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# The Role of Conflict in Sub-Saharan Africa

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Claremont McKenna College



## **The Role of Conflict in Sub-Saharan Africa**

Submitted To  
Professor Jeffrey Flory

By  
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For  
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## **Abstract**

Sub-Saharan Africa is the provider of many critical natural resources. With such resources, one would expect these countries to have thriving economies. Why is the opposite case true? To answer such a question, this paper examines a few critical causes that may justify the current economic situation these African countries are experiencing. Specifically, the paper observes the economic impact of civil war and terrorist conflict in sub-Saharan Africa from 1971 to 2016. To explore the changes in GDP per capita for all these years, this thesis sheds light on three independent variables: year of conflict, education level, and foreign direct investment for many of the 47 sub-Saharan African countries. Replicating Paul Collier's *Bottom Billion*, this thesis will delve into more recent trends of the past two decades, and why the lack of economic advancement is pertinent to these countries. With the results obtained, this thesis proposes solutions to lowering the impact of civil conflict, and steadily advancing the economies across the African continent.

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## I. Introduction

Much of world has been rapidly advancing economically and technologically. The world has become an overall more peaceful place, where knowledge has been created to deliver technologies that positively impact peoples' lives. Also, global trade has enhanced the quality of life and allowed for more global relations. However, this is not the case for everyone. Although the standard of living and quality of life is improving for 6 billion of the 7 billion people on this planet, the bottom billion people on earth are living in poverty and experiencing a decline in quality of life. These bottom billion are in large part located in India and Africa. As far as Africa is concerned, frequent wars, genocides, and civil conflicts have wiped out much of the meaningful effort of economic development. However, some African countries such as South Africa, Rwanda and North African countries are able to maintain peace and sustain solid economic prosperity. Why is it that the sub-Saharan regions of Africa cannot advance?

Africa as a whole has an enormous chance at developing rapidly and successfully. It is important to note that the populations of sub-Saharan African countries are very young. Half of the black Africa population is less than 25 years old. This young generation represents the future of Africa. They are educated, well informed and able to leverage new tools available to them such as the internet and social media. Moreover, the French and English educational systems across sub-Saharan Africa are prone to facilitate immigration to Europe and the United States because the education system is either in French or English and mostly based on foreign education systems as a result of colonization. Africa has been on the path to adopting the latest internet and medical services. Also, Africa is the provider

of most critical natural resources in the world. African countries are actively working on transforming locally natural resources to serve local markets.

The question stands, what makes for this growth disparity between these sub-Saharan African countries and the majority of other countries around the world?

As Collier and Gunning explain, Africa's slow growth is partly explicable in terms of particular factors which are globally important for the growth process, but which are low in Africa (Collier and Gunning 1998). One of these factors is peace; in other words, the most imminent threats to growth in this area of the world are interstate and intrastate conflicts. These conflicts mainly present themselves in the form of civil wars and terrorism. A multitude of countries in Africa have been experiencing civil wars such as Nigeria, Chad, Liberia, Sierra Leone, Democratic Republic of Congo, and many others. In fact, seventy-three percent of people in the societies of the bottom billion have recently been through a civil war or are still in one (Collier 17).

Such conflicts have limited and severely impacted generations of young men and women, teachers, and engineers, depriving society of the work force necessary to sustain economic development. In Nigeria, Boko Haram has killed scores of innocent people leaving thousands of children without any family. In Mali, Islamic extremists have killed many innocent civilians, destroyed cultural symbols such as Timbuktu, and threatened to overthrow the local government. The killing of teachers and burning of schools has resulted in generations of children unable to be educated and therefore ill-equipped to be contributing forces to economic development. In fact, between 2009 and 2015, Boko Haram's attacks destroyed more than 910 schools and forced at least 1,500 more to close.<sup>1</sup>

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<sup>1</sup> "Nigeria: Northeast Children Robbed of Education." *Human Rights Watch*, 11 Apr. 2016.



Similar issues arise in a multitude of regions across Africa. Although the issues also arise in other areas of the world, Africa seems to be trapped in the spiral of creation and destruction. This constant loop of conflict is what Paul Collier notes as the *Conflict Trap*.

In his study *The Bottom Billion*, Paul Collier examines the underlying reasons for sub-Saharan Africa's slow growth and the implications that conflict has on these regions. The *Conflict Trap*, as Collier calls it, explains how and why sub-Saharan African countries are trapped in conflicts that are hindering their economic development. Even though many countries outside sub-Saharan Africa, including the most developed, have experienced major conflicts and civil wars, most of them have managed to establish long periods of peace that allowed them to create long lasting economic and social development. For example, the United States endured a civil war lasting four years. Although this civil conflict devastated the economy of the South and heightened tensions between races, the North and South were able to reconcile, settle their differences, and work together to rebuild industries and institutions.

In this paper, I refer to Collier's *Bottom Billion* study as my framework and extend the analysis by two decades of data. I will be accounting for data from 1971 to 2016. The reason for a start date of 1971 is because it is around this decade that many African countries gained independence from European colonies – e.g., the independence of Lesotho, Botswana, Swaziland, Zambia and Malawi from British rule in 1968.<sup>2</sup> By 1977, 54 African countries had seceded from European colonial rulers.<sup>3</sup> In addition, more data was available in the early 1970's than in the previous decade. The variables examined in

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<sup>2</sup> Ibid.

<sup>3</sup> "Decolonisation of Africa." *Wikipedia*, Wikimedia Foundation, 6 Apr. 2018, [en.wikipedia.org/wiki/Decolonisation\\_of\\_Africa](https://en.wikipedia.org/wiki/Decolonisation_of_Africa)

this study include growth of GDP per capita, peace/conflict dummy variable for each year, level of secondary education, and foreign direct investment in most sub-Saharan African countries. Observing these specific variables, I use regression analysis to determine the impact of conflict on the change of per capita GDP growth from 1971 to 2015.

The results concur with Colliers study for the earlier period. By first running a regression with just conflict year, then adding one more variables to each model, I have a regression output table with clear and concise results. When a country is experiencing conflict, the growth of the GDP per capita declines by 1.704 percentage points. This decline in GDP per capita growth is caused by many factors such as destruction of institutions, death of civilians, etc. I will outline more of these causes in detail later in this paper.

In a second model, secondary education enrollment rate is included. This education variable is lagged by 5 years to fully include those who attained a secondary education and contribute to the GDP. With the inclusion of this variable, the conflict dummy variable continues to indicate a drop in GDP per capita growth, this time by 1.150 percentage points. However, the secondary education variable itself was found to be insignificant. Model 3 includes the previous variables while also adding foreign direct investment (FDI) into the regression. FDI was significant, indicating a positive growth in GDP per capita with higher levels of foreign investment. Overall, the coefficients on education were significant, except for secondary education.

The following section will delve into the historical background of sub-Saharan Africa and will discuss why these regions of Africa stand where they are relative to the rest of the world. The data section then examines the process of collecting data and discusses the importance of each of the observed variables. After discussing the data, this thesis

provides a detailed breakdown of the regression analysis, including the regression steps as well as the implications of the results.

## II. Background: A History of Sub-Saharan Africa

Sub-Saharan Africa was not always in the state we find it in today. Historically, the region has been the site of many empires and kingdoms, including the Axum, Wagadu (Ghana), Mali, Nok, Songhai, Kanem-Bornu, Benin, and Great Zimbabwe (New World Encyclopedia 2015). However, with European interest in Africa increasing dramatically in the late 19<sup>th</sup> century, Africa was divided among the main powers of Europe. In the 1960's, sub-Saharan countries pushed for democracy and independence from the European colonies and protectorates as they aimed for equal status and more control over their political future, government, and natural resources. Historical legacies play a role in subsequent patterns of armed conflict. Most African countries left colonial dominance without armed conflict. The countries that had a violent struggle for independence were much more prone to conflict as independent states.<sup>4</sup> Today, sub-Saharan Africa is the poorest region in the world, still suffering from the legacies of colonialism, slavery, native corruption, economic policies dictated by international organizations, and inter-ethnic conflict.<sup>5</sup> Moreover, the region contains many of the least developed countries in the world.

There are a multitude of factors that can be correlated to sub-Saharan Africa's poverty, from disease to lack of education, etc. Many of these factors stem from a common source – conflict. In fact, Africa is the most conflict ridden region of the world and the only region in which the number of armed conflicts is on the rise.<sup>6</sup> Yet, while no African nation

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<sup>4</sup> “Armed Conflict.” *SIPRI*, Stockholm International Peace Research Institute, 2015,

<sup>5</sup> “Sub-Saharan Africa.” *Sub-Saharan Africa - New World Encyclopedia*, New World Encyclopedia, 23 Oct. 2015.

<sup>6</sup> “Armed Conflict.” *SIPRI*, Stockholm International Peace Research Institute, 2015.

has joined the ranks of the developed nations, the entire continent is not completely impoverished. There is also considerable variation in its wealth in countries such as South Africa and Ethiopia.

\*Table 1: Per capita GDP for different countries grouped by civil war and non civil war.

<b>Civil War</b>	<b>Sierra Leone (1991)</b>	<b>DRC (1994)</b>	<b>Liberia (1990)</b>	<b>Rwanda (1990)</b>
Per capita GDP in current \$U.S.	156.9951224	144.5206962	183.2892117	271.0814379
<b>Non-Civil War</b>	<b>Kenya</b>	<b>Burkina Faso</b>	<b>Botswana</b>	<b>Cameroon</b>
Per capita GDP in current \$U.S.	337.1221889	193.0702363	2750.950026	951.8882236

The figure above illustrates the difference in GDP per capita between two countries, accounting for civil war. The civil war countries are listed with the start date of a major civil war. Below this, the GDP per capita of the non-civil war countries are listed for that same year. Although there are many factors that contribute to the GDP per capita of a country, such as population and foreign investment, this table shows that sub-Saharan African countries experiencing civil war have significantly lower GDP per capita compared to those countries that did not experience civil war.

The poorest states are those engaged in or just emerging from civil wars, including the Democratic Republic of Congo, Sierra Leone, Burundi, and Somalia among others. The rise in conflict combined with recent concerns – AIDS pandemic, food and water shortages, gender inequality – have caused Africa’s economies to diverge from the growing

economies of the majority of the world. The world is developing quickly, but as Collier states, “the real challenge of development is that there is a group of countries at the bottom that are falling behind, and often falling apart” (Collier 2008). Collier further explains, “Africa has experienced a rising trend of conflict because its economies have performed so poorly both absolutely and relative to other regions” (Collier and Hoeffler 2002). Although this means a decreasing standard of living economically, the civil conflicts taking place in these sub-Saharan African countries also have a negative effect on the many societies. Rather than looking forward to new technological inventions and access to enriching resources, these societies are “dominated by individual fear of falling rather than hope coming from society-wide progress” (Collier 2008). Now, the question must be asked: how quickly are these African countries diverging from the rest of the developed world?

During the 1970s, the bottom billion diverged in growth from the rest of the developing world by 2 percent a year, accelerating to an astonishing 5 percent a year in the 1990s (Collier 2008). As Collier explains, the three decades from 1960 to 1990 illustrate one massive and accelerating divergence among the countries of sub-Saharan Africa (Collier 2008). Over the past five and a half decades, which my data largely focuses on, the average person in societies of the bottom billion have had incomes dramatically lower – around 1/6 – than that of the typical person in a developed country. What is being done on a global scale to help these poor countries grow?

Nowadays, there is a larger focus on poverty reduction than on GDP growth rates. There is financial assistance being received from every corner of the globe. Some U.S. development assistance programs such as the Millennium Challenge Corporation (MCC)

and the Africa Development Foundation (ADF) have shown lasting results in programs that stimulate local economies and reduce aid dependency – such as sustainable agriculture, youth entrepreneurship, and improved access to power.<sup>7</sup> In spite of the positive intentions and positive impacts of this foreign assistance, it has resulted in a certain sense of dependence among Africans. The aid programs have not necessarily been designed to encourage long lasting economic development. If taught proper business skills, the recipient African countries could use the aid to purchase goods and services from the same countries supplying the aid in the first place.

Much of this dependence can be attributed to the lack of consistent growth across the continent. In order to spur growth and counteract the divergence in income, African governments need to create the enabling environment to build prosperity in Africa through concrete priorities such as job creation, regional integration, and economic engagement.<sup>8</sup> One sector where Africa is dependent is trade. The current level of trade between African states is only 12 percent compared to 60 percent for Europe, 40 percent for North America, and 30 percent for the Association of Southeast Asian Nations (ASEAN), according to the World Trade Organization (WTO). The CFTA, though, would establish the world's largest single market and effectively boost trade between African states by 50 percent.<sup>9</sup> When combined with good governance and political stability, intra-Africa trade and deepening market integration will significantly increase economic growth, job creation, employment,

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<sup>7</sup> Kwemo, Angelle B. "Making Africa Great Again: Reducing Aid Dependency." *Brookings*, Brookings, 27 Apr. 2017.

<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

poverty reduction, inflow of foreign direct investment, industrial development, and better integration of the continent into the global economy.<sup>10</sup>

Another issue slowing growth within the continent of Africa is the growing population. Rapid population growth overstrains educational systems and local economies and can be a challenge to any government. In the past year the population of the African continent grew by 30 million.<sup>11</sup> By the year 2050, annual increases will exceed 42 million people per year and total population will have doubled to 2.4 billion, according to the UN.<sup>12</sup> Population growth is not necessarily bad, but the government must keep up. The reality is that as the size of any populace expands, governments must construct infrastructure space. Failure to do so results in per capita declines in living standards.<sup>13</sup> Taking this into account, this model observes GDP per capita growth rate as oppose to GDP growth rate since population is considered an important variable for gauging economic changes in times of civil conflict.

In this thesis, I examine the two decades following Collier's work, up to 2015, to indicate how far these countries have diverged in growth relative to the previous decades, and how civil war is affecting this decline. More specifically, to identify for shifts in GDP per capita growth rates across the majority of sub-Saharan African countries, the following section focuses on the specific implications that civil war and terrorism have recently and historically had on sub-Saharan Africa economies.

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<sup>10</sup> Ibid.

<sup>11</sup> Bish, Joseph J, and Director of Issue Advocacy at the Population Media Center. "Population Growth in Africa: Grasping the Scale of the Challenge." *The Guardian*, Guardian News and Media, 11 Jan. 2016.

<sup>12</sup> Ibid.

<sup>13</sup> Ibid.



## Conflict Traps

All societies used to be poor. With hard work, thrift, and intelligence, a society can gradually climb out of poverty, unless it gets trapped (Collier 2008). There are many development trap studies in academia. The trap this thesis focuses on is known as the *conflict trap*. Over the last 30 years, worldwide absolute poverty has fallen sharply from about 40% to under 20%.<sup>14</sup> But in African countries the percentage has barely fallen. Today, over 40% of people living in sub-Saharan Africa live in absolute poverty.<sup>15</sup> The majority of the economies of the sub-Saharan region are dependent on subsistence agriculture and the export of natural resources, such as coffee and metal. This reliance on the environment combined with the exploitation of resources is clearly something that cannot continue forever and is negatively impacting African economies. However, can this account for the immense levels of poverty being observed across the continent? To answer such a question, it is crucial to further examine what Collier terms as *conflict traps*.

Many countries have had civil wars at one time or another – the United States had one in the nineteenth century, Russia one early in the twentieth century, and Britain one back in the seventeenth – but, as these examples show, wars are not necessarily traps. However, given its colonization history, Africa is different. But first, it is imperative to indicate what factors are linked to civil war at the fundamental level.

The first link, as Collier and his colleague Anke Hoeffler suggest, is initial level of income. Put simply, low income indeed heightens the risk of civil war (Collier 2008). The

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<sup>14</sup> “Poverty.” *Our Africa*, [www.our-africa.org/poverty](http://www.our-africa.org/poverty).

<sup>15</sup> *Ibid.*

clearest evidence for this arises during colonialism when many countries experienced decades of enforced peace; the near-simultaneous decolonization of many countries with very different income levels provided a natural experiment for the effect of income on civil war (Collier 2008). Second, slow growth/stagnation/decline make a country more prone to breaking into civil war. As an approximation, a typical low-income country faces a risk of civil war of about 14 percent in any five-year period; each percentage point added to the growth rate knocks off a percentage point from this risk.<sup>16</sup> Many assumptions can be made to explain the phenomenon of low income and slow growth increasing the likelihood of civil war.

One assumption could be a nationwide sense of hopelessness. With such a scarcity of jobs, it is difficult for young men with minimal education to earn a living. A more extreme case is young men joining rebel groups for a sense of purpose and monetary compensation. Life itself is cheap, and joining a rebel movement gives these young men a small chance of riches (Collier 2008). On top of this, national low-incomes indicate a weak economy and weak state, making rebellion less difficult to achieve. Another factor that increases the risk of civil war for a given country is dependence upon primary commodity exports such as oil, cocoa, coffee, diamonds, metals, etc. Natural resources often times help to finance conflict and sometimes even help to motivate it, ie., conflict diamonds.<sup>17</sup>

Although the mentioned factors can give us information on the risk of civil war, they do not explain why these countries in sub-Saharan Africa are failing. The answer lies in the aftermath of the conflict. Most of the costs of civil war, perhaps as much as half,

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<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

accrue after the war is over. There is often a deterioration in political rights, schooling, and standard of living combined with an increase in disease and illiteracy rates. Generally, once a war has begun, the economic damage undoes the growth achieved during peace.<sup>18</sup>

A country such as the Democratic Republic of the Congo will need around half a century of peace at its rate of growth in 1990 simply to get back to the income level it had in 1960 (Collier 2008). With its low income, slow growth, and reliance on primary commodities, it is unlikely that the D.R.C or any country with these characteristics will have extended periods of peace. Not all countries like this fall into the conflict trap, but they are all prone to it (Collier 2008). Although many African governments continue to be dysfunctional, some have now substantially liberalized controls and improved service provision; however, since these improvements are recent, their effect on growth remains largely prospective.<sup>19</sup> The problem of civil war and its effects on Africa's economies is serious, but it is fixable.

There are a multitude of other factors to consider when determining a country's risk of future civil war. Whatever the factors may be, they all influence civil war and present a massive burden to the countries of sub-Saharan Africa. The risk of conflict differs according to economic characteristics, and the economic characteristics are affected by conflict.<sup>20</sup> In this thesis, I set up a model that predicts how the incidence of civil war, along with other factors, affect the GDP per capita growth across the sub-Saharan African region.

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<sup>18</sup> Ibid.

<sup>19</sup> Collier, Paul, and Jan Willem Gunning. *Explaining African Economic Performance*. University of Oxford 1998.

<sup>20</sup> Ibid.

### III. Data

The analysis for this paper draws from the World Bank Database. By filtering for all sub-Saharan African countries and the time frame of 1971 to 2015, I was able to find a sufficient amount of data for each of the four variables I consider. This differs from past works – specifically Collier’s *Bottom Billion* study which looks at years 1960 to 1990– in that my data extends two and half decades beyond Collier’s sample period. The World Bank Dataset is well-suited for this analysis because it is collected annually, making it possible to utilize more recent data. Moreover, the World Bank Dataset contains both growth rates along with levels of data. Furthermore, the World Bank Database has data spanning back many decades, to 1960. This was beneficial to my study since the data I am observing begins in the early 1970’s, which many other data sources did not include.

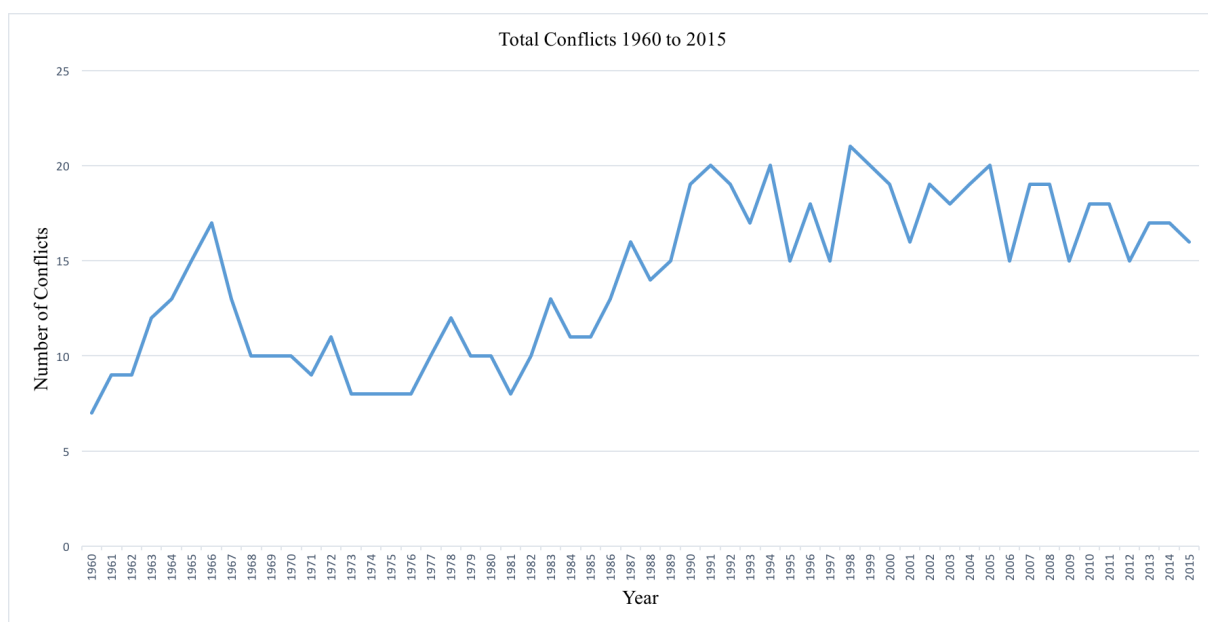
From the World Bank data, I obtained the necessary values for GDP per capita growth rate, secondary education enrollment rate, and FDI. For the peace/conflict variable, I created a dummy variable where 0 would equal peace time and 1 would equal a civil conflict. This study defines a civil conflict as: (a) military action was involved, (b) the national government at the time was actively involved, (c) effective resistance (as measured by the ratio of fatalities of the weaker to the stronger forces) on both sides, and d) at least 1,000 battle deaths resulted”.<sup>21</sup> All of these criteria must be met in order for the conflict dummy variable to equal 1. The reason for using these criteria is that they allow for more comprehensive data and include low-intensity armed conflicts as well as extremely deadly

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<sup>21</sup> Singer J.D. and M. Small (1982), *Resort to Arms: International and civil war, 1816 – 1980*, Beverly Hills, Ca: Sage

wars.<sup>22</sup> The acts of conflict observed in the study include only terrorism and civil war that meet the above four criteria. Figure 1 illustrates the sum of civil conflicts for many sub-Saharan African countries over five and a half decades. As seen, the majority of countries in this region of the world have experienced a rise in civil conflicts over the past five decades, and these conflicts are on the rise.

*Figure 1* Shows total occurrences of conflict when variable takes a value of 1



To gather this data, I searched for websites that had historical timelines, starting in the mid 20<sup>th</sup> century, of all the conflicts for a given country. Although time-consuming, this method of gathering data allowed me to narrow down the conflicts by year, and then by the number of casualties. This manual method of aggregating data helped ensure that the conflicts are legitimate and that they meet the aforementioned criteria.

<sup>22</sup> Ibid.

For the secondary education variable, it did not make sense to include current enrollment rate since those currently enrolled in secondary education do not have an impact on the GDP of a country. Although the enrollment rate of students in secondary education may have an effect on the probability of conflict in a given year, which would impact the per capita GDP growth rate, this study assumes that it is typically those who are working and out of school that impact the economy. To account for this, I lagged the enrollment of secondary education by 5 years; therefore, the data is now accounting for those who ended their secondary education 5 years prior to a given year.

Unlike many studies done on the economic impact of civil wars in Africa (e.g., Anyanwu 2002), this study sheds light on the role of education in African economies. While many previous studies focus on the incidence of civil war and aim to predict future civil conflicts, the study focuses more narrowly on the implications of these conflicts on the countries' per capita GDP growth. The variable added to explain the relationship between the education of each country's peoples and conflict is secondary education. This correlation between education and GDP per capita deserves more attention in this literature, as education has been largely undermined in poorer regions of the world. Many previous studies on this topic have emphasized foreign investment and other economic factors, whereas education provides a huge opportunity for growth and development in these impoverished regions.

There are, however, some limitations to the use of World Bank data. The main drawback is one that occurs across all databases, which is the lack of data on the African continent. Many sub-Saharan African countries gained independence as European colonies in the 1960's. With the task of having to implement new governments and restructure their

countries' institutions, it is no surprise that much data does not appear until the early 1970's. In addition, by observing the difference between *Table 4* and *Table 3* in the results section, it is clear that 21 countries are missing observations for secondary education; certain countries also have incoherent data for this education enrollment variable. One plausible reason for these gaps in data is that very few students continue on to secondary school. If they do enroll in secondary school, many students drop out for different reasons. Job prospects for most people in the developing world are poor, and staying in school past grade 5, or even through grade 10, does not improve them significantly.<sup>23</sup> In impoverished regions, the vast majority will not secure formal employment and will be supported primarily through subsistence level agriculture and trading.<sup>24</sup> Due to missing data, I am only able to include 27 countries in my study when including the secondary education variable.

Another limitation with the World Bank data is the lack of a conflict variable. In order to account for a civil conflict, I manually researched historical timelines of all countries in sub-Saharan Africa. Taking Collier's definition of a civil conflict into account (defined above) I created an excel spreadsheet with every country containing years 1971 to 2015, and labeled a peace year as 0 and a conflict year as 1. Rather than observing overall peace and conflict duration, I independently looked at each year to determine peace or conflict since the model is accounting for year-to-year GDP per capita growth rate. Although the World Bank did not include this data, I was able to form a comprehensive

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<sup>23</sup> Epstein, Mark J, and Kristi Yuthas. "Redefining Education in the Developing World (SSIR)." *Stanford Social Innovation Review: Informing and Inspiring Leaders of Social Change*, Stanford University, Dec. 2012,

<sup>24</sup> Ibid.

spreadsheet accounting for the years of peace and conflict for sub-Saharan African countries.

With the panel data obtained for all three independent variables, along with the GDP per capita growth rates as the dependent variable, I ran regressions to test the impact of civil conflict, FDI, and secondary education enrollment rates to determine their effects on the year-by-year change in GDP per capita growth rates.



## IV. Empirical Analysis and Results

Table 1 shows the regression analysis results. The coefficients illustrate the affect of the given variables on GDP per capita growth. All of the variables are significant, except for secondary education.

VARIABLES	(1)	(2)	(3)
	Model 1	Model 2	Model 3
Conflictyear	-1.704*** (0.391)	-1.150** (0.546)	-1.468** (0.582)
LagSecondaryedu		0.0119 (0.0136)	-0.0241 (0.0153)
logFDI			0.00606*** (0.00117)
Constant	1.575*** (0.310)	1.063* (0.549)	-8.221*** (1.951)
Observations	1,874	791	696
Number of CountryNum	47	27	27

In order to determine whether civil conflict plays a role in explaining GDP per capita growth rate, I estimate a linear probability regression model using cross sectional panel data as follows:

### *Models*

(1) *Basic Model:*

$$Y = \alpha + \beta Xit + \gamma Zit + \theta i + \rho t + \varepsilon i$$

(2) *Regression Model:*

$$growthGDPpc(t) = \alpha + B1(Conflict)t + B2(l5.Secondaryedu)t + B3(FDI)t$$

This study utilizes panel data by combining cross-sectional and time series data. The number of sub-Saharan African countries is the cross-sectional data, and is being examined alongside 44 years – 1971 to 2015. Panel data is advantageous since it provides multiple observations on each individual in the sample, allowing for the model to capture a larger number of observations. Moreover, panel data increases the degrees of freedom and reduces the collinearity among explanatory variables, hence improving the efficiency of econometric estimates.<sup>25</sup> The oft-touted power of panel data also derives from its theoretical ability to identify the effects of specific actions, treatments, or more general policies.<sup>26</sup> In this study, the model is able to determine the individual effect of three variables on GDP per capita growth rate.

The dependent variable used in this study is the relative year-by-year growth of GDP per capita (in percent). It is important to recognize GDP per capita as the growth rate as oppose to simply the level of GDP. The reason being that countries have different populations, resources, and other factors that individually affect the GDP.

*Table 2* Summary Statistics of GDP per capita growth

<b>Variable</b>	Obs	Mean	Std. Dev.	Min	Max
<b>growthGDPpc</b>	1,913	1.265027	7.678233	-50.23014	140.5011

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<sup>25</sup> Hsiao (2003), *Analysis of Panel Data*, Cambridge University Press

<sup>26</sup> Hurlin, Christophe. "Advanced Econometrics II." School of Economics and Management - University of Geneva. University of Orléans.

As seen above, the average growth rate of GDP per capita across all the sub-Saharan African countries observed is positive 1.26 percentage points. Percentage points represent the arithmetic difference of two percentages. Looking at percentage growth rates are relevant when we are thinking of “exits” from poverty, since small absolute changes may be enough to get people from below the magical \$1.25 line to just above it; however, they are still poor by global standards.<sup>27</sup> Moreover, as depicted in the *Table 2*, some countries experience as much as a 50% fall in per capita GDP growth rate. This number is large, but plausible, since civil conflict will further magnify the issues (AIDS, infant mortality, illiteracy) that are already hindering social and economic development in sub-Saharan Africa. Many developed countries do not have these pressing issues, so conflict has less of an impact on those economies than sub-Saharan African economies.

The right hand side of the regression model equation contains three independent variables measured over the years 1971 to 2015. The first coefficient is conflict year, which is observed as a dummy variable, 1 for conflict and 0 for peace.  $\beta_2$  is multiplied by secondary education. This specific variable is lagged by 5 years in order to account for a more realistic impact of the population on GDP. Those in secondary education do not have a direct impact on the economy. However, 5 years after graduation is a sensible timeframe for those who completed secondary education to implement their skills in the workforce. The third independent variable included in the regression analysis is foreign direct investment (FDI), which quantifies investments made by a company or individual in a country abroad.

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<sup>27</sup> McKenzie, David. “Let's Not Overstate the Achievements of China and India – Here Are the Real Growth Stars.” *Impact Evaluations*, 11 June 2012.

When running the regressions, the first step taken was to merge the different datasets for each variable in order to properly run regressions with the program used. The second step was to account for fixed effects. Accounting for fixed effects allows the group means to be fixed (non-random).<sup>28</sup> After having merged the datasets, it was important to decide how to present the regression results. As seen in *Table 1* above, three models are presented, where each subsequent model includes an additional variable.

Model 1 regresses the conflict year dummy variable against the growth GDP per capita. Analyzing the results, one notices the statistical significance of *Conflictyear* at the one percent level. A conflict in a given year is shown to decrease the per capita GDP growth rate by 1.704 percentage points, indicating the negative impact that civil conflicts have on these economies and societies.

Model 2 finds similar results regarding conflict, depicting a drop of 1.150 percentage points in GDP per capita growth when conflict occurs; this model also includes secondary education enrollment rate, lagged for 5 years. By including secondary education, this study attempts to find a relationship between enrollment rate of secondary education students and the growth of GDP per capita. Referring to *Table 1* above, *secondaryEdu*, is insignificant, even though it shows a positive impact on GDP per capita growth. The reason for including education in this model is that the kind of people most likely to engage in political violence are the young, the uneducated, and those without dependents (Collier 2008). Studies demonstrate that education can lift a country out of poverty and that education can contribute to a to a stronger middle class, civil society and rule of law; hence,

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<sup>28</sup> Ramsey, F., Schafer, D., 2002. *The Statistical Sleuth: A Course in Methods of Data Analysis*, 2nd ed. Duxbury Press

one would assume, a more peaceful society (McMahon 2003). In *Table 1*, adding *LagSecondaryedu* affects the response variable by lowering the impact of conflict on GDP per capita growth rate from 1.704 to 1.150 percentage points.

An explanation is that there are many other factors aside from secondary level of education that impact sub-Saharan African economies, such as agriculture, natural resources, and technology. These same factors also impact the enrollment rate of secondary education. For example, an increase in technology can provide schools with better resources and younger generations with new potential skillsets to learn. By providing students with more opportunities through secondary education, more young men will look to attain these useful skills and will be less likely to join rebel groups.

Model 3 includes *FDI* to gauge the effect of foreign direct investment on GDP per capita growth. Foreign direct investment net inflows indicate a positive impact on the economies of sub-Saharan African countries. The numbers in the FDI dataset are recorded in terms of actual level in current U.S. dollars for a given year. Taking the log of FDI and multiplying this by 100, the variable *logFDI* makes *Table 1* simpler to interpret. A 1% change in FDI is represented by a 1 unit change in log of FDI. Therefore, a positive .006 *logFDI* indicates a .006 percent increase in GDP per capita growth rate for each 1% change in FDI. By looking at the coefficient in this way, recognizing the dependent variable as growth rate and FDI in log form, the positive impact of FDI on the dependent variable becomes clear.

The reason for including FDI is to check whether investments made to a sub-Saharan African country positively impact the economy. Having more investments and abundant resources may sound like a benefit rather than a disadvantage. However, as Collier explains

in *The Bottom Billion*, with countries like Sudan and Somalia, even though natural resources are abundant and foreign aid is present, corrupt politicians and other leading authorities within the country are able to seize power and divide the spoils, making their economies more vulnerable.<sup>29</sup> However, what is found in this study is that FDI does in fact have a positive impact on growth of GDP per capita. When it comes to war-torn countries such as Rwanda, Congo, Somalia and Sudan, the conflict leads to a destroyed economy, damaged lives of innocent civilians, and political unrest. In countries with similar dilemmas, foreign direct investment provides capital to help spur infrastructure and industry growth.

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<sup>29</sup> Awanyo, Vanessa. "The Bottom Billion: Causes and Solutions." *The Borgen Project*, 4 Dec. 2017.

## V. Conclusion

In this study, I have applied an econometric model of civil conflict to analyze the incidence of conflict in sub-Saharan Africa – the only region which conflict has been on a rising trend.<sup>30</sup> Previous literature by Paul Collier focused on this complex relationship for the years 1960 to 1990. This study follows the methods adopted by Collier, but extends the dataset by examining years 1971 to 2015 to examine more recent trends in civil conflict and the effects this conflict has on sub-Saharan African economies.

The results of this study offers insight on both the impact of conflict and the influence of education and foreign direct investment on GDP per capita growth rate. The findings depict a strong relationship between conflict and FDI on GDP per capita growth, yet do not find a significant relationship between secondary education and GDP per capita growth. The discussion following the data section explains the reasons for using these specific variables and the impact they have on the GDP per capita growth of sub-Saharan African countries. With conflict and political turmoil constantly present in the majority of these sub-Saharan African countries, it is difficult to point to one factor that is causing this instability. Civil conflict, as shown in this study, is truly detrimental to the growth of a country's economy. Yet, how do these countries aim to maintain peace?

Government corruption is something that must be monitored and addressed. Even with increased foreign direct investment, much of this money is not properly allocated and often makes it way to rebel groups and the pockets of politicians. Also, there must be

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<sup>30</sup> Collier, Paul and Anke Hoeffler. *On the Incidence of Civil War in Africa*. Sage Publications, 2002.

increased unity among the continent. The majority of these countries were once colonized by Europe, causing fractionalization and differences within and between countries. Today, by focusing on establishing similar institutions and organizations, many neighboring countries have the ability to establish rapport among their governments, minimizing the possibility of intrastate and interstate conflict. Moreover, by policing the allocation of foreign investments, this money can be used to restructure the education systems in those countries with low literacy rate and minimal specialized skills. Africa is growing; its people are smart, bright, and becoming more aware of the technological growth happening within and outside the continent. With the proper policing of money (foreign investment and government capital), and further efforts towards inter-continent camaraderie, Sub-Saharan Africa's true potential can be untapped.



## VI. Appendix Tables and Figures

*Table 1*

\*GDP per Capita in USD for all sub-Saharan African countries, years 1971 to 2015

\*Current \$US

\*Attained from World Bank Database

Country Name	1971	1972	1973	1974
Burundi	72.12955294	69.63919255	85.04700015	95.41395105
Benin	112.5700891	134.8194079	161.9873737	174.0141491
Burkina Faso	84.28781501	99.32676402	113.7805843	124.3590305
Botswana	176.663797	222.46945	317.6646403	384.4187546
Central African Republic	108.0397857	121.1997304	140.0130735	142.4427623

*Table 2* Conflict dummy variable for all sub-Saharan African countries, years 1971 to 2015

Country Name	1971	1972	1973	1974
Angola	1	1	1	1
Burundi	0	1	0	0
Benin	0	0	0	0
Burkina Faso	0	0	0	0
Botswana	0	0	0	0
Central African Republic	0	0	0	0

*Table 3* Secondary education for many sub-Saharan African countries, years 1971 to 2015.

\*Enrollment Rate (% gross)

Country Name	1971	1972	1973	1974
Burundi	1.812440038	1.881800056	1.415230036	1.755959988
Burkina Faso	1.283669949	1.31716001	1.401350021	1.628149986
Central African Republic	4.412930012	5.387899876	6.084849834	6.62594986
Cote d'Ivoire	10.35836983	11.29491043	12.18095016	11.80152035
Cameroon	7.982419968	8.898830414	9.923540115	10.69795063

*Table 4* Foreign Direct Investment for many sub-Saharan African countries, years 1971 to 2015.

Country Name	1971	1972	1973	1974
Burundi	450000	150000	270000	x
Benin	1860000	2160000	7540000	6690000
Central African Republic	- 48157265.38	108207643.8	-553260283.6	6690000
Cote d'Ivoire	6940000	10510000	3410000	1630000
Cameroon	125670000	71720000	100250000	17920000

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