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

Modeling and Estimating the Macroeconomic Consequences of Terrorism
October 2010 to September 2011

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December 31, 2011
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.
1. **Executive Summary**

This study continues to provide contributions for our understanding of underlying macroeconomic consequences of terrorism. The study estimates the long-run economic growth effects associated with terrorism and includes impacts due to behavioral influences as specified via social capital networks. To accomplish this task, we extended a panel data set that incorporates the World Bank data on national income and growth, IMF data on financial conditions, RAND and START data on domestic and international terrorism incidents, and data on external and internal conflict. Using this unique dataset, which spans over 40 years for 180 countries, we examine the dynamic effects of terrorism on economic growth, consumption growth, as well as possible effects on capital accumulation and macroeconomic instability. The panel dimension of this data is particularly useful as it allows identification of the effects of terrorism on economic activity, growth and stability that may be evident in long-run trends that cannot be detected absent long-horizon cross-country comparisons. With these added degrees of freedom across the globe, we can then extract the impact on the United States economy.

This project continues to develop a research program to estimate the economic impact of terrorism using a myriad of macroeconometric techniques. To estimate the long-term impact of terrorism the project will employ cross-sectional estimation, to estimate the short- and medium-term impact of terrorism the project employ dynamic panel and VAR analysis. To augment these estimates, the project will include estimates from the impact due to psychological and behavioral factors.

This project continues to be of the three modeling and research analyses of CREATE – “Economic Assessment which includes the estimation of direct and indirect economic impacts and cost-benefit analyses of counter-terrorism options.” Last year’s project resulted in a macroeconomic-model and data construction of over 16,000 terrorist events over 40 years in the United States and abroad. In 2009, it provided macroeconomic estimates on the average loss of GDP growth, which aided in a definitive estimate of the cost of 9/11 of $60 billion. The research was well-received by policy-makers, think-tanks and academia, as the research associated with the funding led to 10 publications and 10 presentations to date. The work for year 7 augments these earlier estimates by including costs due to Psychological and Behavioral factors. This allows one to develop more accurate Benefit-Cost estimates associated 9/11 and other terrorist events, as the “pure” economic costs fail to capture the entire loss to the economy.

2. **Research Accomplishments**

The results from the research program fit nicely into several papers published during 2010-11. Some of the results follow directly from research developed specifically for the project and others are more indirect “off-shoots” from this research program.
2.1 “Lines in the Sand: Border Effects, Economic Integration and Disintegration of Post-War Iraq”

The Obama and Bush administrations decision to improve security in Iraq and Afghanistan by increasing the number of troops has been labeled “the surge”. Is one consequence of the increased troop presence increased market integration by lowering transportation costs and enforcing rule of law? In this paper, we analyze weekly price data for approximately 250 goods from eighteen Iraqi cities between 2005 and 2008. Our paper suggests four empirical regularities associated with price dispersion and market development in post-war Iraq. First, the degree of intra-governorate price dispersion across Iraq is higher than the intra-state dispersion reported for industrialized countries such as the United States or Japan. Second, the degree of price dispersion fell significantly during 2007, coincident with “the surge.” Third, the economic impact of the surge is geographically uneven but loosely follows patterns of U.S. deployment—decreasing by roughly one-third in areas targeted during the surge but remaining relatively static in the Shia south and in the eastern regions bordering Iran, where the surge was nearly nonexistent. Finally, we find the effect of internal “borders” to be relatively modest, though clean interpretation of these border effects is difficult. Taken together, our results suggest that the shift in U.S. security policy in 2007 did bring higher levels of economic integration to the majority of post-war Iraq.

In the midst of the ongoing violence in Iraq and Afghanistan, scholarly debate about the economic costs of conflict often focuses on long-term security and rebuilding considerations, human capital and infrastructure losses, the viability of the All-Volunteer Force, and many other direct and indirect costs of war. An area that has received less attention, however, is the effect of violence on local market development and the prospects for economic integration in a post-conflict country. We aim to provide such an analysis for the case of post-war Iraq.

With six years in theatre and an average of 130,000 to 160,000 U.S. military personnel on the ground at any given point in time, Iraq may be the best documented post-war reconstruction project ever witnessed. Using a rich data set from Iraq’s eighteen governorates, we investigate the costs of market inefficiencies stemming from price volatility across intra-national borders. This paper considers the extent to which these price differences are driven by U.S. security strategy, ethnic differences, fixed geographic factors, and patterns of violence. We are able to consider the extent of regional integration and disintegration during the period from June 2005 through May 2008, a span over which significant shifts in U.S. security strategy are evident. In particular, we consider the effect of “the surge” in 2007 and find evidence that its timing is negatively correlated price dispersion. Controlling for other relevant factors, average price dispersion across Iraq appears to have declined by 2 percentage points (approximately one-tenth of average price dispersion) from January, the date marking the shift in U.S. policy, to October 2007, when U.S. troop levels associated with the surge peaked.

For areas specifically targeted during the surge, such as Baghdad and the Baghdad belt of Anbar, Diyala, Salah Ad Din, and Wasit, the drop is significantly higher with price dispersion declining by as much as 6 to 8 percentage points. We also present results showing that major ethno-religious fault lines are associated with higher levels of price dispersion. In particular, we show that the surge caused Sunni regions and Kurdish regions to become more economically integrated during the surge. However, Shia regions in the south and those bordering Iran, which lay outside the U.S. strategy, did not experience any significant change in economic integration. Although the results suggest that market integration across differing ethno-religious regions remains incomplete, we find that these “lines in the sand” between Kurdish, Shia, and Sunni regions are smaller than the typical border effects found between sovereign nations, though standard border dummies must be interpreted carefully.

In the study of terrorism, a key unanswered question concerns what determines the survival or demise of terrorist groups that engage in both transnational and domestic terrorist attacks. How do terrorist organizations’ tactics, ideologies, base locations, or peak sizes influence their longevity? Are economic, political (e.g., democracy), or geographical (e.g., elevation) and geographical considerations in the terrorists’ base country conducive to survival? Why do some terrorist groups last for 50 or more years while others fail in their first year of operation? This article addresses these and related questions by applying survival analysis to a diverse set of 367 terrorist organizations that conducted operations, at times, during 1970–2007. To date, most studies on terrorist group survival have used a comparativist approach, in which comparisons of a few cases identified some factors (e.g., achieved political goal, military defeat, and reduced popular support) associated with selected groups’ demise (e.g., Cronin 2006, 2009). Such studies offer anecdotal evidence that, by their nature, cannot be applied to terrorist groups in general. Case comparisons do not capture average tendencies that follow from a statistical survival analysis applied to a large number of terrorist groups with diverse ideologies. Such an analysis, as offered here, can identify the key determinants of terrorist group survival.

The Global Terrorism Database (GTD) (National Consortium for the Study of Terrorism and Responses to Terrorism (START 2009) provides almost 40 years of data on terrorist groups’ tactics (e.g., diversification of attacks and the share of transnational terrorist attacks). This event data are combined here with RAND’s information (Jones and Libicki 2008) on terrorist groups’ characteristics (e.g., peak size and base of operations) and ideologies to form a unique data set for studying the influences on terrorist groups’ longevity.

A knowledge of these determinants can inform policymakers as to where and how to allocate counterterrorism resources, so that groups’ survival is shortened. If, for instance, one region of the world has more resilient terrorist groups than other regions, then more counterterrorism measures are needed where terrorist group survival is more assured. If, moreover, democracy promotes group survival owing to due process, constitutional restraints, and freedom of association, then governments may have to rethink their promotion of democracy in troubled countries as the first-best counterterrorism policy or else institute additional countervailing actions. An understanding of terrorist tactics that promote group longevity indicates how counterterrorism resources may be best allocated against alternative types of terrorist attacks.


The increasing size of government debt and government expenditures has become a hot political issue in the United States. Spending on national security, though essential to some extent, has also become closely examined as part of the discussion about national priorities.

Our paper analyzes just one part of the determination of our federal priorities by examining legislation on terrorism in the post 9-11 era. The conjecture that some spending in this area is unwarranted is, of course, not new to the public forum as Heritage Foundation’s Matt Mayer suggests that since March 2003, DHS has doled out almost $30 billion in grants to states and localities. Of that, significantly less than half has gone to the top 30 cities, where that risk of a terrorist attack is greatest.”

Monetary resources, however, are not the only resources with which we should be concerned. As production and support of legislation are two of the largest roles of a legislator, we should also be
concerned with the allocation of legislative resources. Our paper tracks legislative productivity to examine the nature of legislation on terrorism in a scientific manner.

The central contribution of our paper is the examination of the number of sponsored and co-sponsored bills on terrorism in the U.S. Congress (House and Senate) from 1995 to 2010 in order to distinguish between the extent to which any measured increase in legislation on terrorism is due to a reasonable constituency demand versus other factors such as institutional positions, political party, and the economy. We test a standard model of legislative productivity and find some support that political factors play a role in the manner and magnitude of legislation on terrorism. More importantly, however, we find that the most significant factor in explaining legislation on terrorism is likely due to security concerns.


The 1990's brought about a number of changes for many African countries: since 1995, growth in sub-Saharan Africa averaged more than 5 percent per year, democratization reemerged with citizens enjoying more political and civil rights, and countries became more open, with many countries playing a crucial role in the global economy as they exported important commodities (World Bank, 2007). While many economists believe these are all crucial requirements for economic development, it may also play a role in how well developing countries can protect themselves or recover from adverse shocks such as civil conflict, terrorist attacks and commodity price declines. Whether these advancements in development are sustainable or not depends partly on policy characteristics which can either hinder or promote development.

In an earlier paper, Blomberg, Hess and Orphanides (2004) investigate the macroeconomic consequences of terrorism among different sets of countries. This paper expands on their earlier work and focuses on sub-Sahara Africa to measure the economic losses associated with terrorism. Developing countries constitute a special case because they may be less likely to absorb adverse shocks and may be ill-equipped to prevent or combat new forms of shocks such as terrorist attacks. These new challenges may require different attention and resources than the civil conflict and natural disasters that many African nations have historically experienced. As economies grow, governments must decide how to allocate additional resources. One concern is that many African governments' security and counterterrorism efforts are not keeping pace with the spread of more sophisticated terrorist attacks and the increased presence of terrorist groups in many African countries. There may be a number of reasons why this may be the case, ranging from too few resources to devote to counterterrorism measures to a perception that terrorism is not a major concern that African governments face. While it is true that, at least on paper, most African countries are committed to the prevention of terrorism (e.g. the African Union established an African Centre for the Study and Research on Terrorism in Algiers, and Algeria to increase the capacity of the Union members to prevent and combat terrorism), it is not clear whether these efforts are sufficient.

In this paper we contribute to the literature by investigating the economic consequences that terrorism has had on the African economies and if the impact has worsened post-1990. We investigate whether the recent trends in globalization and democracy have made the African economies more or less resilient to terrorist attacks and whether regimes which are more susceptible to resource-curse driven corruption (oil exporting countries) are even less resilient.

Our analysis is based on a panel data set with annual observations on 54 countries from 1968 to 2003. The dataset brings together information from the Penn World Table, the ITERATE dataset for terrorist events, and data on external and internal conflict. We explore these data with cross-sectional and panel
growth regression analysis. We estimate the economic and statistical effect of terrorism on growth, controlling for a variety of other factors. We then investigate the extent to which there appears to be a structural break in the estimated relationships. We find that the fragility of Africa due to terrorism has increased in the most recent period. Results show that the African economies are more susceptible to terrorist shocks post 1994 while its susceptibility to internal and external conflicts has remained unchanged post 1994. We find that most of the fragility can be explained by the growth in countries that rely most heavily on oil. We interpret this result to suggest that countries that have relied on fuel-based growth have not done an adequate job of counter-terrorist prevention. These results are consistent with the observation that oil exporting countries tend to have less diversified economies and have poorer institutional quality, which leads to a larger impact of terrorist attacks on growth.


War, whether external or internal, large or small, is a costly endeavor. Loss of life, loss of close friends or family, and the destruction of material possessions all play a part in the costs of war. The purpose of this paper is to capture only the material, economic welfare costs of conflict stemming from the altered path of consumption resulting from conflict. As such, the measure is quite a lower bound for the true and more encompassing welfare loss from living in a non-peaceful world. But how much would an individual be willing to pay to avoid just the economic costs of conflict? Remarkably, even these pure economic welfare losses from conflict are quite large. We find that, on average, individuals who live in a country that has experienced some conflict during the 1950-2004 sample would permanently give up to approximately 9 percent of their current level of consumption to live in a purely peaceful world. Such large potential welfare gains from reducing warfare should make economists and policy-makers take note, and continue to investigate and advocate for domestic and international institutions to realize such gains.

In this paper, we provide a lower bound estimate for the welfare costs of conflict by exploring only the forgone consumption from being mired in a world of conflict. We demonstrate how one can theoretically `price' the effect that war has on consumption's growth and volatility. Intuitively, these consumption growth costs from war would be avoided in a perpetually peaceful world, which allows us to calculate the equivalent variation of how much individuals would be willing to give up in order to live in a peaceful world.

It is worth noting that implicit in the methodology is the assumption that obviating conflict is possible. Further, the peaceful world we consider removes the effect of war from all participants. That is the cost estimates that we provide are not those from choosing a peaceful path when others have not (i.e., the costs of `turning the other cheek'). Rather, the cost estimates are an individual country's net economic benefit from a peaceful world.

This paper estimates the potential economic gain from peace as the certainty equivalent of how much individuals would be willing to give up of their current consumption up in order to live in a peaceful world. Using panel data (unbalanced) for 184 countries, we calculate a synthetic path of consumption that removes the effects of war on the mean and volatility of consumption growth. From these estimates, the cost of conflict is calculated. The main finding is that a lower bound estimate of the average benefit from eliminating war is about 9 percent of per capita annual consumption. In addition, though many of the poorest countries stand to benefit greatly from peace, the benefits to developed economies can often be substantial. The results are robust to regional effects and possible reverse causality. Further, both data limitations and the nature of this technique suggest that the calculation represents a lower bound estimate of the possible gain from eliminating conflict.
In an attempt to assign an actual dollar value to this lower bound estimate of the cost of war, at an admitted loss of generality, multiply each country's calculated cost of conflict by their actual per-capita and total consumption in 2000 international dollars. By this measure, the average (world) cost of conflict is $224 per person for the 184 countries who appear in our sample. The countries whose citizens would be willing to pay the most to avoid conflict are Iraq ($1,428), the United States ($1,070), the United Kingdom ($903), Cyprus ($872), and Israel ($851). Recall that these are not one-time payments, but a permanent per-capita payment, so that the simple present discounted value is twenty-one times higher for a risk free rate of 5 percent.

Similarly, the total world cost of conflict in 2000 dollars and for the year 2000 population is $918 billion, and this permanent payment would grow at the rate of population growth.

The magnitude of the potential consumption welfare and dollar gains from eliminating conflict should make economists, political scientists, and policy-makers continue to investigate and advocate for domestic and international institutions to realize such gains.


Previous research has shown that trust is an important component that encourages investment and capital formation which, in turn, enhances economic performance. This paper investigates the effect of terrorism on income, including its indirect role through lowering trust. We consider terrorism as a factor that can increase the cost of investing in technology and capital formation due to its ability to diminish trust in an economy. We then develop a novel and rich dataset spanning 179 countries from 1968-2007 with associated community, social, cultural, political and economic factors from ITERATE and the World Values Survey. We estimate the economic impact of terrorism on societal trust by examining the extent to which terrorism taxes trust and how this, in turn, hinders economic performance. Consequently, we develop a measure of the economic consequences of terrorism through sizing the magnitude of the 'trust tax' from terrorism. We find that the trust tax is relatively minor compared to the direct impact of terrorism on income.

Our paper makes two contributions to the literature. First, we analyze the impact of terrorism on individuals in various countries. By doing this, we investigate whether the effects previously reported using aggregate models are robust to a finer granularity of data. Second, we include measures of social capital such as trust to examine the extent to which terrorism is associated with trust and examine if the primary effect of terrorism on income is significantly altered when we consider the alternative channel.

We find that the general results found in the aggregate literature continue to hold using household data. Terrorism and war have negative and statistically significant impacts on income. These results continue to hold when we include various control variables, measures of income and econometric techniques. If anything, the impacts appear to be larger when using individual data.

We also find that the impact of trust is positive and statistically significant in explaining income. When coupled with our finding that terrorism destroys trust, we can estimate the cumulative impact of terrorism on income. We do find that including this secondary impact increases the magnitude of the impact of terrorism. We do not, however, see a drastic change in the economic significance when including the secondary impact.

There are obviously many caveats to these results as we have made several assumptions about the data and the underlying theoretical model. We are hopeful that this paper serves as an initial gateway into
including other measures of social capital in the terrorism literature. We look forward to seeing future papers in the area.

3. Applied Relevance

The applied relevance from the research program is naturally imbedded in the description of the results in the previous section. Rather than be repetitive, this section highlights two obvious areas that follow from the research described above.

3.1. Direct Economic Cost Estimates

In order to properly understand the role for policy-makers to stem terrorism, it is critical to first catalogue a measure of the economic consequence of a terrorist attack. It is then necessary to examine how robust is this estimate. The research employed in these series of papers uses a myriad of techniques, and the results tell a consistent story. Terrorism appears to have a statistically strong (though economically smaller than other forms of conflict) negative impact on growth. This remains true even when considering other types of conflict and endogeneity concerns. Panel regressions which attempt to control for the potential bias due to country or time also confirm the negative impact of terrorism on growth.

We consider four different methodologies to see if the results from the previous section are fragile. First, we re-estimate the model analyzing different parts of the cross-national income or growth distribution. Second, we calculate the cost with regards to lost utility rather than only lost GDP. Third, we calculate the loss to components of GDP rather than only GDP itself. Finally, we calculate the loss using a structural VAR. In summary, we find our results consistent with our earlier findings that September 11 resulted in lost GDP of $60 billion. The upper bound estimate continues to be a loss of $125 billion. This is within the range of estimates of the 6 studies that CREATE sponsored to estimate the economic impacts of 9/11.

In more recent work, we extend the analysis to examine the impacts of behavioral and psychological factors by exploiting a rich dataset on social capital. We find the impact of trust on growth and terrorism’s negative impact through this channel to be statistically relevant. However, the economic costs of such an indirect channel are not particularly large. This means concentrating on the direct cost of terrorism is probably more economically relevant than concentrating on indirect channels due to lost social capital.

We also extend the analysis to estimate the welfare cost of all conflict to include terrorism. Using advanced statistical techniques, we find the cost of conflict is approximately $918 billion a year, which amounts to an average cost of $5 billion per country or on a population basis, $218 billion for the United States. It is imperative to note that this cost aggregates all costs due to all forms of war and terrorism. When looking solely at the welfare cost of terrorism, this work suggests an impact not significantly different than our previous estimates of $50-$60 billion.

3.2. International Relations

This research aims to improve our understanding of the life-cycle dynamics of transnational terrorist organizations by examining the patterns of their attacks over time. A primary contribution of the research is to provide a comprehensive empirical exploration of the survivorship patterns of transnational terrorist organization through 2007 as measured through their capacity to mount attacks across successive periods. In doing so, we explore the extent to which political economic theories help explain the behavior of terrorist organizations. Analysis of survivorship relies on a set of techniques, variously known as hazard models, duration analysis, and time-to-failure models. Although the models can differ slightly in their estimation approach, they all share an interest in estimating the probability of an organization
surviving from one period to the next. For example, it is well known that many new businesses fail in the first year, but if a business survives that first year what is the probability of it surviving through year 2? If it survives year 2, what is the probability of it surviving through year 3? And so on. A few papers have employed duration analysis to investigate individual events or individual terrorist group activities.

Still, none of these papers employs econometric techniques to analyze patterns for the population of transnational terrorist events and terrorist organizations. Previous research examines the trajectories of all terrorist organizations from 1970 to 1997. This approach has significant limitations, however. First, this data end well before 9/11 and therefore miss any changes in the terrorism landscape since then. Second, this research also uses a larger but less specific data set, which conflates domestic and international terrorist events. Moreover, these papers and the previous literature have not sought to explain the duration or life-cycle properties by using the data to test relevant political economic theories. In short, no paper has specifically considered the full range of transnational terrorist activity when estimating the life-cycles of these organizations. Thus, our paper fills two significant gaps in the recent literature: it updates the empirical picture of transnational terrorist activity and it applies an innovative analytical framework to analyzing the durability of terrorist organizations.

This research also aims to look at international relations with Iraq and Afghanistan. We develop a paper to employ a novel data set to test the impact of security strategy on market development in a post-conflict country. We analyze weekly price data for 255 goods from the 18 Iraqi governorates over the years 2005-2008 to assess the extent to which “the surge” mitigated price dispersion and contributed to economic integration of the country. Our paper posits there are four empirical regularities associated with economic development in post-war Iraq. First, the degree of price dispersion has, on average, been 24 percent across all cities during the full time series, somewhat higher than what has been reported in industrialized countries such as Japan. Second, all else equal, price dispersion drops significantly during the “the surge” by as much as 6-8 percentage points for certain governorates and rises slightly afterward. Third, the degree of price dispersion appears to follow the geographic focus on U.S. military operations, with effects stronger in the Sunni and Kurdish regions as opposed to Shia regions bordering Iran. Finally, there is limited evidence to suggest that the sub-national economies (Kurdish, Shia, and Sunni) are not completely economically integrated, though the “border effects” are smaller than those reported across countries in the trade literature. Hence, we conclude there are “lines in the sand” rather than significant border impediments to trade. Iraq never seemed at serious risk of becoming three economic entities, and the surge appears to have reduced that probability still further. Taken together, these results suggest a significant role for basic security policy in explaining market distortions and market integration.

4. Collaborative Projects

The majority of the research was conducted with co-authors at USC and CMC. There was little resource support given outside of the ordinary institutional support for faculty and students. However, as described above, the iterative research process known as the CREATE Economic Impact Modeling Forum (EIMF) was critical in developing some of the research explorations.

We also worked with members of the United States Military Academy to estimate the impact of terrorism in Iraq and Afghanistan. We have been diligently building a database of terrorist organizations with colleagues at the University of Texas at Dallas. We will use the data to learn more about how terrorist organizations evolve.

5. Research Products
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5.1 Publications

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5.2 Conference and Outreach Presentations

Conference Presentations

3. “10 Years after 9/11: Rethinking Counterterrorism” University of Iowa (April 2011)

Outreach Presentations

2. “Our Turbulent Economy: How We Got Here and How Do We Move Forward”, Claremont McKenna College (September 2011).

6. Education and Outreach Products

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7. Additional Information for DHS Data Base

Did project involve human subjects? no

Please identify the academic disciplines involved in this effort