africa). This partition of countries puts most of the Islamic population into the Middle East, Eurasia, and Asia.

[Figure 4 near here]

In Figure 4, we utilize ITERATE data to show the changing pattern over time of transnational terrorism by region. Panels 1 and 2 display a sustained decrease in transnational terrorist attacks beginning in the early 1990s for the Western Hemisphere and Europe, respectively. From 1968 to 1992, there was a lot of spillover terrorism from the Middle East, staged in Western Europe. In panel 3, the Middle East is associated with an increase in transnational terrorism for the start of the 1990s, followed by a fall around 1993, and then an increase after 9/11. This same post-9/11 rise characterizes Asia and Eurasia. In a recent paper,

Enders and Sandler (2006b) show statistically that heightened homeland security in parts of the Western Hemisphere and Europe induced terrorists to shift their attacks on Western interests to regions where Islamic fundamentalists can rely on indigenous populations for support. This can be seen in panels 3 and 4. Eurasia experienced an increase in transnational terrorism at the time when the Western Hemisphere and Europe experienced a decrease. Nevertheless, the number of transnational terrorist attacks is small in Eurasia compared to the Middle East, Asia, and elsewhere.

Measurement and Other Problems

Coming up with five solutions and their benefit-cost ratios is particularly difficult for transnational terrorism. Before we indicate how we circumvented this obstacle, we briefly describe why transnational terrorism is more problematic to do benefit and cost analysis on than many other challenges. First, there are no real solutions to transnational terrorism owing to transference and the other considerations given earlier. The best hope is for action that ameliorates terrorism in the immediate term. Any stream of benefits and costs from solutions or policies is limited in time and lasts for two to five years before some new related or unrelated threat surfaces. Second, there is the *counterfactual* problem, because there is no true way to know what terrorism would have been had certain policies not been taken, once they are imposed. If, for example, nations had cooperated more prior to 9/11, then would 9/11 have been stopped? No one can know for sure. Sometimes, a researcher can apply econometric techniques to identify the counterfactual – e.g., the use of a transfer function in time series analysis.[7] This requires estimating the level of a variable – say, the number of tourists – with terrorism present and then using the estimating equation to ascertain what would happen if terrorism had been

zero. When estimating benefits and costs for solutions, the counterfactual is relevant for at least one side of the calculation. Suppose the solution involves greater proactive measures against the terrorists, then the counterfactual is on the benefit side, since we do not know the reduction in terrorism in light of these measures. If, instead, we hypothesize augmented international cooperation, then the counterfactual involves both the cost and benefit sides, because we have never experienced such levels of cooperation.

Third, policy cost information is often difficult to ascertain. Most countries do not reveal how much is spent on some components of counterterrorism or homeland security, since it may be in a country's strategic interest to keep this information secret. This is particularly true of the intelligence budget. Even when this information is available, there is still the problem as to what counts and what does not count as counterterrorism actions. That is, does the US-led invasion of Afghanistan against the Taliban and al-Qaida count? Most researchers classify this war as a proactive response to a terrorist threat. Similarly, does the US-led invasion of Iraq on 20 March 2003 count when there was no clear indication that Iraq, at the time, supported or harbored al-Qaida? Some researchers exclude this war as a proactive response to terrorism.[8] In computing costs, there is also the joint-cost problem when funds are used for multiple activities, because costs must then be assigned. For example, disaster relief in the United States goes to responding to both natural and terrorist disasters. In general, the costs of many "solutions" do not lend themselves to easy calculation. This means that the costs of augmented cooperation must be proxied. Even the costs of enhanced defensive measures are difficult to ascertain, since we do not know the costs of current measures in most countries. Thus, a procedure must be devised for ascertaining these costs. The same is true about the expense of foreign policy changes by prime-target countries.

Other measurement problems exist for our study. There are no records kept of the degree of injuries from terrorist attacks. As seen earlier in Table 2, there is just a tally on the number of injuries. This then presents an issue when we compute the DALYs associated with transnational terrorism; however, we are able to address this problem in the next section. Additionally, the damage inflicted by most terrorist attacks is not readily available, except for a few spectacular incidents (see Table 6). The best way to address this lacuna is to rely on a method that calibrates losses in GDP. The alternative is to measure the losses associated with various sectors of the economy (such as the airlines and tourism industries) and add them to the losses associated with terrorism-induced reductions in international trade and foreign direct investment. These losses can then be reduced by benefits accruing to those sectors of the economy that expand as a result of terrorism (such as law enforcement). However, it is exceedingly difficult to measure the overall sectoral losses and gains. If, for example, international trade declines as a result of terrorism, intranational trade should expand as domestic firms replace international firms as suppliers of goods. Instead of using this in-direct method, we find it to be far easier to compute the net losses from terrorism as manifested in overall GDP levels.

The Building Blocks to Benefit-Cost Analysis

To calculate the benefits and costs for various solutions, we must first be able to assign a cost to transnational terrorism in terms of lives lost and injuries sustained, security expense, and GDP losses. These three building blocks allow us to do counterfactual analyses so as to measure benefits for the proposed solutions that ameliorate, in the short term, the level of transnational terrorism.

Human Costs: Computing DALYs

To establish the human costs, we must compute the DALYs associated with terrorism for either a given or representative year using casualty figures for transnational terrorism, previously presented in Table 2 for 1968-2006. This table gives the casualties in terms of deaths and injuries on an annual basis. In order to calculate the DALYs associated with terrorism, we must categorize the wounded into their respective injury components (i.e., disability *D* weights). Unfortunately, data on the nature of terrorist-induced injuries sustained are unavailable. We can, however, derive a suitable proxy by appealing to a study conducted by Abenhaim, Dab, and Salmi (1992) of the physical and psychological injuries associated with a terrorist campaign involving twenty-one attacks (twenty bombings and one machine gun attack) that occurred in France during 1982-1987. This campaign resulted from spillover terrorism related to the political situation in the Middle East. These authors sent surveys to the population of 324 civilian victims, who were registered by the police. There was 85% participation rate to the survey with 78% returning the completed survey and another 8% responding to a phone interview. Psychological symptoms were identified from assessing self-reporting on a diagnostic portion of the survey. Although a few studies exist that document the injuries corresponding to an *isolated* terrorist incident, this French study is the most recent longitudinal data set on injuries stemming from terrorist incidents that we could find. We, therefore, use this study to interpolate injury categories from wounded tallies in Table 2. Even though transnational terrorism includes more than bombings, the French study on assessing injuries is an excellent proxy because half of all transnational terrorist attacks are bombings, which are the most likely attacks to result in injuries.

[Table 8 near here]

We employ the distribution of injuries given in the French study to compute DALYs for transnational terrorist attacks in Table 8 for 2005 as the base or representative year, when 550 people died and 864 were wounded. In the left-most column, the type of lesion and psychological symptoms are indicated, in which PTSD stands for posttraumatic stress disorder. The next column lists the percentage of injured that displayed these consequences, where the injury total is greater than 100% because victims may experience multiple injuries. In the third column, the number of each type of injury is determined by multiplying the corresponding percentage by 864 – the number of wounded in 2005. The associated calculation then provides the number of injuries, *N*, for ascertaining the years lost to disability (YLD). In the fourth column, the disability weights, *D*, for these injuries are taken from Mathers, Lopez, and Murray (2003). When a complete correspondence between the disability weight and the lesion does not exist, the following interpretations are applied. The disability weight for hearing loss is that assigned to a severe or profound treated loss. Head trauma is given the weight for a fractured skull or an intracranial injury, both of which have the same disability weight. For respiratory impairment, we use the largest respiratory weight, associated with lower respiratory infection episodes. Bombings are known to have significant impact on internal organs: shock waves from the blast induce significant tissue disruption at air-liquid interfaces, a process known as "spalling" (Frykberg, 2002). For fracture(s) and amputation(s), we equate the loss to a fractured femur, which is the highest among fractures and exceeds all amputations except foot or leg. We consistently use the higher weights for ambiguous cases to give injuries the highest possible monetary consequences. The rather low DALYs later associated with transnational terrorism cannot be blamed on us taking a conservative approach.

The duration, *L*, of each injury is treated as permanent for the victim's remaining life

span. Given that terrorist attacks rarely target children, we assume that a representative victim has reached his or her mean life expectancy, averaged across males and females. Consequently, the duration of the injury is for half of the victim's life expectancy. For the purpose of sensitivity analysis, we conduct the analysis for the life expectancy in three geographical regions: Eastern Mediterranean, European, and the United States, as reported in the World Health Organization's mortality tables for each region. The duration is as follows: Eastern Mediterranean, 31.25 years; Europe, 36.5 years; and the United States, 38.75 years.

Assuming a discount rate of 5% and a value of $1000 per DALY, we calculate the YLD for each injury or symptom using the following formula:

$$\text{YLD} = \$1000 \times N \times D \times [1 - \exp(-0.05 \times L)]/0.05. \quad (1)$$

For deaths, the years of life lost (YLL) calculations are performed in a similar fashion, except that death has a disability weight of one. This calculation is applied to the 550 deaths in 2005. The three right-hand columns in Table 8 aggregate the YLD and YLL for the three different life spans to derive the DALYs. For 2005, YLD is almost half the value of YLL. This would not be true had more people been injured. At a value of $1000 per DALY, the human cost of terrorism ranges from $13 to $14.1 million in 2005, which is very modest. When a DALY is valued at $5,000, the human cost of terrorism ranges from $65.1 to $70.5 million in 2005. In Table 9, we conduct an analogous exercise but use the *average annual* terrorism deaths (419.79) and injuries (1249.28) for the 1968-2006 period from Table 2. As shown in Table 9, there is little change in the range or values of DALYs using an average year, thus indicating a robust analysis. The sole difference is that YLD and YLL are close in value. Henceforth, we use values from Table 9 associated with the $5,000 DALY.

[Table 9 near here]

As a basis of comparison, we calculate terrorism DALYs for US life expectancy (which is the highest) as a percentage of the world DALYs for a selection of the 20 leading global challenges for 2001. The rankings for these challenges in terms of DALYs are perinatal conditions (No. 1), HIV/AIDS (No. 5), malaria (No. 8), tuberculosis (No. 10), and road traffic accidents (No. 11). In Table 10, the transnational terrorism DALYs percentages range from a mere 0.02 for perinatal conditions and HIV/AIDS to 0.04 for tuberculosis and traffic accidents.[9] When measured in terms of DALYs, transnational terrorism is a minor problem because relatively few people die or are injured each year. If we include deaths and wounds from domestic terrorism, the percentages would increase by over tenfold since 7,641 persons died and 14,395 were wounded in domestic terrorism during 2005 (see Table 3). Nevertheless, terrorism DALYs percentages are still relatively small when compared with these other challenges, where much larger numbers of people die or are injured.

[Table 10 near here]

Homeland Security Costs

The second building block concerns the amount spent on homeland security worldwide. This is a difficult figure to compute since most countries do not display a line item in their budget for homeland security. Moreover, homeland security involves many activities including control of immigration, inspection of imports, hardening of targets, gathering of intelligence, guarding of borders, security at airports, and other activities. A decision must be made whether to include just defensive actions or to also include proactive measures such as the US-led invasions of Afghanistan in October 2001 and Iraq in March 2003.

We address these difficulties in a number of ways. There are reliable figures for the United States and the United Kingdom that we can use to proxy estimates for other countries. This proxy is based on the *percentage of GDP* devoted to homeland security in the United States and the United Kingdom following 9/11. The dilemma involves going from US and UK estimates to a worldwide calculation when such figures are not available. Nine alternative calculation methods are used, some of which include just defensive measures while others include defensive and proactive measures. When a proactive response is included, the invasion and occupation of Iraq is included in two of the calculations and left out of one of the calculations. Prior to the US invasion in 2003, Iraq had supplied monetary inducements to some suicide terrorists in Israel and there was some terrorist presence on Iraqi soil (e.g., safe haven to an ailing Abu Nidal). The invasion of Afghanistan is, however, included in all three of our calculations involving proactive measures owing to the safe haven given by the Taliban to Osama bin Laden and al-Qaida. These nine alternative calculations provide both the annual costs and the capitalized costs (over five years) of homeland security. Even with the most conservative estimates, we will discover that homeland security is the dominant consideration in the benefit-cost ratios for some of our proposed solutions.

[Table 11 near here]

Our alternative procedures – numbered M1 through M9 – are best understood in conjunction with Table 11. We identify 66 countries, listed in the left-hand column of Table 11, that experienced transnational terrorism in recent years. All major industrial countries are included in the sample, so that excluded countries, whose GDP are small, would not change totals by much. The second column displays GDP amounts for 2005 in billions of current US dollars for each sample country, taken from the World Bank (2007). The next nine columns

provide homeland security estimates for each of our methods in billions of US dollars.

To illustrate the methods, we first indicate how we assign homeland security expenditures in the United States and the United Kingdom for the calculations. For the United States, we appeal to the careful study by Hobijn and Sager (2007) on the *increase* in homeland security *in 2005*, compared with 2001. These authors compute both federal and private sector augmented homeland security expenditures and put the annual amount at $43.6 billion in 2005, which is 0.35% of US GDP. This first calculation includes no proactive spending. For the United Kingdom, we use Treverton et al. (2008) figure for British counterterrorism and domestic security, which averages to $3.2 billion per year for two recent snapshots in time. This latter figure is 0.146% of UK GDP in 2005.

In Table 11, Method 1 (M1) applies the US GDP percentage to all sample countries for a total of $147.19 billion in 2005. To capitalize this value (see column 3), we allow for GDP growth of 2% to give the future value in 2006 (FV2006). Similar FV values are calculated through 2009. To get the present value, we apply the appropriate discount factor to each FV – e.g., we divide FV2006 by (1 + .05) and FV2007 by $(1 + .05)^2$ – and then sum the five discounted FV terms. Thus, the capitalized value of M1 is $695.09 billion over five years. Method 1 is a high-end estimate because most sample countries will not have allocated over a third of one percent of their GDP on enhanced homeland security since 9/11. Method 2 is more realistic by applying the US percentage to just the United States and the UK homeland security percentage of 0.146% of GDP to the other 65 sample countries. For M2, the annual value is $86.81 billion and the five-year capitalized value is $409.94 billion, with the United States accounting for half of all homeland security spending. This seems to be a realistic share for the prime-target country, whose interests are attacked on average 40% of the time.

Method 3 is more controversial because we include the annualized expenditure associated with the Afghanistan and Iraq Wars, based on figures given in Treverton et al. (2008). These authors provide an educated guess on the annual cost of US federal spending on homeland security, Afghanistan/Iraq, and associated activities (e.g., foreign assistance to at-risk countries). They also include state and local spending on homeland security along with private sector spending of $10 billion, which is close to private spending amounts in Hobijn and Sager (2007). According to Treverton et al. (2008), the United States annually spent $92 billion on defensive and proactive measures since 9/11, which amounts to 0.74% of US GDP in 2005. These authors offer a smaller figure to augmented homeland security than Hobijn and Sager (2007). M3 applies the 0.74% to the four prime-target nations – the United States, the United Kingdom, Israel, and Russia – and applies the earlier 0.35% to the other sample countries. Our justification is that these four countries have proactive campaigns that support the higher percentage. M3 gives an annual costs of $207.78 billion and a capitalized five-year costs of $981.19; M3 represents our top-level estimate and provides an upper bound. Method 4 excludes the Iraq campaign, since the al-Qaida connection in Iraq prior to the US invasion was not clear-cut in contrast to Taliban-ruled Afghanistan. According to calculations in Treverton et al. (2008), $47.2 billion or 0.38% of US GDP in 2005 was spent on augmented homeland security if Iraq costs are excluded. M4 applies this percentage to the GDP of the four prime-target countries and uses the smaller 0.35% for the other sample countries. This results in annual costs of $151.85 billion and capitalized five-year costs of $717.09.

Method 5 takes a radically different approach by taking 61% of the US Department of Homeland Security (DHS) budget for 2005. We use this percentage because officials classify 61% of the DHS budget as going to terrorism-related homeland security activities (DHS, 2004).

We also add $10 billion of private spending on homeland security to $29.6 billion (= 0.61 × $48.5 billion) for a total US spending figure of $39.6 billion or 0.32% of US GDP in 2005. M5 applies this percentage to all sample countries to give annual costs of $134.57 billion and capitalized five-year costs of $635.51 billion.

Methods 6-9 are variations on the themes thus far introduced. M6 is a conservative estimate that applies the US defensive spending of 0.35% of GDP to just the four prime-target countries and applies 0.10% of GDP to all other sample countries for annual costs of $80.89 billion and capitalized five-year costs of $382 billion – estimates similar to M2. Method 7 is more conservative than M3 because the UK percentage of 0.146 is applied to the United Kingdom and to all nonprime-target countries. M7 provides a more measured valuation of defensive and proactive efforts than M3 and is not too different than M4. Method 8 is a conservative variant of M1 since the US defensive percentage of 0.35 of GDP is only applied to the United States, Israel, and Russia; the UK percentage of 0.146 of GDP is applied to the United Kingdom; and a percentage of just 0.10 of GDP is applied to the other 62 sample countries. Finally, M9 is a variant of M8 where a very conservative 0.05% of GDP is used for the 62 nonprime-target countries. With M9, we have the smallest homeland security cost thus far of $63.16 billion in 2005 and $298.26 billion when capitalized for five years. The United States accounts for 68% of these totals.

For our solutions below, we favor two of the above methods – M7 and M9. Since homeland security is the dominant factor in three of our subsequent benefit-cost calculations, we intentionally choose the method M9 that offers the smallest defensive expenditures, so that the adverse ratios cannot later be attributed to our discretion or alleged bias. Given the annual costs

on US homeland security, M9's worldwide spending of $63.36 billion is a highly restrained estimate of augmented defensive measures. For an estimate involving proactive and defensive efforts, we favor M7 which applies a fairly conservative defensive effort to nonprime-target countries. Of course, myriad other variants can be examined, but M7 and M9 are reasonable upper and lower bounds on these estimates. Even though we utilize just two methods, we provide nine calculations so that the reader can get a feel for how alternative assumptions could affect our BCR calculations, which we leave to the interested reader. As shown by M7, the inclusion of proactive measures can greatly augment security spending estimates.

Lost GDP

The third building block involves estimating the annual and capitalized five-year losses in GDP associated with transnational terrorist incidents on a country's soil. At the outset, we should expect such losses to be rather modest unless a country is plagued with transnational terrorism or else experiences a spectacular terrorist event such as 9/11 (Sandler and Enders, 2007). Most transnational terrorist incidents kill on average less than one person and have limited economic consequences (Enders and Sandler, 2006a). We utilize the findings from a study by Blomberg, Hess, and Orphanides (henceforth BHO) (2004) that estimates the losses in per capita income growth for countries experiencing one or more transnational terrorist events in that year.[10] BHO (2004) present a panel study of 177 countries for the 1968-2000 sample period. These authors show that each year of transnational terrorism results, on average, in a fall in income per capita growth of just 0.048%, which is similar to the findings of Tavares (2004), who puts this loss at 0.038%. To be able to use BHO's findings to compute terrorism-induced GDP losses, we need the population (Pop), the per capita GDP in 2005, and the growth rate of per capita GDP between

2004 and 2005 in percent (denoted by 2005 growth/100) for all countries experiencing transnational terrorism during 2001-2005.

The results of our computations are indicated in Table 12. In the left-hand column, we list all countries experiencing one or more terrorist attacks during 2001-2005. Population in thousands is indicated in the second column, and the number of years of transnational terrorist events (T_i) in country *i* during 2001-2005 is listed in the third column. Thus, Algeria experiences transnational terrorist attacks in two years during 2001-2005, while Bosnia-Herzegovina experiences such attacks in four of five years. The terrorism data come from ITERATE, while the Pop and GDP data come from the World Bank (2007). Per capita GDP for 2005 is displayed in the fourth column, while 2005 per capita GDP growth is given in the fifth column.

[Table 12 near here]

The sixth column indicates the cost of transnational terrorism in terms of lost GDP for 2005 for just those countries experiencing an attack in 2005. The entry in this column is computed as follows:

$$(\text{Pop} \times \text{per capita GDP}) \times (\text{2005 growth}/100) \times 0.048.$$

These figures are in thousands so that the total GDP lost in 2005 is approximately $19.412 billion. In the seventh column, we compute an "average yearly cost" in lost GDP for each country based on the fraction of years (T_i/5) during 2001-2005 that a country experiences one or more transnational terrorist attacks. The entry is now computed as:

$$(T_i/5)(\text{Pop} \times \text{per capita GDP}) \times (\text{2005 growth}/100) \times 0.048.$$

This latter computation gives a better average picture that is not as dependent on which countries are attacked during the base year. Thus, a rich nation – e.g., the United States – cannot have

such a disproportionate influence when the latter method is utilized. In Table 12, the losses in GDP for this averaging procedure are $17.363 billion in 2005. We favor this latter technique since it provides a more country-balanced approach; however, there is not a large difference between the two calculations in Table 12.

To capitalize the losses over five years, we compute the present value entries associated with the seventh column for each of the following four years, discounted by a 5% interest rate. For each year after 2005, we *also allow GDP to grow* at the respective country's 2005 growth rate. The five present value terms for 2005-2009 are then summed for the countries' entries in the right-hand column displaying the "5 year cost in growth." The sum over all countries finally gives the capitalized five-year GDP costs of $83.407 billion. If we had used Tavares' (2004) calculations, then these GDP losses would be even smaller. An important insight emerges: homeland security is much more expensive than average estimated losses in GDP tied to the impact of transnational terrorism. This situation very much favors the terrorists, whose actions not only cause harm to targeted economies but also force countries to allocate large amounts of resources to security. Our calculations suggest that this second impact is worse than the economic impact. As countries competitively harden potential targets in the hopes of transferring attacks abroad, the security cost worsens (Sandler and Siqueira, 2006). The $17.363 billion average annual loss in GDP is, however, small compared with the losses of 9/11, valued at $80-90 billion. But one must remember that there had never been a terrorist attack remotely as costly as 9/11.

Solutions

We reiterate that there is no true solution to transnational terrorism because this tactic empowers

the weak. Our solutions are in terms of policy choices that may ameliorate the problem in the short run with fewer attacks. Even the most clever defenses will be outwitted with time and so we typically work with a five-year time horizon, unless stated otherwise. Similarly, proactive measures do not have permanent influences because new generations of terrorists may surface or the terrorists can replenish lost resources with time. In calculating the associated benefits and costs for each policy option, we must confront a counterfactual on either the benefit or cost side as to what would have happened in the absence or presence of the policy. This requires assumptions that may be controversial.

Solution 1: Business as Usual

"Business as usual" involves doing nothing different than the post-9/11 actions that were instituted by the United States and other target countries following the unprecedented hijackings in September 2001. We construct the counterfactual by calculating the average annual attacks for 2002-2006, compared with those for 1990-2001. This comparison indicates that there are on average 129 fewer incidents per year for the post-9/11 period when compared with the pre-9/11 twelve years, which is a 34% drop in transnational terrorism (see Table 2). In terms of casualties in the post-9/11 period, there is both good and bad news. The good news is that there are 120 less injuries per year; the bad news is that there are 67 more deaths per year. The latter follows because the terrorists performed more deadly incidents to make fewer incidents have a larger payoff. Also, augmented defensive and proactive measures meant that only the more determined terrorist groups continued their attacks.

Benefits come, in part, from the reduced GDP losses from the 34% drop in transnational terrorist incidents. If this fall is assumed to be evenly distributed across target incidents, then

this results in a capitalized five-year GDP savings of $28.358 billion (= 0.34 × $83.406 billion). In principle, additional benefits should also stem from reduced casualties from fewer deaths and injuries; but, in fact, these anticipated benefits are negative based on $5000 DALYs. The 67 more deaths per year give a capitalized five-year loss of $26.1 million, while the 120 fewer injuries per year give a capitalized five-year gain of $11.3 million, which, in turn, lowers the benefit of this solution to $28.343 billion.

Costs are associated with security expenditures. To compute these costs, we first use the most conservative capitalized five-year value of $298.3 billion associated with M9 that includes just defensive increases following 9/11. This then provides a BCR of 0.095, so that less than ten cents on a dollar is returned. Next, we use the less conservative capitalized five-year cost of $725.7 billion associated with M7 that includes proactive and defensive augmentation following 9/11. This higher cost yields a BCR of 0.039 or a return of just under four cents on a dollar. Given that the two drivers of the BCR calculation – i.e., saved GDP and security expenditures – are in the billions of dollars while casualty consequences are in the millions of dollars, little would change with a $1000 DALY, except that the BCR would be slightly higher since net casualty costs are reduced to about $2.2 million.

An obvious criticism of our computation is that many target countries value lives and injuries by more than the $5000 DALY, used to investigate the human consequences of challenges in developing countries. Thus, our procedure may undervalue casualties. To respond to this criticism, we apply a $2 million value of life – the average compensation paid to the families of victims of 9/11 (Enders and Sandler, 2006a, 207) – for the 67 additional lives loss per year with Solution 1 and capitalize this value over five years. This gives a present value loss of

$609 million. Next, we modify the YLD calculations to be based on a $2 million value of life.[11] This gives a savings for the 120 reduced injuries of $345 million when capitalized. With this higher value of life, our corresponding BCRs are now 0.094 for M9 and 0.039 for M7. The bottom line is that not much changes, since saved GDP and security costs remain the drivers. Our BCRs – though potentially controversial – are robust.

Why do countries invest in a policy option that apparently has such an adverse BCR? For the United States and other prime-target countries, politics and extreme risk aversion surely play a role. Government officials realize that a single terrorist incident – like 9/11 – could result in $80-$90 billion loss. If such losses are not weighted by the appropriately small likelihood, then overspending on security follows. People often overrespond to very low probability catastrophic events when compared with more certain events with small losses. Moreover, target nations are in a security race to deflect terrorist attacks onto foreign soil. Consequently, overspending may result. With reports in July 2007 that al-Qaida has regrouped (US News & World Report, 2007), the United States will likely raise spending on defensive and proactive measures.

Solution 2: Greater International Cooperation

Solution 2 involves greater cooperation in freezing assets and cutting off terrorists' resources, which may come from charitable contributions, drug trafficking, counterfeit goods, commodity trading, and illicit activities. This solution also concerns extraditing suspected terrorists to face prosecution and punishment if guilty. Additionally, this solution is tied to increased police cooperation among countries so that major plots – e.g., the August 2006 plan to blow up trans-Atlantic flights leaving London with liquid explosives – are foiled. Although this is a relatively cheap solution that can have a permanent impact if links are maintained, it is a difficult solution

to consummate because nations do not like to sacrifice autonomy over security and judicial affairs. Moreover, a single noncooperator – say, a nation that harbors terrorist assets – can undo much of the efforts of others. This is a particularly difficult solution to evaluate because benefits *and* costs involve counterfactuals.

On the cost side, we give high-end and low-end estimates by drawing on the 2005 budget of Interpol and the 2006 budget of the International Monetary Fund (IMF). In 2005, the entire operating budget of Interpol was just $58 million (€42.8 million) (Interpol, 2005), 88% of which was contributed by member states. Interpol fosters interstate police cooperation. This increased cooperation could involve doubling this budget to $116 million in perpetuity, whose present value is $2.32 billion if the discount rate is 5%. For monitoring of terrorist funds, we allocate *one tenth* of IMF's monitoring (global, regional, and country), governance, and capacity-building budget of $709.7 million to enhanced counterterrorism (Committee to Study Sustainable Long-Term Financing of the IMF, 2007). This $71 million expenditure is an educated guess that is 55% of IMF global monitoring spending. Most IMF activities are country-specific monitoring, technical assistance, external training, and bilateral surveillance that have little to do with counterterrorism so that allocating 10% of IMF administrative spending is surely on the high side. At a 5% discount rate, the perpetual stream of $71 million has present value of $1.42 billion. In total, our high-end cost estimate is a perpetual expenditure stream valued at $3.74 billion (= $2.32 billion + $1.42 billion). Throughout, we assume that extradition is virtually costless, since countries are merely utilizing the capacity built into their judicial and executive branches. The low-end estimate for augmented cooperation is to assign just half of the Interpol budget ($29 million) and 5% of the IMF administrative budget ($35.5 million) to supporting greater cooperation for an annual spending stream of $64.5 million. At a 5% discount rate, this

perpetual stream is valued at $1.29 billion.

Because most terrorist acts do not cost very much, increased police and monetary cooperation is not aimed at curbing small events, such as routine bombings or political assassinations. Rather, this enhanced cooperation is likely to stop a spectacular event that involves a great deal of planning and dedicated resources by the terrorists. Conservatively, we suppose that such actions are able to halt one spectacular terrorist event per year, such as the August 2006 plot against trans-Atlantic flights or the recent plot to hold members of the Canadian parliament hostage. The associated yearly benefit would be the average losses associated with a spectacular terrorist event which can vary from $500 million for the 1993 World Trade Center bombing to $80-$90 billion for 9/11. We conservatively place a value of $1 billion on the damages saved from one less spectacular incident. As a perpetual income stream, this results in a saving of $20 billion. Similar remarks can be made for enhanced intelligence expenditures. Antiterrorism intelligence efforts are credited with preventing several potentially spectacular incidents such as the one to blow up fuel supply tanks at New York's JFK airport, revealed in June 2007.

Based on the high-end cost estimate, the BCR is then 5.348; based on the low-end cost estimate, the BCR is then 15.504. We have clearly made some heroic assumptions. Nevertheless, the BCR should be greater than one, because police cooperation is very cheap owing to economies of scope and other considerations, while any large terrorist event avoided can save hundreds of millions of dollars if not billions. Since our benefits and costs are perpetual streams, the BCR is independent of the discount rate, which cancels out in the numerator and denominator.

Surely police forces are cooperating internationally to some extent. What we have tried

to show is that the payback per dollar from additional cooperation is apt to be high given how costly spectacular terrorist events can be. To engage in such events, terrorists must take extra risks owing to the greater manpower, resources, training, and planning that must support such attacks. Internationally linked police operations are better able to spot such large-scale terrorist efforts. Although such cooperation has favorable BCRs, countries have jealously guarded their autonomy over police and security matters.

Solution 3: Increased Proactive Response

This solution calls for increased proactive measures along the lines of the invasion of Afghanistan and other offensive actions against terrorists and their supporters taken by the United States and its allies. These actions ranged from the Philippines to Djibouti and immediately followed 9/11. They are known as Operation Enduring Freedom and do not include the invasion and occupation of Iraq, which began in 2003 (Belasco, 2007). Thus, we use the experience of the US-led proactive campaign as a role model for what an increased proactive response might achieve in terms of BCRs. In some of our cost estimates, we also include Operation Noble Eagle, which secured US military bases abroad from which to plan and launch proactive counterterrorism measures.

In order to get a counterfactual, we contrast the level of transnational terrorism in the first two years following 9/11 when there was the greatest proactive antiterrorist campaign with the levels in 2002-2006 and 1990-2001. We use only a two-year horizon for this solution, since al-Qaida and other terrorists had rebounded by 2004 with transnational terrorism back up to pre-9/11 levels. Moreover, many nations supporting such efforts had dropped out after two years. The war on terror put transnational terrorism into partial remission for two years but did not cure

it.

The annual number of transnational terrorist attacks for 2002-2003 is 205 incidents compared with 255 incidents per year for the post-9/11 period through 2006. We use this comparison for the counterfactual so as to adjust for the continued presence of defensive measures throughout the post-9/11 period. Thus, there are 50 less attacks per year or a decline of 13% in attacks over the 1990-2001 period that we attribute to the larger offensive measures. This translates into $2.257 billion (= 0.13 × $17.363 billion) saving in world GDP for one year. With 5% discounting and a two-year time horizon, this gives a benefit of $4.41 billion from saved GDP. Unfortunately, these two years had violent terrorist events that killed 675 people and injured 2830 others per year. Compared to 1990-2001, there are 159 more deaths and 916 more injuries per year, which is a negative benefit of $75.04 million when evaluated for two years at a 5% discount rate and a $5000 DALY. When the human losses are deducted from the GDP savings, we have net benefits of $4.335 billion associated with the third solution.

Next, we turn to costs which have been computed by the Congressional Research Service (Belasco, 2007). For the relevant two years, Operation Enduring Freedom costs $35.5 billion, while Operation Noble Eagle costs $21 billion for a total of $56.5 billion. This figure drops to $35.5 billion if we leave out Operation Noble Eagle on the grounds that it was only indirectly of a proactive nature. The BCR for the higher costs is 0.077, giving back less than eight cents on a dollar, while the BCR for the lower costs is 0.122, giving back just over twelve cents on a dollar. Given the short-term fix of such proactive campaigns and their great expense, the adverse ratios are not so surprising. It does not help that terrorists tend to respond with more deadly events to make their fewer operations have a greater anxiety consequence. If we use the $2 million value

of life calculations, the BCR falls to 0.047 for the high-cost estimate and to 0.075 for the low-cost estimate. The ratios are even more adverse because the casualties that rose with proactive measures now have a greater value. In fact, if we were to include expenditures by US allies, the BCRs would be even more adverse.

A proactive campaign would pay better if there is a way to eliminate the terrorist threat long term as some European nations did with left-wing terrorists – e.g., Italy with the Red Brigades, France with Direct Action, and Germany with Red Army Faction. But this assumes that terrorist groups in one country do not inspire groups in other countries to take up the cause. Unfortunately, the al-Qaida network encourages groups to take up the holy war. To limit the negative consequences from a proactive campaign, actions must be measured and properly justified to the world audience to maintain the high moral ground.

Solution 4: Augmented Defensive Measures

Our fourth solution is to harden targets globally in order to decrease terrorists' success and to limit their gains when they are logistically successful. This solution is fraught with difficulties because there will always be softer targets somewhere so that such actions will cause some transference of attacks. Transference is, however, not necessarily all bad if the terrorists are forced to attack a less valuable venue. To begin this thought experiment, we must choose a percentage increase for defensive measures. In fact, the percentage really does not make much difference to the BCRs and so we choose a 25% increase for illustration.

Since the increase is only in defensive measures, costs must be based on one of the methods in Table 11 that includes no proactive response. To be as conservative as possible, we choose M9 which gives the smallest cost estimate. The capitalized five-year costs of this

solution are easy to calculate and equal $74.6 billion (= 0.25 × $298.3 billion). Benefits are far more difficult to compute because of transference; thus, we should anticipate that the number of attacks will *not* fall by 25%. To make the strongest possible case for the adverse BCR to follow, we assume the very best (but unlikely) scenario – that attacks drop by 25%. This assumption means that our benefits are an upper bound on the true benefits. With this assumption, the capitalized five-year benefits in saved GDP are $20.852 billion. To these benefits, we must add the estimated gains from fewer casualties. Again, we allow for the best possible scenario where the annual average number of deaths and wounds (for the 1968-2006 period) fall by 25%. This means 313 fewer wounded and 105 less dead per year for capitalized five-year benefits of $76.31 million and $40.86 million, respectively, when based on a $5000 DALY and 5% discount rate. Thus, total benefits are $20.969 billion so that BCR equals 0.281 or a return of about 28 cents on a dollar. In fact, benefits are less than this best-case scenario, thus implying a smaller BCR. The ratio will improve if we use a $2 million value of life, because the best-case benefits from reduced casualties are $1.854 billion – i.e., $899.58 million from wounded and $954.65 million from deaths. Now, BCR equals 0.304, which is still adverse.

Virtually, any percentage increase in defensive measures will yield similar BCRs. The driver of this result is that security costs far outweigh the counterfactual benefits in terms of lower casualties and saved GDP. Such a solution can be more attractive if transnational terrorism becomes more deadly or more harmful to the economy. For this to happen, we must envision chemical, biological, radiological, or nuclear terrorist attacks, which we address later. Based on current threats, it is not surprising that enhanced security is not an ideal solution, because nations probably already spend too much on security in strategic actions to shift attacks

abroad.

Solution 5: More Sensitive Foreign Policies on the Part of a Prime-Target Nation

The last solution is the most difficult to evaluate on either a cost or benefit basis. This solution is motivated, in part, by Michael Scheuer's (2006) *Through Our Enemies' Eyes,* in which he explains that fundamentalist-based transnational terrorism has been a reaction to insensitive US foreign policy.

This solution requires projecting a more positive US image, negating terrorist propaganda, identifying terrorist hypocrisy (e.g., when they murder Muslims in Jordan and Egypt), and showing a more humane side of US foreign policy. This may be achieved, in part, by being more evenhanded by recognizing Israeli and Palestinian rights to exist and prosper. In other instances, more sensitive foreign policy can be promoted by reallocating and/or increasing foreign assistance. Currently, the United States gives only 0.17% of gross net income as official development assistance – some $22.7 billion in 2006 (Organization of Economic Cooperation and Development (OECD), 2007). Next to Greece, the United States allocates the smallest share of national income among OECD countries to foreign assistance. Moreover, US aid is highly skewed to countries that support the United States in its foreign policy agenda. Currently, the larger shares of US foreign assistance goes to Iraq, Sudan, Afghanistan, Pakistan, Colombia, Israel, Jordan, and Ethiopia – countries that the United States deem important in its war on terror. Such aid is not necessarily looked upon as being altruistic, given that the United States is pursuing policy goals with its gifts. Some redistribution of foreign aid may be a costless way of winning favor with the world community through efforts to direct aid to helping people without reciprocity.

Given its ability to move people and supplies, the United States is in an excellent position to bring relief to disaster areas. US efforts in Indonesia after the December 2004 tsunami were an effective way to display a humane side of the United States to a country with a large Muslim population. Efforts by the United States to expand its humanitarian aid in terms of greater foreign assistance *with no strings attached* will gain respect for the United States within the world community. Certainly, the United States has the capacity to do more to address hunger, diseases, and poverty.

Terrorists have been adept in winning over people with ideas and values. The United States and other target countries must also learn to gain the high moral ground through culture-sensitive policies that do not impose Western values. In this regard, democracy cannot be rapidly introduced into countries that have had little or no experience with democracy. US administrations must choose their words carefully, not to insult or humiliate other countries whose policy goals differ with those of the United States. The United States must also ensure that its treatment of prisoners maintains the rights and liberties, embodied by international law. Ill-treatment of prisoners may result in an outbreak of terrorist actions as hostage-taking events showed following the April 2004 revelations about US abuses at Abu Ghraib. Instead of seeking military bases in the Middle East, the United States could rely on its aircraft carriers to position troops and materiel as required. Land bases have led to clashes of culture in the past that have angered people against the United States.

Although it is difficult, we try to estimate the magnitude of the benefits from a more sensitive US foreign policy. Suppose that this policy solution decreases attacks against US interests by 25% a year. This would reduce transnational terrorism by 10% since 40% of all transnational terrorist attacks are on average directed against US interests, mostly abroad. This

would then save $8.34 billion in GDP when capitalized over five years. If, moreover, homeland security could be reduced worldwide by 10% owing to the lessened threat, then this would save at least another $29.83 billion over five years. These two benefits total $38.17 billion. Reduced casualties (42 less fatalities and 125 less wounded) from 10% fewer attacks provide additional benefits of $46.868 million over five years at a $5000 DALY. In total, benefits are estimated at $38.217 billion if a quarter of attacks against US interests are curbed.

With the exception of increased foreign aid, this solution is virtually costless since foreign assistance can be redistributed among recipients with little or no costs to the US budget. Ensuring that the United States respects human rights in its handling of prisoners of war is also costless. If the 25% reduction in US-oriented attacks is a reasonable assumption, then foreign aid can be increased by $7 to 8 billion a year and still give a BCR that is 1 or larger. This is about a 33% increase in US-funded official development assistance. Even if US attacks drop by less than 25%, this solution has much to offer because any fall in such attacks has a payback with little expense. The United States needs to understand what it can do through its rhetoric and policy stance to reduce transnational terrorist attacks against its interests that have negative consequences for countries where attacks are staged.

Of course, it is very difficult to know what type of foreign assistance will do the most to win favor with people worldwide and to curb transnational terrorism. We believe that assistance that responds to dire needs and has no reciprocity implied holds the best chances in this regard. A recent study indicates that regimes with greater civil liberties are better able to curb transnational terrorism (Krueger and Maleckova, 2003). Tavares (2004) shows that regimes with more civil liberties sustain smaller GDP losses from terrorism.

Solution Summary

Table 13 provides a summary of the five solutions and their basic variants in terms of benefits, costs, and BCRs. For four of the solutions (all except Solution 2), we calculate the consequences of casualties in terms of $5000 DALY and a $2 million value of life. Little would change to the BCRs if we used $1000 DALY since savings in GDP and spending on security are driving our results. If we were to use a discount rate of 3% instead of 5%, then this will have little effect on the BCRs for Solutions 1, 3, and 4. For example, the BCRs for Solution 1 rise slightly to 0.098 and 0.040 as benefits increase slightly relative to costs. A lower discount rate will leave the ratios for the two variants of Solution 2 unaffected owing to our long time horizon. For Solution 5, a lower discount rate will make the benefits more favorable. In the Appendix, Table 13A indicates benefits, costs, and BCRs for our solutions using a 3% discount rate. The Appendix also gives the calculations for the cost of homeland security (Table 11A) and lost GDP due to terrorism using a 3% discount rate. Regardless of the discount rate, our basic message remains the same: security-based solutions display adverse BCRs. We favor low-cost solutions that either augment international cooperation of target governments or else put forward a more sensitive foreign policy stance. Neither of these solutions are easy to implement.

[Table 13 near here]

Prognosis for the Future and Conclusions

The biggest unknown is what types of attacks may be used by terrorists in the future. Our adverse BCRs for costly Solutions 1, 3, and 4 are because transnational terrorism has not killed or injured many people and has done relatively little damage to economies. But more deadly and damaging attacks in the future may eventually justify the high cost of defensive and proactive

expenditures. Surely, this fear drives US expenditure on homeland security and its global war on terrorism. As al-Qaida strengthens, the United States has good reason to be vigilant and proactive against new terrorist attacks that can be very costly.

For the future, the most worrying terrorist attacks are chemical, biological, radiological, or nuclear (CBRN) in nature. Table 14 lists examples of each kind of CBRN terrorist attacks. Chemical attacks may involve nerve, blood, choking, or blistering agents, which if dispersed in confined areas can murder large numbers of people. The March 1995 sarin attack on the Tokyo subway had this potential but fortunately did not disperse as planned and so only twelve people died. For biological terrorist attacks, viruses and bacteria pose the greatest concern because once deployed they can replicate themselves and be passed among the victims. Fortunately, bacteria, such as anthrax, are difficult to "weaponize" so that the bacteria will be inhaled in sufficient quantity by the victims. The optimal aerosol particle size is one to five microns, which is sufficiently tiny to remain airborne for hours and sufficiently light to be readily dispersed through air-exchange systems in buildings and other closed spaces. The most worrisome radiological attack is a dirty bomb, which is an explosive device used to disperse highly radioactive substances. A dirty bomb in Manhattan or Los Angeles can create huge economic consequences by making parts of the city uninhabitable if plutonium has been used. Nuclear terrorist attacks are the most unlikely.

[Table 14 near here]

In recent papers, Ivanova and Sandler (2006, 2007) investigate the likely nature of future CBRN terrorist attacks, based on data on past CBRN terrorist incidents, gathered by the Monterey Institute of International Studies. On average, past CBRN incidents killed a half of a person, thus making them only half as deadly as conventional terrorist attacks (Ivanova and

Sandler, 2006). This does not mean that future CBRN terrorist attack will kill few people; rather, it means that conventional terrorism has, until now, posed a greater threat. As a potential hazard, CBRN terrorism presents a great potential risk that justifies vigilance and security precautions. In past incidents, the most common CBRN agent was chemical substances (205 incidents), which account for almost two-thirds of all sample incidents.[12] Biological events are second with 42 instances. There were relatively few radiological events (26) and even fewer nuclear incidents (8). Ivanova and Sandler (2006, 2007) demonstrate that religious cults and terrorist groups with a transnational orientation pose the largest threat. Moreover, groups that engaged in a past CBRN incident are more likely to participate in future CBRN incidents. Rich democratic countries are the likely venue for future CBRN attacks.

When CBRN terrorism becomes a greater possibility, the BCRs for Solutions 1, 3, and 4 will become much larger as benefits grow relative to costs. Fortunately, there are some inhibitors for this disturbing scenario. The cellular structure of today's terrorist groups makes it difficult for them to surmount acquisition and weaponization barriers. CBRN agents pose a handling risk that many terrorists are reluctant to assume. A deadly CBRN terrorist attack is apt to alienate supporters of some terrorist groups. Moreover, such attacks will induce a target country to unleash an unrestrained retaliation that many groups cannot survive – e.g., Aum Shinrikyo following the sarin attack on the Tokyo subway. Finally, a conventional attack like 9/11 is sufficiently deadly to limit the need for CBRN terrorist attacks.

We conclude with some basic insights. First, there is no panacea for transnational terrorism – effective action buys a government some time until a new group surfaces or terrorists discover novel ways to circumvent barriers. Transnational terrorism favors terrorists over a more capable government. Second, solutions that rely on massive defensive and/or proactive measures

have adverse BCRs, primarily because such actions are very expensive. Third, transnational terrorism has, in the past, been associated with relatively few casualties and small economic consequences. Fourth, the best remedies are the cheap ones that either foster international cooperation or make prime-target nations think through foreign policy choices. These solutions are the most difficult to achieve. We do *not* advocate that governments concede to terrorists' demands; rather, we recommend that foreign policy be evenhanded, farsighted, and respectful of other cultures.

We fully recognize that many people will fault our efforts as "making up numbers." Based on calibrated losses of GDP, past casualties, and expenditures on homeland security, we devise counterfactuals to ascertain the payback per dollar for certain solutions to transnational terrorism. Our BCRs are very robust to alternative assumptions. We hope that our study motivates others to ask: are current policy choices with respect to transnational terrorism worth the expenditures? This question needs to be asked and answered. Also, the global community must consider expenditures on transnational terrorism relative to other challenges such as disease, hunger, and the environment. This study is a first step to addressing such questions.

Footnotes

1. On ITERATE, see Mickolus (1980, 1982) and Mickolus, Sandler, and Murdock (1989).

2. The bombing of London, Tokyo, and Dresden in World War II are clear exceptions to the general rule since civilians were the target in these attacks. Other exceptions include the US atomic bombs dropped on Hiroshima and Nagasaki.

3. In a statistical analysis, Enders and Sandler (2000) trace the start of fundamentalist terrorism to the fourth quarter of 1979 when these two events took place.

4. The US Department of State's *Patterns of Global Terrorism* was replaced by annual reports on terrorism by the National Counterterrorism Center (NCC), which *does not distinguish* between domestic and transnational incidents. Moreover, it includes insurgent attacks against an occupying military force. Thus, recent NCC reports give the false impression that transnational terrorism is worsening in terms of the number of events.

5. This paragraph draws from Sandler and Enders (2008).

6. This terminology is from Shubik, Zelinsky, and Krstic (2006).

7. For example, we can regress the number of tourists in period *t* against past values of tourists and the current (and past) value(s) of terrorist attacks. Once this equation is estimated, we can determine the level of tourism with current and past levels of terrorism. Next, we set the coefficients on the terrorism terms in the estimated equation equal to zero (i.e., the counterfactual) and again ascertain the level of tourism. The difference in tourism with and without terrorism for the estimated equation indicates terrorism's influence on tourism (Enders, Sandler, and Parise, 1992).

8. Terrorism became a problem in Iraq in 2004 after the ouster of Saddam Hussein and

the insurgency began.

9. These ratios are the same for $1000 and $5000 DALYs.

10. These authors measure transnational terrorism as a dummy variable equal to 1 if there are one or more attacks in a given year and zero otherwise. They do not include the level of terrorism – i.e., number or severity of transnational terrorist incidents as an independent variable.

11. This modification is to multiply $\sum_i N_i D_i$ (see Tables 8-9) where *i* denotes the various injury classifications by $2 million. (Remember that $D_i < 1$ for injuries.) The resulting figure is then capitalized over a five-year period at a discount rate of 5%. Note that deaths mean that $\sum_i N_i D_i$ equals the number of deaths since $D_i = 1$ and $\sum_i N_i$ sums those who have died.

12. The statistics in this paragraph come from Ivanova and Sandler (2007).

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Figure 1. Domestic and Transnational Incidents

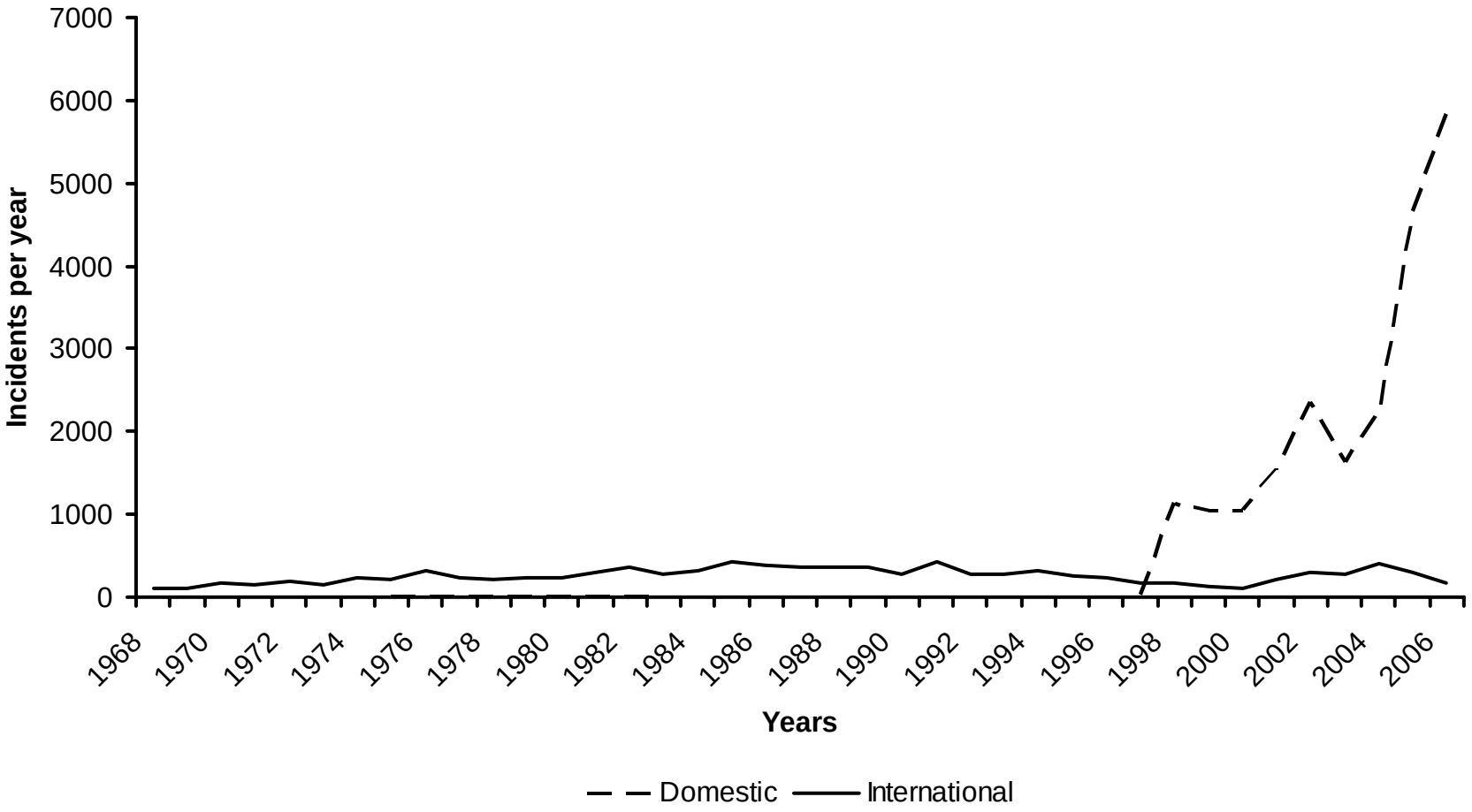

Figure 2. All Incidents and Bombings

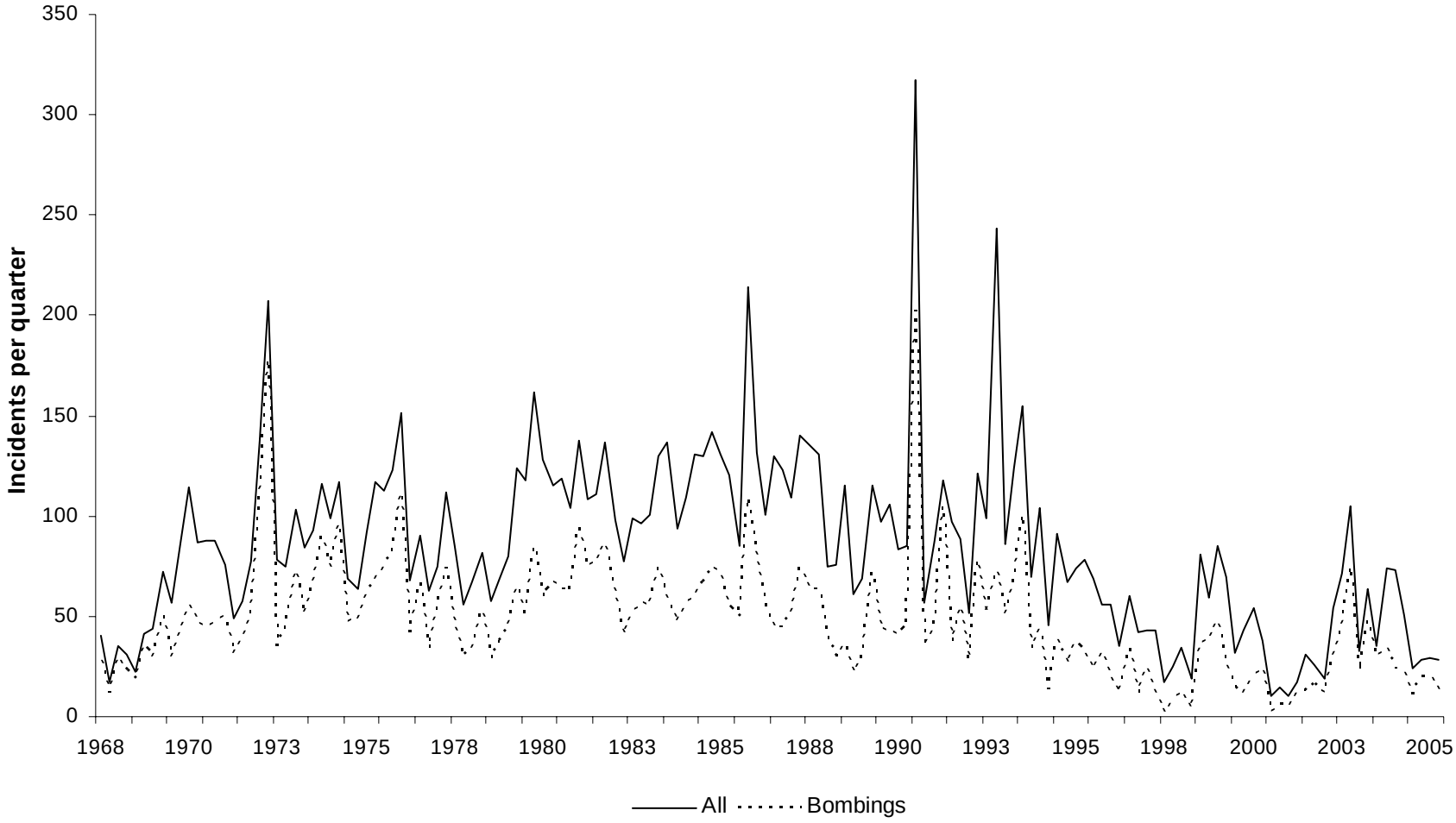

Figure 3. Proportion of Casualty Incidents

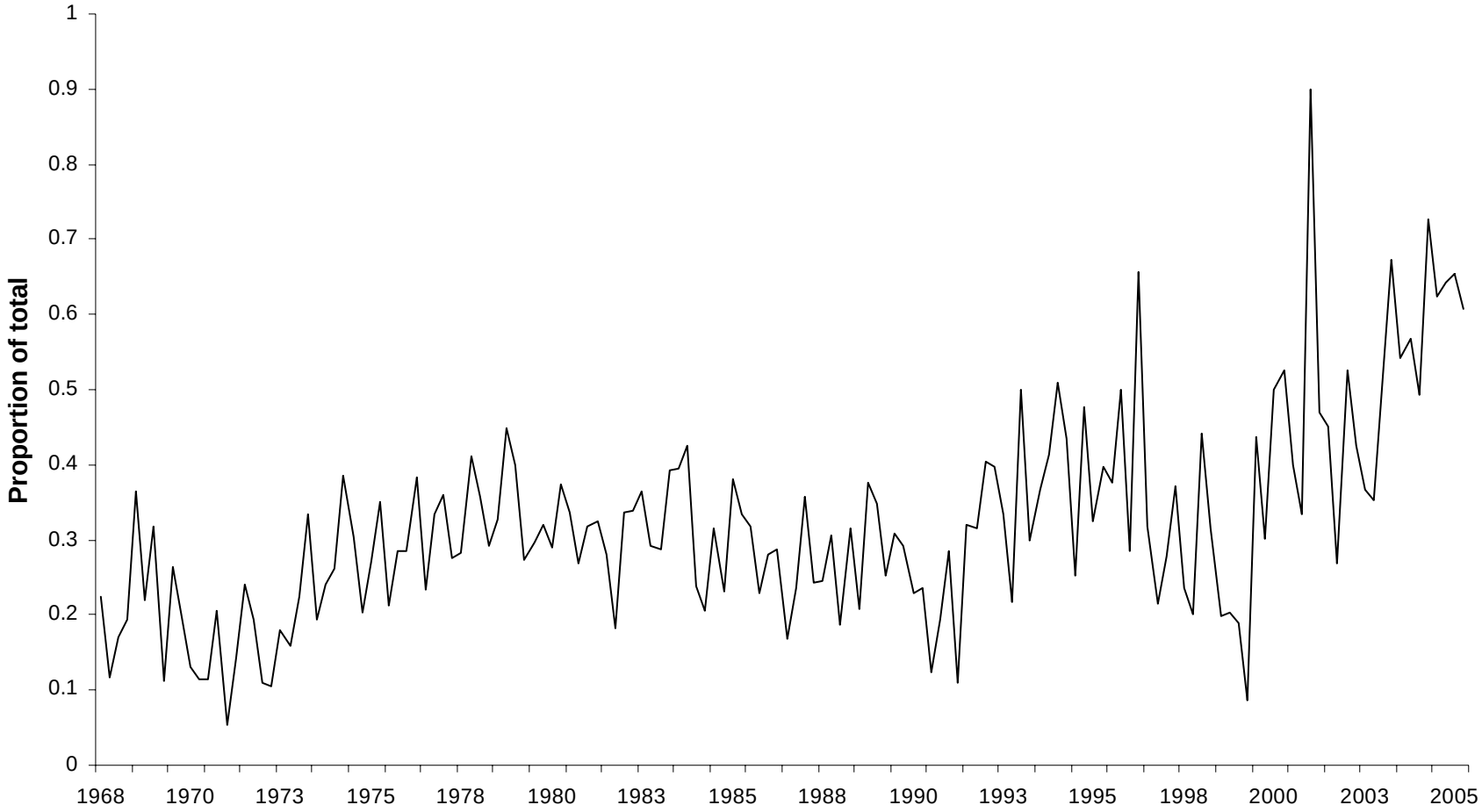

Figure 4. Incidents by Region

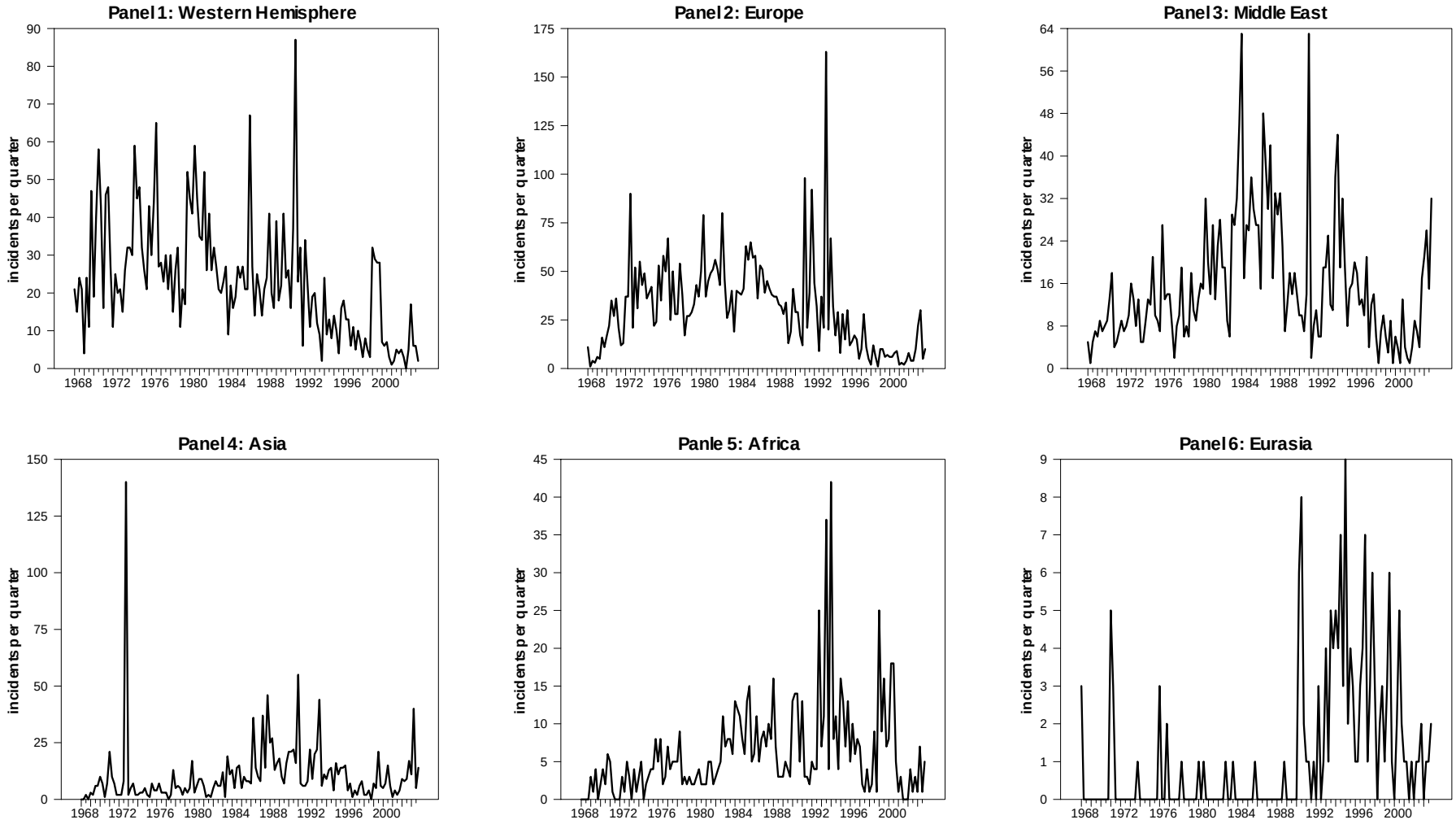

Table 1. Leftist Terrorists Versus Fundamentalist Terrorists

Left-wing Terrorists	Fundamentalists
• Secular, speaks for group	• Religious, speaks for God
• Selective targets, minimal collateral damage	• General targets, maximal collateral damage
• Often gave advanced warning of bombings	• Any advanced warning is of a generalized threat
• No use of suicide bombing	• Some use of suicide bombings
• Interested in a constituency	• Less interested in a constituency
• Relied on bank robberies, kidnappings, and assassinations	• Relied on bombings, armed attacks, and kidnappings
• No interest in using chemical, biological, radiological, or nuclear attacks	• Interest in using chemical, biological, radiological, or nuclear attacks
• The attack must further its goal	• The attack may be warranted if it kills nonbelievers

Table 2. Transnational Terrorist Incidents: Casualties 2006-1968

Year	Number of Events	Deaths	Wounded
2006	161	283	423
2005	308	550	864
2004	395	732	2,023
2003	208	625	3,646
2002	202	725	2,013
2001	355	3,296	2,283
2000	426	405	791
1999	395	233	706
1998	274	741	5,952
1997	304	221	693
1996	296	314	2,652
1995	440	163	6,291
1994	322	314	663
1993	431	109	1,393
1992	363	93	636
1991	565	102	233
1990	437	200	675
1989	375	193	397
1988	605	407	1,131
1987	665	612	2,272
1986	612	604	1,717
1985	635	825	1,217
1984	565	312	967
1983	497	637	1,267
1982	487	128	755
1981	489	168	804
1980	499	507	1,062
1979	434	697	542
1978	530	435	629
1977	419	230	404
1976	457	409	806
1975	382	266	516
1974	394	311	879
1973	345	121	199
1972	558	151	390
1971	264	36	225
1970	309	127	209
1969	193	56	190
1968	125	34	207

Sources: Data for 2004-2006 come from Memorial Institute for the Prevention of Terrorism (MIPT) at <www.mipt.org>; data for 1988-2003 come from US Department of State (various years), *Patterns of Global Terrorism*; data for 1968-1987 come from tables provided to Todd Sandler in 1988 by the US Department of State, Office of the Ambassador at Large for Counterterrorism.

Table 3. Domestic Terrorist Incidents: Casualties 2006-1998

Year	Number of Events	Deaths	Wounded
2006	5,824	10,969	18,788
2005	4,654	7,641	14,395
2004	2,251	4,334	8,837
2003	1,621	1,876	4,434
2002	2,350	1,793	4,392
2001	1,527	1,387	3,030
2000	1,044	736	2,475
1999	1,047	809	2,413
1998	1,124	1,794	2,851

Source: Memorial Institute for the Prevention of Terrorism (MIPT) at <www.mipt.org>.

Table 4. Select Spectacular Transnational Terrorist Attacks

Date	Event	Perpetrator	Deaths
22 July 1946	Bombing of local British military headquarters at King David Hotel, Jerusalem	Irgun Zvai Leumi	91
2 Aug 1980	Bombing of Bologna railway station	Armed Revolutionary Nuclei	84
23 Oct 1983	Suicide truck bombing of US Marines' barracks in Beirut	Hezbollah	241
23 June 1985	Downing of Air India Boeing 747, en route from Montreal to London	Sikh extremists	329
21 Dec 1988	Downing of Pan Am flight 103, en route from London to New York	Libyan intelligence agent	270
19 Sept 1989	Downing of Union des Transports (UTA) flight 772, en route from Brazzaville to Paris	Hezbollah	171
12 March 1993	Thirteen bombings in Bombay	Pakistani agents	317
7 Aug 1998	Simultaneous bombings of US embassies in Nairobi, Kenya, and Dar es Salaam, Tanzania	al-Qaida	301
11 Sept 2001	Four suicide hijackings that crashed into the World Trade Center towers, the Pentagon, and a field in rural Pennsylvania	al-Qaida	2,871
12 Oct 2002	Two bombs outside two Bali nightclubs	Jemaah Islamiyah	202
11 March 2004	Bombing of commuter trains and stations during morning rush hour in Madrid	al-Qaida	190
1 Sept 2004	Barricade hostage seizure of school children and parents in Beslan	Chechen rebels	344

Source: Quillen (2002a, 2002b) and ITERATE

Table 5. Select Terrorist Groups' Sizes (April 2003)

Group	Estimated Number of Operatives
Abu Sayyaf	200-500
al-Jihad	unknown – 100s
al-Qaida	unknown – 1000s
Armed Islamic Group (GIA)	<100
Euzkadi ta Askatasuna (ETA)	unknown – 100s
Fuerza Armadas Revolucionarias de Colombia (FARC)	9,000-12,000
Hezbollah	unknown – 100s
Jemaah Islamiyah	unknown – 100s
Mujahedin-e Khalq Organization	1000s
Palestine Islamic Jihad	unknown
Palestine Liberation Front (PLO)	unknown
Popular Front for the Liberation of Palestine (PFLP)	unknown
Popular Front for the Liberation of Palestine – General Command	100s

Source: US Department of State (2003)

Table 6. Asymmetry of Damages Versus Costs of Terrorist Operations

Terrorist Incident	Damages Inflicted	Costs of Operation	Damage Exchange Ratio
World Trade Center bombing, 1993[1]	$500,000,000	<$2,000	250,000:1
African Embassy bombings, 1998	$161,000,000	<$50,000	3,200:1
USS *Cole* suicide bombing, 2000	$240,000,000	$50,000[3]	4,800:1
9/11 hijackings, 2001	$85,000,000,000[2]	$400,000[3]	212,500:1
Bali nightclub bombings, 2002	$3,000,000,000	$35,000[3]	85,714:1
Madrid train bombings, 2004	$269,000,000	$10,000	26,900:1
London transport bombings, 2005	$2,540,000,000	$2,000	1,270,000:1

Source: Shubik, Zelinsky, and Krstic (2006), unless otherwise indicated.
[1]Mickolus and Simmons (1997)
[2]We took the average of the $80-$90 billion figure given by Kunreuther, Michel-Kerjan, and Porter (2003).
[3]Cronin (2006)

Table 7. Asymmetries between Targeted Governments and Terrorists

Targeted Governments	Terrorists
• Target rich	• Target poor
• Strong relative to adversary	• Weak relative to adversary
• Take a short-term viewpoint when interacting with other governments	• Take a long-term viewpoint when interacting with other terrorist groups
• Do not agree on common enemies	• Agree on common enemies
• Do not address their collective action concerns	• Address their collective action concerns
• Restrained in their response, except to large-scale attacks such as 9/11	• Can be restrained or unrestrained in their response, depending on group
• Hierarchical organization	• Nonhierarchical organization
• Not well-informed about terrorists' strength	• Reasonably well-informed about government's strength
• First-mover disadvantage	• Second-mover advantage
• Impatience	• Patience

Source: Modification of Enders and Sandler (2006a, Table 6.1)

Table 8. Terrorism DALYs: Base Year 2005 (5% discount rate)

	% of Subjects[1]	Number of Injuries[2] *N*	Disability Weight[3] *D*	YLD for East Mediterranean Life Expectancy ($1,000)	YLD for European Life Expectancy ($1,000)	YLD for US Life Expectancy ($1,000)
Distribution of Lesions						
Hearing loss	46.9	405.22	0.12	768.667	815.731	832.414
Severe burns	15.4	133.06	0.26	536.346	569.186	580.826
Head trauma	15.0	129.60	0.35	717.041	760.943	776.505
Eye injury	13.0	112.32	0.11	191.757	203.498	207.660
Respiratory impairment	6.7	57.89	0.28	255.307	270.939	276.480
Fracture(s) and/or amputations	4.5	38.88	0.35	215.112	228.283	232.952
Psychological Symptoms						
PTSD	18.1	156.38	0.11	259.569	275.461	281.095
Major depression	13.3	114.91	0.76	1380.542	1465.070	1495.032
Total YLD[4]				4324.342	4589.112	4682.964
YLL[5] (550 deaths)				8694.275	9226.606	9415.300
DALYs = YLD + YLL				13018.617	13815.718	14098.264
DALYs @ $5,000				65093.083	69078.588	70491.318

[1]Source: Abenhaim, Dab, and Salmi (1992)

[2] $N = 864 \times$ (% of subjects)

[3]Source: Mathers, Lopez, and Murray (2003)

[4]$\text{YLD} = 1000 \times N \times D\,[1 - \exp(-0.05 \times L)]/0.05$

[5]$\text{YLL} = 1000 \times N[1 - \exp(-0.05 \times L)]/0.05$

Table 9. Terrorism DALYs: Using Average Yearly Deaths and Wounds from 1968-2006 (5% discount rate)

	% of Subjects[1]	Number of Injuries[2] *N*	Disability Weight[3] *D*	YLD for East Mediterranean Life Expectancy ($1,000)	YLD for European Life Expectancy ($1,000)	YLD for US Life Expectancy ($1,000)
Distribution of Lesions						
Hearing loss	46.9	585.91	0.12	1111.436	1179.487	1203.609
Severe burns	15.4	192.39	0.26	775.517	823.000	839.831
Head trauma	15.0	187.39	0.35	1036.788	1100.268	1122.769
Eye injury	13.0	162.41	0.11	277.267	294.243	300.261
Respiratory impairment	6.7	83.70	0.28	369.156	391.758	399.770
Fracture(s) and/or amputations	4.5	56.22	0.35	311.036	330.080	336.831
Psychological Symptoms						
PTSD	18.1	226.12	0.11	375.317	398.297	406.443
Major depression	13.3	166.15	0.76	1996.162	2118.382	2161.705
Total YLD[4]				6252.678	6635.516	6771.219
YLL[5] (419.79 deaths)				6639.264	7045.772	7189.865
DALYs = YLD + YLL				12891.942	13681.287	13961.084
DALYs @ $5,000				64459.711	68406.437	69805.421

[1]Source: Abenhaim, Dab, and Salmi (1992)

[2] $N = 1249.28 \times$ (% of subjects)

[3] Source: Mathers, Lopez, and Murray (2003)

[4]YLD = $1000 \times N \times D\ [1 - \exp(-0.05 \times L)]/0.05$

[5]YLL = $1000 \times N[1 - \exp(-0.05 \times L)]/0.05$

Table 10. Relative Values of Terrorism DALYs Compared with Other Challenges

Terrorism DALYs[1] as a percent of:	Percent
World Perinatal DALYs (2001)	0.02
World HIV/AIDS DALYs (2001)	0.02
World Malaria DALYs (2001)	0.03
World Tuberculosis DALYs (2001)	0.04
World Road Traffic Accidents DALYs (2001)	0.04

[1]These ratios are the same for $1000 and $5000 DALYs. We use terrorism DALYs in terms of US life expectancy.

Table 11. Worldwide Homeland Security Estimates Under Nine Alternative Methods (in $billions)

Country	GDP 2005 (current US$)	M1	M2	M3	M4	M5	M6	M7	M8	M9
Afghanistan	7.2	0.025	0.010	0.025	0.025	0.023	0.007	0.010	0.007	0.004
Algeria	102.3	0.358	0.149	0.358	0.358	0.327	0.102	0.149	0.102	0.051
Argentina	183.3	0.642	0.268	0.642	0.642	0.587	0.183	0.268	0.183	0.092
Australia	700.7	2.452	1.023	2.452	2.452	2.242	0.701	1.023	0.701	0.350
Austria	304.5	1.066	0.445	1.066	1.066	0.974	0.305	0.445	0.305	0.152
Bahrain	13.0	0.045	0.019	0.045	0.045	0.042	0.013	0.019	0.013	0.006
Belgium	364.7	1.277	0.533	1.277	1.277	1.167	0.365	0.533	0.365	0.182
Bosnia and Herzegovina	9.4	0.033	0.014	0.033	0.033	0.030	0.009	0.014	0.009	0.005
Brazil	794.1	2.779	1.159	2.779	2.779	2.541	0.794	1.159	0.794	0.397
Canada	1115.2	3.903	1.628	3.903	3.903	3.569	1.115	1.628	1.115	0.558
China	2228.9	7.801	3.254	7.801	7.801	7.132	2.229	3.254	2.229	1.114
Colombia	122.3	0.428	0.179	0.428	0.428	0.391	0.122	0.179	0.122	0.061
Cyprus	15.7	0.055	0.023	0.055	0.055	0.050	0.016	0.023	0.016	0.008
Czech Republic	122.3	0.428	0.179	0.428	0.428	0.392	0.122	0.179	0.122	0.061
Denmark	254.4	0.890	0.371	0.890	0.890	0.814	0.254	0.371	0.254	0.127
Egypt, Arab Rep.	89.3	0.313	0.130	0.313	0.313	0.286	0.089	0.130	0.089	0.045
Finland	193.2	0.676	0.282	0.676	0.676	0.618	0.193	0.282	0.193	0.097
France	2110.2	7.386	3.081	7.386	7.386	6.753	2.110	3.081	2.110	1.055
Georgia	6.4	0.022	0.009	0.022	0.022	0.020	0.006	0.009	0.006	0.003
Germany	2781.9	9.737	4.062	9.737	9.737	8.902	2.782	4.062	2.782	1.391
Greece	213.7	0.748	0.312	0.748	0.748	0.684	0.214	0.312	0.214	0.107
Haiti	4.2	0.015	0.006	0.015	0.015	0.014	0.004	0.006	0.004	0.002
Hungary	109.2	0.382	0.159	0.382	0.382	0.349	0.109	0.159	0.109	0.055
India	785.5	2.749	1.147	2.749	2.749	2.513	0.785	1.147	0.785	0.393
Indonesia	287.2	1.005	0.419	1.005	1.005	0.919	0.287	0.419	0.287	0.144
Ireland	196.4	0.687	0.287	0.687	0.687	0.628	0.196	0.287	0.196	0.098
Israel	123.4	0.432	0.180	0.913	0.469	0.395	0.432	0.913	0.432	0.432
Italy	1723.0	6.031	2.516	6.031	6.031	5.514	1.723	2.516	1.723	0.862
Japan	4505.9	15.771	6.579	15.771	15.771	14.419	4.506	6.579	4.506	2.253

Jordan	12.9	0.045	0.019	0.045	0.045	0.041	0.013	0.019	0.013	0.006
Kenya	18.0	0.063	0.026	0.063	0.063	0.058	0.018	0.026	0.018	0.009
Korea, Rep.	787.6	2.757	1.150	2.757	2.757	2.520	0.788	1.150	0.788	0.394
Kuwait	74.7	0.261	0.109	0.261	0.261	0.239	0.075	0.109	0.075	0.037
Lebanon	22.2	0.078	0.032	0.078	0.078	0.071	0.022	0.032	0.022	0.011
Luxembourg	33.8	0.118	0.049	0.118	0.118	0.108	0.034	0.049	0.034	0.017
Malaysia	130.1	0.456	0.190	0.456	0.456	0.416	0.130	0.190	0.130	0.065
Mexico	768.4	2.690	1.122	2.690	2.690	2.459	0.768	1.122	0.768	0.384
Morocco	51.7	0.181	0.076	0.181	0.181	0.166	0.052	0.076	0.052	0.026
Netherlands	594.8	2.082	0.868	2.082	2.082	1.903	0.595	0.868	0.595	0.297
New Zealand	109.0	0.382	0.159	0.382	0.382	0.349	0.109	0.159	0.109	0.055
Norway	283.9	0.994	0.415	0.994	0.994	0.909	0.284	0.415	0.284	0.142
Pakistan	110.7	0.388	0.162	0.388	0.388	0.354	0.111	0.162	0.111	0.055
Peru	78.4	0.275	0.115	0.275	0.275	0.251	0.078	0.115	0.078	0.039
Philippines	98.3	0.344	0.144	0.344	0.344	0.315	0.098	0.144	0.098	0.049
Poland	299.2	1.047	0.437	1.047	1.047	0.957	0.299	0.437	0.299	0.150
Portugal	173.1	0.606	0.253	0.606	0.606	0.554	0.173	0.253	0.173	0.087
Qatar	29.0	0.102	0.042	0.102	0.102	0.093	0.029	0.042	0.029	0.015
Romania	98.6	0.345	0.144	0.345	0.345	0.315	0.099	0.144	0.099	0.049
Russian Fed.	763.7	2.673	1.115	5.652	2.902	2.444	2.673	5.652	2.673	2.673
Saudi Arabia	309.8	1.084	0.452	1.084	1.084	0.991	0.310	0.452	0.310	0.155
Singapore	116.8	0.409	0.170	0.409	0.409	0.374	0.117	0.170	0.117	0.058
Slovak Republic	46.4	0.162	0.068	0.162	0.162	0.149	0.046	0.068	0.046	0.023
Slovenia	34.0	0.119	0.050	0.119	0.119	0.109	0.034	0.050	0.034	0.017
South Africa	240.2	0.841	0.351	0.841	0.841	0.768	0.240	0.351	0.240	0.120
Spain	1123.7	3.933	1.641	3.933	3.933	3.596	1.124	1.641	1.124	0.562
Sri Lanka	23.5	0.082	0.034	0.082	0.082	0.075	0.023	0.034	0.023	0.012
Sweden	354.1	1.239	0.517	1.239	1.239	1.133	0.354	0.517	0.354	0.177
Switzerland	365.9	1.281	0.534	1.281	1.281	1.171	0.366	0.534	0.366	0.183
Tanzania	12.1	0.042	0.018	0.042	0.042	0.039	0.012	0.018	0.012	0.006
Thailand	176.6	0.618	0.258	0.618	0.618	0.565	0.177	0.258	0.177	0.088
Turkey	363.3	1.272	0.530	1.272	1.272	1.163	0.363	0.530	0.363	0.182
Ukraine	81.7	0.286	0.119	0.286	0.286	0.261	0.082	0.119	0.082	0.041

United Kingdom	2192.6	7.674	3.201	16.225	8.332	7.016	7.674	16.225	3.201	3.201
United States	12455.1	43.593	43.593	92.168	47.329	39.856	43.593	92.168	43.593	43.593
Venezuela, RB	138.9	0.486	0.203	0.486	0.486	0.444	0.139	0.203	0.139	0.069
Yemen, Rep.	14.5	0.051	0.021	0.051	0.051	0.046	0.014	0.021	0.014	0.007
Total		147.19	86.81	207.78	151.85	134.57	80.89	153.68	76.42	63.16
FV2005		147.19	86.81	207.78	151.85	134.57	80.89	153.68	76.42	63.16
FV2006		150.14	88.54	211.93	154.89	137.27	82.51	156.75	77.95	64.42
FV2007		153.14	90.32	216.17	157.99	140.01	84.16	159.88	79.51	65.71
FV2008		156.20	92.12	220.49	161.15	142.81	85.84	163.08	81.10	67.02
FV2009		159.32	93.96	224.90	164.37	145.67	87.56	166.34	82.72	68.37
PV in billions of US$		695.09	409.94	981.19	717.09	635.51	382.00	725.71	360.87	298.26

Method 1 (**M1**): US homeland security percentage of 0.35 of GDP is applied to all sample countries.
Method 2 (**M2**): US homeland security percentage of 0.35 of GDP is applied to just the United States; UK homeland security percentage of 0.146 of GDP is applied to other sample countries.
Method 3 (**M3**): US homeland security plus Afghanistan/Iraq campaigns percentage of 0.74 of GDP is applied to United States, United Kingdom, Israel, and Russia; US homeland security percentage of 0.35 of GDP is applied to other sample countries.
Method 4 (**M4**): US homeland security percentage of 0.38 of GDP without Iraq campaign is applied to United States, United Kingdom, Israel, and Russia; US homeland security percentage of 0.35 of GDP is applied to other sample countries.
Method 5 (**M5**): US homeland security percentage of 0.32 of GDP is applied to all sample countries. This percentage equals the share of GDP that consists of 61% of US DHS budget plus $10 billion for private security.
Method 6 (**M6**): US homeland security of 0.35 of GDP is applied to the United States, United Kingdom, Israel, and Russia; 0.10% of GDP is applied to other sample countries.
Method 7 (**M7**): US homeland security percentage of 0.74 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to all other sample countries.
Method 8 (**M8**): US homeland security percentage of 0.35 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to United Kingdom; and 0.10% of GDP is applied to all other sample countries.
Method 9 (**M9**): US homeland security percentage of 0.35 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to the United Kingdom; and 0.05% of GDP is applied to other sample countries.

Table 12. Lost GDP Due to Transnational Terrorism Attacks[1]

Country	Pop (000)	T_i	per capita GDP	2005 Growth (%)	2005 Cost[2]	2005 Cost (average)[3]	5 year Cost in (Growth)[4]
Algeria	32,854	2	$2,066	3.65		$47,625	$229,081
Angola	15,941	1	891	10.90		14,889	87,969
Argentina	38,747	2	8,096	7.87		475,126	2,577,941
Australia	20,321	1	22,423	1.53		66,962	303,025
Bahrain	727	1	14,588	5.18		5,278	26,524
Bangladesh	141,822	1	415	3.43		19,427	92,866
Belgium	10,471	1	23,381	0.72		16,980	75,069
Bosnia-Herzegovina	3,907	4	1,486	5.25	$14,658	11,726	59,052
Brazil	186,405	2	3,597	0.92		118,876	528,604
Burundi	7,548	2	105	–1.89		288	1,179
Cambodia	14,071	1	356	4.89		2,357	11,751
Chad	9,749	1	267	2.27		569	2,631
Chile	16,295	1	5,747	5.09		45,813	229,633
Colombia	45,600	3	2,174	3.51		100,425	481,162
Congo-Brazzaville	57,549	4	997	5.89	162,441	129,952	666,418
Czech Republic	10,196	1	6,515	5.98		38,190	196,345
Denmark	5,418	1	31,607	2.80		46,082	216,312
Ecuador	13,228	1	1,534	2.37		4,635	21,494
Egypt	74,033	3	1,662	2.87	169,746	101,848	479,055
El Salvador	6,881	1	2,127	0.99		1,397	6,224
Eritrea	4,401	1	176	1.14		85	381
Germany	82,485	3	23,928	0.94		533,246	2,372,185
France	60,743	4	23,641	0.89		490,591	2,179,380
Georgia	4,474	3	23,928	0.94		28,926	128,679
Greece	11,089	2	12,367	3.35		88,280	420,980
Haiti	8,528	2	428	0.70	1,235	494	2,182
Hong Kong	6,944	1	29,945	6.14		122,699	633,683
India	1,094,583	4	586	6.70	2,068,104	1,654,484	8,684,099
Indonesia	220,558	4	942	4.12	411,415	329,132	1,604,632
Iran	67,700	2	1,962	4.75		121,346	602,393
Israel	6,909	4	18,406	3.42		167,090	798,377
Italy	57,471	4	19,387	0.18		77,457	337,112
Jordan	5,411	3	2,091	4.45	24,211	14,527	71,500
Kenya	34,256	2	428	0.23		660	2,876
Kuwait	2,535	4	20,578	5.12	128,457	102,766	515,586
Kyrgyzstan	5,156	2	319	–1.56		492	2,036
Lebanon	3,577	3	5,627	–0.02	172	103	447
Libya	5,853	1	7,517	1.53		6,467	29,267
Macedonia	2,034	1	1,889	3.72		1,375	6,629
Madagascar	18,606	1	233	1.73		722	3,287
Malaysia	25,347	3	4,434	3.30		107,068	509,914
Mauritania	3,069	1	447	2.26	1,493	299	1,380
Mexico	103,089	1	6,172	1.90		116,112	531,078
Morocco	30,168	2	1,354	0.37		2,907	12,722
Netherlands	16,329	1	23,535	0.80		29,646	131,369
Nigeria	131,530	1	420	4.38	116,369	23,274	114,324

Norway	4,618	1	39,666	1.68		29,610	134,585
Pakistan	155,772	4	596	5.16	230,590	184,472	926,708
Peru	27,968	2	2,319	5.00		62,326	311,590
Philippines	83,054	3	1,124	3.26		87,686	417,052
Saudi Arabia	24,573	4	9,323	3.78		333,331	1,609,538
Sierra Leone	5,525	1	218	3.74		433	2,089
Singapore	4,351	1	25,443	3.60		38,306	183,991
Solomon Islands	478	1	647	1.71		51	232
Spain	43,389	3	15,610	1.73		337,165	1,534,497
Sri Lanka	19,582	3	1,004	4.27		24,242	118,717
Sudan	36,233	4	462	5.56	44,785	35,828	182,042
Sweden	9,024	1	29,532	2.31		59,178	273,899
Syria	19,043	1	1,161	1.65		3,509	15,935
Tajikistan	6,507	1	237	6.09		903	4,658
Thailand	64,233	3	2,440	3.50		158,429	758,908
Tunisia	10,022	1	2,418	3.24		7,543	35,856
Turkey	72,636	5	3,390	5.86	694,126	694,126	3,557,020
United Kingdom	60,203	4	26,688	1.23	946,715	757,372	3,397,505
United States	296,497	3	37,574	2.48	13,266,740	7,960,044	37,020,669
Russia	143,151	5	2,444	6.68	1,124,468	1,124,468	5,898,583
Uzbekistan	26,593	1	673	5.18		8,924	44,854
Venezuela	26,577	2	4,939	7.20		181,743	967,393
Yemen	20,975	4	590	1.02	6,083	4,867	21,703
Totals					**$19,411,808**	**$17,363,247**	**$83,406,855**

[1]Pop = Population in 2005 in thousands; T_i = Number of years during 2001-2005 in which there was at least one terrorist event; per capita GDP = per capita GDP in thousands of real 2000 US dollars; 2005 Growth = growth rate of per capita GDP between 2004 and 2005 (in percent); 2005 Cost = estimated real GDP cost of terrorism (in thousands) using the 2005 measure of terrorist incidents; 2005 Cost (average) = estimated real GDP cost of terrorism (in thousands) using the average level of terrorism over the 2001-2005 period; 5 year cost = real present value of 2005 Cost (average) (in thousands) over the next five years using a 5% discount rate.

[2]If a country had at least one terrorist in 2005, the entry for 2005 cost is measured as (Pop × per capita GDP) × (2005 growth/100) × 0.048.

[3]The entries for 2005 cost (average) is computed as: (T_i/5)(Pop × per capita GDP) × (2005 growth/100) × 0.048.

[4]5 year cost is the present value of the entry for 2005 cost (average) for each of the next four years discounted at a 5% real interest rate. The 'Growth' entries project that per capita GDP levels continue at their 2005 growth rates.

Table 13. Solutions: Benefits, Costs, and Benefit-Cost Ratios Based on 5% Discount Rate (Benefits and Costs are in billions of US $)

	$5000 DALY			$2 Million Value of Life		
Solutions	Benefits	Costs	BCR	Benefits	Costs	BCR
Solution 1 (M9)[1]	28.343	298.3	0.095	28.094	298.3	0.094
Solution 1 (M7)[1]	28.343	727.7	0.039	28.094	727.7	0.039
Solution 2A[2]	20.000	3.74	5.348	___	___	___
Solution 2B[2]	20.000	1.29	15.504	___	___	___
Solution 3A[3]	4.335	56.5	0.077	2.657	56.5	0.047
Solution 3B[3]	4.335	35.5	0.122	2.657	35.5	0.075
Solution 4	20.969	74.6	0.281	22.706	74.6	0.304
Solution 5	38.217	___	___	38.930	___	___

[1]Solution 1 (M9) is based on Method 9 in Table 11 for calculating homeland security expense; Solution 1 (M7) is based on Method 7 in Table 11 for calculating homeland security expense.
[2]Solution 2A uses a higher costs for police cooperation and IMF monitoring than Solution 2B. DALY and Value of Life do not figure into the calculations of benefits for Solution 2A and 2B.
[3]Solution 3A is based on the cost of Operation Enduring Freedom (Afghanistan) and Operation Noble Eagle, while Solution 3B is only based on the cost of Operation Enduring Freedom.

Table 14. Types of Chemical, Biological, Radiological, and Nuclear Attacks

- *Chemical attacks*
  - Nerve agents (for example, sarin, VX)
  - Blood agents (for example, hydrogen cyanide)
  - Choking agents (for example, chlorine)
  - Blistering agents (for example, mustard gas)

- *Biological attacks*
  - Poison (for example, ricin, botulinum toxin)
  - Viruses (for example, smallpox, viral hemorrhagic fevers, flu)
  - Bacteria (for example, anthrax)
  - Plagues (for example, black plague, tularemia)

- *Radiological attacks*
  - Radiological dispersement device (for example, dirty bomb)
  - Spread radioactive contaminants without a bomb or device

- *Nuclear terrorism*
  - Attack against a nuclear facility
  - Exploding a nuclear bomb
  - Stealing a bomb and blackmail

Source: Enders and Sandler (2006a, Table 11.1), Institute of Medicine (2002), and White (2003).

Appendix

The following tables relate to the use of a 3% discount rate when computing the cost of homeland security (Table 11A) and lost GDP due to transnational terrorism (Table 12A). Table 13A replicates Table 13 but based on a 3% discount rate.

Table 11A. Worldwide Homeland Security Estimates Under Nine Alternative Methods (in $billions): 3% discount rate

Country	GDP 2005 (current US$)	M1	M2	M3	M4	M5	M6	M7	M8	M9
Afghanistan	7.2	0.025	0.010	0.025	0.025	0.023	0.007	0.010	0.007	0.004
Algeria	102.3	0.358	0.149	0.358	0.358	0.327	0.102	0.149	0.102	0.051
Argentina	183.3	0.642	0.268	0.642	0.642	0.587	0.183	0.268	0.183	0.092
Australia	700.7	2.452	1.023	2.452	2.452	2.242	0.701	1.023	0.701	0.350
Austria	304.5	1.066	0.445	1.066	1.066	0.974	0.305	0.445	0.305	0.152
Bahrain	13.0	0.045	0.019	0.045	0.045	0.042	0.013	0.019	0.013	0.006
Belgium	364.7	1.277	0.533	1.277	1.277	1.167	0.365	0.533	0.365	0.182
Bosnia and Herzegovina	9.4	0.033	0.014	0.033	0.033	0.030	0.009	0.014	0.009	0.005
Brazil	794.1	2.779	1.159	2.779	2.779	2.541	0.794	1.159	0.794	0.397
Canada	1115.2	3.903	1.628	3.903	3.903	3.569	1.115	1.628	1.115	0.558
China	2228.9	7.801	3.254	7.801	7.801	7.132	2.229	3.254	2.229	1.114
Colombia	122.3	0.428	0.179	0.428	0.428	0.391	0.122	0.179	0.122	0.061
Cyprus	15.7	0.055	0.023	0.055	0.055	0.050	0.016	0.023	0.016	0.008
Czech Republic	122.3	0.428	0.179	0.428	0.428	0.392	0.122	0.179	0.122	0.061
Denmark	254.4	0.890	0.371	0.890	0.890	0.814	0.254	0.371	0.254	0.127
Egypt, Arab Rep.	89.3	0.313	0.130	0.313	0.313	0.286	0.089	0.130	0.089	0.045
Finland	193.2	0.676	0.282	0.676	0.676	0.618	0.193	0.282	0.193	0.097
France	2110.2	7.386	3.081	7.386	7.386	6.753	2.110	3.081	2.110	1.055
Georgia	6.4	0.022	0.009	0.022	0.022	0.020	0.006	0.009	0.006	0.003
Germany	2781.9	9.737	4.062	9.737	9.737	8.902	2.782	4.062	2.782	1.391
Greece	213.7	0.748	0.312	0.748	0.748	0.684	0.214	0.312	0.214	0.107
Haiti	4.2	0.015	0.006	0.015	0.015	0.014	0.004	0.006	0.004	0.002
Hungary	109.2	0.382	0.159	0.382	0.382	0.349	0.109	0.159	0.109	0.055
India	785.5	2.749	1.147	2.749	2.749	2.513	0.785	1.147	0.785	0.393
Indonesia	287.2	1.005	0.419	1.005	1.005	0.919	0.287	0.419	0.287	0.144
Ireland	196.4	0.687	0.287	0.687	0.687	0.628	0.196	0.287	0.196	0.098
Israel	123.4	0.432	0.180	0.913	0.469	0.395	0.432	0.913	0.432	0.432
Italy	1723.0	6.031	2.516	6.031	6.031	5.514	1.723	2.516	1.723	0.862
Japan	4505.9	15.771	6.579	15.771	15.771	14.419	4.506	6.579	4.506	2.253
Jordan	12.9	0.045	0.019	0.045	0.045	0.041	0.013	0.019	0.013	0.006

Kenya	18.0	0.063	0.026	0.063	0.063	0.058	0.018	0.026	0.018	0.009
Korea, Rep.	787.6	2.757	1.150	2.757	2.757	2.520	0.788	1.150	0.788	0.394
Kuwait	74.7	0.261	0.109	0.261	0.261	0.239	0.075	0.109	0.075	0.037
Lebanon	22.2	0.078	0.032	0.078	0.078	0.071	0.022	0.032	0.022	0.011
Luxembourg	33.8	0.118	0.049	0.118	0.118	0.108	0.034	0.049	0.034	0.017
Malaysia	130.1	0.456	0.190	0.456	0.456	0.416	0.130	0.190	0.130	0.065
Mexico	768.4	2.690	1.122	2.690	2.690	2.459	0.768	1.122	0.768	0.384
Morocco	51.7	0.181	0.076	0.181	0.181	0.166	0.052	0.076	0.052	0.026
Netherlands	594.8	2.082	0.868	2.082	2.082	1.903	0.595	0.868	0.595	0.297
New Zealand	109.0	0.382	0.159	0.382	0.382	0.349	0.109	0.159	0.109	0.055
Norway	283.9	0.994	0.415	0.994	0.994	0.909	0.284	0.415	0.284	0.142
Pakistan	110.7	0.388	0.162	0.388	0.388	0.354	0.111	0.162	0.111	0.055
Peru	78.4	0.275	0.115	0.275	0.275	0.251	0.078	0.115	0.078	0.039
Philippines	98.3	0.344	0.144	0.344	0.344	0.315	0.098	0.144	0.098	0.049
Poland	299.2	1.047	0.437	1.047	1.047	0.957	0.299	0.437	0.299	0.150
Portugal	173.1	0.606	0.253	0.606	0.606	0.554	0.173	0.253	0.173	0.087
Qatar	29.0	0.102	0.042	0.102	0.102	0.093	0.029	0.042	0.029	0.015
Romania	98.6	0.345	0.144	0.345	0.345	0.315	0.099	0.144	0.099	0.049
Russian Fed.	763.7	2.673	1.115	5.652	2.902	2.444	2.673	5.652	2.673	2.673
Saudi Arabia	309.8	1.084	0.452	1.084	1.084	0.991	0.310	0.452	0.310	0.155
Singapore	116.8	0.409	0.170	0.409	0.409	0.374	0.117	0.170	0.117	0.058
Slovak Republic	46.4	0.162	0.068	0.162	0.162	0.149	0.046	0.068	0.046	0.023
Slovenia	34.0	0.119	0.050	0.119	0.119	0.109	0.034	0.050	0.034	0.017
South Africa	240.2	0.841	0.351	0.841	0.841	0.768	0.240	0.351	0.240	0.120
Spain	1123.7	3.933	1.641	3.933	3.933	3.596	1.124	1.641	1.124	0.562
Sri Lanka	23.5	0.082	0.034	0.082	0.082	0.075	0.023	0.034	0.023	0.012
Sweden	354.1	1.239	0.517	1.239	1.239	1.133	0.354	0.517	0.354	0.177
Switzerland	365.9	1.281	0.534	1.281	1.281	1.171	0.366	0.534	0.366	0.183
Tanzania	12.1	0.042	0.018	0.042	0.042	0.039	0.012	0.018	0.012	0.006
Thailand	176.6	0.618	0.258	0.618	0.618	0.565	0.177	0.258	0.177	0.088
Turkey	363.3	1.272	0.530	1.272	1.272	1.163	0.363	0.530	0.363	0.182
Ukraine	81.7	0.286	0.119	0.286	0.286	0.261	0.082	0.119	0.082	0.041
United Kingdom	2192.6	7.674	3.201	16.225	8.332	7.016	7.674	16.225	3.201	3.201

United States	12455.1	43.593	43.593	92.168	47.329	39.856	43.593	92.168	43.593	43.593
Venezuela, RB	138.9	0.486	0.203	0.486	0.486	0.444	0.139	0.203	0.139	0.069
Yemen, Rep.	14.5	0.051	0.021	0.051	0.051	0.046	0.014	0.021	0.014	0.007
Total		147.19	86.81	207.78	151.85	134.57	80.89	153.68	76.42	63.16
FV2005		147.19	86.81	207.78	151.85	134.57	80.89	153.68	76.42	63.16
FV2006		150.14	88.54	211.93	154.89	137.27	82.51	156.75	77.95	64.42
FV2007		153.14	90.32	216.17	157.99	140.01	84.16	159.88	79.51	65.71
FV2008		156.20	92.12	220.49	161.15	142.81	85.84	163.08	81.10	67.02
FV2009		159.32	93.96	224.90	164.37	145.67	87.56	166.34	82.72	68.37
PV in billions of US$		721.8	425.7	1018.9	744.7	659.9	396.7	753.6	374.7	309.7

Method 1 (**M1**): US homeland security percentage of 0.35 of GDP is applied to all sample countries.
Method 2 (**M2**): US homeland security percentage of 0.35 of GDP is applied to just the United States; UK homeland security percentage of 0.146 of GDP is applied to other sample countries.
Method 3 (**M3**): US homeland security plus Afghanistan/Iraq campaigns percentage of 0.74 of GDP is applied to United States, United Kingdom, Israel, and Russia; US homeland security percentage of 0.35 of GDP is applied to other sample countries.
Method 4 (**M4**): US homeland security percentage of 0.38 of GDP without Iraq campaign is applied to United States, United Kingdom, Israel, and Russia; US homeland security percentage of 0.35 of GDP is applied to other sample countries.
Method 5 (**M5**): US homeland security percentage of 0.32 of GDP is applied to all sample countries. This percentage equals the share of GDP that consists of 61% of US DHS budget plus $10 billion for private security.
Method 6 (**M6**): US homeland security of 0.35 of GDP is applied to the United States, United Kingdom, Israel, and Russia; 0.10% of GDP is applied to other sample countries.
Method 7 (**M7**): US homeland security percentage of 0.74 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to all other sample countries.
Method 8 (**M8**): US homeland security percentage of 0.35 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to United Kingdom; and 0.10% of GDP is applied to all other sample countries.
Method 9 (**M9**): US homeland security percentage of 0.35 of GDP is applied to the United States, Israel, and Russia; UK homeland security percentage of 0.146 of GDP is applied to the United Kingdom; and 0.05% of GDP is applied to other sample countries.

Table 12A. Lost GDP Due to Transnational Terrorism Attacks[1] (3% Discount Rate)

Country	Pop (000)	T_i	per capita GDP	2005 Growth (%)	2005 Cost[2]	2005 Cost (average)[3]	5 year Cost in (Growth)[4]
Algeria	32,854	2	$2,066	3.65		$47,625	$242,655
Angola	15,941	1	891	10.90		14,889	93,424
Argentina	38,747	2	8,096	7.87		475,126	2,734,894
Australia	20,321	1	22,423	1.53		66,962	320,725
Bahrain	727	1	14,588	5.18		5,278	28,111
Bangladesh	141,822	1	415	3.43		19,427	98,361
Belgium	10,471	1	23,381	0.72		16,980	79,430
Bosnia-Herzegovina	3,907	4	1,486	5.25	$14,658	11,726	62,588
Brazil	186,405	2	3,597	0.92		118,876	559,353
Burundi	7,548	2	105	–1.89		288	1,246
Cambodia	14,071	1	356	4.89		2,357	12,454
Chad	9,749	1	267	2.27		569	2,785
Chile	16,295	1	5,747	5.09		45,813	243,368
Colombia	45,600	3	2,174	3.51		100,425	509,647
Congo-Brazzaville	57,549	4	997	5.89	162,441	129,952	706,486
Czech Republic	10,196	1	6,515	5.98		38,190	208,157
Denmark	5,418	1	31,607	2.80		46,082	229,057
Ecuador	13,228	1	1,534	2.37		4,635	22,756
Egypt	74,033	3	1,662	2.87	169,746	101,848	507,294
El Salvador	6,881	1	2,127	0.99		1,397	6,586
Eritrea	4,401	1	176	1.14		85	403
Germany	82,485	3	23,928	0.94		533,246	2,510,188
France	60,743	4	23,641	0.89		490,591	2,306,124
Georgia	4,474	3	23,928	0.94		28,926	136,165
Greece	11,089	2	12,367	3.35		88,280	445,875
Haiti	8,528	2	428	0.70	1,235	494	2,309
Hong Kong	6,944	1	29,945	6.14		122,699	671,844
India	1,094,583	4	586	6.70	2,068,104	1,654,484	9,208,957
Indonesia	220,558	4	942	4.12	411,415	329,132	1,700,009
Iran	67,700	2	1,962	4.75		121,346	638,347
Israel	6,909	4	18,406	3.42		167,090	845,612
Italy	57,471	4	19,387	0.18		77,457	356,621
Jordan	5,411	3	2,091	4.45	24,211	14,527	75,759
Kenya	34,256	2	428	0.23		660	3,042
Kuwait	2,535	4	20,578	5.12	128,457	102,766	546,433
Kyrgyzstan	5,156	2	319	–1.56		492	2,153
Lebanon	3,577	3	5,627	–0.02	172	103	472
Libya	5,853	1	7,517	1.53		6,467	30,976
Macedonia	2,034	1	1,889	3.72		1,375	7,022
Madagascar	18,606	1	233	1.73		722	3,479
Malaysia	25,347	3	4,434	3.30		107,068	540,059
Mauritania	3,069	1	447	2.26	1,493	299	1,461
Mexico	103,089	1	6,172	1.90		116,112	562,179
Morocco	30,168	2	1,354	0.37		2,907	13,459

Netherlands	16,329	1	23,535	0.80		29,646	139,004
Nigeria	131,530	1	420	4.38	116,369	23,274	121,131
Norway	4,618	1	39,666	1.68		29,610	142,455
Pakistan	155,772	4	596	5.16	230,590	184,472	982,168
Peru	27,968	2	2,319	5.00		62,326	330,217
Philippines	83,054	3	1,124	3.26		87,686	441,699
Saudi Arabia	24,573	4	9,323	3.78		333,331	1,704,995
Sierra Leone	5,525	1	218	3.74		433	2,213
Singapore	4,351	1	25,443	3.60		38,306	194,889
Solomon Islands	478	1	647	1.71		51	246
Spain	43,389	3	15,610	1.73		337,165	1,624,253
Sri Lanka	19,582	3	1,004	4.27		24,242	125,781
Sudan	36,233	4	462	5.56	44,785	35,828	192,965
Sweden	9,024	1	29,532	2.31		59,178	289,984
Syria	19,043	1	1,161	1.65		3,509	16,867
Tajikistan	6,507	1	237	6.09		903	4,939
Thailand	64,233	3	2,440	3.50		158,429	803,834
Tunisia	10,022	1	2,418	3.24		7,543	37,975
Turkey	72,636	5	3,390	5.86	694,126	694,126	3,770,854
United Kingdom	60,203	4	26,688	1.23	946,715	757,372	3,595,552
United States	296,497	3	37,574	2.48	13,266,740	7,960,044	39,197,172
Russia	143,151	5	2,444	6.68	1,124,468	1,124,468	6,255,039
Uzbekistan	26,593	1	673	5.18		8,924	47,539
Venezuela	26,577	2	4,939	7.20		181,743	1,026,043
Yemen	20,975	4	590	1.02	6,083	4,867	22,966
Totals					**$19,411,808**	**$17,363,247**	**$88,349,106**

[1]Pop = Population in 2005 in thousands; T_i = Number of years during 2001-2005 in which there was at least one terrorist event; per capita GDP = per capita GDP in thousands of real 2000 US dollars; 2005 Growth = growth rate of per capita GDP between 2004 and 2005 (in percent); 2005 Cost = estimated real GDP cost of terrorism (in thousands) using the 2005 measure of terrorist incidents; 2005 Cost (average) = estimated real GDP cost of terrorism (in thousands) using the average level of terrorism over the 2001-2005 period; 5 year cost = real present value of 2005 Cost (average) (in thousands) over the next five years using a 3% discount rate.

[2]If a country had at least one terrorist in 2005, the entry for 2005 cost is measured as (Pop × per capita GDP) × (2005 growth/100) × 0.048.

[3]The entries for 2005 cost (average) is computed as: (T_i/5)(Pop × per capita GDP) × (2005 growth/100) × 0.048.

[4]5 year cost is the present value of the entry for 2005 cost (average) for each of the next four years discounted at a 3% real interest rate. The 'Growth' entries project that per capita GDP levels continue at their 2005 growth rates.

Table 13A. Solutions: Benefits, Costs, and Benefit-Cost Ratios Based on 3% Discount Rate (Benefits and Costs are in billions of US $)

	$5000 DALY			$2 Million Value of Life		
Solutions	Benefits	Costs	BCR	Benefits	Costs	BCR
Solution 1 (M9)[1]	30.032	309.7	0.097	30.326	309.7	0.098
Solution 1 (M7)[1]	30.032	753.6	0.040	30.326	753.6	0.040
Solution 2A[2]	33.333	6.23	5.348	___	___	___
Solution 2B[2]	33.333	2.15	15.504	___	___	___
Solution 3A[3]	4.373	56.5	0.077	2.678	56.5	0.047
Solution 3B[3]	4.373	35.5	0.123	2.678	35.5	0.075
Solution 4	22.185	77.425	0.287	24.928	77.425	0.321
Solution 5	40.843	___	___	41.550	___	___

[1]Solution 1 (M9) is based on Method 9 in Table 11 for calculating homeland security expense; Solution 1 (M7) is based on Method 7 in Table 11 for calculating homeland security expense.
[2]Solution 2A uses higher costs for police cooperation and IMF monitoring than Solution 2B. DALY and Value of Life do not figure into the calculations of benefits for Solution 2A and 2B.
[3]Solution 3A is based on the cost of Operation Enduring Freedom (Afghanistan) and Operation Noble Eagle, while Solution 3B is only based on the cost of Operation Enduring Freedom.