

assessment paper

# ARMED CONFLICTS

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COPENHAGEN  
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# **Armed Conflicts**

## **The Economic Welfare Costs of Conflict**

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## Introduction

Conflicts, of various sizes and purported purposes, cast a long and dark shadow on the lives of many and on the histories of nations and peoples. Theories of conflict abound – for wars between nations, internal civil conflicts, and terrorist operations – primarily based on national or group leaders convincing followers to take up a fight for some purpose, noble (to advance an idea, a religion, a culture, a form of government) or otherwise (to appropriate). While leaders, on occasion, do profit from conflict, they do so less often than they might ever imagine. Indeed, leaders, depending on institutional constraints, can separate the spoils of war (land, resources) from the dim costs of war.

The men and women who conduct the battles, however, can seldom avoid the costs of war, and so are fully saddled with the loss of life, limb, loved ones, livelihood, and way of life. Nor are the soldiers' interests fully reflected in the interests of those who make the decision to initiate, continue or to change the course of battle. In his famous letter to his World War I commanding officer, Lt. Siegfried Sasson of the Royal Welsh Fusiliers, clearly speaks of wrote:

*“I believe that the war upon which I entered as a war of defence and liberation has now become a war of aggression [sic] and conquest. ... I have seen and endured the sufferings of the troops and I can no longer be a party to prolonging these sufferings for ends which I believe to be evil and unjust. I am not protesting against the conduct of the war, but against the political errors and insincerities for which the fighting men are being sacrificed. On behalf of those who are suffering now, I make this protest against the deception which is being practised upon them; also I believe it may help to destroy the callous complacency with which the majority of those at home regard the continuance of agonies which they do not share and which they have not enough imagination to realise.” July, 1917*

Despite the inherent wastefulness of conflict, we continue to observe it in all its infinite manifestations. And there should be no doubt that we will certainly continue to observe it throughout this century. As he remarked in his speech in accepting the 2009 Nobel Prize for Peace, U.S. President Barack Obama stated “We must begin by acknowledging the hard truth: we will not eradicate violent conflicts in our lifetimes,” and that “There will be times when nations — acting individually or in concert — will find the use of force not only necessary but morally justified.”

Violent conflict is thus wasteful and inevitable – a cheerless combination. But this odd coupling, perhaps surprisingly, may help us to understand how to create a less violent world. Indeed, the key to reversing the inevitability of violent conflict may lie in our better understanding and coming to grips with its wastefulness. In other words, by better understanding the costs of war we may be able to chip away at the existence of conflicts, and build institutions to better insure against their return.

In our paper, we will provide an empirical analysis of data to better understand the effect of conflict, as measured by military spending, on economic activity and the consumption alternatives that a society faces. In other words, how would the present day mix of Butter and Guns consumed by a society change if we were to return to a more war-like time in history. We will then use standard economic theory to answer the question, “How much would you pay to consume the current level of Guns and Butter rather than consume the level required to sustain a more violent environment that

we experienced in the past?” Our answer is that an average person would permanently pay no less than 8% of their current consumption to avoid returning to such a systemic conflict world such as we saw in World War II. That violent, systemic conflict is such a large tax leads us to believe that domestic and international institutions can and should be better designed to realize the benefits to peace.

The literature on the economics of war rests on the shoulders of the founders of modern economics: Keynes (1919), Pigou (1940), Meade (1940) and Robbins (1942) examined the nature and effects of the first and second world wars in times when tremendous, costly international conflict was the unfortunate reality.<sup>1</sup> Since then, as computing power and econometric techniques have progressed, economists have continued to beg the question, “how costly is war?” Barro (2009), which terms major wars to be rare disasters, determined that “society would willingly reduce GDP by around 20 percent each year to eliminate rare disasters [p. 244].” Blomberg and Hess (2011) look specifically at the welfare costs to consumption of war between 1950 and 2004 and estimates that those countries who have been engaged in conflict would have been willing for forfeit 9 percent of their current level of consumption, on average, to avoid war. This is likely a conservative estimate for those countries, since it accounts only for costs to consumption and ignores many of the more difficult to quantify costs to war. Using a similar type of analysis, Bozzoli, Brück and de Groot (2011) find large and long-lasting costs of conflict.

If war has long been studied and found to be highly costly, why then does conflict persist? Kaysen’s (1990) response is that “cultures change much more slowly than technologies and institutions [p. 62],” and thus even if wars are exceedingly harmful, they are not yet “subrationally unthinkable.” Others examine the structural elements, such as regime type, that affect the probability of war. Mesquita and Siverson (1995) examined international wars between 1816 and 1975 and found that war is often a political liability to democratically elected leaders, and thus authoritarian leaders will be inclined to longer, more risky wars than are democratic ones. Garfinkel (1994) found that political competition and electoral uncertainty in a democratic nation can foster cooperation between that nation and others, thus reducing military spending and the number and severity of conflicts.

On the other hand, Gelpi (1997) finds that the data for international crises between 1948 and 1982 indicate that it is democratic, not authoritarian, regimes that use force to divert attention away from domestic problems, since authoritarians have greater capability to deal with or repress domestic unrest. Smith (1996) makes the argument that under a democratic system, when politicians believe elections can be positively affected by adventurous foreign exploits, military action becomes more probable. Further, Hess and Orphanides [1995, 2001a, 2001b] show, theoretically and through the use of data for the United States during the Cold War, that even in a democratic state with rational voters and informational symmetry, a leader might initiate a war in times of economic or other

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<sup>1</sup> Research on the effects of the World Wars continued well past the signing of treaties. For example, Braun and McGrattan (1993) documented the effects World War II on Britain and the United States and found that war did, in fact, crowd out private investment and consumption.

hardship to increase his probability of reelection.<sup>2</sup> Hess and Orphanides analysis is affirmed by DeRouen (1995), which used empirical evidence from 1949 to 1984 in the United States to determine that public approval provides an indirect link between the economy and the use of force.<sup>3</sup>

Some papers even found that a democratic constituency's attempts to punish executives for military adventurism might actually exacerbate the problem. Downs and Rocke (1994) found that this would lead to unwarranted punishing of some executives genuinely acting in the interest of their constituency and to some amount of "gambling for resurrection"—where executives already in a costly conflict choose to unnecessarily perpetuate said conflict, gambling on the chance that the situation might improve and allow them to avoid punishment. Richards *et al* (1993) similarly found that incompetent leaders will be inclined to use diversionary force if they are sufficiently risk-accepting.

In short, the literature argues that the current generation's conflict have arisen out of ethnic or cultural tensions, or due to increasing changes brought by democratization. These challenges pale in comparison to those brought by previous generation's world wars and the cold war. In other words, though conflict remains a serious problem, the cost of war has fallen due to the "peace dividend" experienced since the early 1990's.

However, though wars today are nowhere near the size of the world wars, there is still significant military spending cutting into this "peace dividend." Davoodi *et al* (2001) confirmed the existence of such dividends as world conflict decreased;<sup>4</sup> further, they found that decreases (increases) in military spending are a public good (bad) as it typically results in neighboring countries following suit in decreasing (increasing) military spending. Hartley and Russett (1992) also found that military spending had externalities in the Cold War—public opinion in the United States affected military spending less than did changes in Soviet's military spending. Alesina and Spolaore (2004) provide another explanation for why the peace dividend is limited: decreases in conflict leads to the breakup of larger countries, and such a breakup is liable to lead to an increase in regional conflict.

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<sup>2</sup> Not all analyses are in line with Hess and Orphanides, however. The model presented in Richards *et al* (1993) implies, ironically, that competent leaders are generally more inclined than incompetent ones to use diversionary force. Levy (1989) called into question the proposition that politicians definitively use conflict as a means scapegoating, arguing that such a relationship might be coincidental as opposed to causal. Lian and O Neal (1993) examined the effect of military action on Presidential approval ratings, finding that even for important, well-publicized cases, military action never yielded more than a 3 percent change in popularity.

<sup>3</sup> If poor economic conditions cause leaders to be more likely to start wars, and wars are themselves harmful to the economy, it begs the question: does a "poverty-conflict trap" exist? Using a Markov probability model on data from 152 countries between 1950 and 1992, Blomberg and Hess (2002) found that recessions increase the probability of external and internal conflict (the latter is even more significantly increased when external conflict also exists), which both increase the probability of a recession—evidence indicating that such a trap exists. Further, Blomberg *et al* (2006) determined that a poverty-conflict nexus is most likely to occur in economies with selfish leaders and small returns to capital.

<sup>4</sup> Davoodi (2001) *et al* attributes 66, 26, and 11 percent of decline in military spending to easing of international tensions, easing of regional tensions, and participation in IMF-supported adjustment programs.

The purpose of our paper is to estimate the “opportunity cost” of war on economic welfare. We will do this by examining the returns from the “peace dividend” during very different periods of world-wide conflict during the period since 1900. We will then use these returns to compare them to estimates on the welfare cost of conflict. Rather than use the method we deployed in Blomberg and Hess (2011) to calculate the costs of war, which employed assumptions about the effect of conflict on the long-run level of economic well-being, we use an alternative approach that looks at the composition of spending between Guns (military spending) and Butter (private consumption). We find that society has benefitted enormously by the decline in conflict and military spending since the end of World War II and the Korean War. This suggests that while there has been a significant decrease in the welfare cost of war, we must remain every vigilant and guarded against the potential for the return of larger scale conflict. A prudent society should thus better institutional peace and the peaceful resolution of areas of disagreement.

## **The World Economy from 1900 to the Present**

At the turn of the 20<sup>th</sup> century, the global economy was a significantly different place than it is today. First, the world has become richer although, admittedly, the pace of development has been very uneven. Second, there are a lot more countries. Let’s investigate this second point first. According to the U.S. State Department, the world was comprised of 57 countries in 1900 and has grown to 192 countries<sup>5</sup> by 2000. The population of the global economy has also experienced a dynamic evolution. In 1900, there were 467 million Chinese, 325 million Europeans, 178 million in the Americas and 13.5 million in Africa. Now there are more people living in the United States and Africa, than people residing in Europe.

What has this change meant for the economic outcomes for these groups? Figure 1 plots the Growth in World GDP during the 20<sup>th</sup> century, relative to previous centuries, as estimated by DeLong (1998).<sup>6</sup> The figure demonstrates that the global economy began to take shape during the 19<sup>th</sup> century after a millennia of stagnation. Economic growth increased by 200% during the 19<sup>th</sup> century, such that the

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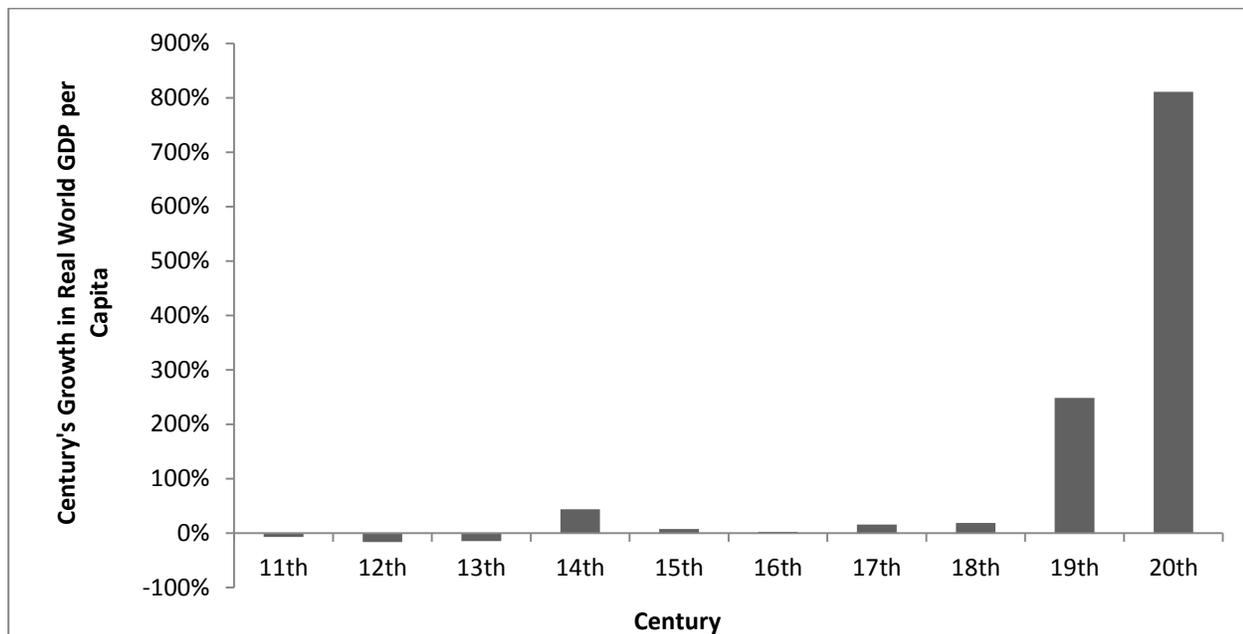
<sup>5</sup> See <http://www.ppionline.org/ndol/print.cfm?contentid=252023>.

<sup>6</sup> As DeLong (1998) states, “Angus Maddison (1995) has constructed estimates of real GDP per capita for the world from 1820 to 2008. His estimates are best thought of as Laspeyres purchasing power parity estimates in 1990 international dollars. That is, they: Compare income levels across countries not using current exchange rates, but instead trying to change one currency into another at rates that keep purchasing power constant (“purchasing power parity”); Value goods in relative terms using the prices found in a country in the middle of the world distribution of income (“international”); Calculate a value for 1990 GDP per capita in the United States equal to U.S. current-dollar GDP per capita in 1990 (“1990 dollars”); Do not take explicit account of the benefits of the introduction of new goods and new types of goods, but instead calculate GDP per capita in the past by valuing the commodities produced in the past at recent prices—and not making any correction for the restricted range of choice enforced by limited production possibilities (“Laspeyres”).”

average GDP per person in 1900 (in 1990 dollars) was \$1,262. The distribution of wealth was heavily influenced by the British Empire: indeed, the top 10 percentile of countries with per capita GDP above \$4,000 (1990 \$US) were the United Kingdom, the United States and Australia.

Figure 1 demonstrates the first point: namely, the significant economic gains of the 20<sup>th</sup> century that took place as growth rose again by an additional 843%. However, the rate of economic transformation was decidedly uneven. As nations splintered, as witnessed by the country coverage of our data set increasing from 39 to 164 countries, the dispersion of GDP per capita increased. By the end of the 20<sup>th</sup> century, approximately one quarter of the countries in the sample had not reached the average world GDP per person in 1900. Moreover, approximately one half of the countries had not reached the income level that the four richest countries obtained in 1900.

**Figure 1. Growth in Real World GDP per Capita, 1000-Present**



All figures are from Maddison (2011) and are in Geary-Khamis 1990 dollars.

The influence of the British Empire was less obvious by the year 2000, as countries from many different regions joined the top tenth percentile. While the rich were primarily concentrated in Europe, countries from Asia (Japan and Singapore) joined the club. By contrast, many countries in Latin America and Africa have lost ground. As the data is sparser before World War II, we provide a regional breakdown of the growth over time in Table 1.

**Table 1. GDP Growth and Growth Per Capita 1950-2010: Selected Groupings**

Century	World	More Developed	Less Developed	Africa	Asia	Europe	Latin America	North America
<b>GDP Growth</b>								
<b>1950s</b>	4.34%	4.23%	4.61%	3.84%	5.07%	4.34%	4.94%	3.79%
<b>1960s</b>	5.04%	5.20%	4.64%	4.62%	5.86%	4.97%	5.25%	4.48%
<b>1970s</b>	4.14%	3.55%	5.60%	4.39%	5.52%	3.36%	5.73%	3.35%
<b>1980s</b>	3.08%	2.59%	4.10%	2.54%	4.85%	2.00%	1.85%	3.05%
<b>1990s</b>	2.80%	1.64%	4.75%	2.46%	4.63%	0.48%	2.89%	3.06%
<b>2000s</b>	4.27%	2.56%	6.37%	4.85%	6.17%	3.06%	3.56%	2.31%
<b>Growth Per capita</b>								
<b>1950s</b>	2.60%	2.50%	2.88%	2.11%	3.33%	2.61%	3.21%	2.06%
<b>1960s</b>	3.31%	3.47%	2.91%	2.88%	4.12%	3.23%	3.52%	2.75%
<b>1970s</b>	2.40%	1.81%	3.86%	2.65%	3.78%	1.63%	3.99%	1.62%
<b>1980s</b>	1.35%	0.86%	2.36%	0.81%	3.12%	0.26%	0.12%	1.32%
<b>1990s</b>	1.06%	-0.09%	3.01%	0.73%	2.90%	-1.25%	1.16%	1.33%
<b>2000s</b>	2.54%	0.83%	4.64%	3.12%	4.43%	1.33%	1.82%	0.58%

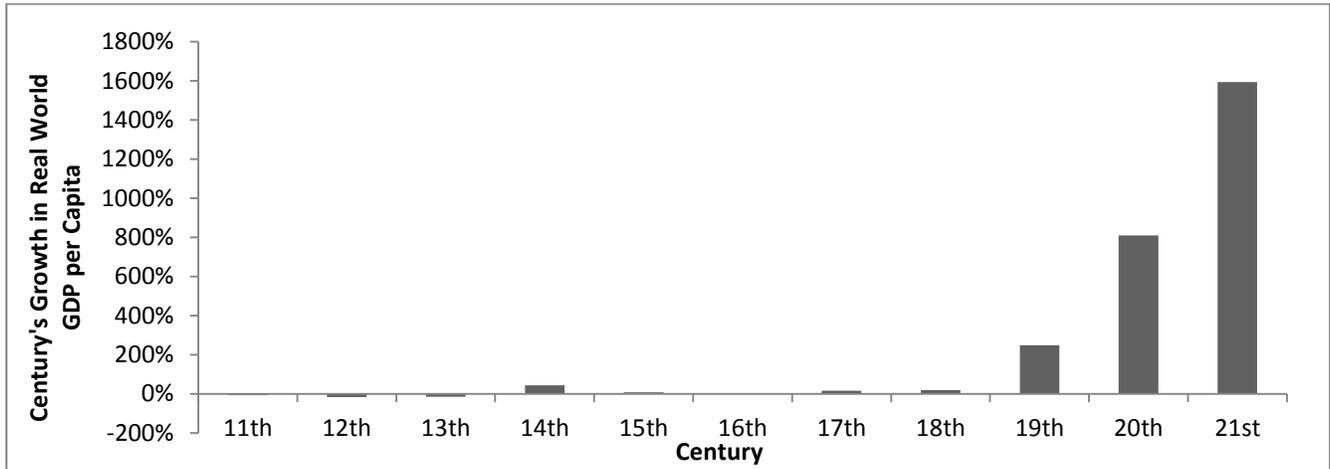
All figures are from Maddison (2011) and are in Geary-Khamis 1990 dollars.

On an individual country level, World growth and World growth on a per-capita basis appear to be falling in each successive decade. This may be consistent with the predictions of the Solow growth model – Solow (1956). As countries approach their long-run equilibrium steady-state, growth due to capital deepening vanishes, and all growth is brought about through technological innovation. This is also consistent with the fact that less developed countries tend to grow faster than more developed countries and that Asia has grown faster than both Europe and North America.

There are a few areas, however, that cannot be so easily understood using a simple Solow growth framework. Why have Africa and Latin America had periods of growth lower than Asia and not significantly different (in fact lower than) North America? One answer to this question may be that these regions (specifically Africa) have experienced significantly more conflict than seen in the developed world. Our paper seeks to address this point during the empirical analysis.

It is also interesting to note that for the majority of the decade of the 2000's, there has been a burst of global growth. This is true for every region to include Africa and Latin America. This is one reason that many investors are now paying more attention to the economic BRICs (Brazil, Russia, India, China) and other emerging market economies. Figure 2 plots the expected growth during the 21<sup>st</sup> century if the first eight years of this century's growth were to be duplicated throughout the remainder of time. As you can see, growth in the 21<sup>st</sup> century should continue to dwarf that obtained in previous centuries.

**Figure 2. Growth in real World GDP per Capita, Estimate.**



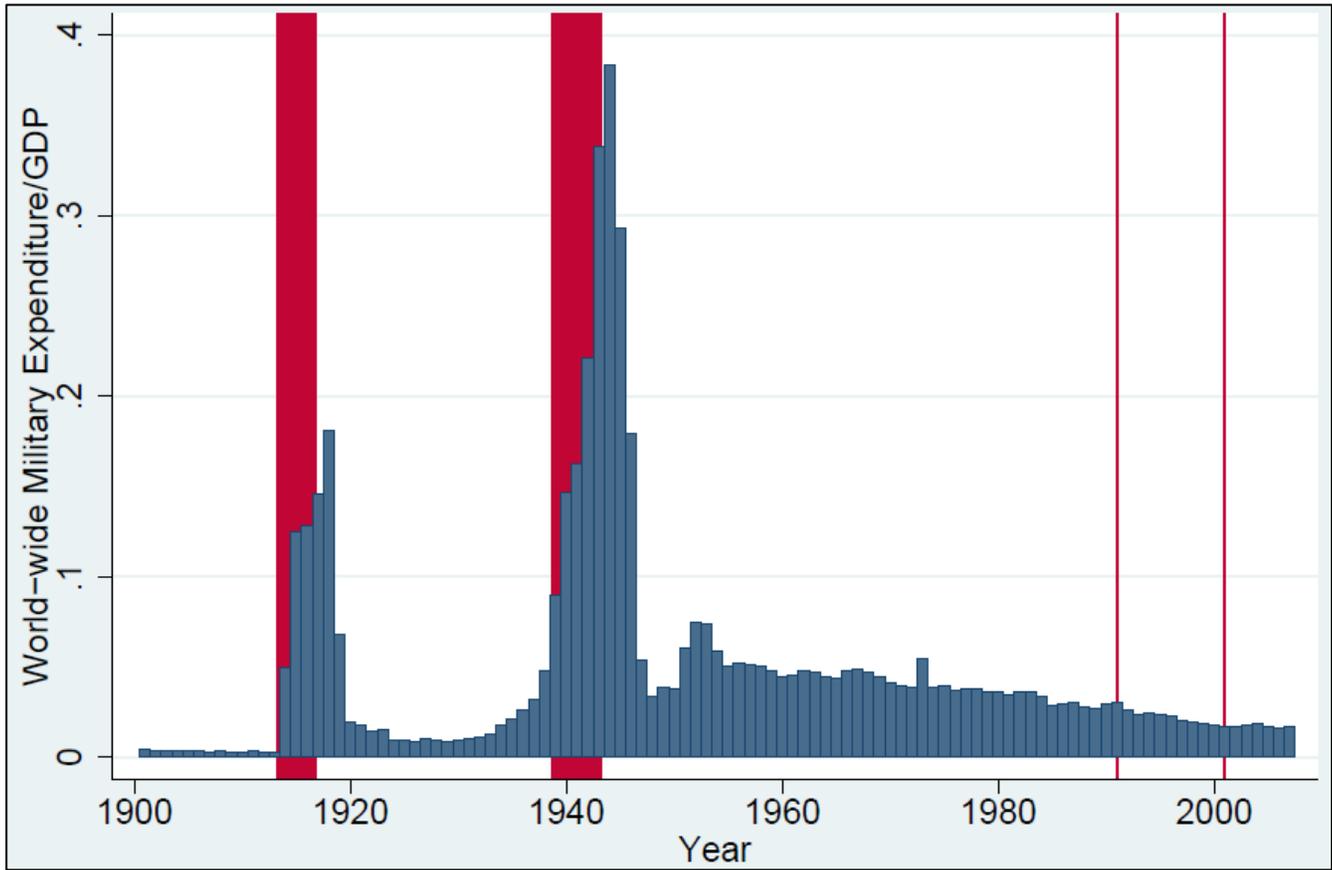
All figures are from Maddison (2011) and are in Geary-Khamis 1990 dollars.

## Conflicts in the 20<sup>th</sup> Century

Over the past century, there have been two World Wars, and innumerable civil and foreign conflicts. The scope of countries involved in mutual conflict has never been higher. Remarkably, however, there has also been a trend toward more conflict resolution during the same period in question. Milton Leitenberg (2006) did an intensive study of conflict during the 1900s and finds that wars accounted for 136.5 to 148.6 million deaths. Leitenberg (2006) also shows that the majority of these losses occurred in the first part of the 20th century, as World War I and World War II accounted for between 78 and 90 million deaths. Indeed, Leitenberg (2006) estimates that since the end of the Second World War, approximately 27 percent of the fatalities from conflict for the century have occurred with 41 million lives lost. In short, deaths in conflict have fallen since the end of the Second, and hopefully last, World War.

One way to see this is to consider the “peace dividend” which occurs at the end of major conflicts -- we denote in red World Wars I and II, Persian Gulf I and September 11, 2001. We examine this by looking at the cost of maintaining a military at the expense of private consumption. Figure 3 shows spending on the military as a percentage of GDP since 1900.

Figure 3. World-wide Military Expenditure/GDP 1900 – 2007



World-wide military spending has two obvious peaks – one in World War I and World War II -- as spending due to the war effort spiked to nearly 40 percent of GDP. Subsequently, there has been a dramatic shift and trend downward. However, it has not fallen to zero. Figure 4 highlights the time period since 1970. Notice that there has been an uptick in spending during the Cold-War, and an associated decline since 1991. There is reason to be concerned that this decline will not continue, as there has been an increase in spending in response to the 9/11 terrorist attacks.

While there are many countries that devote a significant portion of their budget to defense, a handful of countries dominate world-wide military expenditure. In fact, two countries, the United States and the United Kingdom, make up greater than 50 percent of spending. Figure 4 plots military expenditure as a percentage of GDP of the highest spending country -- the United States.

Figure 4. World-wide Military Expenditure/GDP 1980 – 2007

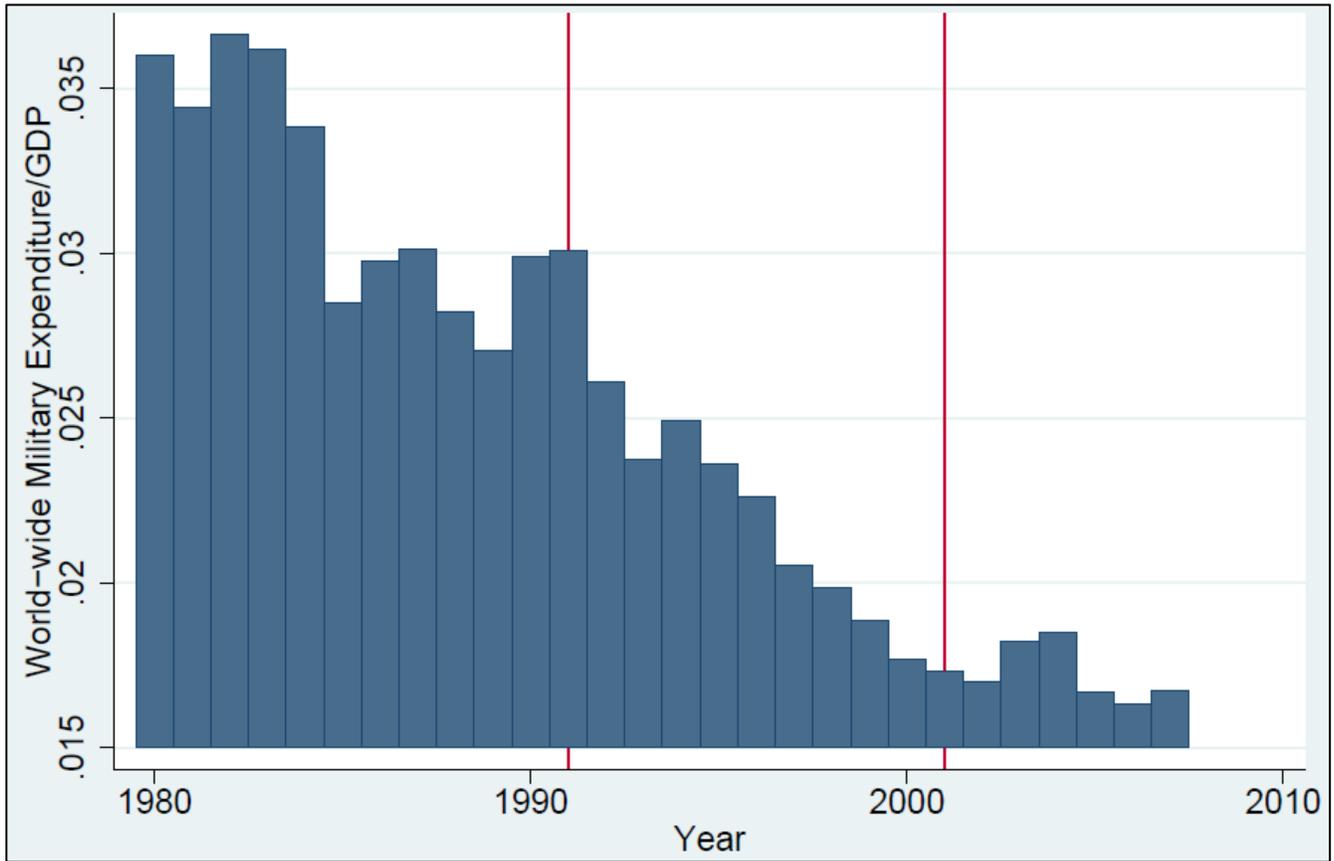
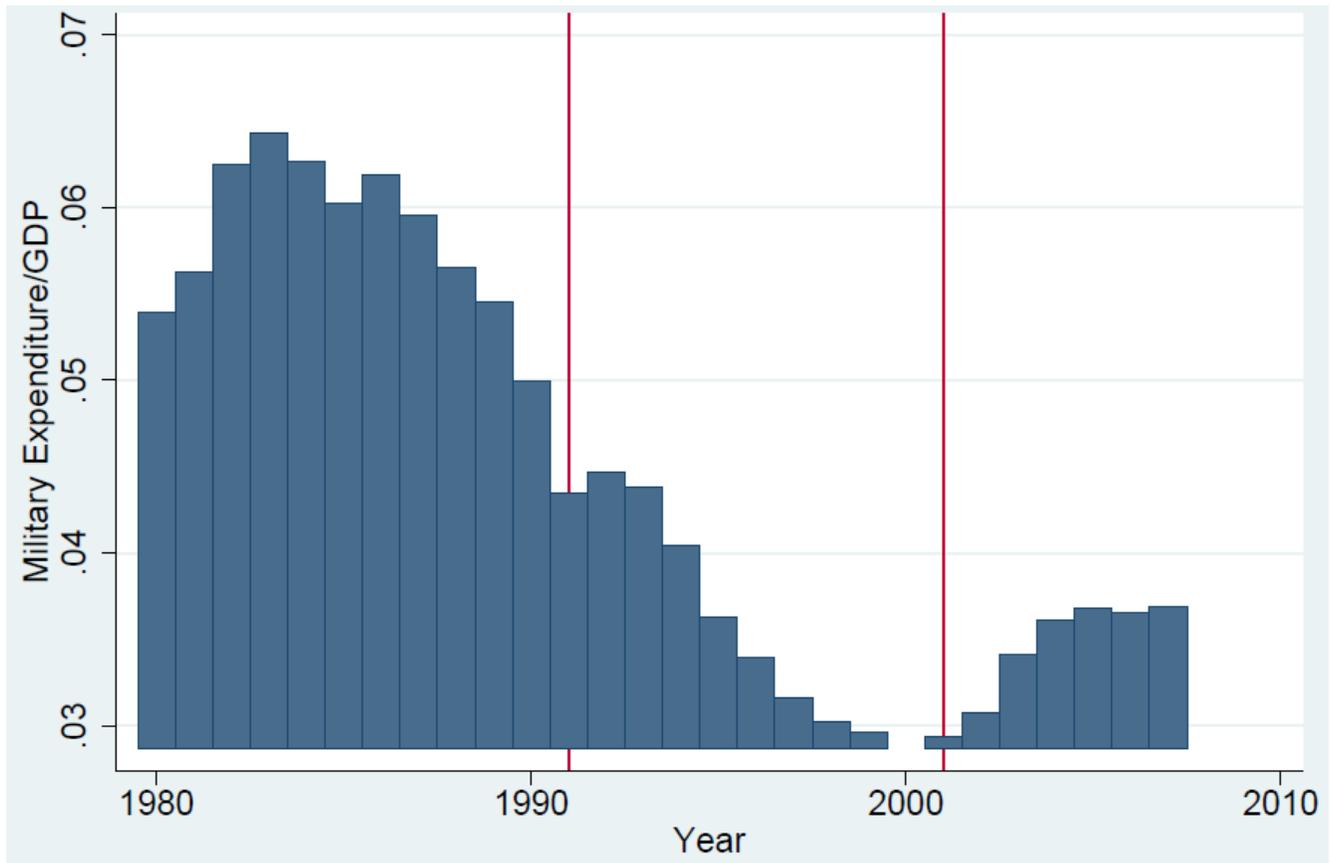


Figure 5 shows similar trends as seen in Figure 4. The United States has enjoyed a peace dividend since the end of the Cold War, but recently has seen an increase in spending since 9/11, primarily associated with the subsequent War on Terror.

Figure 5. US Military Expenditure/GDP 1980 – 2007



How has the most recent US foreign policy affected the rest of the world? To investigate this, we parse the data but a number of groupings. The short answer to the question is that most countries continue to enjoy a peace dividend, though defense spending remains a significant portion of their economic activities. Figure 6 plots the dynamics of military spending by the various income groups defined by the World Bank. In each and every grouping, countries have enjoyed a peace dividend after the end of the Cold War. However, it appears that the highest income group has been most affected by the events following 9/11.

Figure 6. Military Expenditure/GDP: By Income Group

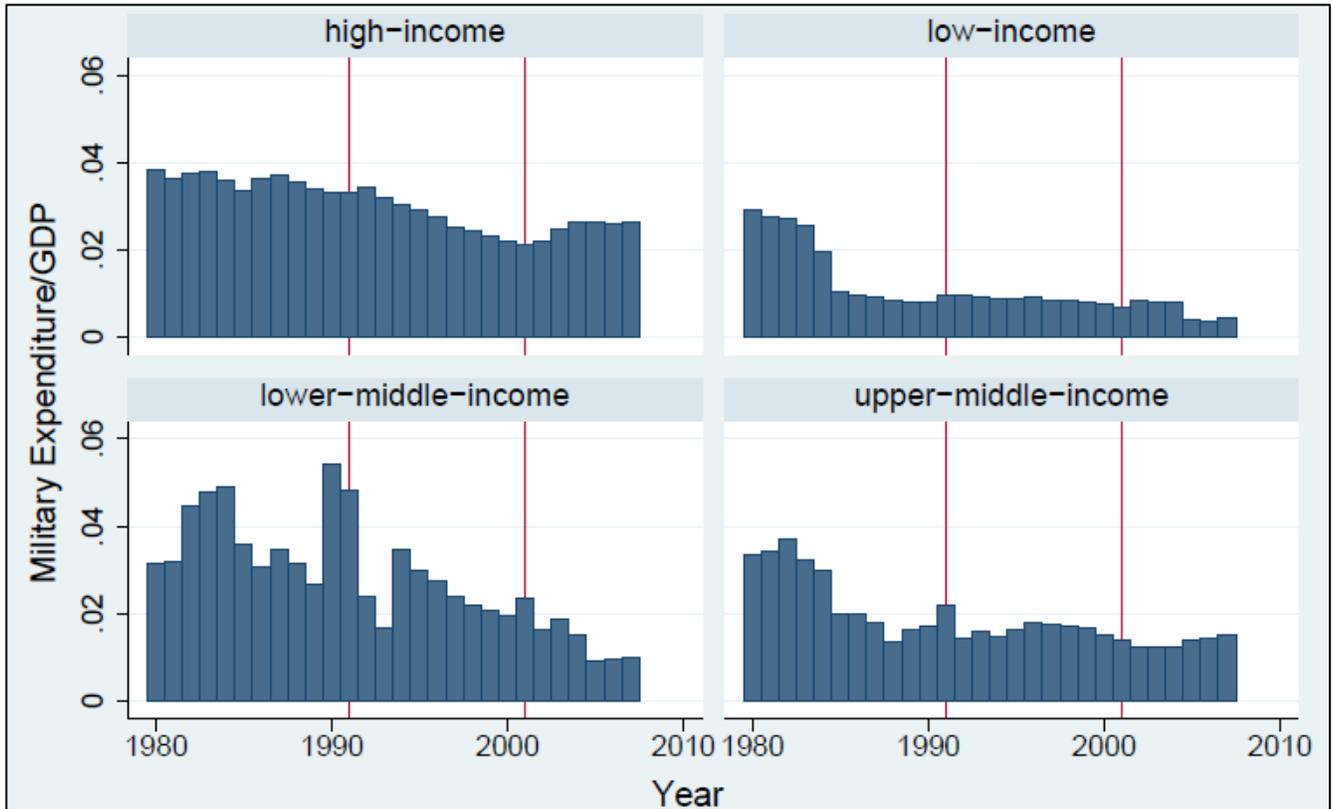


Figure 7 plots the data over the same time period to investigate the extent to which these dynamics are explained by democratization. As was noted in the introduction, many authors conjecture that these factors explain much of the conflict seen since World War II. Figure 7 shows that there are significant differences between these two groups. Non-democracies have seen more variation in their spending patterns. Spending rose drastically during various civil wars but has quieted in the most recent period. At this same time, Democracies have seen a smoother transition but have had a more persistent pattern of spending.

Figure 7. Military Expenditure/GDP: By Governance

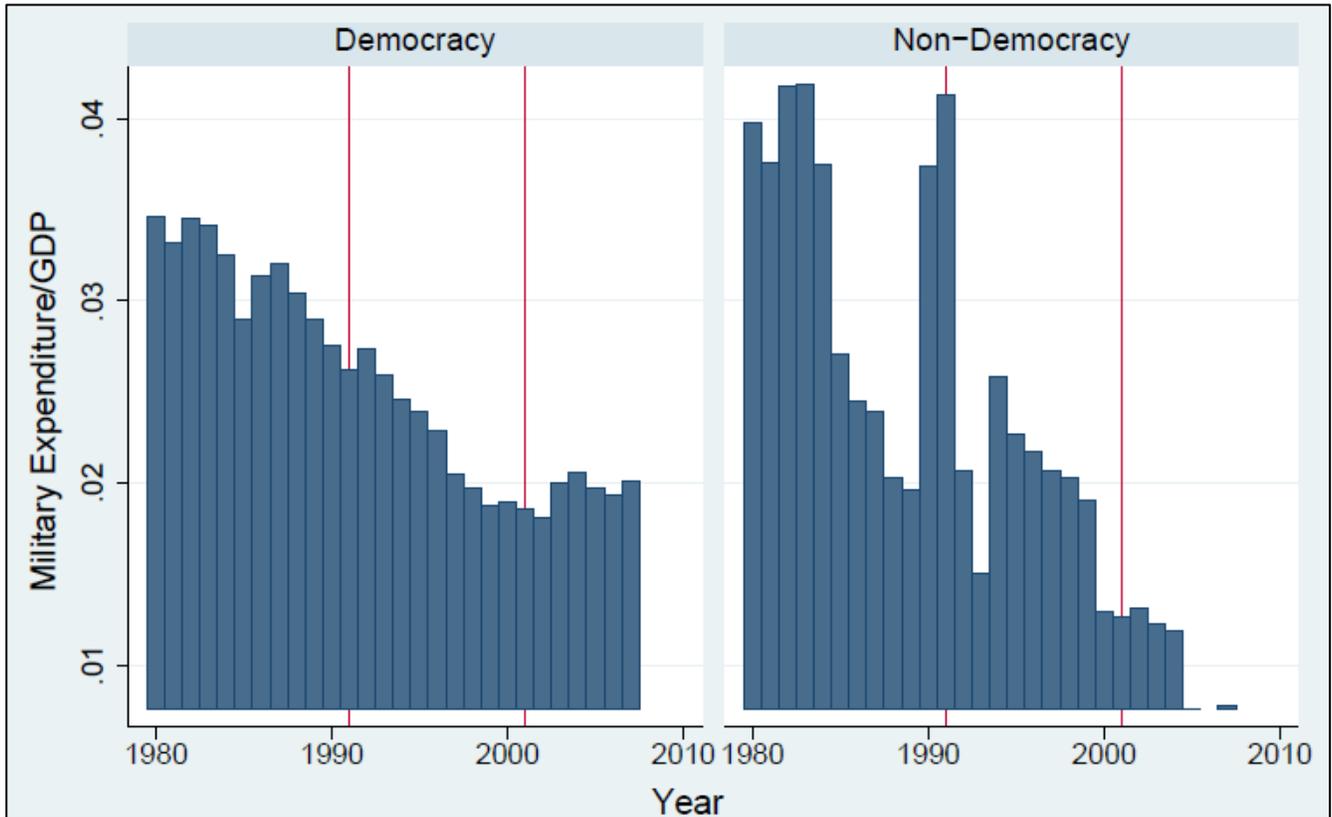
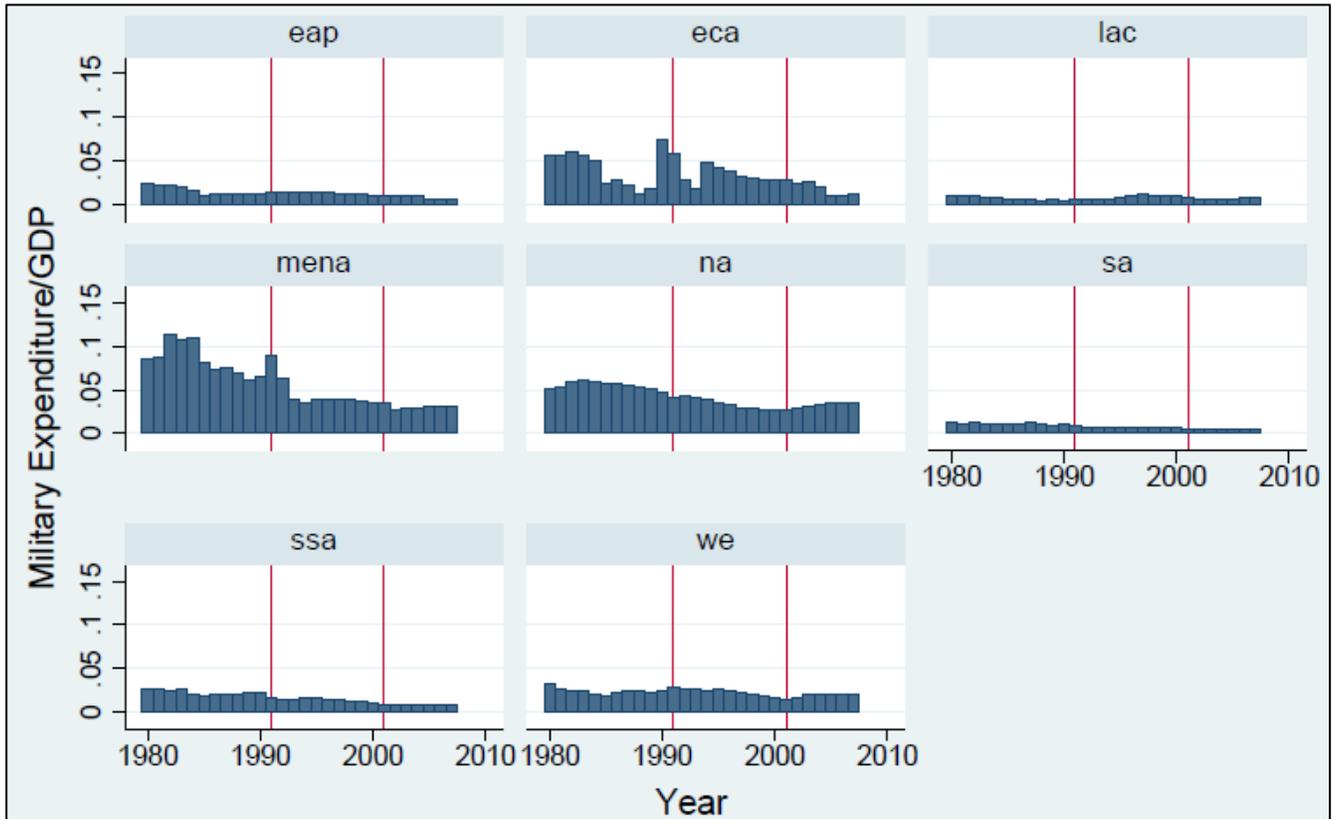


Figure 8 parses the data by region. We employ the standard World Bank definitions.<sup>7</sup> It is easy to see the significant spending levels in the Middle East and North Africa, North America and Western Europe. By contrast, in other regions, there has been less spending devoted to the military. It is also easy to see the peace dividend in the recent era, although it appears that North America and West Europe are the areas that have continued to see higher levels of military spending since 9/11.

<sup>7</sup> EAP is East Asia and the Pacific, MENA is the Middle East and North Africa, LAC is Latin America and the Caribbean, NA is North America, ECA is East and Central Europe, SA is South Asia, SSA is Sub-Saharan Africa, and WE is Western Europe.

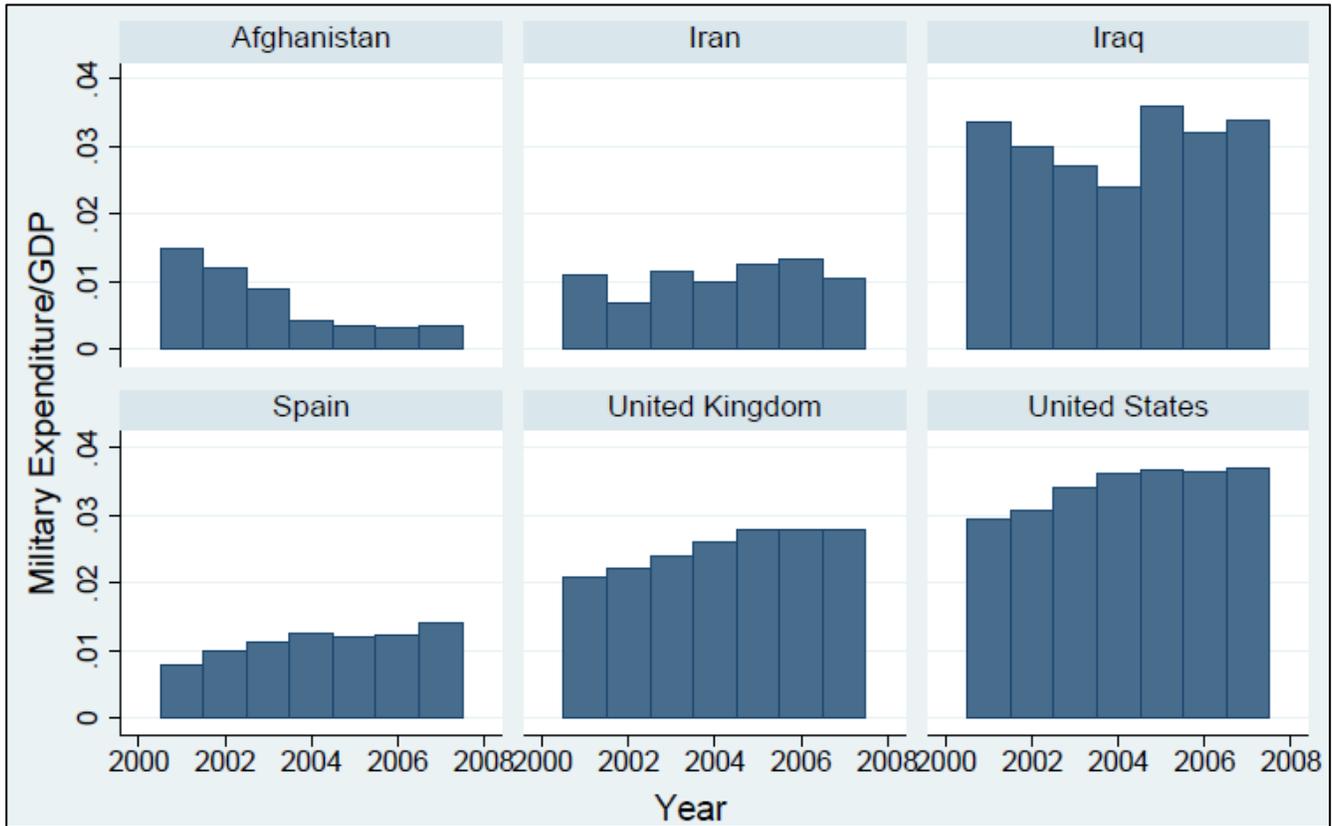
Figure 8. Military Expenditure/GDP: By Region



These figures appear to show a consistent story. There has been a peace dividend enjoyed by most individuals since World War II and this dividend has increased since the end of the Cold War. The notable exceptions are countries affected by the ensuing events of 9/11. These events include targeted terrorist attacks in rich democracies, in Western Europe and North America, and parts of the Middle East.

Figure 9 plots spending in many of these countries since 2001. The graphs include data for countries that have experienced high profile attacks such as the United States, the United Kingdom, and Spain. Also included are countries that have been strategically impacted by these events – Iran, Iraq and Afghanistan. In each of these cases there has been an increase in military spending. However, none of these patterns have been very dramatic, certainly as compared to spending patterns during the World Wars. In short, the preliminary data analysis suggests that there has been a significant decrease in military spending and an increase in peace throughout the 20th century.

**Figure 9. Military Expenditure/GDP Since 9–11: Selected Countries**



### Analytical Methodology

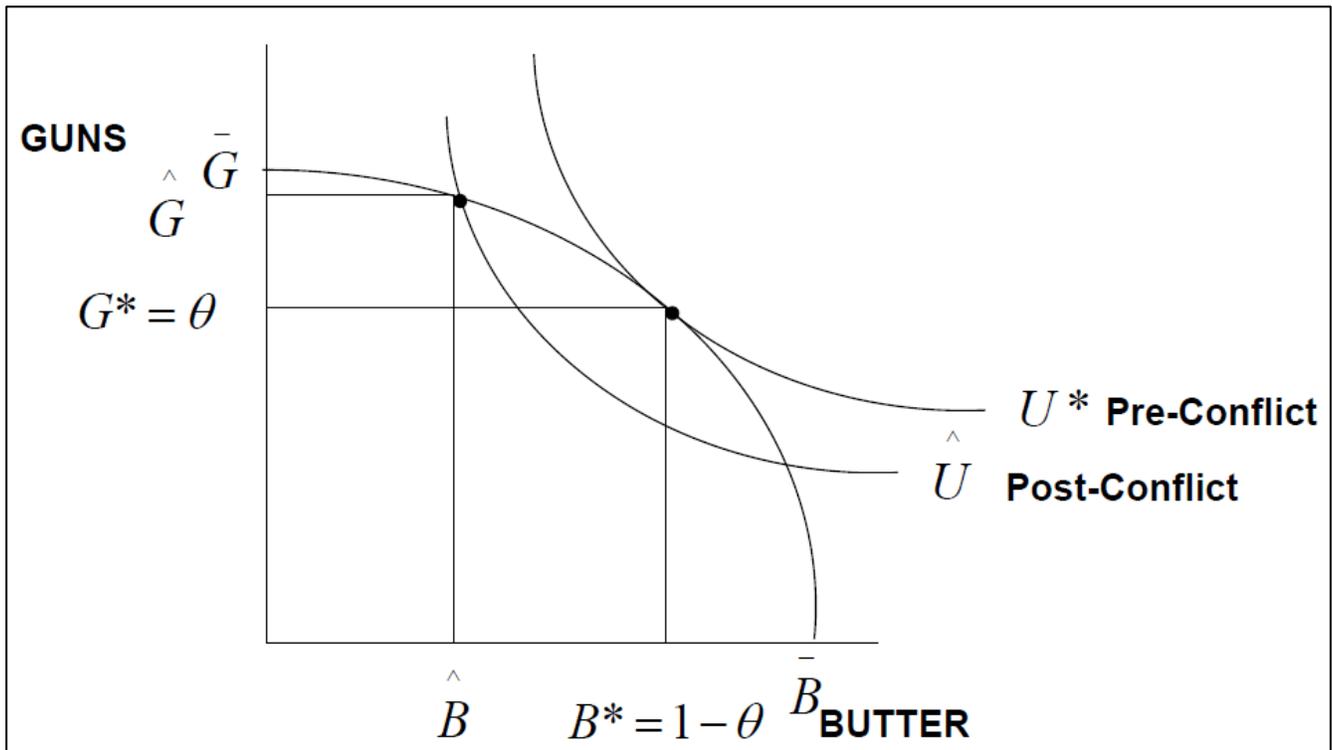
Violent conflict involves significant human costs. A component of these human costs is economic in that conflict affects resource allocations and measurable economic living standards. In general, economists are reasonably good at measuring the economic costs of activities while, admittedly, they are not very good at measuring their non-economic costs. Indeed, while we cannot directly calculate them, we acknowledge them, and note that this omission only strengthens our argument. We will demonstrate with our empirical analysis that the economic cost of violent conflict is large; hence, given all the costs we do not measure, the true total cost of war must be very large.

As stated earlier, the work by Barro (2009), Blomberg and Hess (2011) and Bozzoli, Bruck and de Groot (2011) investigate the economic growth and uncertainty affects from conflict. We refer the reader to each for a more formal explanation. Measuring such effects, however, while informative require the researcher to understand and parameterize the short run and long run affects of conflict on growth. Sometimes these can be difficult to disentangle. Despite their various parametric statistical approaches, there is broad agreement that war has negative economic growth effects, with various levels of short run and long run consequences.

To build on this work, however, one can consider other economic costs associated with conflict and the effects stemming from the required associated expenditures on military goods. The easiest presentation for these calculations is the simple Guns versus Butter trade-off popularized in the Economics textbook authored by Paul Samuelson (1973). Conflict entails military expenditures, and this reallocates a country away from private consumption opportunities.

Figure 10 illustrates our methodology. On the vertical axis, we measure the amount of Guns consumed and produced by a country and on the horizontal axis we measure the amount of Butter, i.e. private consumption, consumed and produced by society. The bowed out production possibility frontier, connected from points  $\bar{G}$  and  $\bar{B}$ , denotes a country's ability to produce combinations of Guns and Butter. The bowed inward country indifference curves demonstrate combinations of Guns and Butter that provide the average citizen in a country a given level of utility. Everything else equal, a country is better off if they can consume more of each good; however, they are willing to tradeoff Guns for Butter along a given indifference curve. As a final point, note that as indifference curves move in the north-east direction, they denote higher levels of utility since they allow citizens to consume more of each good.

**Figure 10. Guns v. Butter: How Much Would You Pay?**



With respect to our analysis, the indifference curve that is just tangent to the production possibility frontier is optimal for society. It indicates combinations of Guns and Butter that a country can

produce and that a country prefers to consume. Indeed, a country cannot obtain a higher level of utility with any other combination of Guns and Butter given what it can produce. For example, a country that consumes the bundle  $(G^*, B^*)$  is at an optimum point. By contrast, were the country to consume a bundle  $(\hat{G}, \hat{B})$ , the country would achieve a lower level of utility and hence would be at a sub-optimal point.

Interestingly, we can calculate how much worse off a country is made if it consumes this inferior bundle of goods. To keep matters simple, let's assume that a country gains utility from consuming Guns and Butter as follows:

$$U(C) = G^\theta B^{1-\theta} \quad (1)$$

where  $\theta$  is a parameter of the utility function. Utility functions such as these are called Cobb-Douglas, and they have the added benefit that the parameter  $\theta$  can be shown to be identified through the optimal fraction of expenditures on Guns vis-à-vis the total consumption on Guns and Butter,  $X = G+B$ : namely,  $\theta = G/X$  and  $1-\theta = B/X$ , evaluated at the optimal bundle.

In order to demonstrate how the world has benefitted from the cessation of periods of heightened conflict, we ask ourselves the following question -- how much would a representative citizen pay to consume his or her preferred consumption bundle of more Butter and less Guns, denoted in Figure 1 with a `\*', as compared to the inferior combination of more Guns and less Butter, denoted with a hat, ^? Using expression (1), the answer to this question can be expressed in the following equation where  $\tau$  is the fraction of current private consumption, Butter, one would be willing to give up in order not to return to a more militarized world. The value of  $\tau$  can be determined from the following equation

$$G^{*\theta} [(1+\tau)B^*]^{1-\theta} = \hat{G}^\theta \hat{B}^{1-\theta} \quad (2)$$

Solving for  $\tau$  we get that :

$$\tau = [\hat{B}/B^*] [\hat{G}/G^*]^{\theta/(1-\theta)} - 1 \quad (3)$$

Following our earlier discussion, and as shown in the diagram, we can easily measure  $\theta$  using the optimal expenditure share expressions  $\theta = G^*/(B^*+G^*)$ , and  $1-\theta = B^*/(B^*+G^*)$ . Moreover, by assuming that overall economic activity is not affected by war, even if the composition of consumption is affected, we are implicitly assuming that  $\hat{X} = X^*$  so that

$$\tau = [1-\hat{g}]/[1-g^*] [\hat{g}/g^*]^{g^*/(1-g^*)} - 1 \quad (4)$$

where  $g = G/X$  and  $\theta = g^*$ .

Our calculation is simple and straightforward. It assumes that there are no long run growth costs or long run economic volatility costs of war. Moreover, it assumes that the reallocation costs of war are

fully embodied in consumption and we do not include the costs of war from production reallocation. Moreover, if conflicts utilize resources that are not fully reported in GDP statistics on military spending, we will likely be underestimating the costs of conflict. Finally, this calculation also omits costs associated with conflict and the loss of life, which we will discuss below. Taken together, our omission of these costs goes to make our conclusion stronger: namely, even when omitting many costs of conflict, the cost remains very high.

Despite these caveats, which tend to bias down our simple welfare measure of conflict, in Table 2 we present the measures of  $G/X$ ,  $g$ , for a number of key time periods in the data: namely, during the peak of spending in 1944, the height of the Korean War in 1952, the end of the Cold War in 1989, the period just before 9/11 in 2000, and the last period of the data sample, 2007. The Table has two key results. First, the military spending ratios have fallen from the peak of World War II for the total and most sub-groups. Indeed, the average ratio (un-weighted) of  $g$ ,  $G/X$ , in 1944 was 11.4%, and this ratio has fallen to 2.5% in 2007. Note that if we weight these spending ratios by the country's size of GDP, then the weighted ratio of  $g$  was 33.2% in 1944. Second, East Asia and the Pacific and North America have military spending ratios that, on average, have declined the most since World War II. Moreover, the ratio for North America, which is dominated in the data by the United States, has declined the most since the Korean War.

**Table 2.  $G/X$  ( $g$ ) Ratio in Various Years, Grouped by Region, Income and Governance**

<b><math>G/X</math> (<math>g</math>): Ratio of GUNS to the Sum of Guns and Butter</b>					
<b>GROUPING:</b>	<b>1944</b>	<b>1952</b>	<b>1989</b>	<b>2000</b>	<b>2007</b>
EAP	0.408	0.032	0.042	0.023	0.026
ECA	0.024	0.033	0.041	0.026	0.015
LAC	0.016	0.022	0.015	0.011	0.01
MENA		0.046	0.118	0.101	0.07
NA	0.336	0.148	0.054	0.028	0.038
SA		0.024	0.012	0.015	0.007
SSA		0.011	0.036	0.027	0.02
WE	0.154	0.044	0.039	0.025	0.033
High-income	0.227	0.057	0.055	0.057	0.048
Low-income	0.009	0.035	0.032	0.023	0.015
Lower-middle-inc	0.01	0.013	0.053	0.026	0.014
Upper-middle-inc	0.023	0.033	0.055	0.042	0.04
Democracy	0.188	0.046	0.031	0.021	0.019
Non-Democracy	0.081	0.029	0.056	0.046	0.035
Average (Unweighted)	0.114	0.037	0.046	0.033	0.025
Average (Weighted)	0.332	0.094	0.041	0.029	0.027

Table 3 presents some welfare calculations based on the data presented in Table 2. The first two columns report that fraction of current consumption that would be willingly forgone in 2007 in order not to return to a mix of spending on military and private consumption that was consumed at the peak of WWII (1944) and the Korean War (1952). Columns (3) and (4) report the value in 2007 \$US

Dollars (billions) of the willingness to pay as measured by  $\tau \times B$ . Columns (5) and (6) express this as a present discounted value scaled by each country's 2007 level of GDP.<sup>8</sup>

Tab 3

**Table 3. Tax, Dividends and Present Value of Peace in Various Years Grouped by Region, Income and Governance**

	Tax ( $\tau$ )		Peace dividends			
	(1)	(2)	$\tau \times B$		PV( $\tau \times B$ ) / GDP	
			Billions 2007 US\$		Percent of GDP	
	(1)	(2)	(3)	(4)	(5)	(6)
GROUPING	1944	1952	1944 Div	1952 Div	1944 PV	1952 PV
EAP	-0.381	-0.011	546.20	28.24	3.91	0.11
ECA	-0.003	-0.002	0.89	1.21	0.04	0.03
LAC	-0.004	-0.006	1.33	2.09	0.05	0.07
MENA	.	-0.011		2.19		0.18
NA	-0.252	-0.071	1,441.10	434.56	3.11	0.85
SA	.	-0.014		5.24		0.20
SSA	-0.002	-		0.11		0.01
WE	-0.127	-0.008	149.13	5.55	1.21	0.07
High-Income	-0.177	-0.016	430.64	58.58	1.98	0.20
Low-Income	-0.002	-0.019	0.03	42.04	0.03	0.20
Lower-Mid-Inc	-0.004	-0.003	0.73	0.66	0.05	0.05
Upper-Mid-Inc	-0.005	-0.008	1.87	3.79	0.05	0.10
Democracy	-0.124	-0.015	199.45	29.33	0.94	0.13
Non-Democracy	-0.052	-0.008	0.48	34.31	0.02	0.17
<b>Total (Un-Weighted)</b>	<b>-0.082</b>	<b>-0.012</b>	<b>3,332.07</b>	<b>446.99</b>	<b>91.94</b>	<b>0.12</b>
<b>Total (Weighted)</b>	<b>-0.262</b>	<b>-0.036</b>	<b>10,735.84</b>	<b>1,465.40</b>	<b>369.95</b>	<b>0.51</b>

The results in Table 3 are striking. Beginning with the reported values of  $\tau$  in columns (1) and (2), we see that the average East Asian economy would give up 38% of their current level of consumption so as not return to the level of military spending associated with the peak of World War II.<sup>9</sup> Other regions, in particular North America and Western Europe, would also be willing to pay dearly not to return to that prior level of consumption allocation – 25% and 12%, respectively. The tax would also be higher for countries that are currently higher income and Democracies. On average, as indicated in

<sup>8</sup> We calculate the present discounted value using a discount factor of .95 which is equivalent to a discount rate of approximately 5% per year.

<sup>9</sup> While this number may seem high, recall that the War in the Pacific during World War II had significant impacts on countries such as Japan and the Philippines.

the row labeled Total Un-Weighted, countries would be willing to forgo 8% of their current level of consumption to live in our more peaceful world.<sup>10</sup> Note that if we weight each country's values of  $\tau$  by GDP, we get a much higher average cost of war, namely, 26.2%. This, of course, reflects the fact that many larger and higher income countries had high levels of military spending during World War II.

As shown in column (2), however, the peace dividend calculated since the peak of the Korean War is smaller, averaging just over 1% of current consumption for the average country. Of course, the peace dividend is much higher for North America, as they played a large role in the Korean Conflict.

While considering the cost of conflict as a tax (or, its mirror image, which is the dividend from peace), it is also useful to come up with a dollar measure for the costs of conflict. In the remaining columns of Table 3 we present dollar measures of this tax. In column (3), we present measures for the peace dividend by multiplying the tax,  $\tau$ , by the 2007 U.S. dollar measure of a country's consumption,  $B$ . In current dollar terms, the permanent peace dividend from the end of World War II for East Asia and the Pacific is over \$500 billion per year, and over \$1.4 trillion per year for North America. Moving to column (5), the present discounted value of these permanent costs, discounted at 5% per year and scaled by the current level of GDP, is 3.9 for East Asia and 3.1 for North America. In other words, the full value of peace dividend is equal to somewhere over three times their current level of GDP. Peace, it turns out, can be quite expensive.

The calculations for the peace dividend, following the end of the Korean War, are correspondingly smaller than those for World War II. In current dollar terms, the permanent peace dividend from the end of the Korean War for East Asia and the Pacific is over \$28 billion per year, and over \$430 billion per year for North America. As shown in (6), the present discounted value of these permanent costs, discounted at 5% per year and scaled by the current level of GDP, is .113 for East Asia and .845 for North America. In other words, the full value of peace dividend for North America is equal to just under the current level of GDP.

## The Human Cost of War

To this point our methodology has concentrated on calculating the cost of war by finding the welfare cost of lost consumption of private goods due to war. Another cost of war that should not be ignored, separate from the cost of increased military spending, is the costly loss of human lives associated with conflict. While there are a variety of approaches to including such costs, our experiment has been to compare periods of extreme conflict, an approach that is more consistent with our methodology would be similar to what was done in Blanchard (1985). In his paper, to calculate debt costs, Blanchard included the mortality rate in the subjective rate of time preference in order to show that finite horizons lower long-run welfare and hence affect long-term decision making. Below, we

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<sup>10</sup> Note that since the value of  $\theta$  is low due to the low level of  $g = G/X$  in 2007, the value of  $\tau$  is approximately equal to the decline in military spending. This can be seen in equation (4) since as  $\theta \rightarrow 0$ ,  $\tau \approx \hat{g}^* - g$ .

employ a modification of his approach in order to calculate the present value of the consumption peace dividend with increased survivorship. In essence, Blanchard (1985) demonstrates that a rise in the probability of death,  $p$ , lowers the discount factor for valuing future welfare in an additive fashion. Therefore, if we value the future welfare with a discount factor of  $\beta$ ,  $0 < \beta < 1$ , then if conflict raises the probability of death by  $p$ , then the value we place on future welfare receives a lower discount factor,  $\beta-p$ .

To incorporate the cost of higher deaths associated with war, and following our earlier calculation based on equation (2), we now have the following equation:

$$\sum_{t=0}^{\infty} \beta^t \{G^*{}^\theta [(1+\tau)B^*]^{1-\theta}\} = \sum_{t=0}^{\infty} (\beta-p)^t \{\hat{G}{}^\theta \hat{B}^{1-\theta}\} \quad (5)$$

Ignoring ' $\tau$ ' for the moment, the left hand side of (5) is the discounted present value of welfare for the optimal level of consumption at reduced levels of conflict and military spending. The right hand side, by contrast, is the discounted present value of welfare when the mix between Guns and Butter is not ideal. Much like before,  $\tau$  is the fraction of current private consumption, Butter, one would be willing to give up in order not to return to a more militarized world that is associated with shorter life spans and which places less value on future utility. As before, we can solve for  $\tau$ . Note that higher levels of conflict have two distinct costs: first, in each period citizens consume too little butter and too many guns. Second, citizens value the future less and hence have lower lifetime welfare.

Solving for  $\tau$  from (5), and following the steps used in (4), we obtain that:

$$\tau = [(1-\beta)/(1-\beta+p)]^{1/(1-g^*)} [1-\hat{g}]/[1-g^*] [\hat{g}/g^*]^{g^*/(1-g^*)} - 1 \quad (6)$$

Note the role of  $p$  in the first term in square brackets reflects how the additional costs of war from shorter life spans makes that value for  $\tau$ , which is negative, more negative.<sup>11</sup>

To see how an increase in the probability of death associated with war affects the willingness to pay for peace, let's reconsider the costs of war for the weighted GDP case where we compare the Guns and Butter consumption bundle in World War II with that for 2007. Recall from the bottom row of Table 3 that the original value of  $\tau$  for this case, not including the cost of war from shorter lifetimes, is  $\tau = -0.262$ .

To calculate the new value of  $\tau$  using expression (6), we will need to specify  $p$  and  $\beta$ . To calibrate the value of  $p$  from World War II, we note that work by Lietenberg (2006) suggests that there were 25 million battle deaths from World War II on a base population of approximately 2.5 billion at that time, suggesting an enhanced death rate of  $p=1\%$  throughout the world during the War. As before, we continue to use the standard value of  $\beta = .95$  which implies a discount rate of about 5% per year. Plugging these values of  $p$  and  $\beta$  into expression (6), we obtain a new value of  $\tau$ ,  $\tau = -.388$ , which is

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11. It is straightforward to show that the approximate change in  $\tau$  brought about by a small change in the probability of death is equal to  $\Delta \tau = -(1+\tau)[(1-\beta)(1-\theta)]^{-1} \Delta p$ . This is simply the first derivative of (5) evaluated at  $p=0$ .

approximately 50 % higher than the original value reported in the bottom row of Table 3. Indeed, by including the human costs associated with a higher probability of death associated with World War II, all the calculations for the Total (Weighted) case based on a comparison to spending in 1944 would rise by about 50%. For example, by including the costs of war for shorter lifetimes, the per-period world-wide peace dividend rises from over \$10 trillion (2007 dollars) to over \$15 trillion. This example is very illustrative – our baseline peace dividend is large. However, incorporating the increased chance of the loss of life from conflict makes it larger by half.

The magnitude of the increased welfare cost due to human losses may appear to be large at 50 percent. There are several caveats. First, our experiment may provide a very conservative estimate on the human cost as we employ the number of military deaths and exclude civilian deaths in our calculation of the probability of death. If we include civilian deaths then the likelihood of death increases by approximately 2 percentage points. Second, our experiment may provide an estimate that is less conservative because it compares a conflict that was very human personnel-intensive to the current scenario which due to peace and technology is less human personnel-intensive. In fact, due to the changes brought to the battlefield by robotics and drones, it is unlikely that the human/personnel cost of war will be comparable again in history. For these reasons and others, we have chosen to concentrate the thrust of our arguments and our calculations on the welfare cost due to lost consumption which we believe is less sensitive to the challenges inherent in calculating costs.

## **2007 to 2050: Predicting the Peace Dividend?**

In our final section, we use our historical estimates to predict future peace dividends. We allow for three different scenarios: a high conflict, a medium conflict and a low conflict future. We use recent history to best approximate the future possibilities. We find that in each of our scenarios, the welfare benefit of peace is highly significant relative to the conflicts experienced in the World Wars of the 20th century. Moreover, there is little evidence to suggest that these dividends will vary greatly in the future. In other words, we predict that there appears to be little deviation from the current scenario relative to the future.

We construct the three scenarios presuming that either:

- High conflict scenario – conflict and military spending, due to the events following 9/11, continues to grow at the trend rate from 2000 to 2007.
- Medium conflict scenario – conflict and military spending remains steady at the current ratios.
- Low conflict scenario – conflict and military spending continue to fall to the low point after the decade following the end of the Cold War.

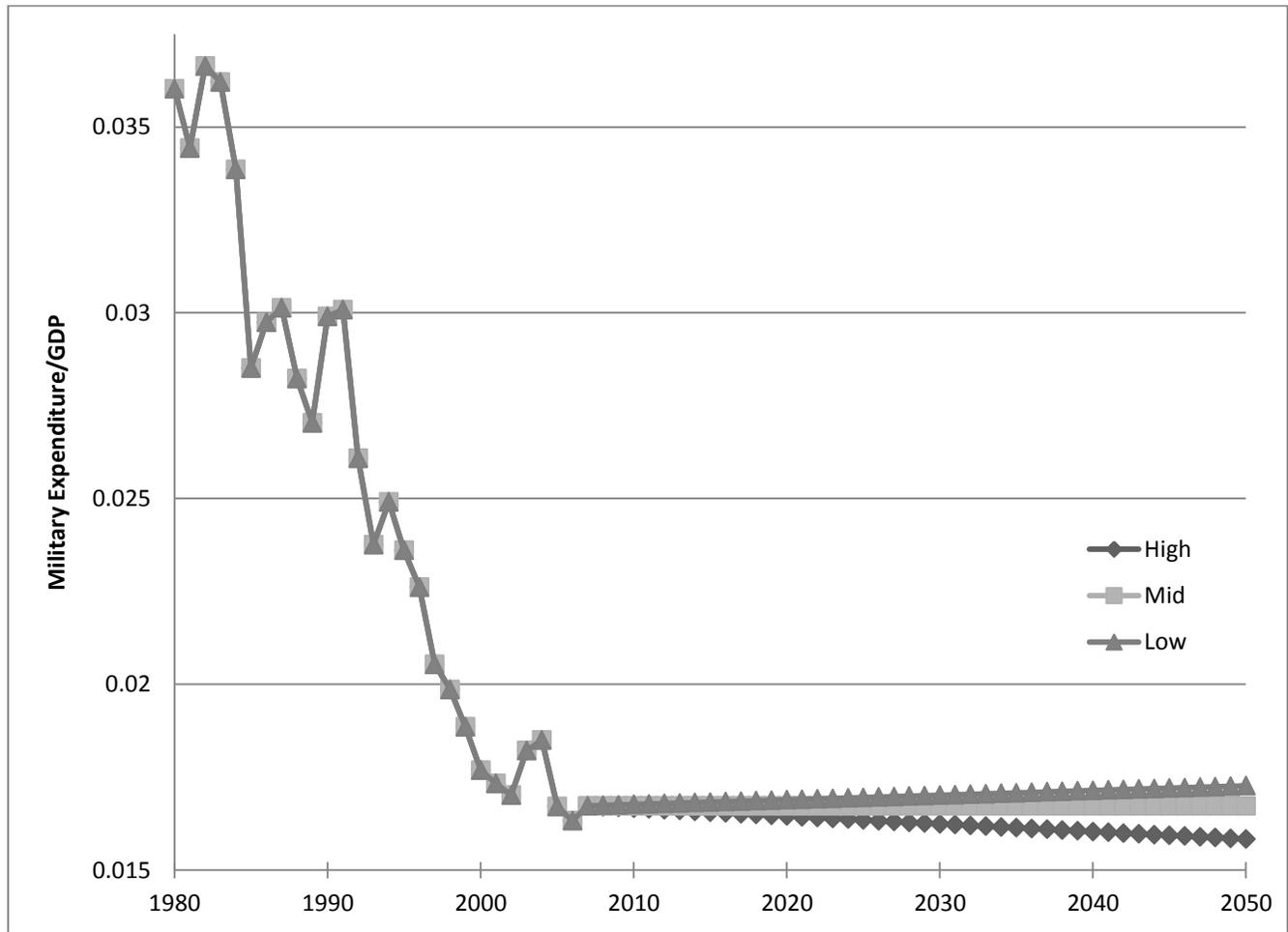
Figure 11 plots the result from this experiment as it depicts the G/Y ratio from 1980 to 2050. Notice there is little difference in the gains to peace between the high conflict, medium conflict and low

conflict scenario – note that the figure is similar for  $G/X$ .<sup>12</sup> A simple interpretation is that the gains to peace have largely been reaped as the world has less globally driven nation-state conflict as compared to the World War II era. If we were to extend our calculations, we find that the range of values for the peace dividend is somewhere between 7.9 to 8.1 percent.

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<sup>12</sup> Alternatively, we could depict the  $G/Y$  ratio over a longer time period similar to what was shown in Figure 3. However, the various scenarios would be visually indistinguishable in such a figure given the increased size of the vertical scale to depict spending associated with World Wars. Hence, we choose to depict the more recent time period and extend it into the future.

**Figure 11. World-wide Military Expenditure/GDP: 1980-2050 (different conflict scenarios)**



## Conclusion

The world is now richer, and it has fewer conflicts. Military spending has also been dramatically reduced, particularly since the second half of the 20<sup>th</sup> century. The consumption welfare benefits from not returning to a prior age of grand scale conflict are large, though these costs have been falling. To continue to secure these enormous benefits from peace, society must be willing to allocate sufficient resources to maintain it. The costs of war are ever present and large. The investment in peace must remain at least as large.

Our approach has been to estimate the cost of war in terms of an opportunity cost to welfare. In doing so, we present many calculations that may serve as a guide to those interested in public policy alternatives. We find that the opportunity cost in terms of lost “butter” amounts to approximately 91 percent of GDP in present discounted terms. This adds up to a loss in welfare of \$9,520 per person in 2007 dollars. When we include human costs, we estimate the loss to be 50 percent greater, or an additional \$4,760 per person.

Alternatively, it may be useful to compare our approach to previous studies as a final robustness check of our methodology. Table 4 presents a comparative summary of analyses on aspects of the costs of conflict, which can be useful for benchmarking our findings to others in the literature. The first column describes the name, year, publication and author of the studies. The second column presents the econometric technique and the third column presents the types of conflicts considered in the study. The fourth column presents the “bottom line” economic cost estimate from the study with the final column including a “human cost” estimate.

**Table 4. Summary of Results in Current and Previous Studies**

Study	Estimation Strategy	Conflicts Considered	Cost of Conflict	Human Cost
<b>Blomberg and Hess (2002)</b>  "The Temporal Links between Conflict and Economic Activity" <i>Journal of Conflict Resolution</i> 46	Markov-switching Model (GDP Loss)	Civil War, External War	2% reduction in GDP per conflict or \$204 per capita per conflict	N/A
<b>Barro (2009)</b>  "Rare Disasters, Asset Prices, and Welfare Costs" <i>American Economic Review</i> 99.1	Calibration (GDP Loss)	Internal Conflict, External Conflict	1.5% reduction in GDP per year or \$153 per capita per conflict	N/A
<b>Rose and Blomberg (2010)</b>  "Total Economic Consequences of Terrorist Attacks: Insights from 9/11" <i>Peace Economics, Peace Science, and Public Policy</i>	Structural VAR Model (GDP Loss)	9/11	0.48% reduction in GDP per capita or \$48.96 per capita	N/A
<b>Blomberg and Hess (2011)</b>  "The Economic Welfare Cost of Conflict: An Empirical Assessment" <i>Oxford Handbook of Peace and Conflict</i>	Calibration (Consumption Loss)	Civil War, External War, Terrorism	\$224 per capita per conflict or	N/A
<b>Current Analysis</b>	Opportunity Cost of War (Consumption Loss)	World War I, World War II	Welfare loss of \$9520 per capita	Additional \$4760 per capita
<b>DALY</b>	-	-	-	Additional \$3900 per capita

The results from our paper are given in the fifth panel down from the top of Table 4. The results seen in column 4 demonstrate that the opportunity cost estimate from our paper is similar to our previous estimate of \$10,449 per capita. Attempting to compare this estimate to others in the literature is quite difficult as most of the other estimates are given as the cost of conflict for a particular country in a particular year. Still, this value is obtainable from our previous study (\$224 per capita) and is quite

similar to that found in Barro (2009) (\$153 per capita) and our 2002 study (\$204 per capita). The cost when considering only 9/11 is not surprisingly significantly smaller at \$49 as shown in Rose and Blomberg (2010). Hence, we believe our estimates are consistent with what has been previously found both by other authors and our own work.

One significant difference in this paper is the inclusion of the “human cost” of conflict which was not considered in any of the previous analysis. As stated previously, we adopt an approach first employed by Blanchard (1985) and estimate the human cost to increase the economic cost by 50 percent or \$4,760 per capita. Again, it may be useful to consider how this estimate differs from a more conventional measure. As a baseline, consider the approach of calculating the loss of life using Disability Adjusted Life Years (DALY’s), which we also provide in Table 4. To make the comparison as straightforward as possible, we examine a DALY’s measure for the lives lost during the most costly period (World War II) relative to the present and beyond. During the war, life expectancy was 65 and the average age of military personnel was 26 making the average number of years lost 39 years. We multiply this by average income and the number of lives lost in World War II relative to population. This conventional approach increases the economic cost by 40 percent or \$3,900 per capita. Again, this is similar to what our opportunity cost approach yields. The sturdiness of our measure, we believe, provides more support for our analysis.

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