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The Copenhagen Consensus: Perspective Paper on Transnational Terrorism Policies

S. Brock Blomberg
Claremont McKenna College
Department of Economics
Claremont, CA 91711 USA
bblomberg@cmc.edu*

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1 Introduction

The guidelines for writing a perspective paper for the Copenhagen Consensus are well-articulated. "The purpose of the Perspective Paper is to balance the Challenge Paper indicating important issues of the challenge not sufficiently dealt with in the paper. If there are several different views upon the particular challenge and the solutions solving it, the Perspective Paper Author should emphasize this and provide necessary information not sufficiently reported in the Challenge Paper. Thus, the paper shall review published research that might have been left out in the Challenge Paper; indicate alternate interpretations of the estimates; and/or point out other strengths, weaknesses and omissions in the Challenge Paper."

Sandler, Enders and Arce (2007)[SAE (2007)] have written a thorough and thoughtful Challenge Paper entitled "Transnational Terrorism". The paper proposes five different policy alternatives and using Benefit-Cost Ratio (BCR) calculations, shows that most of the alternative policies to stem terrorism are not worth the effort, economically speaking. In fact, the only policy SAE find worthwhile is increasing international cooperation. The methodology is solid and the execution is top notch.

Therefore, our perspective paper is going to take a slightly different approach than suggested in the opening paragraph. Rather than spend the majority of the perspective paper quibbling over the various assumptions of the challenge paper, we offer a more productive strategy. We provide an alternative modeling strategy to SAE (2007). We do not presume that one approach is preferred over the other but rather provide a menu of approaches to which the reader may select, depending on his or her preferences. Our alternative model that attempts to estimate the *welfare* cost of terrorism by exploring only the forgone consumption from being mired in a world of conflict. Following the approach by Lucas (1987), 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.

For the most part, our results dovetail with what was found in SAE (2007). Using both the baseline GDP approach and the welfare approach, we show that Business as Usual (BAU) is not very cost effective, yielding 7 to 15 cents on the dollar. Interestingly, even though we come at the problem from a very different angle, these results are similar to what what shown in SAE (2007) who found a return of between 4 to 10 cents on the dollar. This may mean that these results are robust to various strategies for estimating the benefits and costs associated with the current policy environment. In addition, we show that increased proactive measures is also an ineffective policy, yielding 8 to 19 cents on the dollar. These values are somewhat larger than what was found in SAE (2007), though the conclusion is the same. We also show that the least cost-effective policy is the option described by SAE (2007) "more sensitive foreign policy". In this case, we assume the more sensitive foreign policy entails increased economic aid and calculate a yield of between 5 to 10 cents on the dollar. SAE (2007) do not actually do a formal calculation so we do not compare our results. Still, the return is not terribly different from the BAU result implying that it would not be much worse than employing the current policy.

The one area in which we find slightly different results than SAE (2007) is the international cooperation alternative. The differences are probably because we adopt a slightly different experimental design than SAE. Instead of assuming certain returns to international cooperation, our policy experiment assumes that the international community has already been cooperating to prevent UN targeted organizations, e.g. Al-Qaeda and the Taliban. Using the welfare cost approach, we find that increased international cooperation is not cost effective, yielding a return of 26 cents on the dollar. When employing the GDP cost approach, however, we find our only cost effective result with a Benefit Cost ratio of 1.06.

2 Experimental Design

We employ a myriad of candidate policies to investigate the optimal strategy to prevent transnational terrorism. Our candidate strategies follow SAE (2007) and are business as usual, increased international cooperation, increased proactive responses, enhanced defensive measures, and a more

sensitive foreign policy alternative or increased economic aid. We do not consider augmenting defense measures as it is a linear projection of other alternatives. In each case, we estimate a benefit-cost ratios (BCRs) by using history and its associated counterfactual.

To conduct the policy experiment, we need to consider an environment that allows us to compare control and experimental groups. In this case, we consider that there has been a change in attitudes and policies toward terrorism pre- and post-September 11 2001. We assume the dynamics of transnational terrorism and counter-terrorism policies were different after 2001. Obviously, conducting such an exercise requires assumptions on the causal impacts of terrorism that are almost surely overstated and in some cases problematic. With this caveat, we proceed by giving an overview of how we consider each candidate policy.

First, we investigate the impact of current counterterrorism policy by comparing the cost of increased expenditure on homeland security to the increased benefit associated with the change in incidence and severity of transnational terrorism in 2002-2006 as compared to the previous period. Second, we consider the impact of increased international cooperation by comparing the cost of increased expenditure by IMF, INTERPOL and other international organizations versus the change in incidence and severity of transnational terrorist groups targeted by the UN (Al-Qaeda and Taliban) in 2002-2006 as compared to the previous period. Third, we analyze the effect of increased proactive measures by calculating the cost of increased military intervention in the early part of the war in Afghanistan and Iraq versus the change in incidence and severity of transnational terrorism in those locales as compared to the previous period. Finally, we estimate the effect of increased economic aid by comparing the cost of the United States economic aid to Afghanistan and the new development initiative, the Millennium Challenge Account, versus the change in incidence and severity of transnational terrorism in low income countries as compared to the previous period.

SAE (2007) also include an additional option, to augment defense measures. As this is a linear projection of other options, we felt there was little more to be gained from this option that was not already addressed in SAE (2007). Hence, we do not consider it as an alternative.

3 Methodology

In the following subsections, we describe our approach to assessing the relative merits of a variety of policy alternatives. We first present the costs of terrorism, followed by an explanation of the value of the policy alternatives. As the experiment will be to investigate the BCR of the alternatives, we will assume the *cost* to society is the expenditure for each policy alternative and the *benefit* is the reduction in the cost to terrorism.

3.1 Estimating Human Cost of Terrorism

In this subsection, we follow the methodology of SAE (2007) exactly. Rather than repeat a detailed description of how one calculates the economic cost due to fatalities and injuries, we refer the reader to SAE (2007).

The methodology employs a measure of human costs using Disability-Adjusted Life Years (DALYs) values for annual terrorism-related deaths and injuries. The methodology allows one to calculate the lost future income from injuries and adds it to the lost future income from premature death. Using the sample period of 1968-2006, SAE (2007) estimates the average annual terrorism deaths (419.79) and injuries (1249.28) due to transnational terrorism. To calculate the lost future income from premature death, they take the average life expectancy in three geographical regions: Eastern Mediterranean, European, and the United States, as reported in the World Health Organization's mortality tables for each region (Eastern Mediterranean, 31.25 years; Europe, 36.5 years; and the United States, 38.75 years). Assuming a discount rate of 5 percent and a value of $5000 per DALY (a round number that approximates the average income per person in the world), we calculate the post-September 11 (5 year DALY) as $5000N[1 - exp(-0.05L)]/0.05$, where N is the average number of deaths (419) and L is the life-expectancy.

To calculate the lost future income from injury, we obtain a detailed breakdown on the distribution of injuries, using data from a detailed survey of terrorist attacks in France from 1982-1987. Assuming the distribution is an accurate representation of population of terrorist victims,

we can calculate the economic cost of these injuries to society by projecting these costs across the entire sample. Costs are calculated by interacting the economic cost associated with lost income with the severity of the disability as weighted by Mathers, Lopez, and Murray (2003). In this case, the DALY is calculated as $5000ND[1 - exp(-0.05L)]/0.05$ where D is the disability weight. When coupled with the economic cost of fatalities, we have an accurate measure of the human cost of terrorism.

As is shown in SAE (2007), the DALYs associated with terrorism are small when compared with these other global challenges, where much larger numbers of people die or are injured.

3.2 Estimating GDP Cost of Terrorism: Baseline Approach

To estimate the GDP loss due to transnational terrorism, we begin with the approach described in SAE (2007) with one small wrinkle – we add in the conflict complementarity associated with the transference to other forms of conflict. In other words, Blomberg Hess and Orphanides (BHO 2004) demonstrated that the incidence of terrorism is associated with the incidence of other forms of conflict. These costs should also be included as an indirect cost of terrorism.

BHO (2004) presented a panel study of 177 countries for the 1968-2000 sample period showing that each year of transnational terrorism results, on average, in a fall in income per capita growth of approximately 5 percentage points. SAE (2007) adopt the exact estimate of 0.048, so we will do the same. To compute the "average yearly cost" in lost GDP for each country based on the fraction of years (Ti/5) during latest five year period available, the entry is computed as: (Ti/5)(Pop*per capita GDP)*(2005 growth/100)* 0.048.

BHO (2004) also found that there was an important conflict complementarity between terrorism and internal conflicts such as civil war. Over a five year time period, we estimate this amount to be approximately equivalent to the effect of a one year cost associated with a terrorist event. We calculate this as follows: BHO (2004) estimate that the presence of one form of conflict increases the other by 7.7 percent. Taken over a 5 year period with a 5 percent discount rate, we estimate that a terrorist event increases the likelihood of an internal conflict of 35 percent. Since

the impact of internal conflict on growth, on average is -1.27 percent, then the impact from this conflict complementarity on growth is approximately 5 percentage points or equivalent to a one year impact from terrorism. Therefore, to calculate the additional response due to transference in other forms of conflict, we add an additional loss in GDP growth to the five year loss above that is equivalent to the one year loss when an internal conflict occurs. Otherwise our results are identical to SAE (2007).

3.3 Estimating the Cost of Terrorism: Welfare Approach

In this section, we provide an alternative approach to estimating the cost associated with terrorism using a technique first suggested by Lucas (1987) to estimate the potential gains from removing business cycles to welfare in a society. The approach uses utility measures rather than baseline GDP cost approach. A formal description is included in the technical appendix. We provide a condensed description below.

Lucas' approach asks us to consider two consumption paths–the path where there is some positive probability of entering into adverse or beneficial states and a synthetic path where the probabilities of entering into such states are zero. Since Lucas is only concerned with business cycle effects, he does not allow the average rate of consumption growth to differ between these two welfare paths. By equating the two consumption paths, one can "price" the amount an individual would be willing to give up on an annual basis to attain the latter path–i.e., it's equivalent variation. Lucas' insight hinges on the observation that the average person (or representative agent) would be willing to give up some portion of their current consumption to reduce or eliminate the uncertainty or variance of consumption over their lifetime. Formally, we construct utility-based measures and compare the expected welfare from each country remaining in its realized path of consumption, to another synthetic path of consumption where there is no state of transnational terrorism.

To implement the welfare calculations, we need to provide parameter values for the discount rate (θ) and the coefficient of relative risk aversion (ρ), in addition to the consumption growth and volatility measures calculated in the appendix. Clearly, changes in θ and ρ will affect growth.

Four important issues in the selection of these parameters should be kept in mind. First, the parameter values should be plausible. Second, the parameters are constrained such that the model's restrictions are satisfied. Third, the parameter values selected should be suggestive of a lower bound for growth. Fourth, the reader should get an indication of the robustness of growth to changes in the values chosen for θ and ρ. We provide results for the welfare measures using $\theta = .08$ and $\rho = 2$. These values were chosen for these reasons, based on the criteria just discussed (see appendix for more discussion).

3.4 Estimating the Cost of Implementing Policies

In this subsection, we describe how we calculate the cost of the alternative policies. We measure the cost of these policies directly by the change in expenditures during the policy window (e.g. 2002-2006) as compared to the previous period. As most of these costs are taken directly from budget reports, we devote less attention to explaining the manner in which they are constructed.

First, we estimate the cost of increased expenditure on homeland security in 2002-2006 as compared to the previous period. We consider two approaches. As there are reliable figures for only the United States and the United Kingdom, we use these to proxy estimates for other countries. We first adopt the methodology of SAE (2007) and base the proxy on *the percentage of GDP devoted to homeland security* in the United States and the United Kingdom following 9/11. However, this will most surely overstate global expenditure as the United States and the United Kingdom are outliers (the top two) in terms of their military expenditure. To adjust for this, we then adopt a methodology that bases the proxy on *the percentage of World military spending* in the United States and the United Kingdom following 9/11 and adjust global homeland security accordingly.

Second, we consider the impact of increased international cooperation by comparing the cost of increased expenditure by IMF, INTERPOL and other international organizations in 2002-2006 as compared to the previous period. To be consistent, we first adopt the methodology of SAE (2007) who estimate the portion of IMF and INTERPOL budgets related to enhanced counterterrorism. Next, we employ actual expenditure by a variety of international agencies working to stem terrorism

following 9/11. This is the first serious departure from SAE (2007), as we do not estimate portions of the budget, but instead take actual spending devoted to counterterrorism from IMF, INTERPOL and other counterterrorist agencies such as: International Atomic Energy Agency's (IAEA) Nuclear Security Action Plan, the G-8's Financial Action Task Force (FATF), the United Nations, and the Egmont group. We also include the cost of freezing funds devoted to terrorism.

Third, we analyze the effect of increased proactive measures by calculating the cost of increased military intervention in the early part of the war in Afghanistan and Iraq. We employ the exact same estimates reported by SAE (2007).

Finally, we estimate the effect of increased economic aid by comparing the cost of the United States new development initiative, the Millennium Challenge Account and its increased economic aid to Afghanistan.

4 Results

4.1 Policy Alternative One: Business As Usual

Our experimental design allows us to construct the counterfactual by calculating the average annual attacks for 2002-2006, compared with those for 1990-2001, exactly as in SAE (2007). In this case, SAE (2007) shows that there is a 34 percent drop in transnational incidents but there are 67 more deaths and 120 fewer injuries.

To calculate the economic benefits associated with the increased expenditure on homeland security, we provide SAE (2007) estimates on the reduced GDP losses capitalized over the 66 impact countries over the five-year which is \$28.358 billion or $0.34X$\$83.406 billion. (See Table 1A-B) The benefit is however reduced due to the net loss in human costs so that SAE (2007) lowers the benefit of this solution to \$28.347 billion. We add an additional benefit to increase in expenditure on homeland security, by including the reduced GDP losses due to transference of internal conflict. This is shown the in final column as the conflict complementarity. We estimate the reduced GDP losses capitalized over the 66 impact countries over the five-year to be \$1.618 billion or $0.34X$\$4.758

billion. (See Table 1A-B). Hence, once we include conflict complementarities, we estimate the total benefit to business as usual policies to be $29.961 billion.

To calculate the economic benefits using the alternative approach, we take the estimated welfare benefits over the 66 aforementioned impact countries. To do this, we calculate each countries optimal growth with our assumed parameter values, and add up the increased dollar value associated with such a rise in consumption growth. We provide these estimates in Table 2A-B that is analogous to Table 1A-B. In this case, we estimate the average loss in consumption growth to be approximately one percent which computed across the impact countries is $132.569 billion. Therefore, we estimate the benefit of business as usual to be $45.073 billion as our experiment presumes that there is a 34 percent decline in the bottom line number reported in Table 1A-B. The total benefit also includes the added human cost, when therefore reduces the benefit to $45.062 billion.

It it instructive to note that the alternative approach using the Lucas (1987) technique yields a higher estimate on the benefits associated with decreased terrorism, on the order of a 50 percent increase over the baseline approach. Experimenting with different parameter values can go very far in explaining the difference. For example, we assume the constant relative risk aversion parameter ρ is 2, which is around the conventionally accepted upper bound. If we lower our estimate for ρ, then the difference between the estimates widens. If, we assume that individuals are excessively risk-averse when it comes to terrorism, we may investigate how high would ρ need to be in order to obtain similar estimates to the baseline. We consider the possibility that $\rho = 4$, which would be significantly higher than is typically assumed. If $\rho = 4$, then the total benefit is estimated to be $28.767 billion. Research by Becker and Rubenstein (2005) suggests that ρ should not be significantly greater than 4 when understanding the economic behavior associated with terrorism.

Another explanation for the difference in the estimates may be in how the different approaches model the welfare loss associated with terrorism. In the baseline approach, we assume there is a direct dollar for dollar loss to individual welfare from lost income. In the welfare-based approach, we assume there may be greater losses due to the onset of greater risk and individuals would pay more to prevent such uncertainty in the future. Hence, if one believes that the economic costs of such uncertainty are important and should be directly modeled, then the benefits of the

BAU policies may be as much as $45.062 billion, otherwise it may be as low as $29.951 billion.

To calculate the economic costs associated with increased expenditure on homeland security, we begin by employing the estimate of spending from SAE (2007) by applying the US GDP percentage to all sample countries for a total of $147.19 billion in 2005. When capitalized over a five year period, the present discounted value is $695.09 billion. As this number is almost assuredly too high, SAE (2007) adopt 11 different alternatives to settle on their low estimate (M9) which requires an assumption of a low constant percentage of world-wide GDP to be devoted to homeland security, or about $298.3 billion.

Given the challenges associated with estimating worldwide homeland security expenditure based on only having accurate measures for the United States and the United Kingdom, we are sympathetic to employing this naive estimate. However, we adopt a slightly different approach that assumes homeland security costs are a constant fraction of military expenditure. This approach may help to correct for the fact that the United States and the United Kingdom are outliers.

Table 3 provides the estimates from both approaches. In the table, we provide estimates from countries that spend the most on the military according to Stockholm International Peace Research Institute (SIPRI).[1] These 15 countries make up approximately 83 percent of all military expenditure, with the United States and the United Kingdom making up 51 percent. Our approach requires that a greater share of homeland security spending is paid for by the United States and the United Kingdom. Our homeland spending estimates for the top 15 countries is 50 percent lower than SAE (2007) (M1) estimate when using the US rate and significantly smaller when using the UK rate. When capitalized over a five year period, the present discounted value is between $427.7 billion and $302.2 billion. In summary, the approach is more directly constructed by data and therefore yields a result more in line with expectations than when using the (M1) estimate. Interestingly though, our low estimate is not that different than the low estimate (M9) in SAE (2007) even though SAE employ a more ad hoc approach.

[1] `www.sipri.org\contents\milap\milex\mex_trends.html`

4.2 Policy Alternative Two: Increased International Cooperation

The policy alternative investigates the impact of greater cooperation in freezing assets and cutting off terrorists' resources, drug trafficking, and illicit activities. To investigate this policy alternative, our experimental design again allows us to construct the counterfactual by comparing the pre-sample period to the post-sample period. However, in this case it is more challenging to devise a scheme that tests the impact of international cooperation independently from other policy alternatives.

SAE (2007) tackle this issue by making as they say "some heroic assumptions". They compare the cost of monitoring, assumed to be one tenth of IMF's monitoring, and a doubling of INTERPOL's budget to the benefit of eliminating one major catastrophic event, assumed to be $1 billion. We take a very different approach, but still make some restrictive assumptions.

Our experiment is to investigate the costs and benefits of international cooperation in the post- 9-11 period relative to the pre-sample period. We will compare the benefits of reduced welfare loss of the main terrorist organizations specifically targeted by international agencies versus the increased budgetary costs of these international agencies.

Our experiment begins with the United Nations Security Council Resolution 1373, which raised the issue of global awareness and encouraged global counterterrorism capability, cooperation and effectiveness. The UN initially only added Al-Qaida and the Taliban regime of Afghanistan to the sanctions list. Since then, several international groups stepped forward.

- The United Nations Security Council constructed a working group called the Counterterrorism Committee (CTC) to handle the issue of global awareness and global counterterrorism capability, cooperation and effectiveness.
- The International Atomic Energy Agency's (IAEA) Nuclear Security Action Plan provides advice, training and equipment to its 136 Member States to combat nuclear terrorism. The United States has contributed $15.9 million since the Action Plan's inception in March 2002. The IAEA coordinates its nuclear security activities with the United States and other donor

states to mutually reinforce our nuclear security goals.

- The Financial Action Task Force (FATF) is an inter-governmental body whose purpose is the development and promotion of national and international policies to combat money laundering and terrorist financing. The FATF is therefore a "policy-making body" created in 1989 that works to generate the necessary political will to bring about legislative and regulatory reforms in these areas. The FATF has published 40 + 9 Recommendations in order to meet this objective.

- In 2002, the Boards of the IMF and World Bank approved a pilot program of assessments under anti-money laundering and combating the financing of terrorism (AML/CFT). An important element of the AML/CFT program is the provision of related technical assistance (TA).[2]

- INTERPOL is the worlds largest international police organization, with 186 member countries. Created in 1923, it facilitates cross-border police co-operation, and supports and assists all organizations, authorities and services whose mission is to prevent or combat international crime.

- Egmont Group is an international body created in 1995 for the purpose of financial intelligence-sharing (and named for the Egmont-Arenberg palace in Belgium where it was established). Although originally created to fight money laundering, in the fall of 2005, the group broadened its mandate to include tracking and freezing assets and blocking transactions of entities and persons engaged in proliferation activities and support.

Our experiment is to compare the activity of the UN targeted groups, Al-Qaida and Taliban, in the pre- and post-time samples. There are two challenges when trying to isolate the impacts of terrorist organizations. First, not all attacks are claimed by the organizations themselves. In fact, a significant portion of attacks are not attributed to any organization. Second, we do not have access to the ITERATE data for the entire sample period.

[2]See "Twelve-Month Pilot Program of Anti-Money Laundering and Combating the Financing of Terrorism (AML/CFT) Assessment-Joint Report on the Review of the Pilot Program," March 11, 2004, available on the IMF external website www.imf.org.

To combat these concerns, we first gather data that employs similar methodology, the Memorial Institute for the Prevention of Terrorism (MIPT), and then we use it to estimate the incidents attributed to Al-Qaida and Taliban relative to those in which there is an associated aggressor, and weight the impact of the aggregate attacks in ITERATE accordingly. Table 4 shows the relative change in the percent of attributable Al-Qaida and Taliban incidents, deaths and injuries pre- and post-sample using the MIPT data. The table shows that in the pre-sample period, Al-Qaida and the Taliban accounted for 6 attacks with 7453 injuries and 3223 fatalities. This is not surprising given the damage associated with September 11 in the pre-sample period and the lack of such a catastrophic event in the post-sample.

Table 4 however also shows that an increased activity by Al-Qaida and the Taliban in the experimental period. In the pre-sample, these two terrorist groups accounted for 8 different attacks in 6 different countries. In the experimental period, they accounted for 14 attacks in 7 countries. One explanation for the rise in the number of attacks is that international cooperation may have led to a transference to more frequent strikes, each with smaller magnitude.

To estimate the benefit in the reduction of human cost associated with international cooperation, we employ a similar methodology to SAE (2007) with the analogous Table 5. This calculation is applied to the 3061 fewer deaths and 6579 fewer injuries which is almost entirely due to the one year difference between 2001 and 2002. The three right-hand columns in Table 5 aggregate the YLD and YLL for the three different life spans to derive the DALYs. At a value of $5000 per DALY, the benefit for reducing the human cost of terrorism ranges from $472 million to $486 million.

To estimate the relative economic benefits associated with enhanced international cooperation, we then isolate the 7 impact countries over the five-year post-sample period. (See Table 6A) The lost GDP associated with the attacks actually *rose* during the experimental period and is estimated to be $444 million. In addition to increases in terrorism, there were also increases in internal conflicts in the experimental period. These increases are included in column 7 and are estimated to be $86 million. Taken together the loss in GDP cost associated with Al-Qaida and Taliban is therefore $531 million. As the number of attacks per country actually rose during the experimental

period from 6 to 8, we estimate that 1/3 of this loss in GDP is due to transference, or about $177 million. In summary, when taken together, the net benefits from international cooperation is $486 million - $177 million = $311 million.

To calculate the economic benefits using the alternative approach, we take the estimated welfare benefits over the 7 aforementioned impact countries using our assumed parameter estimates, and add up the increased dollar value associated with such a rise in consumption growth. We provide these estimates in Table 6B. In this case, we estimate the average loss in consumption growth to be approximately less than one percent which computed across the impact countries is $1.231 billion. We estimate a loss in benefits due international cooperation to be a 1/3 rise in this number or $410 million. Of course, the total benefit also includes the reduction in human cost, so when taken together, the net benefits from international cooperation is $486 million - $410 million = $76 million.

To calculate the economic cost associated with greater international coordination, we simply add up the increased budget costs associated with the expansion of the aforementioned agencies: UN's CTC budget, IAEA, IMF's AFL/CT, INTERPOL, G8's FATF, and the Egmont group. In addition, we include the lost economic efficiency associated with freezing capital of suspected terrorist financiers. These economic and budgetary costs are provided in Table 7. In each case the best estimate for costs is relatively small. To estimate the cost of frozen capital, we assume lost returns commensurate with what actually occurred. As approximately $100 million in assets have been frozen, this means an opportunity cost if $78 million using average returns from S&P 500.[3] In each case, we assume an annual increase in each case of 2 percent and then sum the total value over a five year horizon. The aggregate sum of all of these costs over the 5 year horizon is $293 million.

4.3 Policy Alternative Three: Increased Proactive Measures

This solution calls for increased proactive measures such as Operation Enduring Freedom. In order to get a counterfactual, we contrast the level of transnational terrorism in the first two years

[3] http://seekingalpha.com/article/35520-investing-for-yield-total-return-implications

following 9/11 when there was the greatest proactive measures and compare it to the previous period. As we have already done the calculations of associated with the benefits of a reduction in lost GDP and the welfare cost over the five year horizon, calculating the benefits over a two-year horizon is straightforward.

In a previous section, we showed that the GDP cost over the longer horizon is $83.406 billion. We also demonstrated that this cost increases the likelihood of other conflicts and this conflict complementarity is $4.758 billion. Taken together, we estimate a loss in GDP of $88.164 billion over the five year period. We also employed an alternative methodology and estimated the welfare benefit associated with an elimination in terrorism to be $132.569 billion over the five year period. On an annual basis, the value for GDP is $18.320 billion and the value for welfare is $26.514 billion. To estimate the impact in increased proactive measures, it only requires us to scale these values by the change in incidents over the smaller horizon.

The annual number of transnational terrorist attacks for 2002-2003 is 205 incidents compared with 255 incidents per year for the post-9/11 period through 2006. This means that there are 50 less attacks per year or a decline of 13 percent over the 1990-2001 period that we attribute to the larger offensive measures. This translates into $2.381 billion ($= 0.13X\$18.320$ billion) saving in world GDP for one year. With 5 percent discounting over a two-year time horizon, this gives a benefit of $4.649 billion from saved GDP. In terms of welfare benefits, this translates into $3.447 billion ($= 0.13X\$26.514$ billion) saving in world GDP for one year. With 5 percent discounting over a two-year time horizon, this gives a benefit of $6.729 billion.

Unfortunately, these two years had violent terrorist events that killed 675 people and injured 2830 others per year. Using SAE's estimate (2007) this amounts to a negative benefit of $75.04 million when evaluated for two years at a 5 percent discount rate and a $5000 DALY. Subtracting this from the benefits above, we find a benefit of $4.576 billion in GDP and a benefit of $6.656 billion in welfare.

For the relevant two years, SAE (2007) shows that Operation Enduring Freedom costs $35.5 billion, while Operation Noble Eagle costs $21 billion for a total of $56.5 billion. This figure drops

to $35.5 billion if we leave out Operation Noble Eagle on the grounds that it was only indirectly of a proactive nature.

4.4 Policy Alternative Five: Increased Economic Aid

The final policy alternative involves an increased sensitivity in foreign policy. Our experimental design looks at the increased funding to low income countries and Afghanistan in particular which means considering two initiatives. The first, the Millennium Challenge Corporation (MCC) is a United States Government corporation designed to work with some of the poorest countries in the world. Established in January 2004, MCC is based on the principle that aid is most effective when it reinforces good governance, economic freedom and investments in people. MCCs mission is to reduce global poverty through the promotion of sustainable economic growth. The initiative that created the MCC, the Millennium Challenge Account has authorized $3 billion so far, so that the change in policy of increased economic aid fits squarely in our policy window. The second initiative is the Afghanistan Freedom Support Act, which authorizes $3.47 billion for Afghanistan over fiscal years 2003-2006 for humanitarian purposes.

To estimate the benefits associated with increased aid to poorer countries including Afghanistan, we continue to conduct exercises comparing pre-sample to experimental periods. To calculate the economic benefits associated with the increased economic aid to possible problem regions, we estimate the reduced GDP losses of low income countries who may be eligible for economic aid. Table 8A-B report the results for the 38 impact low income countries. As there were 82 episodes, each country experienced an average of 2.16 incidents. This number is 3.5 percent lower than the pre-sample average of 2.24 suggesting a slight decrease in terrorism during the experimental period. The direct impact of terrorism capitalized over the five-year is $16.024 billion and the indirect cost due to the conflict complementarities is an additional $2.772 billion making the entire loss in GDP cost $18.796 billion. We therefore estimate the reduced GDP losses capitalized over the low income impact countries over the five-year to be $650 million or $0.035X$18.796 billion. As we do not have access to fatalities rates for low income countries in the experimental period, we assume the human cost to be similar to the estimate in policy alternative one such that the benefit falls by $11 million,

lowing the reduction in GDP loss to $639 million.

To find the estimate using our welfare-based methodology, we conduct the same experiment as alternative one, though we restrict our analysis to the eligible low income countries. In this case, we estimate a welfare loss of $10.651 billion, which when interacted with the 3.5 percent decline in terrorist activity is $373 million or $0.035X$10.651 billion. Finally, we reduce this by $11 million due to human costs making the final number $362 million.

The cost of the policy is simply the budgetary allocations for MCC and Afghanistan over the five year time span. In this case the combination of the two programs amounts to $6.47 billion.

5 And the Winner is...

Our perspective paper takes the approach by estimating two types of models — a GDP cost approach similar to the challenge paper and one based on a welfare model—to see which, if any, of the policy alternatives is most cost effective. Table 10 provides a summary of these results and compares them to the challenge results. The first column of Table 10 provides the 5 different policy alternatives described above. Note that policy alternative 4 is not discussed here as it is a linear projection of policy 1. In each case, the various alternatives are ordered with the smaller BCR above the larger BCR. Columns 2-4 provide the results from SAE (2007) and columns 5-7 provide the results from our models.

For the most part, our results dovetail with what was found in SAE (2007). Using both both approaches, we show that Business as Usual (BAU) is not cost effective, yielding 7 to 15 cents on the dollar. We also show that increased proactive measures is also an ineffective policy, yielding 8 to 19 cents on the dollar. Both of these finding are somewhat larger than what was found in SAE (2007), though the conclusion is the same. We also show that the least cost-effective policy is increased economic aid and we calculate a yield of between 5 to 10 cents on the dollar. Still, the returns on each of these policies are not terribly different and not at all cost effective.

The one alternative in which we find a slightly different result is when evaluating the

international cooperation alternative. Using the welfare cost approach, we find that increased international cooperation is not cost effective, yielding a return of 26 cents on the dollar. When employing the GDP cost, we estimate a Benefit Cost ratio of 1.06. Hence, the results are sensitive to the model employed. However, international cooperation still has the highest yields of all the alternatives.

Table 1A. Lost GDP Due to Transnational Terrorism Attacks: A-L

Country	Pop (000)	Ti	per capita GDP	2005 Growth	2005 Cost (average)	5 year Cost in	Conflict Compementarity
Algeria	32,854	2	$2,066	3.65	$47,625	$229,081	$47,625
Angola	15,941	1	891	10.9	14,889	87,969	14,889
Argentina	38,747	2	8,096	7.87	475,126	2,577,941	
Australia	20,321	1	22,423	1.53	66,962	303,025	
Bahrain	727	1	14,588	5.18	5,278	26,524	
Bangladesh	141,822	1	415	3.43	19,427	92,866	
Belgium	10,471	1	23,381	0.72	16,980	75,069	
Bosnia-Herzegovina	3,907	4	1,486	5.25	11,726	59,052	
Brazil	186,405	2	3,597	0.92	118,876	528,604	
Burundi	7,548	2	105	1.89	288	1,179	288
Cambodia	14,071	1	356	4.89	2,357	11,751	
Chad	9,749	1	267	2.27	569	2,631	569
Chile	16,295	1	5,747	5.09	45,813	229,633	
Colombia	45,600	3	2,174	3.51	100,425	481,162	100,425
Congo-Brazzaville	57,549	4	997	5.89	129,952	666,418	129,952
Czech Republic	10,196	1	6,515	5.98	38,190	196,345	
Denmark	5,418	1	31,607	2.8	46,082	216,312	
Ecuador	13,228	1	1,534	2.37	4,635	21,494	
Egypt	74,033	3	1,662	2.87	101,848	479,055	
El Salvador	6,881	1	2,127	0.99	1,397	6,224	
Eritrea	4,401	1	176	1.14	85	381	
Germany	82,485	3	23,928	0.94	533,246	2,372,185	
France	60,743	4	23,641	0.89	490,591	2,179,380	
Georgia	4,474	3	971	10	28,926	128,679	
Greece	11,089	2	12,367	3.35	88,280	420,980	
Haiti	8,528	2	428	0.7	494	2,182	
Hong Kong	6,944	1	29,945	6.14	122,699	633,683	
India	1,094,583	4	586	6.7	1,654,484	8,684,099	1,654,484
Indonesia	220,558	4	942	4.12	329,132	1,604,632	329,132
Iran	67,700	2	1,962	4.75	121,346	602,393	
Israel	6,909	4	18,406	3.42	167,090	798,377	167,090
Italy	57,471	4	19,387	0.18	77,457	337,112	
Jordan	5,411	3	2,091	4.45	14,527	71,500	
Kenya	34,256	2	428	0.23	660	2,876	
Kuwait	2,535	4	20,578	5.12	102,766	515,586	
Kyrgyzstan	5,156	2	319	1.56	492	2,036	
Lebanon	3,577	3	5,627	0.02	103	447	
Libya	5,853	1	7,517	1.53	6,467	29,267	

Table 1B. Lost GDP Due to Transnational Terrorism Attacks: M-Z

Country	Pop (000)	Ti	per capita GDP	2005 Growth	2005 Cost (average)	5 year Cost in	Conflict Compementarity
Macedonia	2,034	1	1,889	3.72	1,375	6,629	
Madagascar	18,606	1	233	1.73	722	3,287	
Malaysia	25,347	3	4,434	3.3	107,068	509,914	
Mauritania	3,069	1	447	2.26	299	1,380	
Mexico	103,089	1	6,172	1.9	116,112	531,078	
Morocco	30,168	2	1,354	0.37	2,907	12,722	
Netherlands	16,329	1	23,535	0.8	29,646	131,369	
Nigeria	131,530	1	420	4.38	23,274	114,324	
Norway	4,618	1	39,666	1.68	29,610	134,585	
Pakistan	155,772	4	596	5.16	184,472	926,708	184,472
Peru	27,968	2	2,319	5	62,326	311,590	
Philippines	83,054	3	1,124	3.26	87,686	417,052	87,686
Saudi Arabia	24,573	4	9,323	3.78	333,331	1,609,538	
Sierra Leone	5,525	1	218	3.74	433	2,089	
Singapore	4,351	1	25,443	3.6	38,306	183,991	
Solomon Islands	478	1	647	1.71	51	232	51
Spain	43,389	3	15,610	1.73	337,165	1,534,497	
Sri Lanka	19,582	3	1,004	4.27	24,242	118,717	24,242
Sudan	36,233	4	462	5.56	35,828	182,042	35,828
Sweden	9,024	1	29,532	2.31	59,178	273,899	
Syria	19,043	1	1,161	1.65	3,509	15,935	
Tajikistan	6,507	1	237	6.09	903	4,658	
Thailand	64,233	3	2,440	3.5	158,429	758,908	158,429
Tunisia	10,022	1	2,418	3.24	7,543	35,856	
Turkey	72,636	5	3,390	5.86	694,126	3,557,020	694,126
United Kingdom	60,203	4	26,688	1.23	757,372	3,397,505	
United States	296,497	3	37,574	2.48	7,960,044	37,020,669	
Russia	143,151	5	2,444	6.68	1,124,468	5,898,583	1,124,468
Uzbekistan	26,593	1	673	5.18	8,924	44,854	
Venezuela	26,577	2	4,939	7.2	181,743	967,393	
Yemen	20,975	4	590	1.02	4,867	21,703	4,867
Totals					**$17,363,249**	**$83,406,857**	**$4,758,623**

Table 2A: Welfare Cost of Terrorism: A-L

Country	Pop (000)	Ti	per capita GDP	GDP	Final Consumption % of GDP	C Growth	Welfare Cost
Algeria	32854	2	2066	67876364	33.42	4.55	128,408
Angola	15941	1	891	14203431	67.00	4.89	26,326
Argentina	38747	2	8096	313695712	61.09	6.95	936,275
Australia	20321	1	22423	455657783	58.87	5.11	731,380
Bahrain	727	1	14588	10605476	42.01	4.89	12,325
Bangladesh	141822	1	415	58856130	76.40	5.10	122,688
Belgium	10471	1	23381	244822451	53.22	1.05	500,233
Bosnia-Herzegovina	3907	4	1486	5805802	99.18	4.97	63,280
Brazil	186405	2	3597	670498785	60.36	3.82	2,415,535
Burundi	7548	2	105	792540	87.34	4.89	3,828
Cambodia	14071	1	356	5009276	84.99	12.19	8,363
Chad	9749	1	267	2602983	59.85	-7.88	-58,253
Chile	16295	1	5747	93647365	58.22	7.91	126,892
Colombia	45600	3	2174	99134400	61.92	4.72	514,666
Congo-Brazzaville	57549	4	997	57376353	85.21	4.89	540,093
Czech Republic	10196	1	6515	66426940	49.70	1.78	117,584
Denmark	5418	1	31607	171246726	48.46	4.89	229,590
Ecuador	13228	1	1534	20291752	65.98	6.43	33,681
Egypt	74033	3	1662	123042846	71.55	3.03	838,827
El Salvador	6881	1	2127	14635887	93.08	2.56	45,109
Eritrea	4401	1	176	774576	82.24	-26.16	-1,554
Germany	82485	3	23928	1973701080	59.28	4.89	9,698,864
France	60743	4	23641	1436025263	57.08	2.19	11,208,238
Georgia	4474	3	971	4342562	77.05	8.33	22,875
Greece	11089	2	12367	137137663	67.12	4.89	508,988
Haiti	8528	2	428	3649984	67.00	4.89	13,523
Hong Kong	6944	1	29945	207938080	58.19	3.30	376,295
India	1094583	4	586	641425638	58.27	5.67	3,927,836
Indonesia	220558	4	942	207765636	63.89	7.40	1,265,718
Iran	67700	2	1962	132827400	45.88	1.28	456,112
Israel	6909	4	18406	127167054	59.02	4.08	877,855
Italy	57471	4	19387	1114190277	58.85	4.89	7,243,818
Jordan	5411	3	2091	11314401	102.62	22.67	55,865
Kenya	34256	2	428	14661568	74.26	10.04	46,153
Kuwait	2535	4	20578	52165230	27.54	7.03	139,655
Kyrgyzstan	5156	2	319	1644764	84.54	8.32	6,345
Lebanon	3577	3	5627	20127779	89.00	-3.78	545,457
Libya	5853	1	7517	43997001	67.00	4.89	81,550

Table 2B: Welfare Cost of Terrorism: M-Z

Country	Pop (000)	Ti	per capita GDP	GDP	Final Consumption % of GDP	C Growth	Welfare Cost (average)
Macedonia	2034	1	1889	3842226	78.42	3.44	9,268
Madagascar	18606	1	233	4335198	83.15	2.57	11,926
Malaysia	25347	3	4434	112388598	43.59	9.22	321,889
Mauritania	3069	1	447	1371843	92.35	27.18	1,981
Mexico	103089	1	6172	636265308	68.19	5.13	1,181,153
Morocco	30168	2	1354	40847472	59.84	0.69	195,304
Netherlands	16329	1	23535	384303015	48.62	0.22	789,711
Nigeria	131530	1	420	55242600	38.93	-10.79	-203,988
Norway	4618	1	39666	183177588	41.79	3.82	228,506
Pakistan	155772	4	596	92840112	77.97	13.12	551,980
Peru	27968	2	2319	64857792	65.73	4.40	243,848
Philippines	83054	3	1124	93352696	79.80	6.52	558,788
Saudi Arabia	24573	4	9323	229094079	26.33	4.89	666,401
Sierra Leone	5525	1	218	1204450	89.96	4.89	2,997
Singapore	4351	1	25443	110702493	40.74	2.73	147,047
Solomon Islands	478	1	647	309266	67.00	4.89	573
Spain	43389	3	15610	677302290	57.74	4.89	3,242,260
Sri Lanka	19582	3	1004	19660328	76.95	4.89	125,423
Sudan	36233	4	462	16739646	69.39	4.89	128,324
Sweden	9024	1	29532	266496768	48.00	1.92	449,401
Syria	19043	1	1161	22108923	63.30	9.93	29,808
Tajikistan	6507	1	237	1542159	95.43	4.89	4,071
Thailand	64233	3	2440	156728520	58.24	4.87	757,949
Tunisia	10022	1	2418	24233196	57.85	4.76	39,124
Turkey	72636	5	3390	246236040	63.75	8.86	1,744,858
United Kingdom	60203	4	26688	1606697664	46.23	1.83	10,508,445
United States	296497	3	37574	11140578278	65.28	3.87	64,837,305
Russia	143151	5	2444	349861044	49.00	10.92	1,754,686
Uzbekistan	26593	1	673	17897089	73.19	4.89	36,237
Vanauatu				0	48.62	4.89	0
Venezuela	26577	2	4939	131263803	67.00	16.34	309,856
Yemen	20975	4	590	12375250	61.36	4.89	83,890
Totals							**$132,569,449**

Table 3. Estimates of Homeland Security

	Country	Using UK Est	Using US Est	SAE Est (M1)	SAE Est (M9)
1	USA	28.5	43.6	43.6	43.6
2	UK	3.2	4.9	7.7	3.2
3	France	2.9	4.4	7.4	1.1
4	China	2.7	4.1	7.8	1.1
5	Japan	2.4	3.6	15.8	2.3
Top 5		39.6	60.6	82.3	51.2
6	Germany	2	3.1	9.7	1.4
7	Russia	1.9	2.9	2.7	2.7
8	Italy	1.6	2.5	6	0.9
9	Saudi Arabia	1.6	2.4	1	0.2
10	India	1.3	2	2.7	0.4
Top 10		48	73.3	104.4	56.7
11	South Korea	1.2	1.8	2.7	0.4
12	Australia	0.7	1.1	2.5	0.1
13	Canada	0.7	1.1	3.9	0.6
14	Brazil	0.7	1.1	2.8	0.4
15	Spain	0.7	1	3.9	0.6
Top 15		53.3	81.5	122.9	58.7
FV2005		64	94.8	147.2	63.2
FY2006		65.3	96.7	150.1	64.4
FY2007		66.6	98.6	153.1	65.7
FY2008		67.9	100.6	156.2	67
FY2009		69.3	102.6	159.3	68.4
PV in US$ bn		**302.2**	**447.7**	**695.1**	**298.3**

Table 4. Activity Recorded for The Taliban and Al-Qaida

	Incidents	Fatalities	Injuries
1996-2001	8	3223	7453
2002-2006	14	162	874
Difference	6	-3061	-6579

Table 5. Human Cost Associated with International Cooperation

	% of Subjects	Number of Injuries *N (6579/5)*	Disability Weight *D*	YLD for East Med. Life Expectancy ($5,000)	YLD for European Life Expectancy ($5,000)	YLD for US Life Expectancy ($5,000)
Distribution of Lesions						
Hearing loss	46.9	3085.6	0.12	5853.1	6211.5	6338.5
Severe burns	15.4	1013.2	0.26	4164.1	4419.1	4509.5
Head trauma	15	986.9	0.35	5460.0	5794.3	5912.8
Eye injury	13	855.3	0.11	1487.2	1578.2	1610.5
Respiratory impairment	6.7	440.8	0.28	1951.0	2070.5	2112.8
Fracture(s) and/or amputations	4.5	296.1	0.35	1638.0	1738.3	1773.8
Psychological Symptoms						
PTSD	18.1	1190.8	0.11	2070.6	2197.4	2242.3
Major depression	13.3	875.0	0.76	10512.3	11155.9	11384.0
Total YLD				165681.3	175825.6	179421.5
YLL (3061 deaths)				306100.0	306100.0	306100.0
DALYs = YLD + YLL				471781.3	481925.6	485521.5
DALYs ($1000)				94356.3	96385.1	97104.3

Table 6A. Lost GDP Due to Al-Qaeda and Taliban in Post Sample

Country	Pop (000)	Ti	per capita GDP	2005 Growth (%)	2005 Cost (average)	Conflict Compementarity
Indonesia	220558	1	942	4.12	82,175	16435
Kenya	34256	1	428	0.23	324	
Pakistan	155772	1	596	5.16	45,989	9198
Saudi Arabia	24573	2	9323	3.78	166,267	33253
Syria	19043	1	1161	1.65	3,502	
Tunisia	10022	1	2418	3.24	7,537	
Turkey	72636	1	3390	5.86	138,523	27705
Totals					**$444,318**	**$86,591**

Table 6B. Welfare Loss Due to Al-Qaeda and Taliban in Post Sample

Country	Pop (000)	Ti	per capita GDP	GDP	Final Consumption % of GDP	Welfare Cost Growth
Indonesia	220558	1	942	63.89	7.40	316,957
Kenya	34256	1	428	74.26	10.04	23,089
Pakistan	155772	1	596	77.97	13.12	138,216
Saudi Arabia	24573	2	9323	26.33	4.89	333,578
Syria	19043	1	1161	63.30	9.93	29,808
Tunisia	10022	1	2418	57.85	4.76	39,124
Turkey	72636	1	3390	63.75	8.86	349,740
Totals						**$1,230,513**

Table 7. Economic Cost of International Cooperation

Year	INTERPOL	IMF	IAEA	FROZEN ASSET	FAFT G8	UN	EGMONT	Total
1	8.0	3.5	20	15.6	2.61	5	1.8	45.9
2	8.2	3.6	20.4	15.6	2.7	5.1	1.8	46.8
3	8.3	3.6	20.8	15.6	2.7	5.2	1.9	47.8
4	8.5	3.7	21.2	15.6	2.8	5.3	1.9	48.7
5	8.7	3.8	21.6	15.6	2.8	5.4	1.9	49.7
	37.8	16.5	94.4	78	12.3	23.6	8.5	293.3

Notes: Each budget number begins in year one and is increased by 2 percent per annum and discounted at a 5 percent rate over a five year period. INTERPOL's budget increase is found by comparing the 2005 budget [$58 million (euro42.8 million)[SAE (2007)] to the previous year's budget of $50 million or euro36.9 million(see www.interpol.int/Public/ICPO/PressReleases/PR2003/PR200330.asp). Hence, the budget increase is assumed to be $8 million per annum. IMF's budget on AMF/CFT for FY2005 is $3.5 million and is found in box 5, page 28 in "INTERNATIONAL MONETARY FUND: The FY 2005 Budget and the Medium-Term Expenditure Framework" Prepared by the Office of Budget and Planning Approved by Barry H. Potter April 1, 2004. The International Atomic Energy Agency (IAEA) has calculated its annual funding needs at $12 million for its programmes and an additional $20 million per year to enable the Agency to respond to urgent situations that require immediate security upgrades (See www.iaea.org/NewsCenter/Features/Nuclear_Terrorism/index.shtml). We only use the upgrade number for which the United States has pledged $15.9 million. The cost of frozen assets is assumed to be actual loss in opportunity cost of $100 million (see www.whitehouse.gov/news/releases/2001/12/100dayreport.html and seekingalpha.com/article/35520-investing-for-yield-total-return-implications). The UN budget is based primarily on its Global Programme Against Terrorism (GPAT) which budgeted $5 million in 2004 (see www.unodc.org/pdf/brochure_gpt_may2000/20.pdf) and on the UN action to counter-terrorism (see www.un.org/terrorism/cttaskforce.shtml). The G8 FAFT budget is primarily based on the FAFT-GAFI which in 2004 (assuming a dollar/euro rate of 1.5) is $2.61 million (see http://www.fatf-gafi.org/dataoecd/41/25/34988062.pdf). The Egmont Group's budget is primarily driven by the establishment of the secretariat in Toronto which currently estimated at $1.8 million (see www.fintrac.gc.ca/publications/presentations/2007-03-29-eng.asp).

Table 8A. Lost GDP Due to Transnational Terrorism Attacks in Low Income Countries

Country	Pop (000)	Ti	per capita GDP	2005 Growth (%)	2005 Cost (average)	5 year Cost in (Growth)	Conflict Compementarity
Algeria	32,854	2	$2,066	3.65	47,568	231,801	$47,625
Angola	15,941	1	891	10.9	14,862	83,146	14,889
Bangladesh	141,822	1	415	3.43	19,380	94,046	
Bosnia-Herzegovina	3,907	4	1,486	5.25	11,704	58,802	
Burundi	7,548	2	105	-1.89	-288	-1,261	-288
Cambodia	14,071	1	356	4.89	2,352	11,733	
Chad	9,749	1	267	2.27	567	2,693	569
Colombia	45,600	3	2,174	3.51	100,213	487,045	100,425
Congo-Brazzaville	57,549	4	997	5.89	129,772	659,951	129,952
Ecuador	13,228	1	1,534	2.37	4,617	21,956	
Egypt	74,033	3	1,662	2.87	101,702	488,295	
El Salvador	6,881	1	2,127	0.99	1,391	6,444	
Eritrea	4,401	1	176	1.14	85	394	
Georgia	4,474	3	971	10	12,908	71,422	
Haiti	8,528	2	428	0.7	491	2,260	
India	1,094,583	4	586	6.7	1,650,260	8,522,845	1,654,484
Indonesia	220,558	4	942	4.12	328,702	1,616,191	329,132
Iran	67,700	2	1,962	4.75	121,139	602,816	
Jordan	5,411	3	2,091	4.45	14,501	71,747	
Kenya	34,256	2	428	0.23	647	2,956	
Kyrgyzstan	5,156	2	319	-1.56	-493	-2,174	
Macedonia	2,034	1	1,889	3.72	1,372	6,695	
Madagascar	18,606	1	233	1.73	720	3,383	
Mauritania	3,069	1	447	2.26	298	1,413	
Morocco	30,168	2	1,354	0.37	2,902	13,285	
Nigeria	131,530	1	420	4.38	23,228	114,779	
Pakistan	155,772	4	596	5.16	183,957	922,593	184,472
Peru	27,968	2	2,319	5	62,263	311,317	
Philippines	83,054	3	1,124	3.26	87,647	423,949	87,686
Sierra Leone	5,525	1	218	3.74	432	2,111	
Solomon Islands	478	1	647	1.71	51	238	51
Sri Lanka	19,582	3	1,004	4.27	24,177	119,218	24,242
Sudan	36,233	4	462	5.56	35,740	180,615	35,828
Syria	19,043	1	1,161	1.65	3,502	16,428	
Tajikistan	6,507	1	237	6.09	902	4,603	
Thailand	64,233	3	2,440	3.5	157,982	767,663	158,429
Tunisia	10,022	1	2,418	3.24	7,537	36,445	
Uzbekistan	26,593	1	673	5.18	8,900	44,652	
Yemen	20,975	4	590	1.02	4,847	22,467	4,867
Totals					**$3,168,538**	**$16,024,960**	**$2,772,363**

Table 8B: Welfare Cost of Terrorism In Low Income Countries

Country	Pop (000)	Ti	per capita GDP	GDP	Final Consumption % of GDP	C Growth (%)	Welfare Cost (average)
Algeria	32854	2	2066	67876364	33.42	4.55	128,408
Angola	15941	1	891	14203431	67.00	4.89	26,326
Bangladesh	141822	1	415	58856130	76.40	5.10	122,688
Bosnia-Herzegovina	3907	4	1486	5805802	99.18	4.97	63,280
Burundi	7548	2	105	792540	87.34	4.89	3,828
Cambodia	14071	1	356	5009276	84.99	12.19	8,363
Chad	9749	1	267	2602983	59.85	-7.88	-58,253
Colombia	45600	3	2174	99134400	61.92	4.72	514,666
Congo-Brazzaville	57549	4	997	57376353	85.21	4.89	540,093
Ecuador	13228	1	1534	20291752	65.98	6.43	33,681
Egypt	74033	3	1662	123042846	71.55	3.03	838,827
El Salvador	6881	1	2127	14635887	93.08	2.56	45,109
Eritrea	4401	1	176	774576	82.24	-26.16	-1,554
Georgia	4474	3	971	4342562	77.05	1.54	36,563
Haiti	8528	2	428	3649984	67.00	4.89	13,523
India	1094583	4	586	641425638	58.27	5.67	3,927,836
Indonesia	220558	4	942	207765636	63.89	7.40	1,265,718
Iran	67700	2	1962	132827400	45.88	1.28	456,112
Jordan	5411	3	2091	11314401	102.62	22.67	55,865
Kenya	34256	2	428	14661568	74.26	10.04	46,153
Kyrgyzstan	5156	2	319	1644764	84.54	8.32	6,345
Macedonia	2034	1	1889	3842226	78.42	3.44	9,268
Madagascar	18606	1	233	4335198	83.15	2.57	11,926
Mauritania	3069	1	447	1371843	92.35	27.18	1,981
Morocco	30168	2	1354	40847472	59.84	0.69	195,304
Nigeria	131530	1	420	55242600	38.93	-10.79	-203,988
Pakistan	155772	4	596	92840112	77.97	13.12	551,980
Peru	27968	2	2319	64857792	65.73	4.40	243,848
Philippines	83054	3	1124	93352696	79.80	6.52	558,788
Sierra Leone	5525	1	218	1204450	89.96	4.89	2,997
Solomon Islands	478	1	647	309266	67.00	4.89	573
Sri Lanka	19582	3	1004	19660328	76.95	4.89	125,423
Sudan	36233	4	462	16739646	69.39	4.89	128,324
Syria	19043	1	1161	22108923	63.30	9.93	29,808
Tajikistan	6507	1	237	1542159	95.43	4.89	4,071
Thailand	64233	3	2440	156728520	58.24	4.87	757,949
Tunisia	10022	1	2418	24233196	57.85	4.76	39,124
Uzbekistan	26593	1	673	17897089	73.19	4.89	36,237
Yemen	20975	4	590	12375250	61.36	4.89	83,890
Totals							**$10,651,082**

Table 9. Solutions: Benefits, Costs, and Benefit-Cost Ratios

	Challenge Approach $5000 DALY			Perspectives Approach $5000 DALY		
Solutions	Benefits	Costs	BCR	Benefits	Costs	BCR
Solution 1 (M7)[1]	28.343	727.7	0.039	29.951	427.7	0.070
Solution 1 (M9)[1]	28.343	298.3	0.095	45.062	302.2	0.149
Solution 2A[2]	20.000	3.74	5.348	0.076	0.293	0.259
Solution 2B[2]	20.000	1.29	15.504	0.311	0.293	1.061
Solution 3A[3]	4.335	56.5	0.077	4.576	56.5	0.081
Solution 3B[3]	4.335	35.5	0.122	6.656	35.5	0.187
Solution 4[4]	20.969	74.6	0.281	20.969	74.6	0.281
Solution 5A[5]	38.217			0.362	6.47	0.056
Solution 5B[5]	38.217			0.639	6.47	0.099

Notes: [1]For Challenge Approach: Solution 1A is based on Method 7 in SAE (2007) Table 11 for calculating homeland security expense. Solution 1B is based on Method 9 in Table 11 for calculating homeland security expense; For Perspectives Approach: Solution 1A employs the GDP cost approach with conflict complementarities; Solution 1B employs the welfare approach. See Table 3 for calculating homeland security expense.[2]For Challenge Approach: Solution 2A uses a higher costs for police cooperation and IMF monitoring than Solution 2B. DALY and Value of Life do not figure into the calculations of benefits for Solution 2A and 2B. For Perspectives Approach: Solution 2A employs the welfare approach; Solution 2B employs the GDP cost approach with conflict complementarities. [3]For Challenge Approach: Solution 3A is based on the cost of Operation Enduring Freedom (Afghanistan) and Operation Noble Eagle, while Solution 3B is only based on the cost of Operation Enduring Freedom. For Perspectives Approach: Solution 3A employs the GDP cost approach with conflict complementarities; Solution 3B employs the welfare approach. [4]Taken directly from SAE (2007). [5]For Challenge Approach: Taken directly from SAE (2007). For Perspectives Approach: Solution 5A employs the GDP cost approach with conflict complementarities; Solution 5B employs the welfare approach.

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Technical Appendix

Formally, we begin with a representative individual who lives in country i with lifetime utility described by the following equation:

$$U_{it} = E_t \left\{ \sum_{s=t}^{\infty} (1+\theta)^{-(s-t)} \left[\frac{C_{is}^{1-\rho}}{1-\rho} \right] \right\}, \tag{1}$$

where $C_s = (1+\mu_i)^{s-t}\overline{C} \exp^{[\epsilon_{is} - \frac{1}{2}\sigma^2_{\epsilon_i}]}$, $\Delta\epsilon_{is} = \upsilon_{is}$ is a normal, i.i.d. mean-zero shock with variance $\sigma^2_{\epsilon_i}$, and μ_i is the growth rate of consumption. Using the fact that $\exp[1-\rho]\epsilon_{is}$ is log-normally distributed, we can then obtain:

$$E_t\{C_{is}^{1-\rho}\} = (1+\mu_i)^{(1-\rho)(s-t)}\overline{C_i}^{1-\rho} \exp\left[-\left\{ (1-\rho)\rho\sigma_i^2/2 \right\} (s-t) \right]. \tag{2}$$

where σ_i^2 denotes the variance of $\upsilon_{is} = \Delta\epsilon_{is}$. Assuming that the following holds for all i countries,

$$\Phi_i \equiv (1+\theta)^{-1}(1+\mu_i)^{1-\rho} \exp - \left\{ (1-\rho)\rho\sigma_i^2/2 \right\} < 1 \tag{3}$$

and substituting (2) into (1), we obtain expected utility as:

$$U_{it} = \left[\frac{\overline{C_i}^{1-\rho}}{1-\rho} \right] [1-\Phi_i]^{-1}. \tag{4}$$

Instead of a world without consumption uncertainty, as Lucas (1987) proposed for his measure of the welfare costs of business cycles, we propose comparing the expected welfare from each country remaining in its realized path of consumption, to another synthetic path of consumption where there is no state of transnational terrorism.

Formally, to "price" the amount that a representative household in each country would pay in order to obtain the peaceful path of consumption, we return to Lucas' methodology.[4] In other words, we now solve for the amount of current consumption, τ_i^*, that equates the expected welfare of remaining on the current path of consumption to one where consumption is devoid of conflict, namely:

$$\left[\frac{((1+\tau_i^*)\overline{C_i})^{1-\rho}/(1-\rho)}{1-\Phi_i} \right] = \left[\frac{\overline{C_i^*}^{1-\rho}/(1-\rho)}{1-\Phi_i^*} \right] \tag{5}$$

[4] We now denote the the mean and variance of the log-change of per-capita consumption in a peaceful world as μ_i^* and σ_i^{2*}, respectively.

where $\Phi_i^* \equiv (1+\theta)^{-1}(1+\mu_i^*)^{1-\rho}\exp-\{(1-\rho)\rho\sigma_i^{2*}/2\}$.

Solving for τ_i^* and assuming that $\overline{C_i} = \overline{C_i^*}$, we have:

$$\tau_i^* = \left[\frac{1-\Phi_i}{1-\Phi_i^*}\right]^{\frac{1}{1-\rho}} - 1. \tag{6}$$

To understand how potentially enhanced consumption growth and reduced consumption volatility can effect the economic welfare costs of conflict, first, define $\Delta\sigma_i^2 \equiv \sigma_i^{2*} - \sigma_i^2$ and $\Delta\mu_i \equiv \mu_i^* - \mu_i$. A log-linear approximation of expression (6) in the neighborhood of $\Delta\mu_i = \Delta\sigma_i^2 = 0$ yields:[5]

$$\tau_i^* \approx \left[\frac{\Phi_i}{1-\Phi_i}\right] \cdot \left[-(\rho/2)\Delta\sigma_i^2 + (1+\mu_i)^{-1}\Delta\mu_i\right]. \tag{7}$$

Ceteris paribus, if a more peaceful world can deliver more growth and less volatility, each of these factors will raise the amount that a representative individual would pay in order to get rid of conflict.

In developing a baseline specification for a country's per-capita consumption growth, and how conflict might affect it, the simple permanent income hypothesis (PIH) provides a very reasonable starting point. Hence, the baseline specification we adopt is:

$$\Delta log(c_{it}) = \alpha_1 + \alpha_2 T_{it} + I_i + y_t + e_{it}, \tag{8}$$

where again $\Delta log(c_{it})$ is the log-difference of per-capita consumption for country i at time t, I_i and y_t are estimated individual and time fixed effects, respectively and T is a terrorist event. As we do not have reliable consumption per capita data for the entire time sample, we employ GDP per capita data as a proxy assuming that the growth rate must be equated in the steady state. For the sample period 1968-2003, over 191 countries, we estimate $\alpha_2 = -.397$ and find it be significant at the 0.05 percent level. As our model is suggestive of a lower bound, we employ an estimate of $\alpha_2 = -.174$ or the original estimate plus one standard error.

From these results, one can construct a "synthetic" growth rate were an economy to be perpetually at peace as follows. From the estimated, fitted values of equation (8), each country's "peaceful" growth rate at time t is just $\Delta\widehat{log(c_{it})}^* \equiv X_{it}^* = \hat{I}_i + \hat{y}_t + \hat{e}_{it}$. Averaging this yields each country's peaceful growth rate of per-capita consumption, $\widehat{\mu}_i^* = (1/T)\sum_{t=1}^{T} X_{it}^*$.

[5] Although we provide the Taylor approximation in expression (7), all calculations below (Tables 4-6) are done using the exact solution, expression (6).

The construction of a synthetic measure of the volatility (either standard deviation or variance) of consumption during peace involves two steps: estimating the mean squared growth in consumption during peace and the squared mean growth in consumption during peace. Fortunately, the latter has been calculated, $(\widehat{\mu}_i^*)^2$. Hence, to insure that this volatility measure does not become negative, we adopt the following specification for the squared growth of per-capita consumption.

$$|X_{it}^*|^2 = \exp\{2 \cdot [\delta_1 \cdot T_{it} I_i + y_t + u_{it}]\} \tag{9}$$

According to this exponential specification, the squared change in per-capita consumption growth will always be positive, and one can estimate the fixed individual and time effects and the effect of conflict on volatility using non-linear least squares. A more appealing approach, however, is to take natural logs of both sides of (9) so that one can estimate these same crucial parameters using OLS, namely:

$$log(|X_{it}^*|) = \delta_1 T_{it} + I_i + y_t + u_{it} \tag{10}$$

Notice that one can come up with a reasonable measure of the effect of conflict on consumption volatility by estimating the parameters using OLS on the transformed dependent variable. For the sample period 1968-2003, over 191 countries, we estimate $\delta_1 = .31$ and find it be significant at the 0.05 percent level. As our model is suggestive of a lower bound, we employ an estimate of $\delta_1 = .145$ or the original estimate minus one standard error.

To implement the welfare calculations embodied in expression (6), we need to provide parameter values for the discount rate (θ) and the coefficient of relative risk aversion (ρ), in addition to the consumption growth and volatility measures calculated from above. Clearly, changes in θ and ρ will affect τ_i^*. Four important issues in the selection of these parameters should be kept in mind. First, the parameter values should be plausible. Second, the parameters should be such that $\Phi_i < 1$ and $\Phi_i^* < 1$ for all countries – see expression (3). Third, the parameter values selected should be suggestive of a lower bound for τ_i^*. Fourth, the reader should get an indication of the robustness of τ_i^* to changes in the values chosen for θ and ρ. We provide results for the welfare measures using $\theta = .08$ and $\rho = 2$. These values were chosen for the following reasons, based on the criteria just discussed.