Adaptive Adversaries and Their Consequences

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National Center for Risk and Economic Analysis of Terrorism Events
University of Southern California
Los Angeles, California

Adaptive Adversaries and Their Consequences
October 2011 to September 2012

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"This research was supported, in part, by the United States Department of Homeland Security through the National Center for Risk and Economic Analysis of Terrorism Events (CREATE) under Cooperative Agreement 2007-ST-061-RE0001. However, any opinions, findings, and conclusions or recommendations in this document are those of the authors and do not necessarily reflect views of the United States Department of Homeland Security, the University of Southern California, or the Federal Reserve Bank."

Cooperative Agreement No. 2010-ST-061-RE0001
Department of Homeland Security

September 6, 2012

*Funded from other sources
ABOUT CREATE
The National Center for Risk and Economic Analysis of Terrorism Events (CREATE) was the first university-based Center of Excellence (COE) funded by University Programs of the Science and Technology (S&T) Directorate of the Department of Homeland Security (DHS). CREATE started operations in March of 2004. This annual report covers the seventh year of CREATE funding from October 2010 to September 2011, the first year under Cooperative Agreement 2010-ST-061-RE0001 from DHS. While the text of this report focuses on the seventh year, all data tables, publications, lists of participants, students, and presentations and events are cumulative from the inception of CREATE.

CREATE’s research mission is to develop advanced models and tools for risk assessment, economic assessment, and risk management to counter terrorism. CREATE accomplishes this mission through an integrated program of research, education, and outreach, spanning the disciplines of economics, psychology, political science, industrial and systems engineering and information science. CREATE develops models, analytical tools, methodologies and software, and tests these tools in case analyses, representing critical homeland security investment and policy decisions.

Due to the cross-cutting nature of research in risk, economics, and risk management, CREATE serves the need of many client agencies at the DHS, including the Transportation Security Agency, Customs and Border Protection, Immigration and Customs Enforcement, FEMA and the US Coast Guard. In addition, CREATE has developed relationships with clients in the Offices of National Protection and Programs, Intelligence and Analysis, General Council, Health Affairs, and Domestic Nuclear Detection. Using a mix of fundamental and applied research, CREATE faculty and students take both the long-term view of how to reduce terrorism risk through fundamental research and the medium-term view of how to improve the cost-effectiveness of counter-terrorism policies and investments through applied research.

Please visit www.create.usc.edu for more information.
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1. Executive Summary

There are three subcomponent projects. Project 1 is “Immigration Policy and Counterterrorism.” This project is a theoretical exercise that models the proper linkages between counterterrorism policies and immigration quotas. Consider the United States and its transnational terrorism concern, which often comes from abroad. Transnational terrorists target US interests at home and abroad. Moreover, terrorist groups often take up residency in a developing country, which has limited means to root them out. Immigration and counterterrorism policies are both of central concern to the United States and other targeted countries. This project develops the first general equilibrium analysis of labor flows of skilled and unskilled workers that not only account for immigration quotas set up by the developed country (say, the United States), but also for the counterterrorism policies in the developed country and the host developing country for the terrorists (say, Pakistan). This general equilibrium analysis includes the strategic aspects behind the choice of counterterrorist instruments. To simplify matters, the developed country chooses its immigration quotas for skilled and unskilled labor, and its defensive measures to harden potential targets, while the developing host country chooses its proactive counterterrorism measures to root out the terrorists. We hypothesize a realistic scenario where a higher proportion of skilled to unskilled labor is needed to engage in transnational terror incidents than in domestic terrorist incidents.

Even though the analysis is complex and ambiguous in places, there are many important and unambiguous insights. First, developed countries gain from deflecting attacks back to the developing country despite its own interests in the latter. Second, proactive measures against a resident terrorist group need not reduce terrorism at home and abroad. This is a novel result that hinges on labor-intensity considerations in the productive and terrorist sectors in the host developing country and abroad in the developed country. In contrast, the literature views such proactive measures as necessarily reducing
terrorism everywhere. Third, the host country for terrorism may be better off in augmenting proactive measures even if this leads to more attacks at home. This follows when such measures more than compensate for the additional terrorism by augmenting the labor supply in the productive sector (as workers return to the productive sector) so that national income rises. Fourth, we show that a larger unskilled immigration quota raises terrorism against the developed country, while it reduces terrorism against the developing country. If the skilled migrant pool has a limited marginal impact on producing terrorism in the developed country, then a greater skilled labor quota reduces terrorism in the developed country but raises terrorism in the developing country. Fifth, we identify the circumstances where the developed country can gain a strategic advantage through policy leadership. When proactive measures and skilled quotas are strategic substitutes, reduced skilled immigration quotas by the developed country shift the burden of the war on terror to the developing country. Sixth, we establish that optimal immigration or counterterrorism policies cannot be examined in isolation; thus, there are firm theoretical grounds for including US Immigration and Customs Enforcement (ICE) in the Department of Homeland Security. That is, the margins affecting immigration choices can be greatly influenced by counterterrorism policies at home and abroad.

Project 2 is “Foreign Direct Investment, Aid, and Terrorism.” The purpose of this study is to present the first dynamic panel investigation of the effect of terrorism on foreign direct investment (FDI) for developing countries. Our study distinguishes the FDI consequences of three forms of terrorism: domestic, transnational, and total terrorism. This study of FDI is particularly important, because FDI is a major source of savings for developing countries to support their economic growth. We first construct a theoretical model to investigate the relationship between the two major forms of terrorism and FDI. We then empirically analyze how these relationships are affected by foreign aid flows by focusing on 78 developing countries for 1984-2008.

We find that terrorism has a sizable negative impact on FDI; a one standard deviation increase in terrorist attacks per 100,000 persons reduces net FDI by 572.1 million US dollars for an average country. Notably, aid has a mitigating influence on this reduction; on average, aid reduces this loss down to 103.01 million US dollars. A host of models are presented with a varied set of controls for democracy, globalization, openness, literacy, exchange rates, and other considerations. Nevertheless, the findings remain qualitatively and quantitatively quite similar.

Next, the paper investigates the differential impact of transnational and domestic terrorism on FDI. For a one standard deviation increase in attacks, domestic terrorism has a somewhat greater marginal adverse impact on FDI than transnational terrorism. This follows from the greater increase in the number of domestic attacks. Although aggregate aid has a large mitigating impact on the adverse influence of domestic terrorism on FDI, this aid does not have this same mitigating impact on transnational terrorism. Splitting aggregate aid into bilateral and multilateral aid, we find that bilateral aid reduces the adverse effects of all types of terrorism on FDI/GDP, while multilateral aid only limits the adverse effect of domestic terrorism on FDI/GDP. Generally, we find that foreign aid is less effective in the case of transnational terrorism. This is probably due to aid-recipient countries not being able to address a threat that is often based abroad. Most developing countries have little ability to project power beyond their borders.

The third subproject or subcomponent involves finishing up two projects begun in year 7. One of these studies investigates “Reevaluating Terrorism and Economic Growth: Dynamic Panel Analysis and Cross-Sectional Dependence.” This study quantifies the impact of various forms of terrorism on the growth of income per capita for five regional sub-groupings. Unlike all earlier studies, we use dynamic panel analysis where measures are taken at the country-year level. Most important, we account for Nickell bias
(where the number of countries exceeds the number of years), cross-sectional dependence, and endogeneity bias. When these considerations are adjusted and the econometrics is done correctly, we find that terrorism, regardless of its form, has no significant negative impact on economic growth.

Second, we finished our project on “Analysis of Common Drivers of Terrorism.” This study identifies common and idiosyncratic factors that influence transnational terrorism worldwide. Given the linkages among terrorist groups across countries, it is not surprising to expect that there will be common drivers of terrorism across countries. These common drivers can also arise from terrorist training camps being located in relatively few countries and many terrorist groups sharing common hatreds. Common drivers can also arise from countries copying one another’s counterterrorism strategies. Even the realization that defensive measures in one country will deflect terrorist attacks to less guarded countries will result in common drivers affecting transnational terrorist attacks worldwide. Once one or more common factors are identified, we tie these factors to transnational terrorist campaigns in specific countries. This exercise indicates which countries should join forces in the war on terror. Namely, countries whose transnational terrorism is most influenced by common drivers have the most incentives to join forces to address transnational terrorism in a collective manner; in contrast, those countries whose terrorism are driven by idiosyncratic or country-specific factors have the least incentive to address transnational terrorism in a collective manner. The analysis also indicate which countries transnational terrorist campaign have had the most far-reaching influence on global transnational terrorism.

Keyword 1: immigration policy
Keyword 2: counterterrorism
Keyword 3: foreign direct investment and foreign aid
Keyword 4: economic growth

2. Research Accomplishments

2.1. Immigration Policy and Counterterrorism

The first subproject investigates the theoretical linkages between immigration and terrorism by presenting a general equilibrium analysis of immigration and counterterrorism policies. A transnational terrorist organization draws unskilled and skilled labor from the productive sector to attack its targets. Laborers in the developing country choose to engage in terrorism when their returns from such activities exceed those from legal productive employment. The terrorist organization allocates its limited labor supply to attack its host nation and the interests of a developed country (e.g., the United States) at home and abroad. In a game-theoretic framework, the developing nation chooses proactive counterterrorism policies, while taking into account the behavior of the resident terrorist organization. Moreover, the developed nation decides the optimal mix of skilled and unskilled immigration quotas and a defensive (homeland security) counterterrorism policy. The analysis recognizes that skilled labor is more conducive to successful terrorist attacks in the developed country and that unskilled labor is more conducive to successful terrorist attacks in the developing host country. The project identifies complex and subtle interactions between the choice of quotas and counterterrorism policies.

The paper is now done and submitted for publication at a refereed economics journal.

2.2. Foreign Direct Investment, Aid, and Terrorism

This subproject constructs a theoretical model to investigate the relationship between the two major forms of terrorism (domestic and transnational) and foreign direct investment (FDI). We then empirically
analyze how these relationships are affected by foreign aid flow by focusing on 78 developing countries for 1984–2008. We quantify that both forms of terrorism has a significant negative impact on FDI flows. Moreover, we show how alternative aid flows – bilateral and multilateral aid – lessen the impact of terrorism on FDI. Hence, we establish that aid can improve a terrorism-impacted developing economy by reducing the consequences on FDI. In so doing, we quantify how aid to these countries mitigates the negative influence of the diverse forms of terrorism. In particular, we are able to distinguish the relative ameliorating impact of bilateral aid from that of multilateral aid. These impacts are empirically shown to differ by the nature of the terrorism – i.e., is it domestic or transnational terrorism.

The “Foreign Direct Investment, Aid, and Terrorism,” paper is now done and submitted to a refereed journal.

2.3. Finishing projects from previous years

An important empirical puzzle has to do with the economic consequences of terrorism on economic growth and gross domestic product (GDP). Although there have been some interesting contributions, there are still questions to resolve. Owing to data limitation, most studies have only investigated the impact of transnational terrorism on growth. Thus far, the consensus is that transnational terrorism has a small but significant negative effect of about 0.05 to 0.10 percentage points on income per capita growth. This effect characterizes developing, but not developed, countries. The latter countries show little adverse economic effects from terrorism. By ignoring domestic terrorism, most previous studies have failed to include an important component of terrorism. This is particularly worrisome because there can be seven to eight times as many domestic terrorist events as transnational terrorist attacks. START data allow studies to identify the relative contribution of the different kinds of terrorism to losses in GDP growth. It is also essential to account for simultaneity concerns – i.e., growth can affect terrorism, and terrorism can affect growth. Past studies have generally relied on (static) panel analysis of global samples, which may provide an “average” picture that may not be descriptive of many individual countries. It makes more sense to do data pre-analysis so that countries with similar responses can be grouped together and analyzed in subsequent empirical analysis. Studies must also account for cross-country and cross-regional considerations or dependence. These methods were also applied to investigate the influence of terrorism on investment and government expenditures. It is our contention that most economies are more resilient to terrorism than is believed. Terrorists are focused on causing economic hardship on targeted economies. Our growth study quantifies how successful this adaptive adversary has been in its goal. This study informs policymakers as to the best countermeasures to take. It also will serve to identify the economic consequences and cost of terrorism. The study examines total terrorism, domestic terrorism, and transnational terrorism and their impact on economic growth.

Our paper, “Reevaluating Terrorism and Economic Growth: Dynamic Panel Analysis and Cross-Sectional Dependence,” (with Khusrau Gaibulloev and Donggyu Sul) is now complete and is at a refereed journal for review. The paper shows that when cross-sectional dependence is taken into account along with other econometric considerations that dynamic panel analyses for five regional groups show that terrorist campaigns have had no influence on economic growth, investment, consumption, or government expenditure. This is very good news for governments and show that the terrorists have not in general succeeded in causing much economic harm to economies. Since this paper investigates regional groupings, it does not say that an individual country plagued by a significant terrorist campaign (e.g., Israel or Colombia) is free from economic consequences. Also, it does not say that a 9/11-type event would have no short-term economic costs. Instead, it shows that the level of terrorism experienced by most countries has little or no negative impact on economic growth.
This study is now in review at a general economics journal.

We also use principal components analysis to identify whether transnational terrorism for 1970-2007 has common factors that explain the overall pattern of terrorism. We first distinguish common and idiosyncratic (country-specific) factors for the transnational terrorism time series. Any common factors that are identified are then related to common components or drivers – e.g., are there countries whose transnational terrorism determines the behavior of worldwide terrorism? If this is the case, then what is the nature of these common-driver countries – are they failed states or something else? In fact, we find that almost two-thirds of global transnational terrorist attacks are driven by such attacks in Lebanon, which was a failed state throughout much of the 1970s, 1980s, and 1990s. With a more conservative criterion, we identify four additional countries – USA, Germany, Iraq, and the United Kingdom – as core countries in explaining cross-sectional correlation across 106 countries’ transnational terrorism. The five driver countries have assumed this role for various reasons. In the case of Lebanon, it provided safe haven for European, Middle Eastern, and Asian terrorist groups to train and hone their methods – e.g., Hamas, Japanese Red Army, Hezbollah, Fatah, the Popular Front for the Liberation of Palestine, and Abu Nidal Organization. In the case of the United States, foreign policy decisions – e.g., the Vietnam War, the Gulf Wars, and its support for Israel – may have tied transnational terrorist attacks in the United States to such attacks elsewhere. Our study also identifies countries whose transnational terrorism is idiosyncratic and therefore not dependent or related to attacks in other countries.

The principal component paper, “Common Drivers of Transnational Terrorism: Principal Component Analysis,” is now accepted for publication in *Economic Inquiry* and should be published in 2013.
Other projects were published. For example, “A Bayesian Poisson Vector Autoregression Model,” was published in *Political Analysis* in August 2012 and represents work from previous year’s funding. *Political Analysis* is among the two top rated political science journals. In a dynamic framework, this paper examines how terrorists have changed their targeting decisions in relationship to counterterrorism and the changing dominance of terrorists’ interests worldwide. We come up with a new estimator and then apply it to investigate the targeting decision over time by terrorists.

3. **Applied Relevance**

3.1. **Immigration Policy and Counterterrorism**

Our immigration paper identifies when developed countries should restrict the inflow of skilled or unskilled migrants from developing countries, which have a *resident terrorist group* that poses threats to developed countries’ interests at home and abroad. Examples would include Somalia, Pakistan, Afghanistan, and Yemen. Increased unskilled immigration quotas result in more terrorism against the developed countries’ interests. In addition, we are able to identify when larger skilled immigration quotas result in more or less terrorism against the developed countries’ interest. We are able to show that a leadership position where the developed countries choose their homeland security and immigration quotas *prior* to the developing countries choosing their proactive counterterrorism measures can energize the
host developing countries to do more to eliminate the terrorists. Such actions by the host developing countries can be to the advantage of the developed country whose interests are targeted at home and abroad. We show how immigration quotas on skilled and unskilled labor are necessarily tied to counterterrorism actions at home and abroad. These results can inform the US Congress, ICE and DHS.

3.2. Foreign Direct Investment, Aid, and Terrorism

In the aid paper, we find that all types of terrorism (i.e., domestic, transnational, and total) depress foreign direct investment (FDI). Our findings imply that aggregate aid is ineffective in addressing the causes and supply lines of transnational terrorism. Bilateral aid (i.e., aid flowing from say the United States to another country) reduces the adverse effects of all types of terrorism on FDI; however, multilateral aid (i.e., aid from the World Bank or the United Nations) only ameliorates these adverse FDI effects for domestic terrorism. Aid’s ability to curb the risk to FDI for terrorism is important because domestic terrorism is an overwhelming fraction of the total terrorism for many developing nations and FDI is an important engine of development, since it is a key source of savings which finances investment and growth. Our work can inform the US Congress on how aid can impact terrorism in developing countries.

3.3. Finishing projects from previous years

Our paper on common drivers not only identifies where transnational terrorist attacks have had the greatest influence on global transnational terrorist attacks, but it also identifies what proportion of other countries’ transnational terrorism is influenced by these countries’ transnational terrorist campaign. In so doing, the paper identifies which countries have the greatest stake in taking collective or joint action against transnational terrorism. That is, countries, which are primarily influenced by idiosyncratic country-specific causes, have less of a stake than those countries, which are primarily influenced by a common driver. Our study shows how terrorist campaigns are cross-sectionally dependent owing to common grievances, the centralized location of terrorist infrastructure, and ties among terrorist groups.

Our new work on terrorism and economic growth takes into account this cross-sectional dependence to come up with more accurate measures of the impact of the various forms of terrorism on growth. We find that the impact of terrorism on growth is virtually absent when cross-sectional dependence and other econometric concerns are taken into account in an appropriate dynamic panel econometric setting. This means that terrorists have failed in general to have the negative economic influence in general on targeted countries. It also tells authorities that the human cost and social anxiety caused by terrorism has been far greater in most countries than the economic consequences of terrorist attacks. This knowledge allows countries to better calibrate how much offsetting fiscal and monetary policy is needed following terrorist attacks. Except in the case of a huge terrorist attack such as 9/11, very modest monetary and fiscal policy is needed, and in most cases no such policy is needed. Quite simply, terrorists have fortunately not had the economic impact they sought.

4. Collaborative Projects

I am on the data advisory board of START to improve the Global Terrorism Database (GTD). I had agreed to be part of CREATE proposal on adaptive adversaries that was being put together by Steve Hora. I am on the advisory board of the EU-funded SURVEILLE project to evaluate the use of technology to screen transportation passengers. In March, I gave a lecture at CIA headquarters on my recent and current work on hostage-taking terrorism.
5. Research Products

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5.1. Publications and Reports


**Papers Completed and in Review**


5.2. Presentations

1. Sandler, T., “Evolving Threat of Terrorism,” UNIV 1010 Lecture to freshman class, University of Texas at Dallas, Richardson, TX, September 12, 2011, Outreach.


6. Education

I directed Charlinda Santifort’s PhD – she finished her degree on June 11 2012. Her dissertation is on terrorism. I taught “The Political Economy of Terrorism,” ECON 3369 to 21 Honors students at the University of Texas at Dallas during the spring 2012 semester.

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I funded Charlinda Santifort for the summer 2012 using my center’s money since my CREATE grant was so small. We have a number of papers in review and we will continue to work together. She has moved to the Boston area in September, but I will continue to mentor her.

7. Outreach

My INTERPOL-MIND/FIND project has meant an ongoing relationship with this organization and the General Secretariat in Lyon, France. The Secretary General, Ronald Noble, has been very supportive of our research and has allowed us to acquire the necessary data to complete two papers about INTERPOL’s innovative methods to fight transnational terrorism. I have begun research on a third paper with Javier Gardeazabal. This third paper deals with the influence of MIND/FIND technology on international crime.

I presented my work on hostage taking to a CIA-sponsored conference on March 14, 2012. I am advising an EU-funded to project on the use of technology screen passengers. I am an advisor on START’s GTD database.