



The Economics of Terrorism

Economics Methods of Analysis in the Study of Terrorism and Counterterrorism

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DRDC CORA CR 2010-277
December 2010

Defence R&D Canada
Centre for Operational Research & Analysis



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Defence R&D Canada – CORA

Contract Report
DRDC CORA CR 2010-277
December 2010

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Abstract

The Directorate of Future Security Analysis (DFSA) is in the process of developing a Major Terrorist Event concept. This study is intended to inform the concept writers of various aspects of terrorism and counterterrorism derived from using analytical methods found in the discipline of economics. Economics is an appropriate discipline to study the terrorism phenomenon because it constructs theoretical models upon which empirical hypotheses are formulated and tested. By incorporating literature reviews, empirical studies and a variety of theoretical constructs, this study will provide the Department of National Defence (DND) and the Canadian Forces (CF) with analyses germane to development of an integrated counterterrorism concept by identifying how counterterrorism policy issues and capability deficiencies arise from sub-optimal resource allocation and asymmetric (or imperfect) information.

Résumé

Le Directeur – Analyse de la sécurité future (DASF) a entrepris d'élaborer un concept d'événement terroriste d'envergure. Cette étude vise à renseigner les rédacteurs de concepts sur divers aspects du terrorisme et du contreterrorisme par suite de l'utilisation de méthodes d'analyse économique. L'économie est une discipline appropriée pour étudier le phénomène du terrorisme parce qu'elle construit des modèles théoriques à partir desquels des hypothèses empiriques sont formulées et vérifiées. En intégrant l'examen de documents pertinents, d'études empiriques et de divers construits théoriques, cette étude fournira au ministère de la Défense nationale (MDN) et aux Forces canadiennes (FC) des analyses utiles à l'élaboration d'un concept intégré de lutte contre le terrorisme en relevant comment une attribution sous-optimale des ressources et une information asymétrique (ou imparfaite) aboutissent à des questions de politiques et à des insuffisances en capacités en matière de lutte contre le terrorisme.

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Executive summary

The Economics of Terrorism: Economics Methods of Analysis in the Study of Terrorism and Counter-Terrorism

Stocker, Michael; DRDC CORA CR 2010-277; Defence R&D Canada – CORA; December 2010.

Introduction or background: The Chief of Force Development has tasked the Directorate of Future Security Analysis with writing integrating concepts for each of the six missions outlined in the 2008 *Canada First Defence Strategy*. The Integrated Concept Development Team (ICDT 2) responsible for researching and writing the Major Terrorist Event (MTE) Concept has been using a methodology where the main concept report will be supported by academic background papers that present the literature, research, and analysis behind the conclusions, implications, and general findings outlined in the main MTE Concept report. This series of papers covers definitions, governance and legislation, lessons learned, future terrorist attacks, as well as cyber threats and strategic communications. The authors have been Major Alain Rollin, Major Meaghan Setter, and Dr Rachel Lea Heide, under the leadership of LCol William Yee.

Results: The ICDT 2 writing team did not have the time or capability to research the economic aspects of terrorism in-depth nor to the level of comprehension that an expert in defence economics would already possess. With the help of DRDC CORA, an expert in defence economics was identified and contracted to write an academic background paper on "The Economics of Terrorism."

Significance: A review was conducted of significant literature, empirical studies, and a variety of theoretical constructs pertaining to economic aspects of terrorism. In addition to outlining definitions, data sources, choice theory, game theory, and the economic consequences of terrorism, this study identifies how counterterrorism policy issues and capability deficiencies arise from sub-optimal resource allocation and asymmetric (or imperfect) information.

Future plans: This report serves as a useful supporting paper to the MTE Concept and complements the series of papers compiled to accompany and inform the MTE Concept, thus ensuring that the methodology for research has not overlooked the economic aspects of terrorism.

Sommaire

The Economics of Terrorism: Economics Methods of Analysis in the Study of Terrorism and Counter-Terrorism

Stocker, Michael; DRDC CORA CR 2010-277; R & D pour la défense Canada – CORA; Décembre 2010.

Introduction ou contexte: Le Chef – Développement des forces a chargé le Directeur – Analyse de la sécurité future de rédiger des concepts d'intégration pour chacune des six missions énoncées dans la Stratégie de défense *Le Canada d'abord* de 2008. L'Équipe intégrée de développement de concepts (EIDC 2) responsable de la recherche et de la rédaction concernant le concept d'événement terroriste d'envergure utilise une méthodologie selon laquelle le rapport de concept principal s'appuiera sur des études générales de chercheurs qui présentent la documentation et les travaux de recherche et d'analyse qui sous-tendent les constatations, les implications et les conclusions générales énoncées dans le rapport de concept principal sur l'événement terroriste d'envergure. Cette série d'études porte sur les définitions, la gouvernance et la législation, les leçons retenues, les attentats terroristes de l'avenir, ainsi que les cybermenaces et les communications stratégiques. Les auteurs sont le Maj Alain Rollin, le Maj Meaghan Setter et M^{me} Rachel Lea Heide, Ph.D., sous la direction du Lcol William Yee.

Résultats: L'équipe de rédaction de l'EIDC 2 n'avait pas le temps ni les moyens de faire des recherches approfondies sur l'aspect économique du terrorisme, ni le niveau de compréhension qu'un expert en économie de la défense posséderait déjà. Avec l'aide du CARO RDDC, on a identifié un expert en économie de la défense et un marché a été conclu avec lui en vue de la rédaction d'une étude générale de chercheur sur « l'économie du terrorisme ».

Importance: L'expert a procédé à l'examen de documents pertinents, d'études empiriques et de divers construits théoriques liés aux aspects économiques du terrorisme. En plus de présenter des définitions, des sources de données, la théorie des choix, la théorie des jeux et les conséquences économiques du terrorisme, l'auteur de cette étude révèle comment une attribution sous-optimale des ressources et une information asymétrique (ou imparfaite) aboutissent à des questions de politiques et à des insuffisances en capacités en matière de lutte contre le terrorisme.

Perspectives: Le rapport constitue un document utile d'appui au concept d'événement terroriste d'envergure et il complète la série d'études élaborées pour accompagner et expliquer ledit concept, ce qui fait en sorte que la méthodologie de recherche ne néglige pas les aspects économiques du terrorisme.

Table of contents

Abstract	i
Résumé	i
Executive summary	iii
Sommaire	iv
Table of contents	v
List of figures	vi
1 Introduction.....	1
2 Definitions	3
3 Data Sources	5
3.1 Policy Recommendations	6
4 Statistical Properties of the ITERATE Data Set	7
4.1 Spectral Analysis	10
4.2 Intervention Analysis.....	11
4.3 Policy Recommendations	11
5 Terrorism and Democratic Societies.....	13
6 Civil Liberties versus Terrorism Risk.....	15
7 Choice Theory and its Applications.....	18
7.1 Policy Recommendations	20
8 Game Theory and its Applications	22
8.1 Transnational Externalities	23
8.2 Asymmetries among Actors	24
8.3 Policy Recommendations	25
9 Economic Consequences of Terrorism	27
9.1 Economic Growth and Terrorism	27
9.1.1 Case Study: United States and 9/11	28
9.1.2 Case Study: Israel.....	30
9.1.3 Case Study: Spain	31
9.1.4 Conclusion	32
9.2 Policy Recommendations	33
10 Conclusion	34
11 Summary of Policy Recommendations.....	36
Bibliography	37
List of symbols/abbreviations/acronyms/initialisms	41
Glossary	42
Distribution list.....	43

List of figures

Figure 1 - All Incidents and Bombings 7

Figure 2 – Hostage Incidents and Assassinations..... 8

Figure 3 – Proportion of Incidents with Casualties 9

Figure 4 – Terrorism Risk versus Civil Liberties Trade-off..... 15

1 Introduction

The spectacular attacks on New York City and the Pentagon by al-Qaeda terrorists on 11 September 2001 elevated transnational terrorism to the top of the international security agenda. Despite being at the height of its global preeminence, a relatively low-tech, though highly coordinated operation, brought destruction to the United States mainland in a way that no conventional adversary in history had ever done. The attacks served as a watershed event demonstrating how a highly motivated group of individuals utilized advances in telecommunications and transportation to intimidate the world's only superpower and its allies. Unlike previous eras of transnational terrorism, the 1970s for example, where left-wing terrorist groups sought to achieve political goals (such as winning over a particular constituency), the objective of today's modern fundamentalist terror group is one which seeks to inflict maximum human casualty and destruction to produce widespread fear, panic and insecurity in the targeted society.¹ In this respect, the attacks succeeded; Americans specifically, but Westerners in general, experienced a level of personal insecurity perhaps not felt since the height of the Cold War.

Since 9/11 and at the behest of governments around the world, studies of terrorism have proliferated and risen in prominence in academic and public policy circles. Unlike the discipline of political science, which has a large literature on terrorism,² the study of terrorism in economics is a relatively novel endeavour and originates with the work of Landes (1978) and Sandler, Tschirhart and Cauley (1983) subsequently.³ While both approaches tend to be policy-oriented, economic studies construct theoretical models upon which empirical hypotheses are formulated and tested. Economic studies rely on statistical inference whereas the bulk of political science literature depends on informed observation, case studies, institutional details and taxonomy. Economic studies are primarily concerned with predicting behaviour; therefore, they employ rational-actor representations which depict an individual or collective (e.g., terrorist group, government negotiators) as optimizing some goal (utility or net benefit) subject to a set of constraints. These are known as Choice-theoretic models. Game-theoretic models are employed when strategic interactions of two or more sets of optimizing agents are considered, and each set engages in actions that alter the choices of the other set of agents.

Recent economic studies of terrorism have focused on evaluating government intervention and terror-thwarting policies; most prominently, these include: negotiation strategies for managing hostage-taking missions; terrorists' choice of targets; retaliation decisions against state sponsors of terrorism; the effectiveness of alternative anti-terrorist policies; and, the process of international treaty formation. As will be demonstrated, it is often the case that legislative policy gaps and capability deficiencies arise from sub-optimal resource allocation and asymmetric (or imperfect) information held by decision-makers.

¹ On the changing nature of terrorism, see Hoffman (1998), White (2003), and Wilkinson (2001).

² Crenshaw (1992).

³ Landes (1978) applied the economics of crime and punishment to the study of airline hijackings in the United States. Sandler, Tschirhart, and Cauley (1983) provided the first game-theoretic model for transnational terrorism analysis.

As requested, the study will be structured in typical academic fashion. Following the introduction of the study, the author will provide a broad working definition of terrorism (to be qualified when necessary) as well as some criticisms offered by notables in the field. The study will then examine some statistical properties of terrorism activity gathered from generally accepted data sources. The challenges posed by terrorism to the values of a liberal democracy are taken up in a discussion of the terrorism risk versus civil liberties tradeoff. The study will then discuss the two main theoretical constructs, Choice Theory and Game Theory, most often used to describe the expected utility options of terrorists and their targets. Concurrently, policy predictions based on these theoretical models – which encapsulate the central counterterrorism challenges of transference and international cooperation respectively – will be explored. Finally, the economic consequences of terrorist activity will be investigated with particular attention given to short-versus long-run domestic economic performance, indicator analysis, efficacy of mitigation policies, and international economic consequences.

2 Definitions

In this study, “terrorism” will be defined as “the premeditated use or threat of use of extra-normal violence or brutality by sub-national groups to obtain a political, religious, or ideological objective through intimidation of a huge audience, usually not directly involved with the policymaking that the terrorists seek to influence”.⁴ Implicitly, the definition has two main components: the presence or threat of violence and a political or social motive. In the absence of perceived credible threat of violence, the terrorist has no means of compelling action on behalf of policymakers and in the absence of political or social motive, a terrorist attack is merely a criminal act, albeit a violent one. Terrorists seek to broaden their audience of victims to make attacks appear random and thus induce widespread fear. As well, terrorist acts are often well planned and well executed; this demonstrates an effort on their part to account for the risks, costs and potential gains of an attack.

When a terrorist incident in one country involves victims, targets, institutions, governments or citizens of another country, terrorism assumes a transnational character. A skyjacking that originates in country A, but that terminates in country B is transnational as the event places demands on individuals and institutions in both countries. Therefore, a transnational terrorist event is an example of a transboundary externality, where actions conducted in one country impose uncompensated costs or benefits on another country.

An aggregated definition of terrorism as offered above does have its drawbacks. For example, such definitions fail to account for the heterogeneous nature of “the terrorist” and “terrorism,” does little to differentiate between large- versus small-scale attacks or periodic versus protracted terrorist activity.⁵ When it comes to the design of specific counterterrorism policy, adding nuance to the definition is desirable because of the complex and differing nature of the causes and consequences of terrorist activity. The ambiguity inherent in the definition of terrorism should serve as a warning to empirical researchers. Consistency in the use of the term is especially important when pooling data from different sources. If, for example, one data set has a particularly broad definition of terrorism while another has a narrower one, the consolidated data set will likely provide biased results.

Economists apply a rational actor model to the study of terrorism. This model portrays terrorists as calculating individuals who optimize some goal subject to constraints. If and when the parameters of these constraints change, then a rational actor is expected to respond in a predictable fashion. Therefore, actions taken by a government to harden a target should induce the terrorists to shift their attacks to relatively less hardened (or so called “soft”) targets.

The characterization of terrorists as “rational actors” is now commonplace, but as the concept developed during the 1980s, a great deal of controversy accompanied it. People resisted the notion of characterizing terrorists as rational because their goals and methods seem so repellent. But in economics, rationality is judged by the manner in which an agent responds to environmental and other constraints, and not by whether their objectives or modes of behaviour

⁴ Walter Enders and Todd Sandler (2006), *The Political Economy of Terrorism* (Cambridge University Press: New York, 2006), p. 3.

⁵ Hoffman (2006).

fit the norms of society. By responding in a sensible and predictable fashion to changing risks (constraints), terrorists are judged to be rational.⁶

Terrorists groups tend to be relatively weak as compared to the governments they confront; however, history shows that many terrorist groups have successfully waged long-lived campaigns with few resources against formidable odds. A utility tree can model a terrorist group's resource constraint decisions where the group must first allocate capital and labour between terrorist activity (carrying out attacks) and non-terrorist activity (fundraising, recruitment). Then, the group must allocate resources among alternatives within each class of activities. The decision to employ different modes of terrorist attack depends on the relative "shadow price" of each activity, which, in turn, depends on time, other resources requirements and risk considerations. Logically, it follows that attack modes which are logistically complex or risky (e.g., skyjackings, kidnappings) have higher per unit prices than do less complex less risky attacks (e.g., bombings). Because terrorist groups order the operation mode of their campaigns according to the costs and risks they face, the overall logistical success rates are quite high because the least risky operations are used the most often, and the most risky operations are used the least. What these stylized facts then suggest is that a rational actor characterization of terrorists is appropriate in that it captures changes in terrorist behavior as they respond to changes in their operational circumstances.

⁶ On the development of the rational actor model of terrorists, see Enders and Sandler (1993), Im, Cauley and Sandler (1987), Sandler, Tschirhart, and Cauley (1983) and Sandler and Lapan (1988).

3 Data Sources

As was mentioned earlier, one of the greatest strengths of economic studies of terrorism is the ability to construct theoretical models upon which empirical hypotheses are formulated and tested. Empirical studies rely on data sets containing events data in which various aspects of a terrorist incident are recorded. These characteristics include location, type of incident, number of victims, the fate of the terrorists, type of target, negotiations (if any), nationality of terrorist and victim, etc. Since the 1960s, a number of data sets have been compiled concerning both domestic and transnational terrorism. For example, the United States, Germany, and Israel maintain data sets on domestic terrorist activity. The U.S. State Department maintains what is widely regarded as the most complete data set on transnational terrorism; however, it is not available to researchers. The U.S. think tank RAND also maintains such a database, the Terrorism Incident Database, which is now available publicly on the Internet.⁷ The National Memorial Institute for the Prevention of Terrorism (MIPT) maintains an online data set available to the public as does the International Policy Institute for Counterterrorism (IPIC). The most widely used data set for economic studies is known as ITERATE (International Terrorism: Attributes of Terrorist Events) which has been updated over the years to cover the period 1968-2003.⁸ This data set is ideal for time series analysis as it contains observations for over 12,800 terror incidents.

Data sets in general face a number of problems, not the least of which is quality. Depending on how data coders define terrorist incidents, problems related to “reporting bias” are inevitable. Because most data sets rely on newspaper and media accounts of a terrorism incident, those incidents deemed not newsworthy do not get reported and thus are excluded from the data set. “Under-reporting bias” was a central charge against the U.S. State Department’s annual “Patterns of Global Terrorism” publication, when in 2003-2004, controversy erupted over apparent omissions of certain incidents in order to make it appear as though the so-called Global War of Terrorism (GWOT) was being won.⁹ Oppositely, the data sets produced by IPIC suffer from “over-reporting bias.” As an Israeli policy group, IPIC focuses primarily on terrorism activity in the Middle East which produces the tendency to lower the bar on what constitutes a terrorist act. Many of the terrorist incidents which they record can also be interpreted as simple (albeit violent) crimes, especially those which occur between Israelis and Palestinians.¹⁰ These reporting biases can make it difficult for researchers to separate global and country-specific terrorism-related indicators.

Lastly, the data sets mentioned above do not contain information about the target governments’ strategies or behaviour during the incident. This means that these types of data sets are more useful for analyzing terrorist responses rather than government actions. Because all data sets

⁷ See Terrorism Incident Database at http://smapp.rand.org/rwtid/search_form.php. Accessed 14 May 2010.

⁸ Edward F. Mickolus, Todd Sandler, Jean Murdock, Peter A. Flemming (2008), "International Terrorism: Attributes of Terrorist Events (ITERATE), 1968-2007," <http://hdl.handle.net/1902.1/11574> Dunn Loring, VA: Vinyard Software [Distributor] V1 [Version].

⁹ W. Enders (2007), “Terrorism: An Empirical Analysis,” Chapter 26 in *Handbook of Defence Economics* Volume II, K. Hartley and T. Sandler, eds (North Holland: Elsevier Science, 2007), p. 828.

¹⁰ Enders (2007), “Terrorism: An Empirical Analysis,” p. 828.

contain some missing, biased, or truncated values, researchers must be cautious at drawing inferences with data that may not be of sufficiently good quality.

3.1 Policy Considerations

In Canada, there is a clear need for the national security community to have access to a terrorism incident database which distinguishes between domestic and international terrorist incidents. Ideally, such a database would be open to the public thereby allowing researchers in government, academia, and the business community to develop a Canada-specific body of research. The design of such a database ought to be based on the best practices of our allies, with particular attention paid to minimizing the distorting effects of media-based reporting biases and political interference.¹¹ As well, the design of a Canadian terrorism database ought to include data entry fields which describe the government's prevailing counterterrorism policy at the time of any given incident. Such information would be extremely useful in that it would allow researches to track behavioral changes in the strategic interplay between government and terrorist and, also, would allow researchers to back-test how government counterterrorism policy changes of the past affected terrorist strategy of the future.

¹¹ Unfortunately, these twin goals may be mutually exclusively. If, for example, a non-governmental organization (NGO) maintained such a database, it would hardly be susceptible to direct government interference. However, an NGO would be reliant on media-based reporting resources and would thus have to contend with the reporting biases discussed earlier. On the other hand, a government-run database would have the advantage of utilizing intelligence-based reporting resources which would negate the reporting bias problem, but public distribution of any analytical findings would be susceptible to political manipulation.

4 Statistical Properties of the ITERATE Data Set

Given the wide acceptance of ITERATE as the terrorist incident data set of record, many economic studies have applied various statistical methods to analyze the time series properties of this dataset.¹² Statistical methods are needed in order to decompose a dependent variable's time path into the constituent parts of trend, cycle, and noise. Most time series studies use the tools of spectral analysis and intervention analysis; the former allows one to estimate the cyclical patterns in the incident series, while the latter allows one to measure the effects of important structural changes on the incident series. Although a thorough review of this dataset is beyond the scope of this study, some of the more notable empirical findings which validate theoretical predictions will be discussed.

In Figure 1, ITERATE provides quarterly data regarding “all incidents and bombings” for the period 1970 to 2001. From this figure, we can see that transnational terrorism activity displays periodic fluctuations in the frequency of incidents, where periods of high-terrorism and low-terrorism tend to cluster and persist for several periods. It also shows a tendency for terrorist activity to wax and wane, a finding of particular interest to those investigating the efficacy of counterterrorism policy.

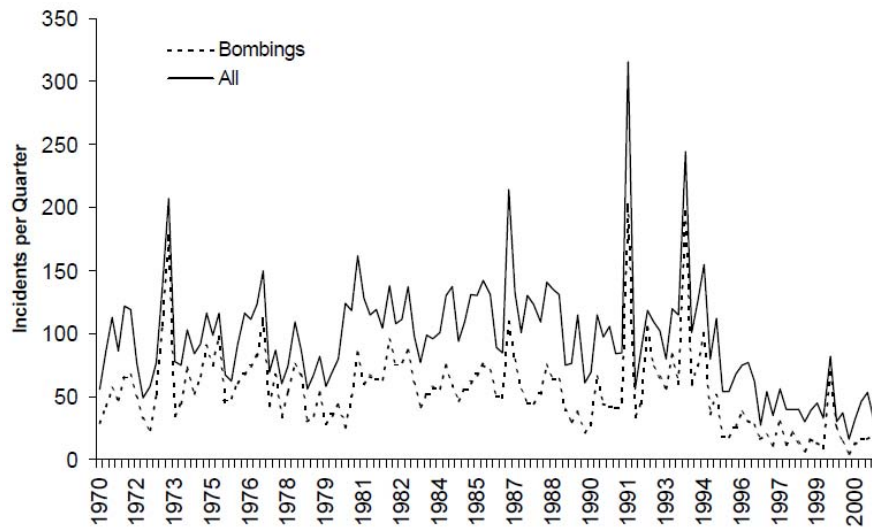


Figure 1 - All Incidents and Bombings¹³

¹² The ITERATE dataset is available at <http://hdl.handle.net/1902.1/11574> for a fee and is cited as follows: Edward F. Mickolus, Todd Sandler, Jean M. Murdock, Peter A. Flemming (2008), "International Terrorism: Attributes of Terrorist Events (ITERATE), 1968-2007," <http://hdl.handle.net/1902.1/11574> Dunn Loring, VA: Vinyard Software [Distributor] V1 [Version]. The author relied on a secondary source reproductions of ITERATE which can be found in: Walter Enders and Todd Sandler (2006), *The Political Economy of Terrorism* (New York: Cambridge University Press, 2006), p. 61-66.

¹³ W. Enders and T. Sandler (2002), "An Economic Perspective of Transnational Terrorism," p. 33. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.58.5983&rep=rep1&type=pdf>. Accessed 20 May 2010.

Bombings are a favoured mode of attack because they are neither logistically complex nor especially costly and thus account for approximately half of all transnational incidents in a given period. Bombings tend to come in spikes because of the relative simplicity of their deployment; therefore, even during periods of relatively low-terrorism activity, bombings still account for the majority. We can also note the decidedly downward trend of transnational terrorism toward the latter half of the 1990s, which is likely due in large part to a decrease in state sponsored terrorism in the post-Cold War era.¹⁴

In Figure 2, the quarterly time series for assassinations and hostage-taking are displayed for the period 1970-2001. As in Figure 1, cycles are again prevalent but these two time series display far fewer incidents per quarter than bombings. Over the long run, it appears as though assassinations and hostage-takings move together with a noticeable decline of incidents starting in the 1990s.

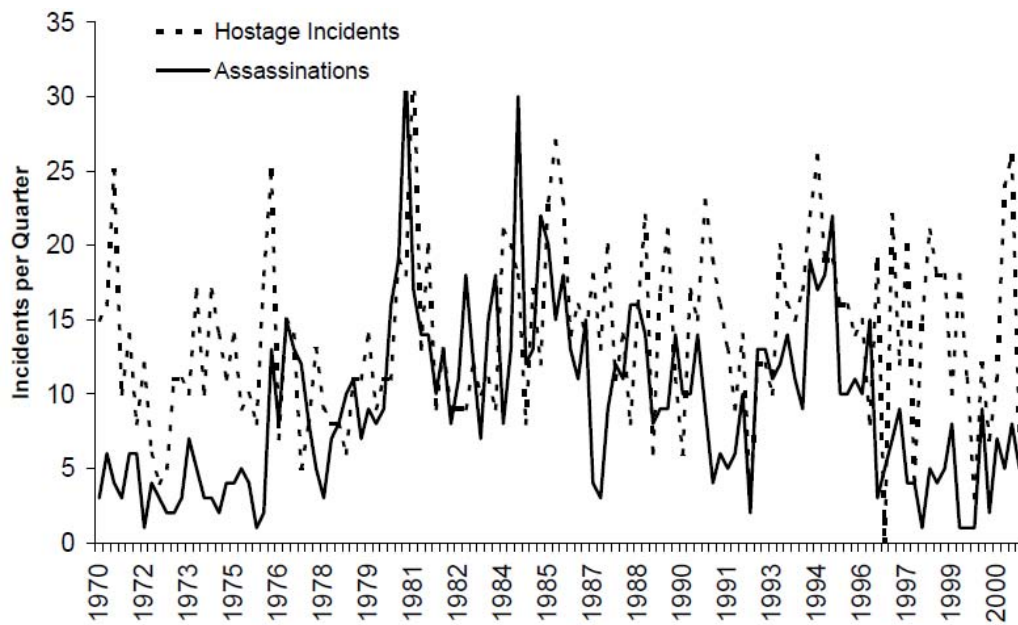


Figure 2 – Hostage Incidents and Assassinations¹⁵

Earlier, a theoretical prediction was offered that said terrorists (as rational actors) will respond to changes in the risk profile of a given terror activity, engaging less frequently in those modes of attack which are more risky and logistically complex. As both Figures 1 and 2 demonstrate, terrorists shift resources to those activities which are less risky and less complex, substituting bombing attacks for hostage incidents and assassination operations. This phenomenon is known as transference and encompasses substitution effects that are geographic, temporal, and tactical in nature. Since hostage-taking and assassinations are similarly complex and risky, it is not surprising to see that they display the same long-run characteristics, although divergences do occur as seen in the 1970 and 1999 figures.

¹⁴ Walter Enders and Todd Sandler (1999), “Transnational Terrorism in the Post-Cold War Era,” article in *International Studies Quarterly* 43.1 (1999): 145-67.

¹⁵ Enders and Sandler, “Transnational Terrorism in the Post-Cold War,” p. 34.

In Figure 3, the quarterly percentage of incidents with casualties (i.e. deaths or injuries) for the period 1970-2001 is presented. This time series is significant because it indicates that since the early 1990s, transnational terrorist incidents are down but are more likely to cause casualties. As the graph depicts, the 1970s saw transnational terrorism become increasingly lethal, a trend which leveled off until the 1990s when it ratcheted up again.

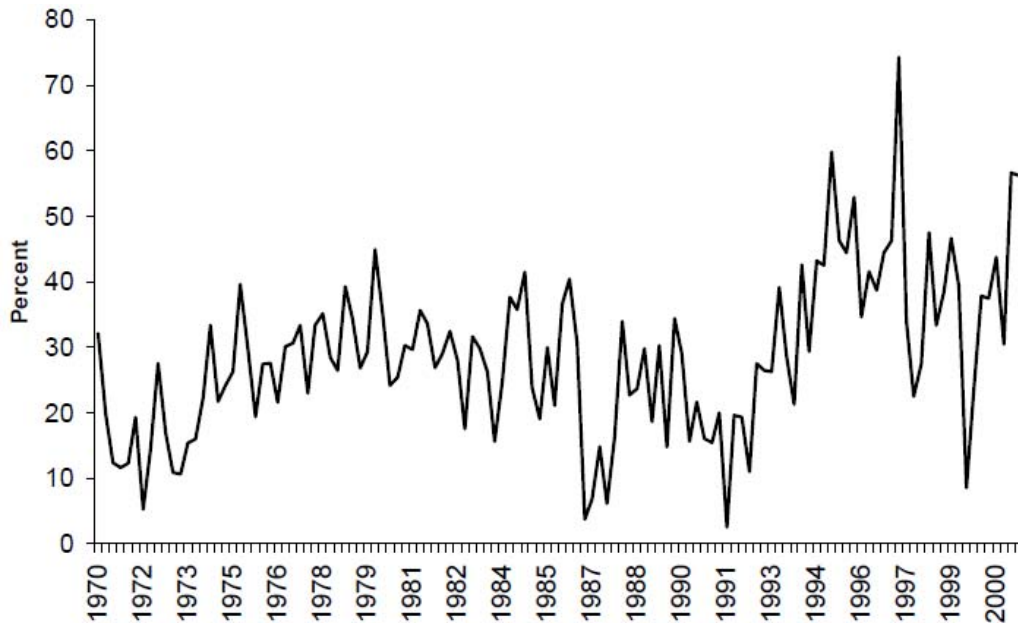


Figure 3 – Proportion of Incidents with Casualties¹⁶

Many analysts have attempted to pinpoint the cause of the increased lethality of terrorism. Some have speculated that it is merely a by-product of the terrorist's need to be ever more daring and spectacular in order to attract media attention. However, unlike the terrorist movements of the 1960s and 1970s which were primarily driven by nationalist, separatist, and/or Marxist ideology, Hoffman (1997) argued that a change in the makeup and motivation of the perpetrators of terrorism has occurred since the 1979 takeover of the U.S. Embassy in Tehran.¹⁷ Since the early 1990s, the motivation of terrorism has changed with "the emergence of either obscure, idiosyncratic millennium movements" or religious-based fundamentalist groups."¹⁸ Unlike the goals of left-wing organizations of the preceding era, which sought to win the "hearts and minds" of the people (and thus avoided needless civilian casualties), today's fundamentalist terror groups purposely seek out mass casualties, viewing all as legitimate targets of attack.

¹⁶ W. Enders and T. Sandler (2002), "An Economic Perspective of Transnational Terrorism," Working Paper, p. 35.

¹⁷ Enders and Sandler (2000) confirms the predictions of Hoffman (1997), noting a significant rise in casualties from transnational terrorism which can be traced back to the 1979 U.S. Embassy takeover.

¹⁸ B. Hoffman (1997), "The Confluence of International and Domestic Trends in Terrorism," article in *Terrorism and Political Violence* 9.2 (1997): 2.

4.1 Spectral Analysis

Various factors may account for the seemingly cyclical nature of terrorist activity and spectral analysis allows one to investigate short-run movements in the series. The extent to which these factors affect various terrorist groups simultaneously produces the wave-like patterns in the above time series. For example, a copycat effect may result from a successful terror attack leading, in turn, to a repetition of this mode of attack until the target government can devise effective countermeasures. Economies of scale can also produce a bunching effect in attacks; if a terrorist group can spread the fixed costs associated with planning and execution over a large number of incidents, the resulting economies of scale reduces per-incident costs.

As government countermeasures become increasingly successful, new terrorist attacks will be inhibited. Terrorists then learn about, and adapt to, these countermeasures and attempt to devise new modes of attack. Therefore, there can be extended periods when there is relatively little terrorist activity. During these periods, terrorist groups can formulate new plans, recruit new members and acquire weapons and funding to support a future campaign.

Faria (2003) devised a theoretical cat-and-mouse model of the attack-counterattack process, where the government seeks to maximize national security by investing in enforcement. A crucial feature of the model is that the terrorist group faces a budget constraint such that it cannot sustain a terror campaign indefinitely. The terror groups utilize weapons, financial resources, and personnel to plan and stage attacks; therefore, when enforcement is high, terrorists find it desirable to replenish their stocks of materiel, finance, and manpower. During this lull in activity, the public's attention wanes, and there is little pressure on politicians to devise new counterterrorism policies. Instead, resources are directed towards society's other challenges; enforcement strictures lighten, providing the terrorist group with an opportune moment for launching a new wave of attacks. The cycle is completed when the public demands a government crackdown on terrorists.¹⁹

Enders and Sandler (1999) and Enders, Parise, and Sandler (1992) employed spectral analysis techniques to investigate the length of the cycles of simple, relative to complex, terrorist incidents. They argued that different modes of attack produce different cyclical patterns. Logistically complex and high risk operations, such as assassinations and hostage-takings, are expected to have long cycles while bombings which are comparatively inexpensive and easy to deploy are expected to have shorter cycles.²⁰ Using updated post 9/11 data,²¹ the researchers found that low frequency terror incidents like hostage-takings had longer cyclical periods than higher frequency incidents, like bombings. These findings are consistent with the hypothesis that more complicated attacks will occur less frequently but will produce more persistent (elongated) cycles.

¹⁹ Joao R. Faria (2003), "Terror Cycles," article in *Studies in Nonlinear Dynamics and Econometrics*, 7.1 (2003): 1-11.

²⁰ As well, the design of effective countermeasures may take a long time to implement and thus might play a role in extending the period of heightened terrorist activity. Inevitably, the terrorist group will try to thwart the government's countermeasures, and, if successful, the cycle will repeat.

²¹ W. Enders and T. Sandler (2006), *The Political Economy of Terrorism* (New York: Cambridge University Press, 2006), p. 72.

4.2 Intervention Analysis

While spectral analysis is a useful tool for modeling the short-run dynamics in a series, intervention analysis uses the lagged values of the series itself to model the long-run dynamics of a series. This allows researchers to investigate whether a structural change in the series pattern has occurred and thereby determine the relationship between current and past observations. Intervention effects in a series can be temporary (a pulse) or permanent (a level shock or level shift) and could be due to a force, such as the rise of Islamic fundamentalism in the late 1970, or to a particular event, such as 9/11.

A useful example of intervention analysis is offered by Enders, Sandler, and Cauley (1990a) who sought to investigate the effects of metal detectors on U.S. domestic skyjackings, transnational skyjackings (involving the U.S.), and all other skyjackings. The researchers viewed the installation of metal detectors as an immediate and permanent intervention in the series beginning in 1973:Q1. They found that the number of transnational skyjackings per quarter decreased by 1.29 incidents immediately (down from an average of 3.03) and produced a long-run decrease of 1.78 incidents per quarter. Even more dramatic was the effect observed on U.S. domestic skyjackings which immediately fell by 5.62 incidents per quarter to a long-run value of just 1.08 incidents per quarter. Therefore, the installation of metal detectors in U.S. airports produced a level shift: a significant immediate and long-term decline in skyjacking activity.²²

A second line of investigation of Enders, Sandler, and Cauley (1990a) was to investigate the effect that United Nations conventions and resolutions had on skyjackings. The late 1960s and early 1970s was a particularly active period when the U.N. passed several resolutions and conventions regarding enforcement and prosecution of perpetrators of skyjackings. The researchers found no significant effect of these interventions on the skyjacking time series. They conclude that without any built-in enforcement mechanisms nations are not likely to change their prosecutorial behaviour, nor will the resources or resolve of terrorists be affected by such feeble international cooperation.²³

4.3 Policy Considerations

Canadian counterterrorism policy must be designed to maximize the government's ability to adapt to and anticipate changes in terrorist strategy and behaviour. The substitution effect witnessed in previous decades will continue as terrorists adopt novel modes of attack to overcome a government's defences. Most alarming today is the proliferation of chemical, biological, radiological and nuclear (CBRN) weapons which, if acquired by terrorists, would usher in a new wave of attack-mode substitution away from "conventional" modes of attack to "non-conventional", CBRN modes of attack. Therefore, counterterrorism policy must raise the financial cost and logistical complexity of *all* modes of attack so as to minimize the dangers of the transference phenomenon. This can be achieved through a combination of defensive and proactive measures which target the terrorists themselves and the resources they rely upon.

²² Walter Enders *et. al.* (1990a), "U.N. Conventions, Technology, and Retaliation in the Fight Against Terrorism: An Econometric Evaluation," article in *Terrorism and Political Violence*, 2.1 (1990): 83-105.

²³ Enders (1990a), "U.N. Conventions," pp. 83-105.

Counterterrorism legislation should therefore be designed to enhance the government's counterterrorism capacity and capability. Some specific areas of focus might include: a loosening of restriction on the use of military force abroad, greater government scrutiny of financial transactions, increased domestic surveillance of persons or groups of interest, hardening of soft targets, securing CBRN materials, and restrictions on immigration and international travel. Owing to the dynamic nature of the government-terrorist interplay, counterterrorism policy and legislation should be revisited routinely to ensure it is as up-to-date as possible with current terrorism trends; however, funding the government's various counterterrorism organizations should be long-term and predictable to ensure that defensive measures, once built, do not decay. Prioritizing funding requests will be challenging, but constant monitoring of terrorism trends will allow policymakers to anticipate needs and direct funds accordingly.

5 Terrorism and Democratic Societies

The basic requirement of a liberal democracy is the protection of its people and property. Failure to meet these basic security needs will result in a governing party's electoral defeat. Those democracies which confront terrorism must engineer responses to such attacks which maintain the perception that the government can provide sufficient security without compromising its own liberal democratic values.²⁴ That the very nature of democracies aids and abets terrorist activity²⁵ – by allowing freedom of expression, speech, association, movement and rights to privacy and unwarranted search and seizure – is a confounding irony for defence planners. The characteristics of an “open society” therefore create a favorable environment within which terrorists can devise, develop, and implement violent terror campaigns.

After a degree of foreboding, democratic societies are generally willing to sacrifice civil liberties for greater security during periods of crisis. If innovations in terrorist activity continually outflank a government's protection efforts, this tendency is likely to increase as a general sense of insecurity permeates society. Liberal democracies face a double-edged sword when considering a response to a terrorist attack. On the one hand, a liberal democracy can react defensively to an event and risk being seen inept or ineffectual. There is no shortage of analyses which attempt to cast President Carter's failed hostage rescue attempt in Iran in such a light.²⁶ Conversely, a democracy can react offensively to an event and, in so doing, risk losing the support of its people and even inadvertently increase public sympathy for the reactionaries. France's attempt to crush the Front de Liberation Nationale (FLN) during the Algerian civil war turned the native Algerian Muslim population against the French, and in favour of the terrorists. More recently, world opinion turned sharply against the United States when news of the handling of detainees at Guantanamo Bay became public.

Liberal democracies possess built-in restraints which are relied upon to prevent an overreach in government power and purview and, thus, prevent any diminution of civil liberties. But these restraints (such as the guarantee of a fair trial and access to an appeals court if convicted) also have the perverse effect of facilitating rather than hindering terrorist activity. As well, democracies offer a target-rich environment wherein it is easier to acquire, legally or otherwise, all the necessary inputs (weapons, training, funding) for a robust terrorism campaign.

Because democracies provide such an accommodating environment for terrorists, one would expect to find greater terrorist activity in these types of political systems than in autocratic ones. Indeed, because terrorists pursue political concessions from a government under immense public pressure, a liberal democracy is more likely to concede to terrorist demands than an autocratic government. Autocracies are invariably less responsive to public demands, less accountable for their actions, and can therefore deploy draconian measures to confront terrorism. Such measures might include restrictions on movement, association, or access to information, all of which would be unpalatable to a liberal democracy. Autocracies also have the ability to control public information, meaning terrorism is likely to be underreported in these countries. By limiting the public's awareness about challenges to its rule, autocracies can externalize domestic terrorism.

²⁴ The origins of the liberal democracy dilemma can be found in Wilkinson (1986).

²⁵ Schmid (1992).

²⁶ Hoffman (1998).

Spillover terrorism, where terrorist groups stage their terrorist activities in one country while being based in another, was the modus operandi of Middle Eastern terrorism throughout the 1970s and 1980s. State-sponsored terrorism prevailed throughout most of the Cold War and was responsible for some spectacular attacks on Western targets including the 1987 North Korean bombing of Korean Airlines flight 858.

The need to quantify the relationship between liberal democracies and terrorism is apparent but difficult to assess. Group-based analyses such as Eubank and Weinberg (1994) suggest that liberal democracies are 3.5 times more likely than autocracies to confront terrorism. Although this study failed to account for spillover terrorism, a subsequent study, Eubank and Weinberg (1998), used event data to test the prevalence of terrorism in democratic and non-democratic countries and found their results to be similar. Other studies like Li (2005) examined whether the type of liberal democracy might have a bearing on the presence of terrorism in these countries. Intuitively, one would expect proportional representation systems to experience less terrorism than majority rule systems because the former offers more viewpoints and a greater governing presence for minority constituents. While Li (2005) found that this proposition held, other studies using different techniques have identified a reverse causality in that the presence of more parties implies more extreme views, the proponents of whom might be more inclined to resort to terrorism.²⁷ Li (2005) also confirmed that transnational terrorism is positively related to a democracy's essential characteristics, such as press freedom, political constraints on the executive, and political participation among potential voters.

These studies allow us to conclude that terrorism migrates from autocracies to democracies and that terrorism is more prevalent in liberal democracies, owing to their target-rich and generally permissive operating environment. The presence of an unconstrained free press makes attacking a democratic society even more attractive because terrorist groups are reassured knowing that not only will their attacks be made public but, also, that their message and political goals will also be given public airing. Policymakers must then be cognizant of the dilemma they face when considering a counterterrorism policy: an overreaction to a terrorist event may compromise core democratic principles and, thus, engender support for the terrorist; conversely, too timid a response may result in waning public confidence in the government and could elicit future attacks if terrorists perceive the government as being favourably inclined to granting concessions.

²⁷ William Eubank and Leonard Weinberg (1994), "Does Democracy Encourage Terrorism?" article in *Terrorism and Political Violence*, 13.1 (1994): 429-430.

6 Civil Liberties versus Terrorism Risk

The crux of the liberal democracy dilemma is how best to balance two somewhat conflicting societal demands: seeking greater security and protection against terrorist threats and preserving a maximum level of civil liberties. To understand this dilemma, a microeconomic-based indifference curve analysis of this trade-off relationship is required.

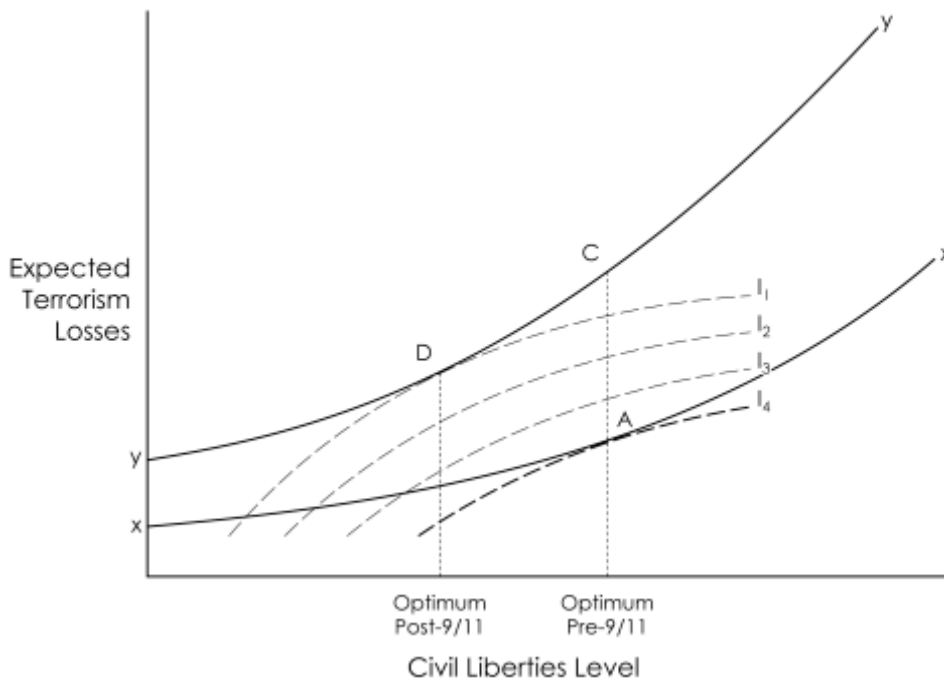


Figure 4 – Terrorism Risk versus Civil Liberties Trade-off²⁸

In Figure 4, expected damage from a terrorist attack is measured on the vertical axis and the level of civil liberties is measured on the horizontal axis. The curve X-X represents the constraint that a society faces in a liberal democracy confronted with a terrorist threat. At a given point in time, all choices on or above X-X are feasible (trade-offs below X-X are infeasible). The “cost” of increased civil liberties is greater exposure to terrorism and its expected damage for the reasons discussed earlier – for example, freer media makes a country a more attractive venue for attack. With enhanced liberties, terrorists can engage in larger organizations and larger-scale attacks. Along X-X, each increase in civil liberties comes at the expense of larger expected terrorism-induced losses, so that the constraint is positively sloped. X-X rises at an increasing rate implying that a very free society can achieve the largest reduction in terrorist risks by moving right to left along X-X. Each additional sacrifice of freedom gains less additional security from terrorist attacks. Curve X-X represents the perceived terrorism risk - civil liberties constraint

²⁸ W.K. Viscusi and R.J. Zeckhauser (2003), “Sacrificing Civil Liberties to Reduce Terrorism Risks,” *Journal of Risk and Uncertainty*, 26.2-3 (2003): 30.

before 9/11. The events of 9/11 made people aware that, for each level of civil liberties, the expected terrorism damage is higher. Thus the perceived post-9/11 constraint Y-Y is above and steeper than X-X.

The “preference” or “taste” side depends on society’s indifference map, which indicates how society is willing to trade off terrorism risks for civil liberties. Consider for example indifference curve I-4 which depicts all combinations of expected terrorism damage and civil liberties’ bundles which provide equal levels of satisfaction to society. Because expected terrorism losses represent a “bad” and civil liberties represent a “good”, the indifference curve I-4 is upward sloping, indicating that society is willing to accept greater anticipated losses only if compensated with more civil liberties. Similarly, society is willing to sacrifice some of its liberties in return for greater security – that is, fewer and less severe terrorist attacks. The shape of an indifference curve shows that, for each increase in civil liberties, society is less willing to accept further risks in terms of terrorism. In moving left to right along I-4, each equal increment in civil liberties results in smaller tolerated increases in risks. This trade-off is valid because it complies with the notion that societies are less risk-accepting as freedoms expand; thus, a very free society is more willing to sacrifice freedoms for security (moving right to left along I-4) than a less free society.

The terrorism risk-civil liberties tradeoff also shows that the well-being of society increases when moving from a high indifference curve (ex. I-1) to lower indifference curves such that that indifference curve I-4 represents the highest satisfaction level of the four curves displayed. This follows because lower indifference curves have reduced risks for each level of civil liberties and thus, are improvements in social welfare. If a society or group within society is more accepting of risks or less willing to give up freedoms, then its indifference curve would be steeper, indicating that it would tolerate greater risk for every gain in liberty.

Given the constraint level and indifference curve maps, it is feasible to determine a social equilibrium where the greatest level of social welfare can be obtained given the stated constraints. Because social welfare increases with lower indifference curves, the social optimum is reached at tangency A between constraint curve X-X and indifference curve I-4. At point A, society’s optimal trade-off of risks and liberties equals the feasible trade-off along X-X. Technological innovations and/or international cooperation may shift the X-X constraint downward, thus lowering potential terrorism losses for each level of civil liberties.

A practical illustration of the terrorism risk-civil liberties trade-off is apparent when we consider how 9/11 affected U.S. attitudes and policy vis-à-vis terrorism. Prior to 9/11 and given constraint curve X-X, the optimal choice of the trade-off would have been point A (where civil liberties were high and terrorism risk was seen as low). Following the attack, society’s perception of terrorism risk associated with any given level of civil liberty changed dramatically. Perceived risks rose for any level of civil liberty; therefore, the marginal cost of civil liberties increased significantly. New perceptions of terrorism risk shifted the constraint curve upwards to Y-Y which is above and steeper than X-X. If pre-9/11 levels of civil liberty were to be maintained, then a social optimum of point C would be achieved, although in this case the risks of terrorism would be very high. Instead, tangency D is achieved, an outcome which requires reducing civil liberties from its initial level at point A. While expected losses at point D are greater than at point A, it is far less than the risk which would prevail at point C.

This exercise shows why the social-optimum level of civil liberties is neither at its highest possible value nor why the risk of terrorism is not at its lowest possible level, given these specific parameters. The optimal level of civil liberties changes depending on environmental conditions. Society's willingness to sacrifice some civil liberties for other goals explains why, for example, in the wake of 9/11, the U.S. public was generally accepting of national security legislation like the Patriot Act which placed restrictions on habeas corpus, immigration, and stepped up electronic surveillance. Just as civil rights advocates argue that such rights ought to be guaranteed and immutable, advocates of risk control claim that individual safety risks must be minimized to the detriment of individual freedoms. When taken to the logical limit, a zero-risk mentality emerges among legislators, regulators and, to an extent, the public itself. Compromises on both sides must be made; hence, the socially optimal point D is most desirable for its balance of terrorism risk and civil liberty.

7 Choice Theory and its Applications

Developing effective counterterrorism measures requires an understanding of how terrorists behave. Although it may be distasteful to describe terrorists as rational actors, doing so allows one to frame their behaviour as utility maximizing actors who carry out their activities subject to a set of constraints. Terrorist groups possess a set of preferences or outcomes which they value differently, while their scarce resources require them to pursue those activities which produce maximum expected utility or net benefits. The rational actor model can therefore provide a number of policy-relevant predictions including a terrorist's choice of targets, new types of attack modes, and a terrorist's responses to government countermeasures.

The choice theory model of terrorist behaviour is derived from the household production function model developed by Becker (1971) which analyzed the decision-making process for a family group. Landes (1978) applied this model to analyze the behaviour of a potential skyjacker contemplating the forceful diversion of a commercial aircraft. The model was then generalized by Enders and Sandler (1993) to analyze the behaviour of rational terrorists in their pursuit of some shared political goal (which may include the elimination of unspecified socio-political, economic, racial, geographic, religious, or ideological grievances).²⁹ Terrorists can achieve these shared goals through the consumption of basic commodities such as media attention, political instability, popular support for the terrorist cause, and the creation of an atmosphere of fear and intimidation. These basic commodities are produced by a variety of political and economic strategies which range from legal activities, such as advertising their cause or running their own candidates for public office, to extreme strategies like direct armed conflict and guerrilla attacks on the government. Terrorist groups must select among alternative strategies to produce basic commodities; if they embrace actual terrorist tactics, they would have to choose among attack modes such as skyjackings, kidnappings, or suicide bombings.³⁰

Terrorist groups are likely to choose a combination of terrorist activities and non-terrorist activities with which to augment the production of basic commodities. Within each type of activity, preferences exist, as different types of terrorist and non-terrorist activities are expected to produce different but still beneficial outcomes. In this way, terrorist activities can be viewed as a composite good, where different attack modes are substitutable if they are capable of producing the same basic commodity. Substitution among attack modes is most likely when logistical complexity and basic commodity production are similar; for example, skyjackings and hostage-takings are logistically comparable and produce a similar amount of media coverage. Attack modes can also be complements if they are essential for the production of a single basic commodity or if they reinforce each other's effectiveness; for example, bombings and threats are complementary as terrorists often issue public threats through the media or government authorities following a successful bombing campaign. Such low-cost threats reinforce the desired outcome: a sense of public intimidation which persists long after the actual bombing campaign has ended.³¹

²⁹ On the development of the rational actor model of terrorists, see Enders and Sandler (1993), Im, Cauley, and Sandler (1987), Sandler, Tschirhart, and Cauley (1983), and Sandler and Lapan (1988).

³⁰ Enders (2007), "Terrorism: An Empirical Analysis," chapter in *Handbook of Defence Economics* Volume II (North Holland: Elsevier Science, 2007), p. 833.

³¹ Enders (2007), "Terrorism: An Empirical Analysis," p. 833.

For any given period, a terrorist group faces a resource constraint in that there is a finite amount of money, materiel, manpower, and “creativity” from which they can draw to carry out either type of activity. A terror group’s expenditures cannot exceed its revenues, and so it faces the same allocative challenges that a household does in that resources expended in one activity precludes expenditures on other types of activity. To produce basic commodities, the terror group must therefore choose between terrorist and non-terrorist activities (first order allocative decision) and between competing modes of activity within each of the two types (second order allocative decision). So, if a terrorist group seeks media attention, it will likely select a mode of activity from within the terrorist activity set which might include suicide bombings, hostage taking, or skyjackings. Rather than “spend” resources in the current period, a terror group can also decide to “save” its resources for a future period.³² A rational terrorist may be motivated to time a future campaign to coincide with future events, such as during an election contest, thereby enhancing the overall effectiveness of an attack.

A terror group’s resource allocation decisions are influenced by the prices associated with terrorist and non-terrorist activities. The price of a mode of attack includes the value of the resources needed to plan and execute the mission as well as the cost of casualties to the group’s members. For example, the 9/11 attacks were a high-priced mission in that the operation required extensive planning and coordination and because success would mean the loss of 20 well-trained operatives. But the effectiveness of an attack mode is not necessarily commensurate with its price.³³ Threats and hoaxes require few inputs and are thus relatively inexpensive but, if employed effectively, can produce disproportionate results, as seen in the public trepidation which followed the 2001 anthrax attack in the United States. The cost of an envelope, talcum powder, and postage was minor, but authorities had to react with the same precautions as though the contents were truly hazardous.

The prices and expected benefits faced by terrorists can be affected by a government’s counterterrorism policies. Any policy which raises the price of one mode of attack relative to another induces a shift in terrorist preferences away from the more expensive attack mode to a less expensive (though logistically similar) attack mode. This weakest link policy induced substitution effect is known as “transference.”³⁴ For example, enhanced airport security increases the logistical complexity of a skyjacking which therefore raises its price. But, if the government does nothing to enhance point of entry security, then attacks using contraband become relatively cheaper. If immigration services make it more difficult for terrorists to enter a country, the terror group may be induced to attack that country’s overseas interests. Such specific counterterrorism policies which target a terror group’s second order allocative decision can be generalized to influence a terror group’s first order allocative decision, that being how many resources are directed toward terrorist versus non-terrorist activities. A government can induce a terror group to substitute from terrorist to non-terrorist activity by raising the price of all types of attack modes by, for example, denying the terrorists a populated safe haven or significantly increasing government expenditures on counterterrorism or, conversely, by lowering the costs of non-terrorist activities such as providing greater access to the electoral system. Lastly, a government counterterrorism policy which targets a terror group’s overall income or resource base can

³² Enders (2007), “Terrorism: An Empirical Analysis,” p. 833.

³³ Enders and Sandler (2006), *The Political Economy of Terrorism*, p. 117.

³⁴ Enders and Sandler (2006), *The Political Economy of Terrorism*, p. 117.

severely impact allocative decisions as any decrease (increase) in terrorist resources decreases (increases) the level of all terrorist and non-terrorist activity.

Empirical studies of the rational actor model of terrorism have proven consistent with the theoretical predictions discussed above. Enders and Sandler (1993) examined how a number of counterterrorism measures induced substitutions across various terrorist attack modes. The researchers confirmed that increases in the relative price of one attack mode (for example, increased airport security) reduced skyjackings incidents but induced terrorists to substitute into hostage-taking attacks.³⁵ In a subsequent study, Enders and Sandler (2005a), the researchers sought to determine how the overall level of terrorism and the various attack modes utilized have changed since 9/11. They concluded that, post-9/11, counterterrorism policies did in fact hamper al-Qaeda's ability to direct logistically complex operations such as assassinations and hostage takings. Instead, al-Qaeda diverted away from logistically complex operations to relatively simpler attacks such as bombings which also displayed a higher casualty propensity.³⁶ Enders and Sandler (2006b) extended these analyses to test for changes in the location of terrorist incidents within six regional classifications following 9/11. Their findings confirmed previous theoretical predictions that given increased counterterrorism measures in the Western hemisphere, terrorist carried out weakest link attacks against Western interests in the Middle East and Eurasia where such countermeasures were relatively weaker.³⁷

The rational actor model of terrorism is a potent methodological tool because it provides discrete predictions as to how terrorists respond to government counterterrorism policy. The relatively meager resource base of a terrorist group is its greatest vulnerability. Empirical studies have shown that terrorists display an acute sensitivity to fluctuations in the relative price of attack modes. Transference occurs because governments can affect the relative price of different modes of attacks. However, *ad hoc* counterterrorism policy which targets only one kind of attack mode can produce dangerous, unintended consequences as terrorists search out weak links and substitute into other modes of attack for which the government may not be prepared to defend against. Denying terrorists the income or resources needed to carry out their activities appears to be the most effective way to effect a decrease in the overall level of terrorism.

7.1 Policy Considerations

Choice theory models of terrorist behaviour offer some compelling insights for the design of a Canadian counterterrorism policy. Specifically, the model shows how terrorist groups respond to relative changes in the price of terrorist versus non-terrorist activities and between relative changes in the price of different modes of attack. Therefore, a central tenet of any counterterrorism policy ought to be the targeting of a terrorist's income or resource base. If terrorist income decreases, the relative cost of terrorist activities will increase, and the demand for such activities will fall. Denying terrorists the financial and other resources they rely on can be

³⁵ Walter Enders and Todd Sandler (1993), "The Effectiveness of Antiterrorism Policies: A Vector Auto-regression Intervention Analysis," article in *American Political Science Review*, 7 (1993): 829-844.

³⁶ Walter Enders and Todd Sandler (2005a), "After 9/11: Is It All Different Now?" *Journal of Conflict Resolution*, 49.2 (2005): 259-277.

³⁷ Walter Enders and Todd Sandler (2006b), "Distribution of Transnational Terrorism Among Countries by Income Classes and Geography after 9/11," *International Studies Quarterly*, 50 (2006): 367-393.

accomplished by increased surveillance of terrorist financial networks, shutting down money-laundering operations, increased surveillance of money transfers from ethnic diasporas, denial of safe havens, and, most promisingly, targeting sources of cash flow such as the global trade in narcotics and counterfeit goods. It should be recognized that governmental organizations like the Canadian Security Intelligence Service (CSIS) and Financial Transactions and Reporting Analysis Centre of Canada (FinTrac) are already heavily engaged in these types of operations, but, in light of the findings presented above, their efforts ought to be buttressed with additional resources.

A second prediction of the Choice Theory argued that a government's effort to harden certain kinds of targets raises the relative cost of attacking those types of targets, relative to other, softer ones. A narrow focus on the hardening of targets leaves a government susceptible to other types of attacks as terrorists will substitute one form of attack for another. To minimize the dangers posed by transference, Canadian counterterrorism policy should seek to raise the cost of all types of attack modes by broadening the number of targets it intends to harden. Increasing the logistical complexity of an attack mode will decrease the frequency of its use. The hardening of targets should extend geographically to encompass Canadian interests abroad including embassies and consulates, major Canadian business interests, favored tourist destinations, etc., because increased homeland security induces terrorists to shift their attacks abroad to locations where targets are more lightly defended and where terrorist activity may be condoned by a sympathetic indigenous population.

Lastly, Canadian counterterrorism policy should ensure that both of the above strategies are maintained without funding disruptions. Terrorists can defer attacks into the future, in effect, saving their resources for a more propitious opportunity. If terrorists become aware of a weakening of certain types of defences, they will no doubt seek to take advantage; therefore, it is extremely important that, once defences are erected, they are maintained vigilantly.

8 Game Theory and its Applications

Game theory is a useful methodological tool for analyzing domestic and transnational terrorism because it captures the strategic interplay between terrorists and targeted governments. Both sets of actors in this interplay make independent decisions based on how they believe the other will act and react to different threats and policies and, so, are considered rational actors because they seek to maximize their utility subject to a set of constraints. The game theory formulation introduces the principles of externality and asymmetry into the dynamic interplay between government and terrorist. Depending on the choice of specification, these concepts govern how actors interact, influencing international cooperation, bargaining strategy, capability assessment, organizational structure and counterterrorism policy (i.e., pre-emption, deterrence, retaliation).

Game theory is particularly applicable to understanding how countries cooperate to confront transnational terrorism and what challenges exist to effective international cooperation. The confluence of globalization and the force-multiplying effects of advanced information technology suggest that a determined and innovative terrorist group can penetrate the defences of any single country. Because the capabilities of domestic defences differ from country to country, their relative vulnerability and interdependence actually serve as obstacles to effect cooperation. This is the case because terrorists weigh the relative risks associated with different modes and targets of attack, the most lightly defended targets represent the “weakest link” and are thus most vulnerable to attack. The 1998 U.S. embassy bombings in Kenya and Tanzania were American assets which lay outside the hardened domestic security apparatus; their weaker defences made for attractive targets.

In the wake of 9/11, some efforts at global counterterrorism cooperation were made, most notably, the U.S.-led invasion of Afghanistan. Although initially successful at removing the imminent threat of an al-Qaeda sanctuary, international support for this effort has since trended downward. Countries tend to rely on unilateral counterterrorism action because (a) they fear a loss of national security autonomy – for example, consider the tepid response from many of the United States’ traditional allies when they were asked to contribute to yet another cooperative counterterrorism undertaking, the 2003 invasion of Iraq – and (b) they want to limit the often large transaction costs associated with international cooperation – for example, the 2004 al-Qaeda inspired attack on Spain’s train system was intended as a warning that cooperation with the U.S. would carry heavy costs.

Game theory analyses are used to investigate how externalities generated from proactive and defensive counterterrorism measures influence a country’s “dominant strategy,” i.e. its decision to embrace cooperation or rely on unilateral efforts.³⁸ More specific extensions of these games have investigated government-terrorist strategic interplay with respect to deterrence-preemption-status-quo and retaliation strategy,³⁹ terrorist finance countermeasures,⁴⁰ hostage negotiation,⁴¹ population sympathies,⁴² factions within terrorist groups,⁴³ signalling and intelligence,⁴⁴ and

³⁸ See Arce and Sandler (2005a) and Sandler and Siqueira (2005).

³⁹ Sandler and Siqueira (2006).

⁴⁰ Basile (2004) and Levitt (2003).

⁴¹ Sandler and Lapan (1988).

⁴² Bueno de Mesquita (2005c).

political versus militant terrorism.⁴⁵ A thorough review of these studies lies beyond the scope of the study; however, the concepts of externality and asymmetry are central to understanding the power of the game theory methodology and thus deserve particular attention.

8.1 Transnational Externalities

Inefficiencies in transnational counterterrorism cooperation result in transnational externalities, where one country's actions or choices impose an uncompensated cost or benefit on one or more other countries. A country, whose actions impose costs on other countries, will not change its behaviour if doing so is costly and there is no mechanism to compel change. Similarly, a country whose actions have beneficial consequences in other countries may undersupply these actions because those external benefits are not supported or subsidized by the recipients. So, proactive counterterrorism measures that reduce threats to other countries produce external benefits⁴⁶ while defensive countermeasures redirect terror attacks to more vulnerable countries⁴⁷ (an externalized cost). Consider the type of attacks which occurred after 9/11. Many Western countries implemented greater defensive countermeasures at home (e.g., hardening vulnerable targets, thickening borders) which, in turn, incentivised terror groups to attack Western targets in lightly defended, developing countries like the Philippines, Indonesia, Malaysia, Pakistan, Saudi Arabia.

Cooperating countries can try to internalize or adjust these external costs by bargaining, whereby the externality recipient compensates the provider country for decreasing its counterterrorism defences. However, this bargaining solution is likely to break down when there are more than two countries involved, because transactions costs become prohibitive. As well, there is the problem of ascertaining the level of compensation required to arrive at a socially optimum level of defence, because the compensation recipient has the perverse incentive to exaggerate the threat level it faces. Each of these options would require a supranational authority to determine counterterrorism defence and compensation levels, but countries are unlikely to give up sovereignty over their own national security policy unless the situation they face is indeed dismal.

Similarly, proactive counterterrorism policy can produce transnational external benefits. A measure which reduces the capabilities of a terrorist group which threatens a group of allied countries produces external (private and public) benefits that all enjoy in the form of a lessened threat level. So, for example, U.S. efforts to capture or kill al-Qaeda leadership after 9/11 provided external benefits to targeted countries in the form of debilitated al-Qaeda command and control capabilities. Again, the issue of compensation arises in that the provider of the external benefit ought to be compensated for its proactive measures by the external benefit recipients. In the absence of compensation, the service will be undersupplied because the marginal cost of the undertaking exceeds the private (but not the global) benefit; however, again, the absence of supranational authority precludes this ameliorative option, notwithstanding the fact that the number of benefit recipients is large which increases the complexity of the proposed compensation transaction.

⁴³ Bueno de Mesquita (2005b).

⁴⁴ Arce and Sandler (2007).

⁴⁵ Lapan and Sandler (1993) and Overgard (1994).

⁴⁶ Rosendorff and Sandler (2004).

⁴⁷ Enders and Sandler (1993, 2004, 2005a, 2006b).

Achieving an optimal level of retaliation or deterrence against terrorists is complicated by the incentives of allied states to sit on the sidelines, or “free ride,” while another state more directly affected by the terrorist threat, engages in some public good producing counterterrorism measure. The amount of public good produced by retaliation or deterrence can be reduced by a state which offers safe havens to terrorists in exchange for a pledge to attack elsewhere. These states tend to face an under-supply of domestic security (they are often failed or failing states) and are referred to as a “paid rider.”⁴⁸ Paid rider behaviour leads to an outcome worse than what would otherwise prevail and can undo most if not all the benefit produced by counterterrorism-leading states because it eliminates the incentives of others to contribute to the public good of retaliation or deterrence. In fact, the paid rider payoff structure is so attractive that it dominates the free rider payoff, therefore making international cooperation even more difficult to achieve.

8.2 Asymmetries among Actors

Terrorist groups, unlike governments, find it easier to cooperate with one another and do so in loosely tied networks.⁴⁹ By contrast, governments find it difficult to cooperate despite obvious collective action interests.⁵⁰ Several factors may account for this seeming discrepancy. First, a government’s relative strength may produce a false sense of security thereby inhibiting it from appreciating the need for coordinated action. In contrast, a terrorist group’s relative weakness, compared to the well-armed government that they confront, means they have little choice but to pool and husband their meagre resources. Second, governments tend to hold differing opinions as to which group of reactionaries do, in fact, constitute a terrorist group. Terrorists, on the hand, might have different agendas and goals but they possess a unity of purpose by focusing on the same group of targets (for example, the “West”, particularly the United States and Israel). Lastly, terrorists, and the governments they confront, operate on different time scales. Whereas liberal democracies narrow their time horizons by election cycles (and their probability of re-election), terrorists tend to hold lifetime positions and thus view cooperation with their colleagues as investment that will pay dividends in the long run.

These asymmetries have the unfortunate effect of providing the cooperative terrorist with all the tactical advantages. Global terrorist networks can identify and exploit weakest link vulnerabilities whenever they appear. They can deploy their best trained units to hit these targets of opportunity which, owing to poor international cooperation, always exist.⁵¹ As well, targeted countries are invariably target-rich environments, whereas terrorist groups and their sanctuaries are target poor, a fact which is especially frustrating given the terrorist penchant for interspersing itself among population centres. Governments must essentially defend everywhere and be fortunate always; terrorists may pick and choose their targets and need only be fortunate occasionally.⁵² Governments are organized hierarchically making them especially susceptible to espionage, but modern terrorist groups are cellular, non-hierarchic, can operate autonomously,

⁴⁸ Lee (1988) and Lee and Sandler (1988).

⁴⁹ Hoffman (1998).

⁵⁰ Sandler and Enders (2004), Sandler (2005).

⁵¹ Sandler (2003).

⁵² Edward F. Mickoulous, Todd Sandler, and Jean M. Murdock (1989), *International Terrorism in the 1980s: A Chronology of Events* (Ames: Iowa State University Press, 1989), p. 115.

and possess little information which could cause network-wide damage in the event of capture.⁵³ Lastly, governments tend to know little about the size, disposition, and material capabilities of terrorist groups but, conversely, terrorists know a lot about their targets (much of which they gather from public records). The aggregate effect of these asymmetries is, therefore, a reversal of the advantages which would normally accrue to the strong.

At the broadest level, game theoretic analyses of terrorism demonstrate how inefficiencies in international counterterrorism cooperation arise from the self-interest of countries to maximize their own private benefit payoffs. Pursuit of this dominant strategy results in a lack of coordination among countries; this, in turn, produces an oversupply of country-specific defensive measures and an undersupply of offensive action which only exacerbates the weakest-link problem. As the geographical and technological reach of modern transnational terrorism expands to encompass greater numbers of differing targets, the externality problem too will worsen. In the absence of sufficient compensation mechanisms which might optimize global counterterrorism defences, unilateralism, and not sovereignty-subordinating cooperation, will likely characterize the national security policies of at-risk countries. Moreover, cooperation among an ever growing chorus of targeted states is likely to become increasingly difficult, meaning the degree of sub-optimality in counterterrorism cooperation will continue to grow. To avoid these outcomes, governments must embrace greater cooperation across all areas of counterterrorism policy. Until governments come to appreciate the extent of their self-imposed disadvantage, terrorists will continue to exploit their asymmetric advantages.

8.3 Policy Considerations

Because terrorism does not pose a threat to every country in the world, international cooperation will remain partial and have limited effectiveness. However, pursuing a purely autonomous counterterrorism policy is simply not an option for Canada. Canada cannot rely solely on international counterterrorism agreements or conventions as they have been shown to have little real impact in outlawing specific modes of attack. Therefore, despite the challenges inherent in international counterterrorism cooperation, it is a strategy which will conserve and most effectively allocate our resources. Canada must embrace a cooperative strategy that coordinates our defensive and offensive measures across all forms of counterterrorism including military action, terrorist financing, border security and even the psychological warfare aspects of counterterrorism.

Intelligence sharing is an obvious starting point but must be followed by collective decision-making. Those states which do face the threat of terrorism should form a “coalition of the willing” to provide a forum for intelligence sharing and collective action. A grand strategy for counterterrorism should be developed and enforced by all member states. Geographically contiguous states could also form a common security perimeter which would reduce costs and minimize border guard deployments.

Because “paid riding” behaviour within such coalitions can be so damaging, enforcement mechanisms are needed to demonstrate to those states still “on the fence” that noncompliant

⁵³ Arquila and Ronfeldt (2001).

behaviour will have negative effects on their country. For example, noncompliant states could be branded as state sponsors of terrorism if they permit terrorist safe havens on their territory. The ensuing political, economic, and security implications ought to be sufficiently threatening so as to deter a country from such misbehaviour. On the other hand, coalition states can be incentivised to increase their offensive counterterrorism measures by increasing the private benefits they gain from such action. This could be accomplished by increasing military and economic aid to these states or allowing them to have a greater say in coalition counterterrorism policy.

9 Economic Consequences of Terrorism

Although terrorism is chiefly a political phenomenon intent on achieving political aims, it nevertheless can be used to produce painful economic dislocations within target countries. Depending on the nature of the terrorist threat, whether it is a single incident/event or a prolonged state of endemic insecurity, a targeted country can expect both short- and long-term impacts on its economy, stemming from both the direct and indirect costs of a terrorist event. Current research suggests that large, diversified economies can more readily absorb economic shocks produced by acts of terrorism, whereas small countries dependent on a few large industries are at a greater risk of suffering economic fallout. This is the case because in diversified economies, terrorism is likely to cause a substitution from sectors vulnerable to terrorism into relatively safer areas. Prices can speedily allocate capital and labour to sectors with higher marginal product and lower “risk premiums.” The “resilience” of market economies owing to the process of reallocation (or “factors of production” mobility) can limit the economic impact of terrorism.

From a theoretical standpoint, the economic consequences of terrorism can be divided by their effects on the economy as a whole (at the macroeconomic level) and by the effects on individual consumer and business behaviour (at the microeconomic level). With respect to the former, an analyst would want to examine metrics such as lost output, stock market volatility, foreign direct investment activity (including trade), currency volatility, credit liquidity, and the “crowding out” effects produced by inevitable increases in homeland defence spending and potential overseas military operations. At the microeconomic level, metrics like consumer confidence, business sentiment, insurance premiums, freight rates, tourism and transport activity, would help in capturing how off-site consumer and business behaviour is affected by terrorism.

In general, most economists believe that the macroeconomic consequences of a terrorist attack are minimal for a large, diversified country. However, small countries enjoy proportionately lower levels of resilient capacity; therefore, terrorist attacks can cause more acute economic pain, especially if the attack is directed at strategic, revenue-generating economic interests such as oil and gas refineries, port facilities, or tourist destinations. There exists a variety of modern examples with which we can further explore the dynamic economic consequences of terrorism, but first let us examine the effect persistent terrorist activity has on the long term economic growth potential of a country.

9.1 Economic Growth and Terrorism

Comparing the experiences of different countries which confront persistent terrorism is a difficult task. For one, the costs likely to face the U.S. or Canada will be different than those faced by other countries. Moreover, countries vary greatly in size and institutional structure, thereby making inter-country comparisons a difficult if not misguided venture. Despite these complications, Blomberg, Hess, and Orphanides (henceforth BHO (2004)) sought to test the relationship between economic growth and terrorism using a sample of 177 countries from 1968 to 2000. The researchers found that terrorism is associated with a reduction in economic growth such that per capita growth falls by about 1.5% for every year a country suffers a terrorist

attack.⁵⁴ Not surprisingly, BHO (2004) conclude that the cost of terrorism can be sizeable for countries that face a continuing threat of terrorism. A country's standard of living in both the short and long run is negatively affected by a general redirection of economic activity away from investment spending toward government spending (e.g., counterterrorism spending).

Often-cited criticisms of BHO (2004) point out that the model does not capture dynamic inter-relationships between economic growth and terrorism. It can be argued that the specification of the BHO (2004) model does not account for countries which face multiple incidents per year (frequency) or acts of terror which are more harmful than others (intensity). The study also makes no distinction between countries of different political systems. In trying to investigate this latter point, Tavares (2004) employed a dynamic specification of BHO (2004) but found similar results nonetheless. While there did exist a negative and persistent relationship between economic growth and terrorism, the most notable finding in this study was that the effect of a typical terrorist attack decreases as the level of political freedoms increases in the target country.⁵⁵ The interpretation then follows that democracies are better able to withstand attacks than countries with other types of less flexible governmental structures. This falls in line with our previous findings which explained how democracies utilize markets to allocate resources between at-risk and low risk sectors.

9.1.1 Case Study: United States and 9/11

A most useful starting point to investigate the economic consequences of terrorism is the case provided by the September 11 attacks in New York City. 9/11 was the largest terrorist event in history, and it targeted the world's largest market economy. Initial studies done within a year or two of the 9/11 attack reached widely varying conclusions as to the ultimate cost of the attack. For example, the Bureau of Economic Analysis (2001) estimated total direct losses of \$48.7 billion (USD) which represented about 0.5% of GDP in 2001.⁵⁶ Looney (2002) estimated total direct costs at \$27.2 billion⁵⁷ while Bernasek (2002) found the costs running as high as \$151 billion.⁵⁸ The International Monetary Fund (IMF) (2001) found loss of output to be as much as \$75 billion, or ¾% of GDP in 2001 dollars.⁵⁹

A series of more recent studies funded in part by the U.S. Department of Homeland Security (DHS) uses some of the latest economic modeling techniques to assess the 9/11 attacks. Using "event analysis" – comparing data and trends before and after an event to look for breaks and/or regime shifts in the time series – analysts sought to evaluate impacts at the sectoral and regional level as well as the national level. Having the benefit of being able to review previous DHS studies as well as those of the NYC Office of the Comptroller, researchers at CREATE (Center

⁵⁴ Brock S. Blomberg, Gregory D. Hess, and Orphanides Athanasios (2004), "The Macroeconomic Consequences of Terrorism," article in *Journal of Monetary Economics*, 51.5 (2004): 1007-32.

⁵⁵ Jose Tavares (2004), "The Open Society Assesses its Enemies: Shocks, Disasters and Terrorist Attacks," article in *Journal of Monetary Economics*, 51.5 (2004): 1039-70.

⁵⁶ Enders and Sandler (2006), *The Political Economy of Terrorism*, p. 204.

⁵⁷ R. Looney (2002), "Economic Costs to the United States Stemming from the 9/11 Attacks," article in *Strategic Insights*, 6.1 (2002).

⁵⁸ A. Bernaske (2002), "The Friction Economy," article in *Fortune*, 18 February 2002, p. 3.

⁵⁹ International Monetary Fund (2001), "How has September 11 Influenced the Global Economy," Chapter 11 in *World Economic Outlook*, December 2001.

for Risk and Economic Analysis of Terrorism Events) arrived at the following direct-cost conclusions: first, the regional impact observed in New York and New Jersey is significant and amounts to approximately \$46.5 to \$56.5 billion (or 50% of the total impact on the U.S. economy); second, the national impact, though significant, is substantially smaller than was estimated among the initial studies and came out at \$35 to \$109 billion, or 0.5 to 1.0% of 2006 GDP.⁶⁰ The observed tendency of early studies to overestimate future impact effects is in line with our theoretical assumptions stated earlier. Indeed, the resilience of the U.S. economy, of which business relocation and input substitution are the main forms, demonstrates how market economies can absorb unforeseen shocks to the system with minimal macro-level disturbance.

Although the direct costs of the 9/11 attacks are large, they are overshadowed by the indirect costs. For example, Navarro and Spencer (2001) estimated total output loss (including work stoppages and lost productivity) at \$47 billion.⁶¹ The Bureau of Labor Statistics (2003) reported layoffs (in the quarter following 9/11) spiked unemployment by a full percent.⁶² Ito and Lee (2004) estimated tourism and transport, the hardest hit sectors of the economy, lost \$1.5 billion and \$700 million respectively.⁶³ Navarro and Spencer (2001) found U.S. stock markets, which had been closed for a week following the attacks, reported capitalization declines totaling \$1.7 trillion, most of which was a reflection of shareholder pessimism about lost future profits and higher risk premiums.⁶⁴ As well, the U.S. Department of Justice established a Victim's Compensation Fund which paid out a total of \$38.1 billion to families of the deceased.⁶⁵

It is generally agreed that the U.S. economy rebounded quickly after the initial shock of the attack had worn off. A primary concern of policymakers was ensuring the health of the U.S. financial system. The attacks on the World Trade Center badly damaged the physical infrastructure of the markets; for example, the communication and computer systems at the Bank of New York (the world's largest settlement bank) were severely damaged. To avoid a panic in resale markets and meet demand for highly liquid assets, the Federal Reserve cut the federal funds rate dramatically and encouraged banks to avail themselves of the Fed's discount window. Borrowing through these mechanisms more than doubled from 11 September to 12 September thanks to this expedited monetary action. Pro-cyclical fiscal policy was in the offing too. The first tax cuts of the Bush Administration came into effect in May 2001, leading to higher (after tax) disposable incomes. Adding to the aggregate demand stimulus was a variety of supplemental requests, of which Congress approved some \$40 billion worth, which appropriated funds for search and rescue and site security. Both measures played an important role in restoring consumer and business confidence in the months following the attack.

⁶⁰ S. Brock Blomberg and Adam Z. Rose (2009), "Introduction to the Economic Impacts of the September 11, 2001, Terrorist Attacks," in *Peace Economics, Peace Science, and Public Policy*, 15.2 (2009): 5.

⁶¹ Peter Navarro and A. Spencer (2001), "September 11, 2001: Assessing the Costs of Terrorism," article in *Milken Institute Review*, 4th Quarter 2001: 16-31.

⁶² Bureau of Labor Statistics (2003), "Extended Mass Layoffs and the 9/11 Attacks," article in *Monthly Labor Review: The Editor's Desk*, [<http://www.bls.gov/opub/ted/2003/sept/wk2/art03.htm>], accessed May 14, 2010.

⁶³ Harumi Ito and Darin Lee (2005), "Assessing the Impact of the September 11 Attacks on U.S. Airline Demand," article in *Journal of Economics and Business*, 57.1 (2005): 75-95.

⁶⁴ Navarro and Spencer (2001).

⁶⁵ Enders and Sandler (2006), *The Political Economy of Terrorism*, pp. 206.

The long-term indirect costs of 9/11 are the largest segment of total cost. The costs of combating terrorism by the United States government have consumed hundreds of billions of dollars. Nanto (2004) points out that for FY2004, the Administration requested an 83% increase in funding over its FY2002 request to combat terrorism. As well, 14 other agencies requested more than double their FY2002 level of which the largest increases went to DHS and DOD. On top of all this, a FY2004 Supplemental Request for appropriations for Operations Iraqi Freedom and Enduring Freedom totaled more than \$151 billion. A 2004 CBO study estimates that a total of \$144 billion will be spent for the period 2005-2009 for non-defence outlays for homeland security.^{66 67} From a fiscal standpoint then, the long-run indirect costs of 9/11 – which includes subsequent financing of the Global War on Terrorism (GWOT) and ongoing operations in Iraq and Afghanistan – runs into the hundreds of billions.

When taken together, the direct and indirect costs of 9/11 are significant; however, the vast majority of the burden lies with the federal government. As well, given the nearly decade-long preeminence of the GWOT in the U.S. defence community, the U.S. government has clearly demonstrated a strong inclination to finance heightened levels of defence spending at the expense of other federal obligations. Thanks in part to the resilient capacity of the U.S. economy as well as timely, expansionary monetary and fiscal policy, the United States government had effectively mollified those pre-existing recessionary pressures which the attacks had magnified. Danger to the country's long-term growth and productivity prospects were also minimized, though at some cost to the country's fiscal position.

9.1.2 Case Study: Israel

Israel's long experience with terrorism provides a wealth of information with which to examine the interrelationship between terrorism and economic performance. It is an advanced though small democracy dependent on foreign export markets for growth. It is also a highly militarized society, as 2008 military expenditures consume 7% of GDP and military exports account for a large share of total national exports.⁶⁸ Israel therefore provides an excellent baseline scenario for a democratic state seeking economic development while enduring persistent terrorist activity.

Eckstein and Tsiddon (2004) analyze time series data for the period 1980-2003 to study the effect of persistent terrorism on real GDP, investment, exports, and consumption of non-durable goods in Israel. They measure terrorism by taking a weighted average of the number of Israeli fatalities, injuries and non-casualty incidents. The researchers found that the initial impact of terrorism on economic activity persists for just a single quarter; and, that the effect on exports and investment is three times larger than that on non-durable consumption and GDP.⁶⁹ This finding reinforces our earlier theoretical predictions that the sectoral effects of terrorist activity are much larger than the effect on the overall economy.

⁶⁶ Dick K. Nanto (2004), "9/11 Terrorism: Global Economic Costs," article in *Congressional Research Service Report for Congress*, 5 October 2004.

⁶⁷ Note: This estimate was given before the appropriation requests for the 2006 Baghdad surge and the 2010 Afghanistan surge. We can safely assume these figures had to be adjusted upward.

⁶⁸ Country Analysis: Israel (2009), *The SIPRI Military Expenditure Database*, Stockholm International Peace Research Institute. Available at: <http://milexdata.sipri.org/result.php4>. Accessed on 14 August 2010.

⁶⁹ Zvi Eckstein and D. Tsiddon (2004), "Macroeconomic Causes of Terror: Theory and the Case of Israel," article in *Journal of Monetary Economics*, 51.5 (2004): 971-1002.

Given these results, Eckstein and Tsiddon then sought to forecast the counterfactual time paths for the four independent variables under the assumption that all terrorist activity ceased after 2003:Q4. Under this specification, the researchers found real per capita GDP would grow 2.5% from 2003:Q4 to 2005:Q3. They then calculated the effects if terrorist activity remained steady through the same period and found that the real per capita growth rate would be zero. Finally, if terrorist activity increased over that same period, real per capita GDP would decline 2% and investment would plummet at an annual rate of 10%. Again, these findings reinforce the theoretical predictions that sectoral contraction would be more severe than overall effects.

9.1.3 Case Study: Spain

Like Israel, Spain has also had to endure decades of persistent terrorist activity emanating from Basque Country. When terrorist activity increased in the early 1970s, the Basque Country was Spain's third wealthiest region (per capita basis, out of 17 regions). But after 30 years of conflict with ETA and 800 terrorism-related deaths, the region had fallen to sixth place. ETA separatists specifically set out to target Basque entrepreneurs and corporations and so conventional wisdom attributes the upswing in terrorist activity with the decrease in the Basque standard of living.

To assess the macroeconomic costs of terrorism in the Basque region, Abadie and Gardeazabal (2003) compared the per capita GDP of the Basque region to that of a comparable synthetically-constructed region without terrorism. The researchers found an average 10% per capita gap between the two regions where changes in the gap were attributed to variations in the intensity of terrorist activity. Abadie and Gardeazabal then utilized the 1998-1999 cease-fire to produce an experiment where the performance of Basque and non-Basque stock portfolios could be compared. They found that when a credible cease-fire was announced by ETA, the stock portfolio of the Basque-related firms increased by 10%. That same portfolio then fell 11% when the cease-fire collapsed fourteen months later.⁷⁰ As expected, the non-Basque stock portfolio did not experience any significant movement corresponding to either cease-fire announcements.

Abadie and Gardeazabal (2003) noted that the impetus for their study was the apparent dearth of analysis on the economic effects of the Basque Country conflict. With few exceptions, little work had been done in the field. But as Abadie and Gardeazabal (2003) demonstrated, when terrorists target firms from particular regions (or countries) the risk of future attacks can induce investors to move capital out of terror-prone firms. Higher operating costs are incurred by such terror-prone firms because even in the absence of a direct attack, the threat thereof necessitates the acquisition of added resources to secure the firm's facilities and its personnel. If an actual attack does occur, infrastructure can be destroyed, production and shipping delays can be expected and insurance rates can become debilitating. The outlook for corporate profits is therefore dim. Firms may therefore find it cheaper to shift operations to countries with less terrorist activity.

Enders and Sandler (1996) sought to address the issue of foreign investment in terror-prone regions by estimating the effects of terrorism on the level of net foreign direct investment (NFDI) in Spain and Greece. Unlike a large economy (such as the United States) which can draw in

⁷⁰ Alberto Abadie and Javier Gardeazabal., (2003) "The Economic Cost of Conflict: A Case Study of the Basque Country," article in *American Economic Review*, 93.1 (2003): 113-132.

foreign capital from a multitude of sources and respond demonstrably to terror attacks (or attempts), smaller economies like Spain and Greece have less resources to draw on. Moreover, both Greece and Spain have extensive experience with terrorist attacks directed against foreign commercial interests: ETA in Spain and 17 November and the Revolutionary Popular Struggle in Greece. Eschewing some of the more intricate difficulties of estimating changes in NFDI, Enders and Sandler reported finding that a typical terrorist event in Spain decreased NFDI by \$23 million, 59% of which persisted after the first quarter. This suggests a reasonable amount of “memory” in the system. The researchers then compared these findings to those produced by a synthetic “no terrorism” analysis and found an expected versus actual NFDI gap amounting to 15% of total NFDI. The results for Greece were even more striking as Enders and Sandler found that terrorism accounts for nearly 33% of the variation in Greece’s NFDI.⁷¹

9.1.4 Conclusion

Findings based on the case studies described above reinforce many of the theoretical assumptions offered to describe the economic consequences of terrorism. Although the scale of macroeconomic effects of terror attacks differ across countries, most studies show the indirect costs to be quite sizeable when one includes lost output, increased security costs, and higher private sector “risk premiums” in the accounting. The concept of “resilience” showed how crucial the institutional, political and economic structure of a target country is to mitigating the macroeconomic effects of terrorist attacks. Reliance on market allocations of capital and labour, based on price elasticity, allows substitution to occur between high-risk and low-risk commercial activities. The mobility of factors of production might therefore represent a country’s best defence against potential economic dislocations caused by terrorism, assuming the attack itself cannot be prevented.

In the case of 9/11, the CREATE series of studies repeatedly demonstrated the disproportionate effect the attacks had at the local, regional, and sectoral level. Although national level monetary and fiscal policy responses were employed with untypical verve, U.S. macroeconomic indicators did not react unreasonably pessimistically, once the initial shock of the attacks had worn off. In spite of criticisms of methodology, researchers have attempted to estimate the causal and correlative relationship between economic growth and terrorism. As seen in BHO (2004), the negative relationship between terrorism and economic growth seems to be significant, robust, and persistent across the vast majority of countries. This relationship is especially debilitating for non-democratic, non-free market states and for countries reliant on a small number of strategic, revenue-generating interests.

Advanced analytical techniques now allow researchers to construct and assess synthetic regions or countries to provide comparative baseline scenarios. As shown in Eckstein and Tsiddon (2004) and Abadie and Gardeazabal (2003), these techniques have the unfortunate distinction of showing how much the development of an economy can be impeded by persistent terrorist activity. In the case of both Israel and Spain, the economy is subject to what is essentially a “terrorism tax” which crowds out private sector investment, raises the cost of doing business, and, ultimately, reduces the population’s standard of living.

⁷¹ Walter Enders and Todd Sandler (1996), “Terrorism and Foreign Direct investment in Spain and Greece,” article in *Kyklos*, 49.3 (1996): 331-352.

9.2 Policy Considerations

With the exception of countries like Israel and Spain, which confront a persistent terrorist threat, the economic consequences of terrorist attacks are generally modest for capitalist democratic societies. In fact, in many ways terrorist events produce economic effects not unlike those produced by natural disasters or industrial accidents. Although terrorist attacks act as an exogenous shock to an economy (such attacks are generally of low intensity and are very short-lived) the effects tend to be localized; that is, they are geographically and sector-specific. A variety of fiscal and monetary tools can further smooth out the economic shocks produced by unexpected terrorist attacks; therefore, from a counterterrorism policy standpoint, the government should be prepared to utilize such tools to ameliorate any deleterious effects. As United States experience with 9/11 showed, the Canadian government should also be willing to employ central bank lending mechanisms to reassure concerned investors, utilize targeted tax breaks for affected populations and industry sectors, set up temporary terrorism insurance facilities, shut down stock markets temporarily, and provide sufficient resources for reconstruction and increased homeland security. There is little else a capitalist democracy can actively do aside from the above mitigating actions. Ideally, the government would allow the price mechanism to allocate labour and capital freely between high-risk and low-risk commercial activities. Therefore, ensuring the continued mobility of capital and labour is Canada's best defence against potential economic dislocations caused by terrorism.

10 Conclusion

This study is intended to inform the Department of National Defence of various aspects of terrorism and counterterrorism derived from the use of economic methods of analysis. Economics is a suitable and powerful discipline to study the terrorism phenomenon because it constructs theoretical models upon which empirical hypotheses are formulated and tested. The study incorporated literature reviews, empirical studies, and a variety of theoretical constructs germane to the development of an integrated counterterrorism concept. Among its principal goals was to identify how legislative policy gaps and capability deficiencies arise from sub-optimal resource allocation and asymmetric (or imperfect) information.

The study began with a brief discussion of the definitional challenges inherent in the study of terrorism. It was admitted that the agreed-upon working definition of terrorism does have its weaknesses but is sufficient for the purposes of this study. Caution is suggested, though, when analyzing data sets, as there is an inherent tendency to under- or over-report terrorist incidents depending on the source of the data. A concise time series analysis of terrorist event types was then offered to draw out and discuss some of the observable trends found in the ITERATE data set. By using the tools of spectral and intervention analysis, the author was able to demonstrate that many of the theoretical predictions offered in subsequent theoretical sections were consistent with observed trends. Terrorism poses a unique challenge to liberal democracies in that the very nature of liberal democracies aids and abets terrorist activity – by allowing freedom of expression, speech, association, movement, and rights to privacy and unwarranted search and seizure – and is thus a confounding irony for defence planners. The characteristics of an “open society” therefore create a favorable environment within which terrorists can conduct their violent campaigns. The challenge for government is thus to balance the competing demands for increased civil liberties and reduced terrorism risk in a way that is politically acceptable.

Both Choice Theory and Game Theory were utilized to demonstrate the incentive structure which exists between governments and terrorists on the one hand, and between governments, on the other hand, trying to cooperate in transnational counterterrorism efforts. Choice Theory, which relies on a rational actor depiction of terrorists, offered several discrete theoretical predictions, most significantly regarding the transference phenomenon, which were then found to be consistent with various empirical studies. Terrorists, like other economic actors, respond to incentives. This suggests that an effective counterterrorism policy is one which manipulates these incentives in ways that raise the cost of terrorist activity to prohibitive levels. The discussion of Game Theory and its applications showed how the pursuit of a country’s own counterterrorism self-interest gives rise to a global sub-optimal allocation of counterterrorism defences. Relative differences in counterterrorism capabilities among countries give rise to a weakest link problem, and the absence of appropriate compensation mechanisms means the weaker one’s defence, the more likely it is to be sought out for attack.

Lastly, a discussion of the economic consequences of transnational terrorism was provided. Numerous empirical studies confirm earlier theoretical predictions that the indirect costs of terrorism are quite sizeable when one includes lost output, increased security costs, and higher private sector “risk premiums” in the accounting. The concept of “resilience” showed how crucial the institutional, political, and economic structure of a target country is to mitigating the

macroeconomic effects of terrorist attacks. Reliance on market allocations of capital and labour, based on price elasticity, allows substitution to occur between high-risk and low-risk commercial activities. The mobility of factors of production might therefore represent a country's best defence against potential economic dislocations caused by terrorism, assuming the attack itself cannot be prevented.

11 Summary of Policy Considerations

It is strongly advised that the issues identified in this study be considered and integrated into a Canadian counterterrorism policy. Many of the issues described were gleaned from the experiences of our allies in their confrontations with terrorism. Canada's experience with domestic and transnational terrorism is comparatively small; this then suggests that the national security and political community will have to work hard to avoid complacency in the realm of counterterrorism. Although some mitigating strategies may seem onerous, alarmist, or duplicative, effective counterterrorism requires multiple layers of defences and an inventory of preemptive and reactive capabilities.

Canadian counterterrorism policy must be designed to maximize the government's ability to adapt to and anticipate changes in terrorist strategy and behaviour. Defeating sophisticated terrorist groups will require the counterterrorism community to focus on raising financial cost and logistical complexity of all modes of attack. As was shown, the government is already involved in many of these areas therefore enhancing counterterrorism efforts requires additional and predictable long term funding to ensure that defensive measures, once built, do not decay.

There should also be awareness on the part of security and political community that increased defences at home may induce terrorists to strike Canadian targets abroad. Policymakers must be aware of the second and third order effects produced by domestic counterterrorism policy. Yet despite the many obstacles detailed above, Canada must come to terms with the international aspects of modern terrorism. In an era where CBRN type attacks become increasingly likely, the allocation of scarce defence resource should be made in a cooperative decision making forum to maximize the effectiveness of liberal democratic counterterrorism coalitions.

There are limits to the effectiveness of a government in confronting terrorism. Terrorism, as a tactic of the weak to confront the strong, cannot be fully eliminated but its effects can be minimized. Rather than focusing on counterfactuals of the past, governments should be more concerned with how their actions and policies will affect the future. Governments need to communicate that any political and economic fallout resulting from terrorist attacks will never be so great that the government would consider conceding to terrorist demands.

Bibliography

- Abadie, Alberto and Javier Gardeazabal (2003). "The Economic Cost of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93.1 (2003): 113-132.
- Arce, D.G. and T. Sandler (2005a). "Counterterrorism: A Game Theoretic Analysis." *Journal of Conflict Resolution* 49 (2005): 183-200.
- Arquilla, J., and D.Ronfeldt (Eds) (2001). *Networks and Netwars*. Santa Monica: RAND, 2001.
- Basile, Mark (2004). "Going to the Source: Why Al Qaeda's Financial Network is Likely to Withstand the Current War on Terrorist Financing." *Studies in Conflicts and Terrorism*, 27.3 (2004): 169-85.
- Becker, G. (1971). *Economic Theory*. New York: Alfred Knoff, 1971.
- Bernaske, A. (2002). "The Friction Economy." *Fortune*, 18 February 2002, p. 3.
- Blomberg, S. Brock, Gregory D. Hess, and Orphanides Athanasios (2004). "The Macroeconomic Consequences of Terrorism." *Journal of Monetary Economics*, 51.5 (2004): 1007-32.
- Blomberg, S. Brock, and Adam Z. Rose (2009). "Introduction to the Economic Impacts of the September 11, 2001, Terrorist Attacks." *Peace Economics, Peace Science and Public Policy*, 15.2 (2009): 5.
- Bueno de Mesquita, E. (2005a). "Conciliation, commitment, and counterterrorism: A Formal Model." *International Organization*, 59 (2005):145-176.
- Bueno de Mesquita, E. (2005b). "The Terrorist Endgame: A Model with Moral Hazard and Learning." *Journal of Conflict Resolution*, 49 (2005): 237-258.
- Bueno de Mesquita, E. (2005c). "The Quality of Terror." *American Journal of Political Science*, 49.3 (2005): 515-530.
- Bureau of Labor Statistics (2003). "Extended Mass Layoffs and the 9/11 Attacks." *Monthly Labor Review: The Editor's Desk*.
- Crenshaw, M. (1992). "Current Research on Terrorism: The Academic Perspective." *Studies in Conflict and Terrorism*, 15 (1992): 1-11.
- Eckstein, Zvi and D. Tsiddon (2004). "Macroeconomic Causes of Terror: Theory and the Case of Israel." *Journal of Monetary Economics*, 51.5 (2004): 971-1002.

- Enders, Walter, Todd Sandler, and Jon Cauley (1990a). "UN Conventions, Technology and Retaliation in the Fight Against Terrorism: An Econometric Evaluation." *Terrorism and Political Violence*, 2.1 (1990): 83-105.
- Walter Enders and Todd Sandler (1993). "The Effectiveness of Antiterrorism Policies: A Vector Auto-Regression Intervention Analysis." *America Political Science Review*, 7 (1993): 829-844.
- Enders, Walter and Todd Sandler (1996). "Terrorism and Foreign Direct Investment in Spain and Greece." *Kyklos*, 49.3 (1996): 331-352.
- Enders, Walter and Todd Sandler (1999). "Transnational Terrorism in the Post-Cold War Era." *International Studies Quarterly*, 43.1 (1999): 145-67.
- Enders, Walter and Todd Sandler (2000). "Is Transnational Terrorism Becoming More Threatening?" *Journal of Conflict Resolution*, 44.3 (2000): 307-32.
- Enders, W. and T. Sandler (2002). "An Economic Perspective of Transnational Terrorism," *Working Paper*.
- Enders, W. and T. Sandler (2004). "What do we know about the Substitution Effect in Transnational Terrorism?" *Research on Terrorism: Trends, Achievements, and Failures*. London: Frank Cass, pp.119-137.
- Enders, W. and T. Sandler. (2005a). "After 9/11: Is It All Different Now?." *Journal of Conflict Resolution*, 49(2): 259-277.
- Enders, W. and T. Sandler (2006). *The Political Economy of Terrorism*. New York: Cambridge University Press, 2006.
- Enders W. and T. Sandler. (2006b). "Distribution of Transnational Terrorism Among Countries by Income Classes and Geography after 9/11." *International Studies Quarterly*, 50 (2006): 367-393.
- Enders, W. (2007). "Terrorism: An Empirical Analysis." *Handbook of Defence Economics* Volume II. North Holland: Elsevier Science, 2007, pp. 816-864.
- Eubank, William L. and Leonard B. Weinberg (1994). "Does Democracy Encourage Terrorism?" *Terrorism and Political Violence*, 13.1 (1994): 429-430.
- Faria, Joao R. (2003). "Terror Cycles." *Studies in Nonlinear Dynamics and Econometrics*, 7.1 (2003): 1-11.
- Hoffman, Bruce. (1997). "The Confluence of International and Domestic Trends in Terrorism." *Terrorism and Political Violence*, 9.2 (1997): 1-15.
- Hoffman, B. (1998). *Inside Terrorism*. New York: Columbia University Press, 1998.

- Im, Eric I., Jon Cauley, and Todd Sandler (1987). "Cycles and Substitutions in Terrorist Activities: A Spectral Approach." *Kyklos*, 40.2 (1987): 235-55.
- Ito, Harumi, and D. Lee (2005). "Assessing the Impact of the September 11 Attacks on U.S. Airline Demand." *Journal of Economics and Business*, 57.1 (2005): 75-95.
- International Monetary Fund (2001). "How has September 11 Influenced the Global Economy?" *World Economic Outlook: The Global Economy After September 11*.
- Landes, William M. (1978). "An Economic Study of US Aircraft Hijackings, 1961-1976." *Journal of Law and Economics*, 21.1 (1978): 1-31.
- Lapan, Harvey E. and T. Sandler (1993). "Terrorism and Signaling." *European Journal of Political Economy*, 93.3 (1993): 383-97.
- Lee, D.R. (1988). "Free Riding and Paid Riding in the Fight against Terrorism." *American Economic Review*, 78.2 (1988): 22-26.
- Lee, D.R. and T. Sandler (1988). "On the Optimal Retaliation Against Terrorists: The Paid-Rider Option." *Public Choice*, 61 (1988): 141-152.
- Levitt, Matthew (2003). "Stemming the Flow of Terrorist Financing: Practical and Conceptual Challenges." *Fletcher Forum of World Affairs*, 27.1 (2003): 59-70.
- Looney, R. (2002). "Economic Costs to the United States Stemming from the 9/11 Attacks." *Strategic Insights*, 6.1 (2002).
- Mickoulous, Edward F., Todd Sandler, and Jean M. Murdock (1989). *International Terrorism in the 1980s: A Chronology of Events*. 2 vols. Ames: Iowa State University Press, 1989.
- Mickolus, Edward F., Todd Sandler, Jean M. Murdock, Peter A. Flemming (2008), "International Terrorism: Attributes of Terrorist Events (ITERATE), 1968-2007." Dunn Loring, VA: Vinyard Software, 2008.
- Nanto, Dick K. (2004). "9/11 Terrorism: Global Economic Costs." *Congressional Research Service Report for Congress*.
- Navarro, Peter and A. Spencer (2001). "September 11, 2001: Assessing the Costs of Terrorism," *Milken Institute Review*, 4th Quarter 2001: 16-31.
- Overgaard, Per Baltzer (1994). "Terrorist Attacks as a Signal of Resources." *Journal of Conflict Resolution*, 38.3 (1994): 452-78.
- Rosendorff, B. Peter and T. Sandler (2004). "Too Much of a Good Thing? The Proactive Response Dilemma." *Journal of Conflict Resolution*, 48.5 (2004): 657-71.
- Sandler, Todd (2003). "Collective Action and Transnational Terrorism." *World Economy*, 26.6 (2003): 779-802.

Sandler, Todd (2005). "Collective versus Unilateral Responses to Terrorism." *Public Choice*, 124 (2005): 75-93.

Sandler, Todd, and Keith Hartley (1995). *The Economics of Defence*. Melbourne: Cambridge University Press, 1995.

Sandler, Todd and Harvey E. Lapan (1988). "The Calculus of Dissent: An Analysis of Terrorists' Choice of Targets." *Synthese*, 76.2 (1988): 245-61.

Sandler, T. and K. Siqueira (2005). *Global Terrorism: Deterrence versus Preemption*. (unpublished manuscript), Los Angeles: University of Southern California, 2005.

Sandler, T. and K. Siqueira (2006). "Global Terrorism: Deterrence Versus Pre-emption." *Canadian Journal of Economics*, 39 (2006): 1370-1387.

Sandler, Todd, John T. Tschirhart, and Jon Cauley (1983). "A Theoretical Analysis of Transnational Terrorism." *American Political Science Review*, 77.1 (1983): 36-54.

Schmid, Alex P. (1992). "Terrorism and Democracy." *Terrorism and Political Violence*, 4.4 (1992): 14-25.

Stockholm International Peace Research Institute (2009). "Country Analysis: Israel." *The SIPRI Military Expenditure Database*.

Tavares, Jose (2004). "The Open Society Assesses its Enemies: Shocks, Disasters, and Terrorist Attacks." *Journal of Monetary Economics*, 51.5 (2004): 1039-70.

Viscusi, W., K. and R.J. Zeckhauser (2003). "Sacrificing Civil Liberties to Reduce Terrorism Risks." *Journal of Risk and Uncertainty*, 26.2-3 (2003): 99-120.

Wilkinson, Paul (1986). *Terrorism and the Liberal State*, rev. ed. London: Macmillan, 1986

Wilkinson, Paul (2001). *Terrorism Versus Democracy: The Liberal State Response*. London: Frank Cass, 2001.

White, Jonathan R. (2003). *Terrorism: 2002 Update*. 4th ed. Belmont: Wadsworth/Thomson Learning, 2003.

List of symbols/abbreviations/acronyms/initialisms

CBRN	Chemical, Biological, Radiological, Nuclear
CF	Canadian Forces
CSIS	Canadian Security Intelligence Service
CORA	Centre for Operational Research and Analysis
CREATE	Center for Risk and Economic Analysis of Terrorism Events
DFSA	Directorate of Future Security Analysis
DHS	Department of Homeland Security
DND	Department of National Defence
DRDC	Defence Research & Development Canada
DRDKIM	Director Research and Development Knowledge and Information Management
FinTrac	Financial Transactions Reports Analysis Centre of Canada
FLN	Front de Liberation Nationale
GDP	Gross Domestic Product
GWOT	Global War on Terrorism
IMF	International Monetary Fund
IPIC	International Policy Institute for Counterterrorism
ITERATE	International Terrorism: Attributes of Terrorist Events
MIPT	Memorial Institute for the Prevention of Terrorism
MTE	Major Terrorist Event
NGO	Non-Governmental Organization
NYC	New York City
R&D	Research & Development
US	United States
USD	United States Dollar
UN	United Nations

Glossary

Choice Theory: Rational actor representations which depict an individual or collective as optimizing some goal subject to a set of constraints.

Free Rider: A state that benefits from its allies' actions while sitting on the sidelines

Game Theory: Representations employed when strategic interactions of two or more sets of optimizing agents are considered and each set engages in actions that alter the choices of the other set of agents.

Paid Rider: A state that gains national security assurances by offering terrorists concessions; for example, offering safe havens to terrorists in exchange for a pledge to attack elsewhere.

Transnational Externality: Where one country's choices impose an uncompensated cost or benefit on one or more other countries.

Rational Actor: One who responds in a sensible and predictable fashion to changing risks and constraints.

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3. TITLE (The complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title.) The Economics of Terrorism: Economics Methods of Analysis in the Study of Terrorism and Counter-Terrorism		
4. AUTHORS (last name, followed by initials – ranks, titles, etc. not to be used) Stocker, M.		
5. DATE OF PUBLICATION (Month and year of publication of document.) December 2010	6a. NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.) 56	6b. NO. OF REFS (Total cited in document.) 71
7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.) Contract Report		
8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the research and development – include address.) Defence R&D Canada – CORA and Chief of Force Development – DFSA 101 Colonel By Drive Ottawa, Ontario K1A 0K2		
9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.) LPO6454AA71	
10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.) Contractor's Document Number: Not Assigned	10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.) DRDC CORA CR 2010-277	
11. DOCUMENT AVAILABILITY (Any limitations on further dissemination of the document, other than those imposed by security classification.) Unlimited		
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The Directorate of Future Security Analysis (DFSA) is in the process of developing a Major Terrorist Event concept. This study is intended to inform the concept writers of various aspects of terrorism and counterterrorism derived from using analytical methods found in the discipline of economics. Economics is an appropriate discipline to study the terrorism phenomenon because it constructs theoretical models upon which empirical hypotheses are formulated and tested. By incorporating literature reviews, empirical studies and a variety of theoretical constructs, this study will provide the Department of National Defence (DND) and the Canadian Forces (CF) with analyses germane to development of an integrated counterterrorism concept by identifying how counterterrorism policy issues and capability deficiencies arise from sub-optimal resource allocation and asymmetric (or imperfect) information.

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