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Research Paper

The Impact of Armed Conflict War On Economic Growth: Lessons From 20 Countries Around The World

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Abstract
Armed conflicts or wars (interstate and intrastate) have proved to have severe and devastating consequences on the economics of different countries around the world who were involved in such conflicts or wars. The major purpose of this study is to assess the impact of such conflicts or wars on the growth rate of GDP per capita of countries. We used an OLS, cross-sectional, regression model with STAT software covering 20 countries for the period 1990-2015. The findings of the study indicated a negative correlation between armed conflicts or wars and the growth rate of GDP per capita. The findings also indicated a positive causal relationship between each of the armed conflicts, the initial growth rate of GDP per capita, investment as a ratio of GDP, and the growth rate of GDP per capita. The findings further indicated a negative relationship between each population growth rate and school enrolment ratio with the growth rate of GDP per capita.

Keywords:
War, Armed Conflict, Economic Growth, GDP Growth Rate, Investment, Population Growth Rates, School Enrolment Ratio

ورقة بحثي

تأثير الصراعات المسلحة والحروب على النمو الاقتصادي: دروس من 20 دولة حول العالم

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المستخلص

برهنت النزاعات المسلحة أو الحروب (حروب أهلية أو بين الدول) عن نتائجها المدمّرة على اقتصادات الدول التي تشهد مثل هذه النزاعات أو الحروب. إن الهدف الرئيس لهذه الدراسة هو تقييم أثر النزاعات المسلحة أو الحروب على معدل نمو حصة الفرد من الناتج المحلي الاجمالي. وقد استخدمنا أسلوب OLS، المبني على دراسة عدة دول، ونموذج الإنحدار المتعدد مع برنامج STAT الذي غطّى 20 دولة حول العالم للمدة 1990–2015. إن نتائج هذه الدراسة أظهرت أن هناك ارتباطاً سلبياً بين النزاعات المسلحة أو الحروب ومعدل نمو حصة الفرد من الناتج المحلي الإجمالي. كما أكدت الدراسة على وجود علاقة سببية إيجابية بين كل من النزاعات المسلحة، ومعدل النمو الأولي لحصة الفرد من الناتج المحلي الاجمالي، والاستثمار كنسبة من الناتج المحلي الإجمالي، ومعدل نمو حصة الفرد من الناتج المحلي الاجمالي. كذلك شدّدت الدراسة على وجود ارتباط سلبي بين كل من معدل نمو السكان ومعدل الانتساب إلى المدارس مع معدل نمو حصة الفرد من الناتج المحلي الاجمالي.

الكلمات الرئيسة:

الحرب، النزاع المسلّح، النمو الاقتصادي، معدل نمو الناتج المحلي الاجمالي، الاستثمار ، الناتج المحلي الاجمالي، معدل نمو السكان، ومعدل الانتساب الى المدارس.

مجلة

تنمية الرافدين

(TANRA): **مجلة علمية، فصلية، دولية، مفتوحة الوصول، محكمة.**

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I. Introduction

Throughout most of human history, warfare was extremely profitable. Victory on the battlefield was a major source of raw material, capital, land, and cheap manpower for the winning side. Armed conflicts, in all of its forms and manifestations, are still prevalent in the world. As recent history has repeatedly shown, conflicts impose large social and economic costs and immeasurable human sufferings. Loss of lives, devastation of infrastructure, destruction of human capital, political instability and increased uncertainty are all factors that can lower investment and economic development during and after a conflict, making it difficult to break out from the "conflict trap" (Kasych, 2023). Conflicts often appear to complicate government budgets, reduce revenue by losing a portion of the tax base while increasing military spending and public debt (Gates et al, 2023). As the world moves to a more dangerous direction and with tensions between rival governments being in a very complex situation, an important and relevant question to consider is: How war would impact the growth of GDP per capita of a country? In the model used, the economic growth rate per capita of 20 countries averaged between 1990-2017 is the dependent variable and is regressed on the armed conflicts as the independent variable. Serving as control variables are the initial growth rate of the GDP per capita, investment as share of GDP, population growth rate, and school enrollment. The aim of this regression is to show the impact of armed conflicts on growth rate of GDP per capita. The ordinary least square estimation is used: we found a negative relationship between the presence of armed conflicts and the growth rate of GDP per capita. There is a positive relation between the initial growth rate of GDP per capita and the growth rate of GDP per capita. There is a positive relation between investment as share of GDP and the growth rate of GDP per capita. There is a negative relation between population growth and the growth rate of GDP per capita. Finally, there is a negative relation between school enrollment and the growth rate of GDP per capita.

The ultimate objective of this study is to investigate the impact of armed conflict on the growth rate of GDP per capita. Another major objective of the study is to explore the effect of each of the initial growth rate of GDP per capita, the investment as a share of GDP, population growth rate, and school enrollment on the growth rate of GDP per capita.

In this study, we analyze the consequences of armed conflicts or wars (intrastate and interstate) on the socio-economic growth and development of countries around the world who experienced such conflicts. This is the problem statement of the study. Also, in this study we conduct a cross-sectional assessment of 20 different countries and show such consequences, hence filling the gap in literature. This is the major significance of this research.

In this study, we tried to answer the following research question:

What will be the impact of armed conflict and other independent control variables on the growth rate of GDP per capita?

To answer this research question, we tested two hypotheses:

1. The Null Hypothesis (H_o): There is no impact of armed conflicts and other independent control variables on the growth rate of GDP per capita.

2. The Alternative Hypothesis (H_1): There is an impact of armed conflicts and other controlled independent variables on the growth rate of GDP per capita.

In the next section of this study, we will present an extensive literature review to cover the topic from all its dimensions. Section III will present the methodology of the research paper. Section IV will include the results and findings of the study. Section V will contain the analysis and discussion of findings of the study. Section VI presents the conclusions of the study together with its policy implications. Section VII deals with the limitations of the study and implications for future research. The study lists at the end the used references.

II. Literature Review

There exists an extensive review of literature regarding the impact of armed conflicts on macroeconomic and social indicators, such as GDP growth, GDP per capital, investment, population growth, and school enrollment. This section will present the key literature review about the study topic.

II.1 Impact of 75 Civil Wars

Kang et al (2005), in their study on 75 civil wars during the period 1960-2002, they used a cross-sectional framework by assessing the effect of civil wars on economic growth, relying on the neoclassical and endogenous growth theories. The model used includes the characteristics of the civil war variable as a regressor combined with initial GDP per capita and other exogenous variables. The model studied was:

$$G_{it} = a_{it} + \beta_W W_{it} + \delta_X X_{it} + \theta_Z Z_{it} + \varepsilon_{it}$$

Where the economic growth during postwar periods is represented by G, "i" is the index of the country taken, "t" is the index of time taken, the characteristics of civil war are represented by W, the determinants of long-term total factor productivity are represented by X, the other variables are exogenous to an economy, civil wars are represented by Z and the error term is represented by e. However, the characteristics of civil war were correlated with the error term of the equation, thus calculating the first equation alone will cause major statistical problems. Nevertheless, another equation was introduced where the characteristics of civil war, W, are stochastic and a function of economic growth, G, some exogenous variables, P, and an error term, u. The second model used was:

$$W_{it} = \gamma_{it} + \lambda_G G_{it} + \pi_P P_{it} + \upsilon_{it}$$

Both equations are solved simultaneously using two-stage least-square (2SLS).

Growth in capital stocks as a percentage of GDP is strongly and positively associated with increases in GDP; a 1% growth of capital stock is associated with 0.07% growth in GDP. The logged inflation rate is strongly and negatively associated with economic growth; war, debt, and inflation weaken the postwar economic growth. The impact of growth in exports is positive and significantly different from zero. Holding other variables constant, a 1% growth of exports is associated with 0.103% growth of GDP. Growth has also been shown when the major donor nations of the world provide more aid; for every $1 per capita in foreign aid, growth in GDP increases by 0.007% per year. Other findings were also mentioned in this study. First, less

destructive wars have better postwar economic growth. Second, few countries that experienced violent civil wars were capable of rebuilding their political and economic infrastructure. Third, foreign transfusion is needed to rehabilitate the economy, since the local resources will have already been depleted during war. Finally, the burden of cleaning up the mess in the aftermath of civil wars seems to be shared with the international community, although civil wars have domestic origins.

II.2. Sub-Saharan Africa Case

Fang et al (2020), in their study on the effects of conflicts on Sub-Sahran Africa, tried to show the economic consequences of conflicts in sub-Saharan Africa. The paper attempted to present the estimates of the economic impact of 45 sub-Saharan African countries during 1989–2017. The standard growth model is used for estimations in this study. This study showed the influence of conflict, investment rate, trade openness, and export-partner growth on real per-capita GDP, as indicated in the table, below.

Impact of Conflict on Growth, Uppsala GED (1989-2017)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SSA	**Non-SSA EMs & LIDCs**	**All EMs & LIDCs**	**All EMs & LIDCs**	**All EMs & LIDCs**	**All EMs & LIDCs**	**All EMs & LIDCs Diff GMM**	**All EMs & LIDCs Sys GMM**
Per capita GDP (lagged)	-0.042** (0.012)	-0.046** (0.014)	-0.042** (0.010)	-0.038** (0.010)	-0.046** (0.011)	-0.041** (0.021)	-0.041** (0.010)	-0.021** (0.009)
Conflict intensity	-3.468*** (0.856)	-2.897* (1.700)	-3.289* (1.756)	-2.772** (1.043)	-2.785*** (0.736)	-2.269*** (0.693)	-2.837** (1.118)	-2.799** (1.322)
SSA x Conflict intensity			-0.363 (1.863)					
Institutional quality x Conflict				1.358** (0.631)				
Debt x Conflict					-0.025* (0.031)			
Center-periphery x Conflict						-1.911*** (0.438)		
Investment/GDP	0.047 (0.041)	0.097*** (0.032)	0.062** (0.031)	0.052 (0.032)	0.094 ** (0.038)	0.101*** (0.032)	0.063 (0.044)	0.055 (0.053)
Human capital		-1.414 (3.182)	-1.075 (1.805)	-2.528 (1.924)	-0.338 (1.955)	1.583 (1,966)	0.368 (2.499)	-2.373 (1.448)
Trade openness (log)	3.764** (1.442)	0.902 (1.718)	1.357* (0.760)	1.367 (0.847)	1.357* (0.714)	0.571 (0.609)	1.496 (0.924)	1.008 (1.005)
Terms of trade (pct change)	0.002 (0.010)	-0.055 (0.047)	-0.027 (0.032)	-0.033 (0.039)	0.006 (0.016)	0.005 (0.032)	0.021 (0.031)	0.016 (0.032)
Export partners growth	-0.170 (0.146)	0.434** (0.146)	0.352* (0.137)	0.378** (0.148)	0.421* (0.133)	0.334*** (0.124)	0.811*** (0.206)	0.294 (0.202)
Institutional quality				-0.506 (0.563)				
Public debt/GDP					0.016 (0.011)			
Center-periphery						0.386* (0.212)		
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Frequency	Annual	Annual	Annual	Annual	Annual	Annual	5 Year	5 Year
Observations	1,120	1,527	2,473	2,206	2,378	1,897	503	523
R-squared	0.257	0.274	0.234	0.247	0.257	0.288		
No. of countries	40	56	90	81	90	89	90	90
No. of instruments							98	104
AR2 Test							0.446	0.536
Hansen Test							0.522	0.572

Note: Dependent variable is growth of per-capita GDP from Penn World Tables. The intensity of conflict variable is the percentile of conflict-related deaths as a share of population based on the Uppsala Georeferenced Event Dataset. Columns 1 to 6 are estimated using OLS with country and year fixed effects. Columns 7 and 8 are estimated using difference and system GMM with 5 year averaged data. Standard errors reported in parentheses are clustered at the country level. ***, **, and * indicate statistical significance at the 1, 5 and 10 percent level respectively.

Source: Fang et al. (2020) study

The research concluded that more intense conflicts are associated with 1% points lower growth in countries with strong institutions than countries with weak institutions (1.5 compared to 2.5 percentage points). Countries with stronger fiscal fundamentals, in terms of lower debt, experience lower decline in growth. Presumably, because there is more room to respond to the destruction caused by conflicts. Conflicts in peripheral regions are likely to have a smaller impact on aggregate growth as compared to economic/ urban hubs in the country. Conflicts that happen where the centrality measure is at the mean would experience growth 1 more percentage point to a conflict where the centrality measure is one standard deviation above the mean. Other findings indicated that on average, countries that experience conflicts have a 2.5 percentage points lower in the annual GDP growth. The cumulative impact on per capita GDP increases over time.

Collier (1999), in his study on the effects of civil wars, quantified the consequences of civil war on development both during the war and in five years following the conflict. He combined economic information from the Penn World Tables with information on civil wars from the Correlates of War Project. This particular data set offered a sample of ninety-two nations of which nineteen had civil wars between 1960 and 1992. The dependent variable was the decade average per capita GDP growth rate of each nation; and he introduced three variables meant to record the economic consequences of a continuing war, the history of the conflict in succeeding years, as well as the effect of the length of economic transition following the conflict. He stated that economies on average grow 2.2 % more slowly during the war as opposed to their past. The most evident reason behind this is that civil conflict destroy physical and human capital, along with lower investment that could regenerate both. Civil wars quickly lower the physical capital stock through the damage of public infrastructure and also decrease investment in the capital of private and public sectors. He further stated that the absence of investors could be devastating for any economy and far worse for conflict-torn nations.

II.3. Effect of Various Forms of Violence

Thies et al (2020) conducted a quantitative analysis on the effect of war on economic growth. The article studied the effect of various forms of violence across space and time, covering all major countries throughout the period of 1955 till 2015, with observations being every five years using panel data. The variables they

considered in their study were real GDP per capita, economic freedom, war and coup (see table 2). The observed results showed that higher intensity wars had lower GDP per capita by 16% to 24% and considered significant, while lower intensity wars had a lower impact. Coups had a negative impact on GDP per capita, lowering it by 8 to 9%. Economic freedom, however, had a significant positive impact on GDP. Loss of human lives and the obliteration of physical and human capital also affected the GDP negatively. The reduced foreign and domestic trade also had a negative impact on the GDP. However, another key factor that was affected by wars and conflicts is education. Armed conflicts can result in reverse education gains over the years. In many countries, armed conflicts usually affect the poorest households the most as they are the ones who lose most of their assets and income. This often drives households with no choice but to take their children out of school because they simply could not afford their education during those times; this is only one of the many reasons for the loss of education during and after wars.

Table 2. Real GDP Per Capita, Economic Freedom, War And Coup

	Real per Capita GDP	Economic Freedom	War	Coup
Source	**(Maddison Project)**	**(Fraser Institute)**	**(Systemic Peace)**	**(Systemic Peace)**
Mean	13,078	5.9	0.07	0.09
Std. Dev.	14,909	1.3	0.17	0.19
5th %ile	987	3.6	0	0
25th %ile	2,774	4.9	0	0
50th %ile	7,782	5.9	0	0
75th %ile	18,144	7.0	0	0.20
95th %ile	41,337	7.9	0.57	0.40
% nonzero	-	-	24	26

Source: Thies el al. (2020) Study

II.4. UNESCO Report

A report published in 2011 by UNESCO titled "The Hidden crisis: armed conflict and education" covered the relationship between armed conflicts and education by looking into the negative implications of conflicts for all goals of the education. They gave more in-depth examples as to what leads to the loss of education such as schools and educational facilities being targeted and damaged. For instance, 50 percent of Bosnia and Herzegovina's schools needed restoration and rehabilitation as a result of conflicts. Also, as a result of Mozambique's long civil war, 58 percent of primary schools were lost or abandoned, compared to 85 percent in Iraq. This suggests the strong relationship between the loss of education and armed conflicts. Another reason for education loss mentioned in the report is that teachers and students may die or be displaced. For example, the Rwandan genocide resulted in the deaths or displacement of more than 66% of the teachers in secondary and primary schools (see table 3). Years of schooling lost in association with trend interruption during selected conflict episodes, selected countries

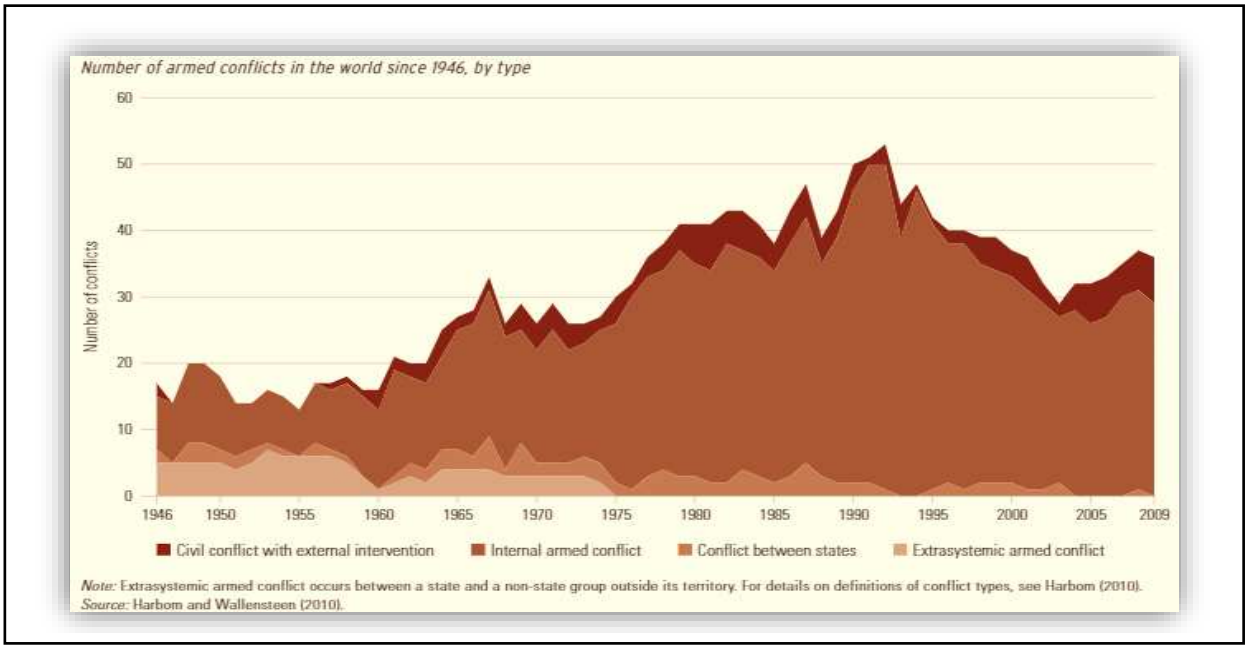
Table: 3 Effects of wars on countries

untry	Average years of education at	Growth rate for years in school		Years of schooling lost
		Pre-conflict	During conflict	

	start of conflict	%	%	
Afghanistan (1978–2001)	1.8	5.9	0.4	5.5
Burundi (1994–2006)	2.9	6.6	-0.3	3.4
Cambodia (1967–1978)	3.3	4.0	-1.1	2.3
Iraq (1990–1996)	6.2	2.2	0.1	1.4
Mozambique (1977–1992)	2.7	7.2	0.7	5.3
Rwanda (1990–1994)	2.9	4.7	0.1	1.2
Somalia (1986–1996)	2.9	4.5	-2.5	2.3
Notes: The dates in brackets refer to the conflict period under review. All growth rates are compound growth rates. The pre-conflict rate is calculated using the 10-year period preceding the conflict. The growth rate during the conflict is calculated over the entire conflict period identified. The number of years of schooling lost is calculated using forward projections of the compound growth rate before the conflict (best-case scenario). Burundi: data from 1994–2005.				

Source: UNESCO Report (2011).

The table above shows the years of schooling lost covering seven countries in a state of conflict. The variables in the table are the average years of education at the start of a conflict and the growth rate for years in school before and during the conflict. By substracting the two growth rates for years in school the total years of schooling is obtained. For example, Afghanistan lost 5.5 years of schooling during 1978-2001, while Burundi lost 3.4 years during 1994-2006. This illustrates that conflicts are a significant factor that contribute to education overall, only 79% of the youth were literate in impoverished countries suffering from conflict compared with 91% in other poor countries that are free of any conflicts. Conflicts are fatal on several aspects but perhaps the least evident one is education, since the consequences over the long term are not only faced by individuals but also their countries as less years in school converts into slower economic growth even after the conflict ends since education is a key investment in human capital. Another interesting point mentioned in the report was that most conflicts in the past 3 decades were fought within states, not across borders. Civil wars cause major threats to the well being and security of civilians, not to mention the devestating impact on young students and education systems. (See Figure 1)



Source: UNESCO Report (2011)

Koubi (2005) studied the effects of wars on economic performance and growth in several countries between 1960 and 1989. He found out that there is a negative correlation between economic growth and war: economic growth was lower in countries that were involved in severe and prolonged war. He also found out that the longer and more severe war, mainly postwar, the higher the economic growth rate in the long run. He explained such consequences of wars on economic growth and performance as follows: wars are more likely to occur in countries that have poor economic performance, and hence war will have a detrimental effect on a country's economic activity. He argued that in the long run, wars lead to an enhancement in the country's growth rate. He asserted that a war with long duration by 10% generates a 2.1% growth in the average growth rate of the countries under study.

Howell (2011) argued that the cost of war, as measured by spending on military operations, has both positive and negative implications for economic growth. She asserted that in the short run, the mutual relationship between both variables is positive: when war takes place, the economy will experience a massive military spending which pulls up investment due to the expansion of the defense sector and other related sectors, thus leading to economic growth. In the long run, the war generates an overall uncertainty about future economic prospects, which in turn, reduces investment and hence economic growth. She refered to the case of World War II and said that this War established and promoted a demand for tanks and armaments, which made the economy operating at full capacity, and people were working even two shifts a day.

Groot et al (2022) found out that in 2014, the world would have been 12% more healthier without violent conflict since 1970. They said that the war over 45-year

period induced substantial GDP loss. The civil conflicts in Asia had accumulated the greatest costs in the form of GDP losses. North American, European, and Oceanic countries benefited from wars that occurred on their grounds. They identified evidence of a "peace dividend" where economic growth rates were higher following the end of conflicts. But they declared that the accumulated gap in GDP was negative and big for most of the involved countries and long wars. They deduced that, when comparing policies of recovery of participating countries in wars and those who were affected by such wars, speeding up growth in the post-two to three years of the conflicts is an effective way to reduce the economic burders of violent conflicts.

Imai et al (2000), in measuring the economic impact of war, found out that a civil war leads to a lower economic growth, and reduces overall investment and hence the capital stock of a country. They also found out that a war does not have any negative effects on the government's fiscal balance, mainly deficits in the overall budget. In addition, they found out that the effects of a war on a country's economic activity and performance depends mainly on the civil war's scope. The results they found from their study were that a wide-spread civil war has costs that are in excess of five times more than the narrowly civil war, and lead to a decline in a country's GDP by 1.25% per annum.

II.5. U.S. Economy

IFEAP (2020), in its study on the economic consequences of war on the U.S. economy, argued that spending on military operations has a positive impact on economic demand during periods of low confidence and contraction: A war can lead to growth in industrial and technological sectors, an increase in aggregate demand, and a reduction in unemployment. They argued that when military expenditure is financed by a progressive tax system, like what happended throughout World War II, it can induce a better income distribution. This new income distribution constituted in the post -1945 period a driving force for developing the position of middle classes whose spending formed the founding pillar for the long post-war boom in economic activity in the U.S. It asserts that military spending still produced negative economic consequences during World War II as represented by declining consumption and investment spending, two major components of GDP. It stated that U.S. increased military spending was funded through debt (World War II, Cold War, Afghanistan, Iraq) or through taxation (Korean War) or inflation (Vietnam). In all wars, US taxpayers shouldered the largest burden, and the private sector's consumption and investment spending experienced a major decline. There were other key consequences such as larger fiscal deficits, higher taxation, lower growth rates, and higher inflation. Under such circumstances, the overall impact of war on the U.S. macroeconomy was negative and substantial.

II.6. Russia-Georgea War

Petracco et al (2012), in their study on the impact of the war between Russia and Georgea during 2008 and 2009, evaluated the effects of this war on the performance of Georgea's private enterprises and their perception of the business climate. They found out that this war did not produce always negative consequences, and that such consequences were differentiated based on the size and age of enterprises. The results

of their study pointed to a negative and substantial negative effects on export sales for some countries, on the young enterprise's labor productivity, and on exit of some enterprises from the market at earlier stages. They found out that the armed conflict did not produce always a negative impact on the perceptions of those enterprises regarding the business environment in affected countries. This impact could be explained by the measures undertaken by the Government of Georgeo to lessen the severity of the war consequences, and also by the support extended to the country from the international community. Young enterprises were severely hit by the war, where some of them had exit from the market and others perceived the environment as unfavorable and put plans to survive. Middle and older enterprises continued to work, trying to limit losses and costs of the war, under unfavorable business conditions, and considered corruption as a major consequence of the war and a major impediment to doing business.

II.7. Developing and Developed Countries

Groot et al (2022), in their research paper on the impact of war on national and international economies, found out that developing countries were severely affected by violent conflicts, while several developed countries benefited from these conflicts when wars took place in other countries. Increased military spending by countries involving in wars has induced several industries in several developed countries that are related to the defense sector. The study showed that Asia would have generated the greatest scope of benefits between 1970 and 2014. North American countries lost nearly 0.9 trillion US dollars during that period. For countries like Iraq and Afghanistan, their GDP would have more than doubled in the absence of violent conflict. They argued that a violent conflict has a negative repercussion on a country's total output since it distorts production and shifts assets from a country involved in a war to countries having peace. They also argued that a violent conflict leads to increased spending in security and declining trade.

II.8. Effects of Cold War

Murdoch et al (2021), in their study on the relationship between civil wars and economic growth, declared that the end of the Cold War has led to intrastate wars instead of interstate wars, mainly among many developing countries. They asserted that such intrastate wars were stimulated by several factors such as ethnic hatreds and greed for resource wealth. Cold wars have significant effects on economic growth in the countries experiencing such wars and in neighbouring countries, such as the diversion of foreign direct investment, distortion in trade, damages to social capital, loss of human capital, displacement of people, and the shift of resources to less productive sectors. The study showed that Africa had a better resilience and ability to grow in contrast to Latin America and Asia. The neighbour spillover effects of the war were stronger in Asia than in Africa, in the short-run and long-run.

II.9. Russia – Ukraine War

Prohorors (2022), in his study on the impact of Russia war on Ukraine, said that this war had aggravated the economic problems and challenges to both countries and even the European countries, mainly rising inflation and negative economic growth, thereby leading to the threat of stagflation. European countries received the hardest

shock among Western countries, and the countries of Central and Eastern Europe that have good trade relations with Russia suffered the most. He asserted that the war in Ukraine has led to a surge in uncertainty in the economy and business sector, mainly with respect to energy use, demand, trade and ownership. As a result of this war, the confrontation between Russia and the West has increased, a development that generated adverse consequences on the economies and companies of Europe. Two major adverse results of this war concerning the business sector were lower sales and income and higher costs, and both induced a significant drop in profits.

Caldara et al (2022), in their study on the impact of war in Ukraine on global economy and inflation, argued that global geopolitical risks had surged since Russia's war on Ukraine. They said that this war is drove up inflation, uncertainty, and economic contraction, especially in these two countries. Commodity and financial markets were in turmoil, they asserted. By using an economic model and recent data on key macroeconomic variables from Russia, Ukraine, and several European countries, the researchers found out that this war induced a reduction in the level of aggregate GDP of the world by nearly 1.5% and an increase of 1.3% in inflation. Such consequences resulted from decreased consumer sentiment, higher goods prices, and tighter monetary and financial conditions. A severe effect of the war was a large hit to European economies, mainly its goods-production industries.

III. METHODOLOGY

III.1. Research Design – The Model

In this study, we used the OLS regression cross-sectional model based on STATA Software to study the impact of armed conflict (the independent variable) on the average growth rate of GDP per capita (the key independent variable). Also we will study the impact of key independent control variables such as initial growth of GDP per capita, average investment as a share of GDP, average population growth rate, and average school enrollment ratio, on the average growth rate of GDP per capita.

The OLS regression model took the following form:

$grgdp = B_1 + B_2\ ac + B_3\ grgdpi + B_4\ inv + B_5\ pop + B_6\ schen + E$

where:

- "grgdp" denotes the average growth rate of GDP per capita.
- "ac" denotes the average armed conflicts.
- "grgdpi" denotes the initial growth rate of GDP per capita.
- "inv" denotes the average investment as a share of GDP.
- "pop" denotes the average population growth rate.
- "schen" devotes the average school enrollment ratio.
- "E" denotes error (i.e. other independent variables not considered in the regression model that could have an impact on the dependent variable).

The regression models estimated the coefficients of independent variables, namely B_1, B_2, B_3, B_4, B_5 and B_6.

III.2. Data Collection Methods and Validity

The regression model used covers 20 countries from different regions of the world, and covered the period extending between 1990 and 2017. The countries included in this study were: Algeria, Azerbaijan, Armenia, Burundi, Congo, Georgea, Indonesia, Mexico, Niger, Nepal, Rwanda, Iraq, Turkey, Tajikistan, Mali, Russia, Uzbekistan, India, Iran, Namibia.

I have chosen these countries because they all experienced civil wars, armed conflicts, or civil wars and armed conflicts with other countries.

The data on armed conflicts were retrieved from the Center of Systemic Peace (CSP) database, while the data on the average growth rate of GDP per capita, initial growth rate of GDP per capita, average investment as a share of GDP, average population growth rate, and average school enrollment were all retrieved from the World Bank (WB) database.

We believe that the data used in this study are both valid and reliable, since they are retrieved from two leading international organizations that are known for their credible data and information about macroeconomic and social indicators that are always used by scholars and researchers all around the world.

III.3. Expectations of the Model

Given the regression model at hand, we can expect that an increase in armed conflicts tend to slow down the activities of economic agents such the government, private sector, consumers, and economic sectors, and hence aggregate economic activity and economic growth rate, and therefore the average growth rate of GDP per capita. In this sense, we expect a negative causal relationship between the average growth rate of GDP per capita and armed conflicts. We can also expect a positive correlation between the average growth rate of GDP per capita and the initial growth rate of GDP per capita. We can expect a positive correlation between the average investment as a share of GDP and the growth of GDP, since investment is a major component of GDP and a key driver of its growth. We can expect a negative correlation between population growth and the growth rate of GDP per capita in the short run, while the correlation turns positive in the long run, mainly because the growth rate of GDP and GDP per capita will be higher than population growth. School enrollment would enhance the skills and productivity of labor and hence boost the activity of economic sectors, thereby inducing better GDP and GDP per capita growth rates.

IV. RESULTS & FINDINGS

IV.1. Validity of Observations and Variable Ranges

The summary statistics of the dependent variable and independent variables are represented by using the "Stata Software". We used the command: "summarize grgdp ac grgdpi inv pop schen" and obtained the following results in table 4:

Table 4: summarize grgdp ac grgdpi inv pop schen" results

Variable	0bs	Mean	Std. Dev.	Min	Max
grgdp	20	-0.04987	2.713191	-6.5337	3.4253
ac	20	787.432	785.9146	21	2823.6
grgdpi	20	-1.654955	6.797449	-16.9937	10.7152
inv	20	20.54512	5.748889	7.9342	30.9311
pop	20	1.422145	1.225929	-1.4492	3.4541

Variable	0bs	Mean	Std. Dev.	Min	Max
Schen	20	57.49094	29.589693	6.4645	98.3202

Source: primary data from the researcher database.

All 20 observations are valid and there is no missing observation of any variable. The grgdp variable ranges from -6.53% to 3.43% with a mean of -0.05%. The armed conflicts variable ranges from 21 to 2823.6 with an approximate mean of 787.43. The growth rate of GDP per capita initial ranges from -16.99% to 10.72% with a mean of -1.65%. The investment variable ranges from 7.93% to 30.93% with a mean of 20.55%. The population growth ranges from a -1.45% to 3.45% with a mean of 1.42%. The school enrollment ratio variable ranges from 6.46% to 98.32% with a mean of 57.49%.

IV.2. Correlation Signs

We implemented the command: "corr grgdp ac grgdpi inv pop schen" also by using the "Stata Software" and got the following results in table 5:

Table 5. corr grgdp ac grgdpi inv pop schen" results

Corr grgdp ac gradpi inv pop schen obs = 20						
	grgdp	**ac**	**grgdpi**	**inv**	**pop**	**schen**
grgdp	**1**					
ac	-0.3033	1				
grgdpi	0.5844	0.047	1			
inv	0.3358	0.107	0.2642	1		
pop	0.2449	0.1983	0.5324	-0.0293	1	
schen	-0.2689	-0.0218	-0.2168	0.4714	-0.6426	1

Source: primary data from the researcher database.

Since there are no missing values, the correlations are based on all 20 observations. The Pearson Correlation Tests shows that the correlation between any variable and itself is always 1. The correlation between armed conflicts "ac" and the growth rate of GDP per capita "grgdp" is -0.3033; indicating a negative linear relationship between armed conflicts "ac" and the growth rate of GDP per capita "grgdp". The correlation between school enrollment ratio "schen" and the growth rate of GDP per capita "grgdp" has also a negative linear relationship. However, there is a positive correlation between all of growth rate of GDP per capita initial "grgdpi", investment as share of GDP "inv", and the population growth rate "pop" with respect to the growth rate of GDP per capita "grgdp"; with coefficients of 0.5844, 0.3358 and 0.2449 respectively. The "grgdpi" has a weak correlation with "grgdp" with respect to all the other independent variables.

IV.3. Summary Statistics and Regression Coefficients

Table 6 show the summary statistics and regression results of the study.

Reg grgdp ac grdgpi inv pop schen						
Source	ss	df	MS	Number of obs	=	20
Model	92.6278887	5	18.5255777	F(s,14)	=	5.49
Residual	47.2388315	14	3.37420225	Prob > F	=	0.0053
Total	139.86672	19	7.36140633	R – squared	=	0.6623
				Adj R– squared	=	0.5416
				Root MSE	=	1.0369
grgdp	Coef.	Std. Err.	t	P> | t |	[95% Conf.	Interval
ac	-0.0011248	0.0005568	-2.02	0.063	-0.002319	.0000694
grgdpi	0.2049663	0.0781344	2.62	0.02	0.0373847	.3725479
inv	0.2504684	0.09474	2.64	0.019	0.0472713	.4536655
pop	-0.8102117	0.5582101	-1.45	0.169	-2.007453	.39703
schen	-0.0596099	0.0231357	-2.58	0.022	-0.1092311	- .0099887
_cons	0.6084116	2.051607	0.3	0.771	-3.791848	5.008671

Using the Stata software, we used the command: "reg grgdp ac grgdpi inv pop schen". It generated a summary-statistics as well as a table of regression coefficients. There is a negative relationship between armed conflicts, population growth and school enrollment ratio with respect to the growth rate of GDP per capita. However, there is a positive relationship between the growth rate of GDP per capita initial and investment as share of GDP with respect to the growth rate of GDP per capita. A 1 unit increase in armed conflicts would decrease the growth rate of GDP per capita by 0.0011. The Prob > | t | is the p-value of the F-statistic. It is statistically significant at 10% significance level where we fail to reject the null hypothesis. The p-value of armed conflicts is 0.063, hence it is significant. As 1-unit of growth rate of GDP per capita initial increases, growth rate of GDP per capita also increases by 0.2049. Its p-value which is equal to 0.020 denotes that growth rate of GDP per capita initial is statistically significant. As investment as share of GDP increases by 1-unit, the growth rate of GDP per capita increases by 0.2504. According to its p-value, which is equal to 0.019, investment as share of GDP is statistically significant. As population growth rate increase by 1-unit, the growth rate of GDP per capita decreases by 0.8102. Its p-value is equal to 0.169, which means that the population growth rate is not statistically significant. As the school enrollment ratio increases by 1 unit, the growth rate of GDP per capita decreases by 0.0596. Its p-value which is equal to 0.022 denotes that school enrollment ratio is statistically significant. Many indicators that show how good the model is, are found in the goodness of fit in the top right of the table. The p-value of the F statistics is 0.0053. This indicates that a statistically significant relationship exists between the independent variables and the dependent variable. R-squared, which is equal to 0.6623, determines how great the model fits the data. Thus, 66.23% of the variation in the growth rate of GDP per capita is explained by the following regressors: armed conflicts "ac", growth rate of GDP per capita initial "grgdpi", investment as share of GDP "inv", population growth rate "pop", and school enrollment ratio "schen". Adjusted R-squared is typically used when comparing 2 models explaining the same variable with one having some additional regressors compared to the other.

Therefore, if we add a regressor to the model and the adjusted R-squared is greater than 0.5416, then the cost of adding that regressor is exceeded by its benefits. (see table 6).

We performed a significance test of the regressors individually and got the p-values as the ones shown in the previous regression table. Then we test whether there is an impact of the independent variables: “ac”, “grgdpi”, “inv”, “pop” and “schen” on the dependent variable “grgdp”, or not. The p-value is 0.0053; we reject the null hypothesis that the coefficients are equal to zero and there is an impact of the independent variables on the dependent variable. Next, I jointly tested the coefficients of armed conflicts and population growth rate and conclude that we reject the null hypothesis.

IV.4. Regression Equation

The main aim of my study was to evaluate the effect of war on the growth rate of GDP per capita of 20 countries within the period of 1990 and 2002 using Ordinary Least Squared estimation.

Our estimated model can now be viewed as follows:

Grgdp = 0.6084 - 0.0011ac + 0.2050grgdpi+ 0.2505inv -0.8102pop - 0.0596schen

The increase of armed conflicts, population growth rate and school enrollment ratio would negatively affect the growth rate of GDP per capita. Moreover, an increase in the growth rate of GDP per capita initial and investment as a share of GDP would increase the growth rate of GDP per capita.

Table 7: The relationship between the variables

estat ovtest
Ramsey RESET test using powers of the fitted values of grgdp Ho: model has no omitted variables
F(3, 11) = 2.47 Prob > F = 0.1167
F(3, 11) = 2.47 Prob > F = 0.1167

To test for the existence of any omitted variables, we implemented the Ramsey’s test. We failed to reject the null hypothesis; there were no omitted variables in the model; thus, there is a linear relationship between the independent variables and the dependent one. (see table 7).

However, there is a probability of endogeneity, where the error term would have an effect on the independent variables. The dependent variable along with the independent variables, would both be affected by the shocks in the error term. Thus, the violation would occur regarding the zero conditional mean assumption because the error term was correlated with the regressors. A decrease in investment would increase the unemployment rate. Both the growth rate of GDP per capita and the school enrollment ratio would also decrease because of a decrease in investment and an increase in the unemployment rate. Therefore, a change in investment would not only change the growth rate of GDP per capita, but also a change in the growth rate of GDP per capita would change investment, similar to the school enrollment ratio.

V. Analysis and Discussion

V.1. Analysis

The analysis of the regression model indicated that there exists a significant positive causal relationship between armed conflict and the growth rate of GDP per capita. A 1% increase in armed conflicts leads to a 0.11% decrease in the growth rate of GDP per capita. There also exists a significant positive causal relationship between the growth rate of initial GDP per capita and the growth rate of GDP per capita. A 1% increase in the growth rate of initial GDP per capita leads to a 20.49% increase in the growth rate of GDP per capita. The correlation between average investment as a share of GDP and growth rate of GDP per capita is positive and significant: a 1% in the former variable leads to a 25.04% increase in the latter. The relationship between population growth and the growth rate of GDP per capita is negative: a 1% increase in the former leads to an 81.02% decrease in the latter. Lastly, there exists a significant negative correlation between school enrollment and growth rate of GDP per capita: a 1% increase in the former leads to a 5.96% decrease in growth rate of GDP per capita.

The adopted regression model implied a high value of R-squared which was equal to 0.6623 or 66.23%. This means that the chosen independent variables in this model explain 66.23% of the variation in the dependent variable. In this case, we have to reject the Null Hypothesis (Ho) and accept the Alternative Hypothesis (H_1).

V.2. Discussion

The results and findings of our study do coincide with the literature review on the effects of armed conflicts on GDP and GDP per capita growth rates. Armed conflicts have the effect of decreasing GDP, GDP growth rate, per capita GDP, and the growth rate of GDP per capita. Armed conflicts lead to a disruption in the aggregate economic activity via its negative effect on the activity of economic sectors. Armed conflicts lead to a drop in GDP and a worsening of social and living conditions through its impact on people's incomes, and also through its impact (increase) on inflation rates.

As far as investment is concerned, armed conflicts lead to an increase in overall investment in the economies of countries who experience or do not experience armed conflicts, due to the effect of increased military spending and its linkages to sectors related to the defense sector. However, we believe that in the long run, investment will decline due to the effect of uncertainty on aggregate economic prospects, leaving a negative effect on the GDP, its growth rate, and the growth rate of GDP per capita.

With respect to the growth of initial GDP per capita, it has a positive effect on the growth rate of GDP per capita, especially if countries involved in armed conflicts rely heavily on labor in their economies and industries, and if the labor productivity is high.

Population growth affects negatively the growth rate of GDP and the growth rate of GDP per capita, especially in countries with population growth rates that exceed economic growth rates. Uncontrolled population growth may inhibit a higher unemployment rate that directly exerts a negative effect on GDP and its growth.

Lastly, lower school enrollment rates means lower education and skills that both impact negatively the economy's overall productivity, leading to slower GDP growth rates and, hence, lower growth rates of GDP per capita.

VI. Conclusions and Policy Implications

VI.1. Conclusion

Interstate civil wars or armed conflicts tend to have devastating consequences on key macroeconomic variables such as GDP, GDP per capita, economic growth rates, employment, inflation, activity of economic sectors, activity of private enterprises, infrastructure, and economic prospects.

On the social level, armed conflicts tend to reduce the overall living conditions, purchasing power of incomes, exchange rates of national currencies, and school enrollment rates. They also increase poverty, unemployment, unbalanced income distribution, and unbalanced regional development.

In recent years, intrastate Wars or Cold Wars are increasingly replacing interstate wars, due to ethnic and greed reasons. Still such wars exert further pressures on macroeconomic variables, leading to lower economic and social conditions.

VI.2. Policy Implications

Both interstate and intrastate have devastating implications for the global economy, its macroeconomic and social conditions. In fact, interstate civil wars cause death and injuries among the population; huge material and infrastructure destruction; declining economic activity and growth; lower incomes; higher unemployment and poverty rates; disruption in fiscal balances, trade balance, and the balance of payments; and increased uncertainty about future economic prospects.

Countries around the world need to find effective solutions for their mutual conflicts, so as not to be affected by armed conflicts or wars. Today, there are international organizations that have a key role in conflict resolutions, whether they are political or economic. A more peaceful and growing world is beneficial to all of its members, whether developing or developed countries. Peace gains and economic gains should be at the core of the political and economic strategies of all countries around the globe.

VII. Limitations and Implications for Future Work

One limitation of this study is that the population sample size in our study is relatively low: 20 countries were included in the study. For future research, this sample should be widened to include more countries.

Another limitation of the study is that it excludes key players in the international marketplace that have a strong political and economic power, such as the United States of America, United Kingdom, France, Germany, Canada, Italy and many others. Hence, a more cross-sectional study will prove to be vital to the explanation of the effects of civil or armed conflicts on national and international economies.

A third limitation is that the period covered in the study is not quite long. Future research should expand this period to more than the 1990-2015 period. The longer the period and the more recent the data is, the better are the results.

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