WAR AND ECONOMIC PERFORMANCE

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Abstract

I study the consequences of interstate wars for economic growth in a large cross section of countries during the period 1960-89. I find that cross-country differences in economic growth are systematically related to the occurrence and the characteristics of war. In particular, post-war economic performance is positively related to the severity and the duration of war. Moreover, these growth-enhancing effects vary negatively with a country’s level of economic development. Both of these findings suggest that "Phoenix" type of factors (as suggested by Organski and Kugler) are present not only in global, highly destructive, technology creating wars but also in smaller, interstate conflicts.

Keywords: Interstate wars, war characteristics, economic performance

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**Introduction**

"…I do not see how one can look at figures like these without seeing them as representing possibilities. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia’s or Egypt’s? If so, what exactly? If not, what is it about the “nature of India” that makes it so? The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else…"


A remarkable feature of economic growth is how its rate has varied both over time and across countries. A large body of literature has attempted to provide an explanation for this (see Barro and Sala I Martin, 1995; Levine and Renelt, 1992) by linking observed patterns of growth to the so called "growth engines:" technological progress, and physical-human capital accumulation.

In addition to these, numerous other sources of growth have also been suggested. They include factors such as institutional (property rights, the type of financial system), demographic (age/sex composition of the labor force), political (the degree of political freedom, political stability) and public policy (the composition of government expenditure). Interestingly, the non-economic factors have received considerably less scrutiny than the economic ones. This may reflect a discipline based bias regarding relative importance and also the fact that many non-economic influences are of qualitative nature and thus harder to quantify in regression analysis.

Societies have experienced significant fluctuations in both their economic (high versus low growth rates) and international state of affairs (war versus peace). It is natural to inquire whether these two important social phenomena are related. Intuitively, war seems an obvious influence on economic growth because it is associated with changes in productive capacity and
institutions. For instance, it leads to the destruction of productive inputs (physical and human capital), the diversion of resources from directly productive activities, the development of new technologies with potential for commercial applications, etc. In addition to its direct economic effects, war may also affect growth via a plethora of indirect channels, such as through its impact on political structures, demographics, national cohesion, the distribution of income and so on.

There are several important questions pertaining to the relationship between warfare and subsequent economic performance. The first concerns the existence of an *unconditional* relationship between these two phenomena. By unconditional we mean a relationship that does not take into account the characteristics of the particular war (intensity, severity, duration, etc.) or of the countries involved (rich, poor, democratic, etc.). The existing literature has been almost exclusively preoccupied with this type of relationship (Organski and Kugler, 1980; Wheeler, 1980).

The second question concerns the existence of a *conditional* relationship. It asks whether the "characteristics" of war (intensity, duration, severity) and the countries involved (level of income, education, etc.) influence the existence -and the properties- of the relationship between war and economic performance. This question is important for three reasons. First, it is possible that a conditional relationship could exist -so that war matters- even in the absence of an

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1 The work of Barro and Lee's (1994) work represents a semi-conditional approach. Barro and Lee condition performance on the characteristics of the countries involved (such as on the level of educational attainment, investment, government policies, etc.) but not on the characteristics of the war itself (such as its duration, severity, etc.). It should also be mentioned that the analysis of Organski and Kugler contains some limited conditioning, as they relate post war performance to having won or lost a war, having being occupied etc.
unconditional relationship. This could be the case if different war/country characteristics were associated with different economic outcomes. Aggregation of wars/countries might lead to a cancellation of opposing influences, making one erroneously conclude that war does not matter\(^2\). Second, knowing which characteristics matter and how could help one discriminate among competing theories (something that cannot be done on the basis of unconditional relationships). And third, one might be able to use the conditional associations to predict how a particular war in a particular country might be expected to influence that country's future economic prospects.

The third question concerns the identification of the mechanisms (political, economic, etc.) through which war impacts on economic performance. Is it, for instance, through the simple destruction of physical productive capacity as the famous Solow model of growth suggests (the Organski and Kugler, 1980, "Phoenix factor") or does it also require the destruction of inefficient existing political institutions (Olson, 1982)?

The present paper is mostly concerned about the second question but it also uses the empirical patterns discovered to discuss the third question. I examine the implications of interstate war for subsequent economic performance (growth) in a large cross section of countries over the period 1960-89. The choice of the period is dictated by data availability. This period does not include any major (global) wars so the focus of the analysis, unlike that of almost all of the existing literature, is on regional, interstate wars. With the exception of Collier's work (1999) which, however, deals only with civil wars, there exists no previous work of this type in the literature.

There are two main findings. First, whereas severity (a high rate of battle-deaths per

\(^2\) Barro and Lee speculate that the aggregation problem may be responsible for not finding a relationship between war and growth.
population) and long duration seem to contribute positively to subsequent economic growth, war intensity does not seem to matter. And second, a country’s level of economic development makes a difference for the relationship between war and growth. The richer a country the smaller the post-war improvement in its macroeconomic performance (for a given level of war severity). Based on these findings, one may want to speculate about the relative merits of the leading theories of war and growth. I think that the empirical results seem to favor the Organski-Kugler Phoenix factor theory over that of Olson.

Section 1 offers a review of the existing literature on the relationship between war and economic growth. Section 2 presents the empirical analysis, and section 3 concludes.

1. Literature Review

A. Theory

There exists a large, informal literature relating war on subsequent economic growth. Many channels have been proposed, some favoring and some retarding growth. Given the abundance of suggestions, one needs a concrete framework for selecting the most relevant ones. Modern growth theory provides such a framework.


The neoclassical model of Solow links wars to growth through three channels: a) Through the destruction of resources (the "Phoenix factor"). The post WWII behavior of Germany, Italy and Japan is a good example of this channel. b) Through a change in the savings rate. If thriftiness increases as a result of war (an increase in the savings rate, not necessarily the amount of savings) then growth accelerates. And c) through the invention-adoption of new technologies
in the post-war period (this is the most important factor in the long term). This was certainly the case for WWII.

Based on these channels one may argue that the exogenous model of growth appears to generate a presumption of a positive effect of war on subsequent economic performance. No such presumption emerges from the endogenous growth theory which has ambiguous predictions. These predictions seem to vary very much with the postulated "main engine" of growth, initial conditions, the relative resource destruction and so on.

We now turn to the discussion of the main works in political science dealing with war and economic performance. We do so within the context of the modern theory of growth\(^3\).

According to Olson's (1982) theory of collective goods, the relationship between war and subsequent economic performance must be conditioned on the effects of war on political structures and distributional coalitions. Entrenched coalitions work to satisfy their private (group) interests at the expense of the public interest. As a result, they slow the society's capacity to adopt new technologies and undertake the necessary reallocation of resources. Subsequently, they retard the process of economic growth. The historical evidence suggests that vested interests have indeed played a key role in retarding the adoption of new technology (see Easterly, 2001). The destruction of such vested interests during a war (specially in the loser countries) can create conditions that are favorable to the introduction of the new and superior technologies, leading to a higher growth rate (the Schumpeterian creative destruction; Schumpeter, 1992).

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\(^3\) It is beyond the scope of the present paper to offer a detailed literature review. The interested reader should consult the excellent survey by Van Raemdonck and Dielh (1989). It should be mentioned, though, that most of the effects considered in the literature represent level, rather than growth effects.
The works of Organski and Kugler (1977, 1980) combine the technological innovation-adoption and the direct resource destruction channel of the neoclassical theory. Their argument is that nations that suffer serious damage to their industrial capacity during the war rebuild afterwards. Rebuilding typically takes the form of higher investment, which by itself increases the growth rate of output (as predicted by the neoclassical theory of growth). Moreover, nations may have the opportunity to rebuild on a more technologically advanced basis (the technology channel). These factors underlie their concept of the "Phoenix" factor.\footnote{Organski and Kugler focus a great deal on the differential effects of war on growth across winners and losers. Their concept of the "Phoenix" factor, though, does not differ from the concept of convergence in the model of Solow. The losers are likely to have a larger Phoenix factor than the winners - and hence grow faster - because of the larger destruction they may have suffered. Nevertheless, if the neoclassical model is valid, growth in all war participants ought to accelerate after the war (relative to before).}

The preceding analysis reveals that both the Olson and the Organski-Kugler theories predict the same positive relationship between war and subsequent growth. Both emphasize also the role played by the adoption of new technology in this process. The key difference is that Olson requires a change in political structures-institutions as a prerequisite of faster growth while Organski-Kugler do not impose any such preconditions.

Before concluding this section, it may be worth reporting some additional channels that have been suggested in the literature. Dulles (1942) argues that war may have a positive impact on growth through its effect on human capital. In particular, it may lead to an improvement in managerial and organizational skills. Thorp (1941), on the other hand, emphasizes the loss of human capital and its negative implications of that for growth. Both of these effects can be
studied within the endogenous growth theory. But as it has already been said, the implications tend to be theoretically ambiguous.

Other factors that have been suggested - but are not grounded on modern growth theory and hence it is not possible to know whether they are legitimate growth determinants - are: a) the reorganization of the world economic and financial system. World War II was followed by a significant reduction in trade barriers and by an increase in international cooperation (for instance, the establishment of the IMF). b) Ratchet effects. Namely, the possibility that post-war allocations to the military may never return to their prewar levels (Peacock and Wiseman 1961; Russett, 1970; Diehl and Goertz 1985). Expenditure displacement effects have also been studied by Rasler and Thompson (1989.) c) Public finance effects. If war has been financed through large issues of public debt, then servicing that debt may require high taxes as well as redirection of funds from productive investments (such as in public infrastructure).

B. Previous empirical work

The existing empirical studies of the relationship between war and economic performance are one of three types: a) Those that study the unconditional relationship between war and economic growth. b) Those that examine the conditional relationship. And c) those that attempt to identify the mechanisms through which war affects economic growth.

The main works in the first category are those by Organski and Kugler (1977, 1980), Wheeler (1980), and Rasler and Thompson (1985). They all examine how the process of growth is affected by war by studying the time series behavior of aggregate output preceding and following war. Extrapolations are performed relative to a base year and the results are conditioned on a limited set of characteristics of the countries under consideration such as being
a winner or loser, belligerent or not and so on. The extrapolations use either linear or non-linear statistical trend fitting methods.

Wheeler (1980) examines sixty cases from 1816-1970. While he finds no effects on aggregate, he reports significant individual patterns with some countries experiencing positive, some negative and some no effects. Unfortunately, the cross section variation in performance cannot be conditioned on any observable, measurable variables so no firm conclusions can be drawn. Kugler and Organski (1977, 1980) study the two world wars and document the existence of the "Phoenix factor" described above. Rasler and Thompson (1985) study both global and interstate wars involving five major powers for the period 1700-1980. They conclude that global wars have more important but transitory positive effects on growth than interstate wars. They could not, though, establish whether interstate wars have small but -statistically- significant effects or no effects at all.

The unconditional relation between war and economic growth contains limited information. A lack of a relation does not necessarily imply that wars do not affect economic performance. For instance, this could be the case if different war characteristics were associated with different patterns and the combination of the conditional patterns led to a zero unconditional effect (aggregation problem). Similarly, the presence of an unconditional relationship does not necessarily imply that war matters for economic performance. First, in the absence of conditioning on particular country characteristics there is a possibility that: a) the observed associations are due to exogenous, common factors. In other words, it is not possible to know whether and which part of the effects attributed to war are actually due to some other factors which are missing from the analysis. And b) causality runs in the other direction, that is, from economic growth to war. These problems of unconditional relations make it necessary to look for
a conditional one.

The second category includes only two pieces of work, Barro and Lee (1994) and Collier (1999). Barro and Lee study the determinants of economic growth from 1965 to 1985 in a large cross section of countries. Their regressions condition growth on various country characteristics but not on war characteristics. They find that the estimated coefficient of war effects is insignificant. Nevertheless, they speculate that "...our failure to find important growth effects from external wars involves the poor quality of our data, rather than the unimportance of war" (p. 26.) By poor quality they mean the lack of variables that "... measure the seriousness of the wars (expenditures, casualties.)..." Collier (1999) uses an approach similar to that of Barro and Lee to study the economic consequences of war. He conditions the relationship between war and growth on a limited set of war characteristics (only war duration) and finds that protracted wars have been associated with higher growth. However, Collier only studies civil wars.

The main works in the third category are those by Chan (1987), and Kugler and Arbetman (1989). Chan examines the post world war II growth experience of countries in the Asian Pacific rim and concludes that the evidence is consistent with Olson's thesis that post-war growth should be an increasing function of the degree of destruction of entrenched political structures (war "trauma"). Kugler and Arbetman, on the other hand, carry out a comparative analysis of the relative role played by economic and political destruction due to war and conclude that once the effects of the former have been accounted for, the latter does not seem to matter (thus, refuting Olson's thesis). However, while both works offer valuable insights, it should be kept in mind that there exist formidable difficulties encountered in constructing good measures of the degree of the destruction of political structures. Our indirect method of comparing these two theories may actually be less controversial (see below).
2. The Empirical Analysis

Ideally, one would like to base the investigation of the relationship between war and economic performance on a well-specified model. Unfortunately, no such formal model exists in the literature. Nevertheless, one can appeal to standard theories of economic growth (such as the neoclassical theory and the endogenous growth model) in order to design the appropriate empirical strategy.

To this objective, I adopt the standard approach in the empirical growth literature, as exemplified by the paper of Barro and Lee (1994). This strategy involves the estimation of an equation that is loosely based on the new growth theories. The dependent variable is the average growth rate. The independent variables are either beginning of period or period averages and represent possible determinants of physical and human capital, technology, social infrastructure, efficiency and so on. As mentioned above, Barro and Lee also include some war-related variables (a war dummy and the fraction of time spent in war) but do not find any significance influences emanating from them.

In this paper I examine how the average rate of economic growth over the period 1975-89 has been affected by wars that took place during the period 1960-1974. The choice of the time periods was motivated by the desire to minimize simultaneity problems. To that purpose I also exclude from the sample those countries that were engaged in a war during the 1975-89 period when these countries also fought a war during the 1965-75 period (such as Israel and Syria). The number of countries included in the analysis varies (between 71 and 110) depending on which other exogenous variables are used.
Description of variables

The dependent variable is the *average growth in per capita real output* in 1975-89. The independent variables comprise both war and non-war variables.

The war variables are taken from Small and Singer (1994) and have been extensively used in the study of international conflict\(^5\) (for instance, see Bueno de Mesquita, 1981; Bueno de Mesquita and Lalman, 1992). The data set covers wars up to 1992. I use three war variables: the total number of months a nation was involved in a war as an indicator of *duration* (**DUR**); battle deaths per nation month of war as a measure of *intensity* (**BDNM**); and battle deaths per 10,000 of population as a measure of *severity* (**BDP**). Tables 1 and 2 report some descriptive statistics of these variables (for the period 1960-75).

The remaining independent variables are those commonly used in the growth literature\(^6\): They capture physical and human capital accumulation as well as some other relevant features. In particular, I use:

a) A physical capital variable, namely the *ratio of real gross domestic investment to GDP* (**I**).

b) Two human capital variables: A school attainment variable, *years of male secondary schooling* (**SM**); and *life expectancy at birth* (**LIFE**). These variables' intended use is to capture influences on growth that come through good health, better work habits, and a higher level of skills\(^7\).

c)  

\(^5\) The set of wars used by Barro differs from that identified by Small and Singer as it also include civil wars.

\(^6\) They have been taken from Barro and Lee (1994). A description of the data as well as the data themselves are available at the site of the NBER. ([www.nber.org](http://www.nber.org)). The readme.txt file in the data subdirectory contains a very detailed description of the data set.

\(^7\) I am simply stating the justification offered by Barro and Lee. The interested reader is referred
Other growth influences: The \textit{ratio of real government consumption to GDP less the ratio of nominal spending on defense and non capital expenditures on education to nominal GDP} (G) is used to capture the unproductive activities of a state. According to Barro and Lee, it may be used as a proxy for, among other things, political corruption. The \textit{black market premium on foreign exchange} (PREM). This variable is introduced as a proxy for market distortions. The average number of \textit{successful and unsuccessful revolutions and coups per year} (RC). Barro and Lee view this variable as representing the probability of revolution.\footnote{The estimated coefficient on the revolution variable may be biased if economic growth affects the probability of a coup. It is not hard to think of situations where poor performance feeds discontent and increases the probability of a violent confrontation within a society. Barro and Lee seem to believe that the probability of a revolution is approximately constant, in which case there is no estimation bias.} And finally, an initial real income variable (Y) in order to capture convergence factors.

In addition to these variables I also include an interactive term, namely the product of the initial \textit{level of real GDP} and war severity (Y*BDP). This is intended to capture non-linearities, and in particular the possibility that the effects of war on growth may vary systematically with the level of economic development (war may prove favorable to certain types of countries but not to others).

The key econometric issue in this analysis concerns simultaneity. As mentioned earlier, in order to minimize this problem\footnote{A related problem concerns inverse causality. Using different time periods for the left and right sides of the equation can address this issue.}, I condition economic performance in the second half of the

to the cited paper by Barro and Lee for a detailed discussion of the theoretical underpinnings and the robustness of the variable selection.
sample (1975-89) on wars that took place during the first half (1960-74) and I also exclude those countries that fought a war during 1960-74 if they also participated in a war during 1975-89. I also deal with a related problem that may arise from the calculation of the non-war independent variables. Using 1970-74 values -as done, for instance, by Barro and Lee- is problematic because these values may already contain the effects of wars that occurred during the 1960-74 period (either because the wars are still ongoing or because of their immediate economic effects). Hence, an insignificant coefficient on a war variable does not necessarily imply that war does not matter for subsequent economic performance. In order to get around this problem I use values from the very beginning of the sample, that is, from 1960-64. In particular, I, LIFE, G and PREM are calculated –following Barro and Lee- as the average of the values during 1960-64 while SM and Y use the 1960 observation. The only exception to the beginning of period approach is the RC variable, which is calculated over the full sample 1960-89.

Tables 3 and 4 describe the effects of war. Table 3 reports the regression results when only war variables are included as independent variables. The main finding is that war severity and duration have a statistically significant, positive association with average economic growth. Countries that experienced severe (high number of battle deaths per population) and/or long wars grew faster relative to those that did not.

right hand side variables in the regression helps but does not always eliminate this problem. I have thus examined whether there is a systematic relationship between current income and the probability of a future war. None was found.

Splitting the sample this way also helps mitigating the problem that arises from the uneven distribution of wars across countries within the sample period.
The coefficient on the interaction term is negative. War has a stronger growth enhancing effect in less developed countries (given a level of severity\textsuperscript{11}).

Could these results reflect omitted variables bias? Table 4 adds a set of the standard determinants of growth (from Barro and Lee). The main pattern documented above survives intact. Severity is significantly associated with growth and this dependence varies with the level of economic development. It must be noted that these findings are quite robust to changes in the set of variables included as additional determinants of growth. It is also remarkable that the war related variables play a more significant role than the economic variables in predicting future economic performance. It seems that the influence of political phenomena has indeed been underestimated by the existing economic literature on growth!.

What is the interpretation of these findings? The neoclassical theory of growth (and both the Organski-Kugler and Olson versions of it) predicts that resource destruction and economic rebuilding -often on a more technologically advanced basis- accelerates subsequent economic growth. War severity and duration seem good proxies for the destructiveness of war. Hence, the finding that they have a positive effect on economic growth provides support to the neoclassical theory of growth (and hence to both the Organski-Kugler and Olson theories). Moreover, the finding that post war performance is negatively associated with a country's pre-war level of economic development offers further support to the neoclassical growth theory. This is because a key aspect of the model of Solow is the so-called convergence hypothesis which relies on the assumption that the marginal product of capital (and hence the effects of reconstruction on

\textsuperscript{11} It must be noted that the dependence of after war performance on the stage of economic development is not due to a systematic relationship between income and the \textit{characteristics} of war. The correlation between initial income and war indicators is small or negligible.
growth) is higher in less developed countries.

While the empirical evidence seems to be consistent with both leading theories of war and growth in political science (the Organski-Kugler and Olson) one may still ask which theory receives the strongest support? I think that the Organski-Kugler is favored because of two reasons: First, the prediction of the theory of Olson is conditional on war being associated with the destruction of vested interests. We do not have any direct information on this so we cannot test it directly. But for the Olson theory to be valid it is also necessary that war severity-duration is highly, positively correlated with the degree of destruction of entrenched coalitions. While this is not implausible, its use as an auxiliary assumption raises a higher hurdle for Olson than for Organski-Kugler (who do not have a political destruction prerequisite).

Second and more importantly, for the theory of Olson to be validated by my findings, it is necessary that a war of given severity-duration is more likely to destroy entrenched coalitions in less developed countries than in developed countries. This is due to the finding that the interactive term (severity-initial income) suggests stronger positive growth effects of war in poorer countries. While this case cannot be ruled out, there is nothing in the literature that suggests that vested interests in poor countries are more vulnerable than those in rich countries.

Before concluding this section, let me briefly turn to another type of war which unlike interstate wars has received a great deal of attention lately. Collier (1999) uses an approach similar to Barro and Lee to study the economic consequences of civil war. He finds that protracted wars have been associated with higher growth (he only considers war duration). One might consider expanding my analysis to include also civil wars. Table 5 reports results when both types of war have been included (note that the sample now excludes all those countries that fought either an interstate or a civil war during 1975-89). As can be seen the estimated
coefficient on severity (BDP) is now insignificant and the significance of the duration variable also drops.

The reduction in the strength of the association between war and growth may be due to two factors. First, we have seen that the probability of being involved in a interstate war is independent of a country's level of economic development (footnotes 9 and 11). This is not true for civil wars where underdevelopment goes hand and hand with civil strife. Civil war occurs more frequently in countries with great ethnic diversity and income inequality. Such countries have been at the bottom of the distribution of growth rates; see Easterly (2001). Consequently, one cannot treat the occurrence of civil war as exogenous to the determinants of economic growth that have been excluded from the regression (the error term). Including civil wars then creates a simultaneity problem that biases the estimated coefficient downward. And second, not only the determinants but also the characteristics of the two types of war are so different that there is a risk of diluting any significant effects when both types are included. For instance, the average severity of civil wars is less than five percent of that of interstate wars while the standard deviation of the severity of civil wars is only about two percent of that of interstate wars!

3. Conclusions

I have studied the economic consequences of war in a large cross section of countries during the 1960-89 period. Variables pertaining to the duration, severity, and intensity of war were used together with standard economic variables. The value added of the present paper compared to the existing literature can be found in three elements. First, it studies a category of wars (regional, interstate) which, with few exceptions, have been relatively ignored before. This category of wars is helpful for determining whether war can affect economic growth even in the
absence of large direct destruction of resources and major changes in the technological frontier and international institutions. And second, it studies a relationship, namely, the conditional effect of war on economic performance that has not been investigated before. And third, it allows a comparison of competing political theories without relying on controversial measures of the degree of destruction of existing political institutions.

The results indicate that war matters for growth. Protracted and/or severe wars are conducive to higher growth. Moreover, the positive effects decrease with the level of income of the war participant. Both of these findings offer stronger support to the "Phoenix factor" emphasized by Organski and Kugler rather than the theory of the destruction of existing political institutions suggested by Olson.
References


Key: AVERAGE GROWTH= Average Real GDP Growth Rate, BDP=Battle Deaths per Population, DUR= War duration, BDNM=Battle Deaths per Nation Month, Y = Initial Level of Income (as of 1960), MS=Male Secondary School, I=Investment, G=Government Expenditure, LIFE=Life Expectancy, PREM=Black Market Premium, RC=Revolutions/Coups.

Table 1
Correlations of Interstate War Variables

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<th>BDP</th>
<th>BDNM</th>
<th>DUR</th>
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Table 2
Descriptive Statistics of Interstate War Variables

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<td>Mean</td>
<td>271.4447</td>
<td>2133.605</td>
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<td>Median</td>
<td>11.73709</td>
<td>599.1037</td>
<td>5.500000</td>
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<td>Maximum</td>
<td>3777.006</td>
<td>8835.498</td>
<td>97.06000</td>
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<tr>
<td>Minimum</td>
<td>0.452649</td>
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<td>0.166667</td>
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<tr>
<td>Std. Dev.</td>
<td>864.3265</td>
<td>2767.514</td>
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<td>Skewness</td>
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<td>0.885480</td>
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<td>Kurtosis</td>
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<td>3.237793</td>
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### Table 3

**Interstate War (1960-74) and Economic Growth (1975-89)**

War variables only

Dependent Variable: AVERAGE GROWTH  
White Heteroskedasticity-Consistent Standard Errors & Covariance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
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<tr>
<td>BDNM</td>
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<td>2.06E-06</td>
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<td>BDP</td>
<td>0.000534</td>
<td>0.000279</td>
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<tr>
<td>DUR</td>
<td>0.000480</td>
<td>0.000249</td>
<td>1.926846</td>
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<td>Y*BDP</td>
<td>-2.26E-07</td>
<td>1.11E-07</td>
<td>-2.035694</td>
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</table>

Adjusted R-squared: 0.053494  
S.E. of regression: 0.030611  
F-statistic: 2.455324  
Prob(F-statistic): 0.050628  
Observations: 104

### Table 4

**Interstate War (1960-74) and Economic Growth (1975-89)**

All variables

Dependent Variable: AVERAGE GROWTH  
White Heteroskedasticity-Consistent Standard Errors & Covariance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDNM</td>
<td>-1.04E-06</td>
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<td>0.000302</td>
<td>2.238772</td>
<td>0.0289</td>
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<td>DUR</td>
<td>0.000347</td>
<td>0.000176</td>
<td>1.975580</td>
<td>0.0528</td>
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<tr>
<td>Y*BDP</td>
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<td>1.18E-07</td>
<td>-2.359621</td>
<td>0.0216</td>
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<td>I</td>
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<td>0.053099</td>
<td>-0.790617</td>
<td>0.4323</td>
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<tr>
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<td>0.065132</td>
<td>0.497325</td>
<td>0.6208</td>
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<tr>
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<td>0.000545</td>
<td>1.829328</td>
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<td>PREM</td>
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<tr>
<td>RC</td>
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<td>0.018077</td>
<td>-0.707509</td>
<td>0.4820</td>
</tr>
</tbody>
</table>

Adjusted R-squared: 0.197  
S.E. of regression: 0.0272  
F-statistic: 2.724  
Prob(F-statistic): 0.008  
Observations: 71
### Table 5

War (1960-74) and Economic Growth (1975-89)

Interstate and Civil Wars

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.018996</td>
<td>0.003453</td>
<td>5.500800</td>
<td>0.0000</td>
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<td>4.12E-06</td>
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<td>0.000212</td>
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<td>0.0617</td>
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<tr>
<td>Y*BDP</td>
<td>9.22E-09</td>
<td>1.20E-07</td>
<td>0.077071</td>
<td>0.9387</td>
</tr>
</tbody>
</table>

Adjusted R-squared 0.019  S.E. of regression 0.031
F-statistic 1.447  Prob(F-statistic) 0.225
Observations: 90