UNIVERSITI PUTRA MALAYSIA

WAR AND CONFLICT, AND THEIR RELATIONSHIP WITH EXCHANGE RATE VOLATILITY, GOVERNANCE AND BIODIVERSITY

YIEW THIAN HEE

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WAR AND CONFLICT, AND THEIR RELATIONSHIP WITH EXCHANGE RATE VOLATILITY, GOVERNANCE AND BIODIVERSITY

By

YIEW THIAN HEE

Thesis Submitted to the School of Graduate Studies,Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

June 2016

DEDICATION

To my loving father, mother, wife, children, sister, supervisor, lecturer and friends

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Doctor of Philosophy

WAR AND CONFLICT, AND THEIR RELATIONSHIP WITH EXCHANGE RATE VOLATILITY, GOVERNANCE AND BIODIVERSITY

By

YIEW THIAN HEE

June 2016

Chairman : Professor Muzafar Shah Habibullah, PhD
Faculty : Economics and Management

Armed conflict causes death and sufferings to the civilian population. Besides the loss of human lives and suffering of civilian population, armed conflicts have severe effects on social, economic and national politics. In the new global economy, the determinants of armed conflict have become important issues that are attracting the attention and focus of researchers. The purpose of this study is to investigate the relationship between armed conflicts and select economic factors such as exchange rate volatility, governance and biodiversity. Exchange rate volatility creates exchange rate risk that will affect international trade and may cause capital flight. This situation will lead to a slowdown of economic growth, increase economic hardship and poverty that will increase the risk of an armed conflict. However, the impact of exchange rate volatility on armed conflict is still vague. Using data from 74 developing countries with internal armed conflict from 1970 until 2012, this study applies logit, probit, pooled ordinary least square (POLS), negative binomial (NB), and hurdle models to estimate the impact of exchange rate volatility on armed conflict. The results suggest that higher exchange rate volatility increases the risk of armed conflict. This study also finds that slow economic growth, increase population, increase terrain ruggedness will increase the risk of armed conflict. In addition, the relationship between primary commodity export volatility with armed conflict is inverted *U*-shape. On the other hand, economists recognized that a country run with poor governance would encourage corruption and injustice that could develop widespread poverty. Consequently, citizens will come to bear with high grievances and the desire for redress, factors that could trigger armed confrontation with the incompetent government. To determine the impact of governance on armed conflict, this study employed data from 80 developing countries for the period 1996 – 2013 and applied logit, probit, POLS, NB, and hurdle models. The results of the study indicate that governance indicators such as voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption are negatively correlated with armed conflict. In other words, poor governance increases the risk of armed conflict. Lastly, this study investigates the impact of armed conflicts on biodiversity. Armies hunting for food

as well as extract forest produce from the forest in the combat zone could result in severe forest destruction, and enormous loss in biodiversity. In this study, the number of threatened species – plant, mammal, fish and bird species; was used to proxy for biodiversity loss. The results indicate that increase in armed conflict will have negative impact on the number of threatened plant and fish species as well as on biodiversity loss. In conclusion, the results of this study indicate that countries with good policy and good governance will reduce the onset of armed conflict and consequently will be able to mitigate biodiversity loss.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

KONFLIK DAN PEPERANGAN, DAN HUBUNGANNYA DENGAN KEMERUAPAN KADAR PERTUKARAN, TADBIR URUS DAN BIODIVERSITI

Oleh

YIEW THIAN HEE

Jun 2016

Pengerusi : Profesor Muzafar Shah Habibullah, PhD
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Konflik bersenjata menyebabkan kematian dan penderitaan kepada penduduk awam. Selain daripada kehilangan nyawa manusia dan penderitaan penduduk awam, konflik bersenjata memberi kesan buruk terhadap sosial, ekonomi dan politik negara. Dalam ekonomi global ini, penentu kepada konflik bersenjata merupaka isu penting yang memberi tarikan dan fokus kepada penyelidik. Tujuan kajian ini adalah untuk menyelidik hubungan di antara konflik bersenjata dengan faktor ekonomi terpilih seperti kemeruapan kadar pertukaran, tadbir urus dan biodiversiti. Kemeruapan kadar pertukaran menyebabkan risiko kadar pertukaran dan akan mempengaruhi perdagangan antarabangsa dan juga boleh menyebabkan larian modal. Keadaan ini membawa kepada pertumbuhan ekonomi yang perlahan, meningkatkan kepayahan dan taraf kemiskinan yang mana akan membawa kepada risiko konflik bersenjata. Walau bagaimana pun, kesan kemeruapan kadar pertukaran terhadap konflik bersenjata masih lagi kabur. Menggunakan data 74 negara membangun yang menghadapi konflik dalaman bersenjata dari tahun 1970 hingga 2012, kajian ini mengaplikasikan model logit, probit, kuasa dua terkecil terkumpul (POLS), binomial negatif (NB) dan hurdle, untuk menganggar kesan kemeruapan kadar pertukaran terhadap konflik bersenjata. Dapatan kajian mencadangkan bahawa kemeruapan kadar pertukaran yang tinggi akan meningkatkan risiko konflik bersenjata. Kajian ini juga mendapati bahawa pertumbuhan ekonomi yang perlahan, peningkatan jumlah penduduk, kawasan berbukit bukau akan meningkatkan risiko konflik bersenjata. Juga kajian ini mendapati bahawa hubungan di antara kemeruapan eksport komoditi utama dengan konflik bersenjata adalah berbentuk *U* terbalik. Di pihak lain pula, ahli ekonomi mengakui bahawa negara yang di tadbir urus dengan lemah akan menggalakkan rasuah dan ketidakadilan yang mana akan membawa kepada kemiskinan yang lebih meluas. Untuk menentukan impak tadbir urus terhadap konflik bersenjata, kajian ini menggunakan data 80 negara membangun untuk jangkamasa 1996-2013, dan mengaplikasi model logit, probit, POLS, NB dan hurdle. Hasil kajian mendapati bahawa petunjuk tadbir urus seperti suara dan akauntabiliti, kestabilan politik dan ketiadaan keganasan, keberkesanan kerajaan, kualiti kawal

selia, peraturan perundangan dan kawalan rasuah adalah berkolerasi negatif dengan konflik bersenjata. Dalam lain perkataan, tadbir urus yang lemah meningkatkan lagi risiko konflik bersenjata. Akhir sekali, kajian ini menyiasat kesan konflik terhadap biodiversiti. Tentera bersenjata yang mencari makan dari hasil keluaran hutan dalam zon pertempuran akan menyebabkan kemusnahan hutan seterusnya membawa kepada kerugian besar biodiversiti. Dalam kajian ini, jumlah spesis terancam seperti jumlah spesis tumbuhan, mamalia, ikan dan burung terancam; di gunakan untuk mengukur kerugian biodiversiti. Hasil kajian menunjukkan bahawa peningkatan konflik senjata memberi impak yang negatif terhadap jumlah spesis tumbuhan dan ikan dan juga kerugian biodiversiti. Kesimpulannya, hasil kajian ini menunjukkan bahawa negara yang mengamalkan dasar yang baik dan tadbir urus yang baik dapat mengurangkan permulaan konflik bersenjata dan seterusnya akan mengurangkan kerugian biodiversiti.

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I certify that a Thesis Examination Committee has met on 13 June 2016 to conduct the final examination of Yiew Thian Hee on his thesis entitled "War and Conflict and their Relationship with Exchange Rate Volatility, Governance and Biodiversity" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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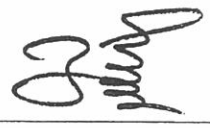

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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I hereby confirm that:

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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Name of Member of Supervisory Committee: Associate Professor Dr. Law Siong Hook

Signature: _____
Name of Member of Supervisory Committee: Associate Professor Dr. Wan Azman Saini Wan Ngah

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AL	Agricultural land
ACD	Armed conflict dummy
ABDHL	Average battle death high and low
BD	Bird species threatened
CAR	Central African Republic
CC	Control of Corruption
CR	Critically Endangered
CDF	Cumulative distribution function
DRC	Democratic Republic of the Congo
DFID	Department for International Development
EN	Endangered
EKC	Environmental Kuznets curve
EITI	Extractive Industries Transparency Initiative
FIS	Fish species threatened
GDP	Gross domestic product
GDPPCG	Gross domestic product per capita growth
GARCH	Generalized autoregressive conditional heteroskedasticity
GMM	Generalized method of moments
GPPAC	Global Partnership for the Prevention of Armed Conflict
GE	Government Effectiveness
HM	Hurdle model
INSTB	Instability
INSCR	Integrated Network for Societal Conflict Research
IUCN	International Union for Conservation of Nature
LF	Likelihood function
MM	Mammal species threatened
ML	Maximum likelihood
MDG	Millennium Development Goals
NB	Negative Binomial
OLS	Ordinary least squares
OECD	Organisation for Economic Co-operation and Development
PARDL	Panel autoregressive distributed lags
PRIO	Peace Research Institute Oslo
PLN	Plant species (higher) threatened
PM	Poisson model
PSV	Political Stability and Absence of Violence/Terrorism
POL	Polity
POL2	Polity squares
PP	Population
SXPV	Primary commodity export volatility
SXPV2	Primary commodity export volatility square

RER	Real exchange rate
RERV	Real exchange rate volatility
RQ	Regulatory Quality
RUG	Ruggedness
RL	Rule of Law
RP	Rural population
SP	Social polarization
TB	Total of biodiversity threatened
UNICEF	United Nation Children's Fund
UNEP	United Nations Environment Programme
UNSTATS	United Nations Statistic Division
UCDP	Uppsala Conflict Data Program
VA	Voice and Accountability
VU	Vulnerable
WGI	Worldwide Governance Indicators
ZTNB	Zero Truncated Negative Binomial

CHAPTER ONE

INTRODUCTION

1.1 Introduction

It is becoming increasingly difficult to ignore the civil wars that occur in the world. Civil wars have become a global phenomenon and a major world problem[1]. Besides being the main cause of battle-related deaths, civil wars cause untold sufferings to the civilian populations and can destabilize regions with social and political repercussions that can ripple beyond the borders of the war state. The number of civil wars has increased steadily after World War II ended in 1945. They are more common than international wars[2]. In the mid-1990s, civil wars affected close to one quarter of all countries in the world (Humphreys, 2003). Collier et al. (2009: 1) reveal that "Once started, civil wars are hard to stop: they persist for more than ten times as long as international wars". Civil wars will lead to more victims now compared to the past.

Civil war is a type of armed conflict. According to Uppsala Conflict Data Program (UCDP)/ Peace Research Institute Oslo (PRIO) (2013: 1), the definition of armed conflict is "a contested incompatibility that concerns government and/or territory where the use of armed conflict force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in one calendar year". Armed conflicts are divided into four types, namely extrasystemic, interstate, internal (civil war) and internationalized internal, which are described as follows:

1. Extrasystemic armed conflict happens between a state and non-state group outside its own territory. These conflicts are by definition territorial, since the government is fighting to retain control of a territory outside the state system. An example of extrasystemic armed conflict is the Angolan war of independence in which the people of Angola fought against Portugal, their imperialist ruler, from 1961 until 1974 (Lacina, 2009);

2. Interstate armed conflict occurs between two or more states. For instance, interstate armed conflict occurred between Iran and Iraq in 1974 (Lacina, 2009);

[1] This discussion is adopted from Themner and Wallensteen (2013).

[2] Civil war is an internal armed conflict which occurs between the government of a state and one or more internal opposition group(s) without intervention from other states. International war is known as internationalized internal armed conflict happening between the government of a state and one or more internal opposition group(s) with intervention from other states on one or both sides.

3. Internal armed conflict occurs between the government of a state and one or more internal opposition group(s) without intervention from other states as in the case of the internal war between the government of Nepal and the Nepali congress from 1960 until 1962 (Lacina, 2009);

4. Internationalized internal armed conflict is a war fought between the government of a state and one or more internal opposition group(s) with intervention from outside powers on one or both sides. The Laotian Civil War between the government of Laos and the Communist Pathet Lao demonstrates an example of this type of conflict: the 2 warring parties received external support from the United States and North Vietnam respectively during 1960 until 1973 (Lacina, 2009).

Armed conflicts are also differentiated by the level of violence which is measured by the fatality numbers. Minor conflicts produce more than 25 battle-related deaths while conflicts that cause more than 1000 battle related deaths in a calendar year are considered as wars[3].

The common definition of civil war is based on 2 basic criteria. First, the warring factions must be from the same country and fighting within the boundaries of the state for the control of the political centre, a separatist state or to force for a major policy change. Second, at least 1,000 human lives must have been lost in a year. Except for interstate armed conflicts, all the other 3 types described above and subject to the cumulative fatalities in a year, are civil wars (Collier et.al, 2006). The UCPD/PRIO uses a low threshold of 25 battle-related deaths per year to consider any internal armed conflict as a civil war.

Figure 1.1 provides a summary of the occurrence of each of the 4 types of armed conflicts for the period 1946 – 2012. Figure 1.1 shows that interstate wars were on a gradual decline. In the later half of the 2000s, no incidence of armed conflict between different sovereign states was recorded. However a few flare-ups emerged since 2010. Extrasytemic armed conflicts which are essentially wars of independence fought between the colonial territories and the imperialists, have stopped since the mid-1970s. However the number of internal and internationalized internal armed conflicts climbed sharply throughout the 1960s, 1970s, and 1980s. The highest number of armed conflicts was recorded in 1992 where there were 53 cases. Since then, the number has been on a down trend, decreasing to 32 cases in 2012, down from 37 in 2011. There were eleven armed conflicts listed in 2011 which ended in 2012. However, three new flare-ups emerged in 2012, one each in India (Garoland), Mali and Sudan (Themner and Wallensteen, 2013). Moreover, three previous conflicts in Central African Republic (CAR), Democratic Republic of the Congo (DRC) and Mali (Azawad) restarted with new rebel groups in 2012.

[3] The definition of "minor" and "war" are based on the UCDP/PRIO (2013) armed conflict dataset codebook (Version 4).

Nevertheless, most of the armed conflicts were considered "minor" because the fatality figures were between 25 and 999 battle-related deaths in a given year. Nonetheless these conflicts cannot be ignored for they may be minor in terms of direct fatalities, they could have disastrous impacts including on society and economic development. In 2012, there were six civil wars on-going worldwide, namely in Pakistan, Syria, Sudan, Somalia, Yemen, and Afghanistan. Together these wars caused a total of 60,260 (high estimate) battle related deaths in 2012.

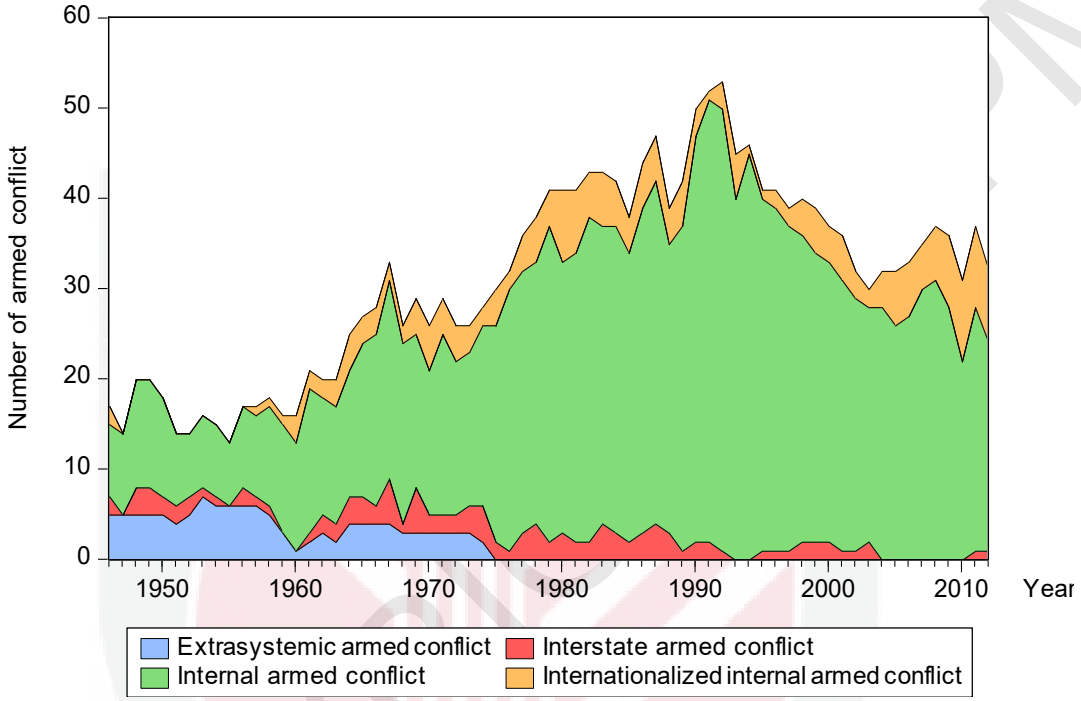

Figure 1.1: Number of armed conflict by type from 1946 until 2012

Sources: Gleditsch et al. (2002) and UCDP/PRIO (2013).

1.2 Number of armed conflicts by regions from 1946 until 2012.

UCDP/PRIO (2013) Armed Conflict Dataset provides data on the number of armed conflicts by region. Figure 1.2 shows the details for the period between 1946 and 2012.

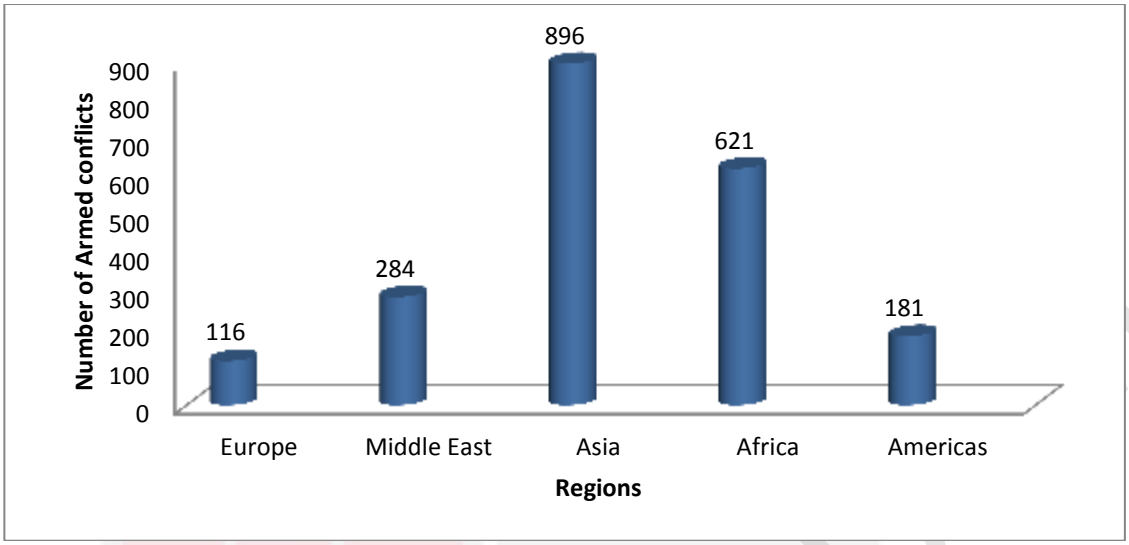

Figure 1.2: Number of armed conflicts by region from 1946 until 2012.

Sources: Gleditsch et al. (2002) and UCDP/PRIO (2013).

During this period Asia recorded the highest number of armed conflicts with 896 cases, followed by the African continent 621 cases. Outbreaks of armed conflict during this same period in other world regions are 284 cases in the Middle East, 181 in the Americas and 116 in Europe. Generally, the Asian region experienced more violence than other regions. Looking beyond these numbers of armed conflicts, the consequences of these violent acts of war are a more important issue. In the following section, this study discusses the consequences of armed conflicts.

1.3 The consequences of armed conflicts

Civil wars have profound political, social and economic consequences. In view of the devastating impact and wide spread repercussion, there is increasing critical attention on the consequences of armed conflicts from academic researchers and policy makers alike. Stubbs (1999) indicated that armed conflicts have severe effects on social, economic and politics and very succinctly describes the phenomenon:

"These effects include widespread loss of life, forced migration, social and political dislocation, greatly diminished capacity of the institutional state and even its total destruction, severe shortages of essential commodities such as food and fuel, the destruction of economic infrastructure and productive capacity and in the worst cases breakdown of the economy and collapse of the debt-ridden state. Of course, all of these effects may combine to lead to civil war or revolution which may perpetuate the downward spiral of social, economic, and political disintegration". Stubbs (1999:339)

One of the most significant current discussions on the consequences of armed conflicts is the effect on economic growth. Armed conflicts disrupt economic development, leading to under-development, perpetuating poverty and lack of growth in a country (Murshed, 2007).Collier (1999) found that armed conflicts reduce growth rate of gross domestic product (GDP) by 2.2%, damaging growth through five channels namely, destruction, disruption, diversion, dis-saving, and portfolio substitution. Furthermore, chaos and instability will cause the flight of assets such as human, physical and financial capital out of the country. This scenario could lead to the collapse of the country, both economic and social, in addition to the entrenchment of poverty in the state.

Messer and Cohen (2004) argued that armed conflicts would lead to the destruction of food system. Fighting and violence damage farm crops and disrupt farming activities, resulting in depressed food production. For example, armed conflicts caused the damage of "$120 billion worth of agricultural production" in Africa from mid-1960 to 2000 (Messer and Cohen, 2004: 3).This could result in a wide spread scarcity of food, causing hunger and starvation to the population. Guha-Sapir and Gomez (2006) found that armed conflicts could lead to severe malnutrition among the people. This finding is corroborated by the results of Bruck (2006:33) which concluded that "39% of all children under 3 years of age were moderately or severely underweight" in northern part of Mozambique after 5 years of civil war.

Armed conflicts have strong negative impact on education enrolment and education expenditure. Lai and Thyne (2007) in their study on states embroiled in civil war during the period 1980 – 1997, concluded that conflicts result in decrease in education enrolment and education expenditure in these states. The average drop in education expenditure during the period of civil war was an annual 3.1% - 3.6%. In addition, persistent civil strife weakens the capacity of governments to provide social services to their citizens.

Several studies reveal that civil wars cause increase in infant mortality (Ammons, 1996; Stewart et al., 1997; and Davis and Kuritsky, 2002). Davis and Kuritsky (2002) found that countries involved in civil war have 10% higher average infant mortality rates compared to non-conflict countries. Additionally, Gates et al. (2012) found that armed conflicts increase infant mortality by 10% in conflict countries.

Armed conflict indirectly increases the displacement of people who are then expose to new risks such as diseases, in new locations of accommodation. Ghobarah et al. (2003:192) sum up the situation:

"epidemic diseases such as tuberculosis, measles, pneumonia, cholera, typhoid, paratyphoid, and dysentery- are likely to emerge from overcrowding, bad water and poor sanitation in camps, while malnutrition and stress compromise people's immune systems".

Degomme and Guha-Sapir (2010: 297) investigated the pattern of mortality rates in the Darfur conflict. They found that "more than 80% excess deaths were not a result of violence" but from an increased spread of diseases which had also raised the infant mortality rates.

Civil wars also limit the population's access to adequate safe water. Gates et al. (2012) found that armed conflicts affect about reduced 1.8% of the population from access to potable water. Armed conflicts have clear detrimental effects on the livelihood of the people leading to escalating poverty and hunger. Parallel with the findings of earlier research works, the results of their study also shows that civil war causes a reduction in the enrolment in primary education and increase in child mortality.

Ghobarah et al. (2003) concluded that civil conflicts reduce the efficiency of public health resources. During wartime, transportation infrastructure such as road, bridges, railroad systems, communications and electricity face destruction and disruption. The degradation of state apparatus weakens the ability of the state to provide clean water, food, medicine, and relief supplies to the local populace as well as refugees. Overall, armed conflict would eventually destroy the social, political and economic institutions in the country (Gate et al., 2012).

1.4 The cost of armed conflicts

Besides the loss of human lives, the economic costs of civil wars are massive. Recent investigators had examined the cost of armed conflicts. Using data on 161 countries, Collier and Hoeffler (2004b) estimated the average costs of armed conflicts in low-income countries from 1960 until 1999. They investigated the cost in the conflict country, the cost in the neighbouring countries, and conflict trap effect. Table 1.1 indicates the estimated average costs of armed conflicts in low-income countries.

Table 1.1: Estimated average cost of armed conflicts in low-income countries.

Type of costs	Approximate costs (share of initial GDP, percent)[a]	Approximate costs (US$ billions)
Economic costs (the loss of GDP) in the conflict country	105	
Economic costs (the loss of GDP) in the neighbouring country	115	
Military expenditure (the diversion of government spending to the military) in the conflict countries	18	
Military expenditure (the diversion of government spending to the military) in neighbouring countries	12	
Total average military and economic costs to the region	250	49[b]
Health costs to the conflict-affected country		5
Subtotal (military, economic and health cost)		54
Conflict trap effect		10.2
Total cost		64.2

Sources: Collier and Hoeffler (2004b).

a. Initial GDP is gross domestic product just before armed conflict.
b. The estimate is based on an average GDP of $19.7 billion in conflict-affected low-income countries.

At the national level, the costs of armed conflicts results in decreased economic growth. According to Collier and Hoeffler (2004b), one year of armed conflict leads to a decrease of 2.2% of a country's growth rate and a 105% decrease in the GDP.

With the diversion of national resources to increase military spending, funding for social welfare and development would be compromised. Collier and Hoeffler (2004b) found that welfare of the population would decrease because of higher military spending during and after the war. The present value of the estimated military expenditure in the conflict countries was about 18% of GDP. Armed conflicts have a cruel effect on human health and they found that the economic cost of this aspect was around US $5 billion.

Economic costs of armed conflicts transcend national boundaries. At the regional level, Collier and Hoeffler (2004b) found that neighbouring countries to a war state incur economic losses of a staggering 115% of their GDP and also increase military expenditure up to 12% of GDP. In total, a single civil war can result in military spending of US$49 billion by the conflict state and its neighbours combined,

equivalent to 250% of their GDP. In addition, there is a loss of US$5billion on the health cost bill.

Conflict trap is a phenomenon in which countries that had just experienced a civil war are more likely to have further conflict (Hoeffler, 2008).Using data from 21 countries from 1965 until 1999, Collier and Hoeffler (2004b) found that conflict risk averaged 22.3% over the five years before the war. However, conflict risk increases to 38.6% in post-war. They pointed out that an expenditure of US $10.2 billion over a period of 15 years is needed to recover the risk to pre-war level. In other words, the economic cost of a conflict trap effect was US $10.2 billion. In total, national and regional costs of a single civil war add up to US $64.2 billion.

1.4.1 Military spending on armed conflicts

The allocations of government spending on armed conflicts have become an important issue while military spending on armed conflicts has drawn much academic interest. According to Fjelde and De Soysa (2009), government expenditure might have a strong effect on inducing peace. And high level of expenditure might lower the risk of civil conflicts. However, some public expenditure, including military spending, does not serve redistributive or welfare goals (Burgoon, 2006). Moreover, military expenditure still affects the social rights of citizens.

Military spending to procure expensive defense arms and equipment, ammunitions and provide training to the army is becoming a huge expenditure for governments. Large military spending budget and focus on training might lead to large portion of the population equipped with military skill (Hewitt et al., 2012). In addition, fire arms or military equipment would likely become more commonly available and diffused throughout the country.

As shown in Table 1.2, the total military cost of U.S. major wars from 1775 until 2010 reached US $7,966,112 million. Vast sum of money was spent for each episode of military conflict. The highest military expenses were incurred in World War II, reaching a total amount of US $4,104 billion over the period1941 - 1945. The second highest in terms of military cost was the war in Iraq (2003 – 2010) which reached US $784 billion and third is the US$738 billion spent in the Vietnam War (1965 – 1975). This is followed by the Korean War and World War I which incurred cost of US $341 billion and US $334 billion in military expenditure respectively. Table 1.2 indicates that wars from 1775 until 2010 cost the U.S. billions of dollars.

Table 1.2: The cost of major U.S. wars from 1775 until 2010

	Years of war spending			Years of war spending	
	Total military cost of war in millions/billions of dollar	Top 5 military cost		Total military cost of war in millions/billions of dollar	Top 5 military cost
American Revolution	**1775-1783**		**World War II**	**1941-1945**	Top 1
Current year $	101 million		Current year $	296 billion	
Constant FY2011$	2,407 million		Constant FY2011$	4,104 billion	
War of 1812	**1812-1815**		**Korea**	**1950-1953**	Top 4
Current year $	90 million		Current year $	30 billion	
Constant FY2011$	1,553 million		Constant FY2011$	341 billion	
Mexican War	**1846-1849**		**Vietnam**	**1965-1975**	Top 3
Current year $	71 million		Current year $	111 billion	
Constant FY2011$	2,376 million		Constant FY2011$	738 billion	
Civil War: Union	**1816-1865**		**Persian Gulf War[b]**	**1990-1991**	
Current year $	3,181 million		Current year $	61 billion	
Constant FY2011$	59,631 million		Constant FY2011$	102 billion	
Civil War: Confederacy	**1861-1865**		**Iraq[a]**	**2003-2010**	Top 2
Current year $	1,000 million		Current year $	715 billion	
Constant FY2011$	20,111 million		Constant FY2011$	784 billion	
Spanish American War	**1898-1899**		**Afghanistan/ Other[ac]**	**2001-2010**	
Current year $	283 million		Current year $	297 billion	
Constant FY2011$	9,034 million		Constant FY2011$	321 billion	
World War I	**1917-1921**	Top 5	**Total Post-9/11-Iraq, Afghanistan/Other[d]**	**2001-2010**	
Current year $	20 billion		Current year $	1,046 billion	
Constant FY2011$	334 billion		Constant FY2011$	1,147 billion	

Source: Daggett (2010).

a. Totals for post-9/11 operations include all funds appropriated through the enactment of FY2010 appropriations plus $33 billion in requested additional supplemental appropriations for FY2010. Totals are for activities of the DOD only and do not include costs of reconstruction assistance, diplomatic security, and other activities by other agencies. Figures for post-9/11 costs are for budget authority—all other figures are for outlays.

b. Most Persian Gulf War costs were offset by allied contributions or were absorbed by DOD. Net costs to U.S. taxpayers totaled $4.7 billion in current year dollars. Source: **"**Department of Defense Annual Report to Congress for Fiscal Year 1994," January, 1993.

c. Reflects funding for "Operation Enduring Freedom," the bulk of which is for operations in Afghanistan but which also includes amounts for operations in the Philippines, the Horn of Africa, and other areas.

d. Based on data available from DOD, CRS is not able to allocate $5.5 billion, in current year dollars, in FY2003 by mission. That amount is included here in the total for all post-9/11 operations. The total also includes $28 billion, in current year dollars, for enhanced security at domestic U.S. military bases from FY2001-FY2009.

Military expenditure on wars means there are opportunity costs for governments as the military spending could be used for other public expenses, such as education and public health. Taydas and Peksen (2012) argued that government spending on welfare contributes to sustaining peace as the provision of social services decreases grievances by offsetting the effects of poverty and inequality in society. According to Lanjouw et al. (2001), social services such as education and health would bring positive externalities for the society. Further, Lanjouw et al. (2001) found that education and health are crucial for the poor since education and health would improve quality of life and wealth of the society. Moreover, welfare spending might increase the standard of living of the citizens (Taydas and Peksen, 2012). If government decreases military spending, more resources would be made available to increase other public spending. Accordingly, this will bring positive effects on the quality and quantity of the other public sectors which will bring about improvement in the welfare of the people. On the other hand, when the government increases military spending, this may necessitate the reduction in public spending in other sectors such as social spending, rural development and maintenance work. Consequently, the progress and welfare of the people will be affected.

1.5 The impact of armed conflict on battle deaths[4]

Armed conflicts have a severe effect on mortality. The impact of armed conflicts produces heavy damage in the loss of human lives (Collier, 2000). In other words, armed conflicts directly increased battle deaths. Specifically, the PRIO defines "battle deaths as deaths resulting directly from violence inflicted through the use of armed force by a party to an armed conflict during contested combat". Figure 1.3 provides estimates of annual battle fatalities from 1946 until 2008. The escalating trend of total battle deaths in late 1940s and early 1950s is alarming as a result of the massive fatalities caused by the various military wars: the Chinese civil war killed 2 million people from 1946 to 1949; Greek civil war caused 160,000 deaths from 1946 to 1949; the Korea War destroyed 1.5 million human lives from 1949 to 1953; and the French-Indochina war in Vietnam killed 600,000 people from 1946 to 1954. Total battle deaths witnessed a reversal to the up-trend again in the late1950s and early 1960s because of the Algerian war of independence (1954 – 1962) which killed 443,453 people and the Vietnam War (1955 – 1964) that took the lives of 523,259 people. The trend in total battle deaths increased sharply in 1968, 1971, 1972 and 1974 because the second Vietnam War caused a cumulative fatal count of 4,635,527 people during the period 1965 to 1975. The trend of total battle deaths started to decrease after the second Vietnam War.

[4] This discussion is adopted from Lacina and Gleditsch (2005).

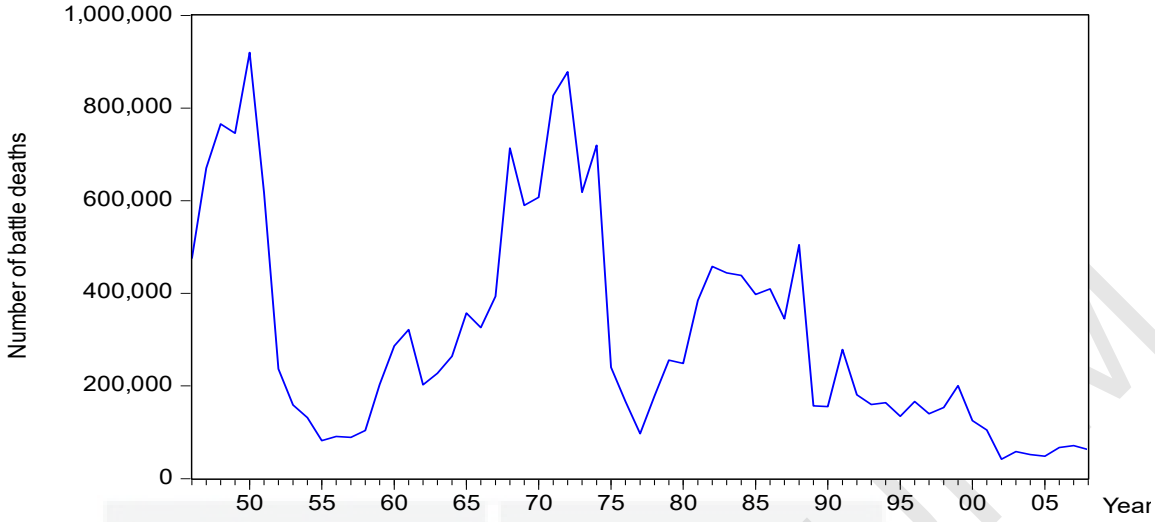

Figure 1.3: Estimate of annual battle fatalities from 1946 until 2008.

Sources: Lacina and Gleditsch (2005) and Lacina, (2009b).

In 1978, total battle deaths started to climb again due to the combined impact of the Cambodian civil war (1978 - 1998) that killed 217,200 people and the civil war in Afghanistan and Soviet invasion (1978 to 2001) which cause the loss of 804,073 human lives.

During the decade of the 1980s, total battle deaths increased significantly because of the out-break of war in Iran and Iraq which caused a total of 1,250,000 deaths during 1980 – 1988. With the end of the Iran-Iraq war, world battle death toll dropped significantly. Nevertheless, the trend began to pick-up again in 1991 because the conflict in Iraq resulted in the Persian Gulf War that killed 44,271 people from 1990 and 1991. The ensuing few years saw a general steady level of battle deaths until 1991, when civil war erupted in Eritrea that killed 350,000 people from 1964 to 1991. Other later conflicts are the Taliban conflict in Afghanistan that killed 24,250 people from 2003 to 2008; the invasion of Iraq by the United State of America, the United Kingdom, Australia during the civil war in Iraq during 2004 to 2008, which resulted in the deaths of 124,002 people and also the conflict in Sri Lanka from 2003 to 2008 that killed 20,129 people. In summary a total of almost 20 million human lives were lost worldwide due to armed conflicts over the period 1946 – 2008. Incidentally, armed conflicts induce demographic changes and affect population growth rates.

Table 1.3: Battle deaths as a result of armed conflicts

Armed conflicts	Years	High estimate of battle deaths	Top 10 battle death
Chinese Civil War	1946-1949	2,000,000	Top 2
Greek Civil War	1946-1949	160,000	
Korea War	1949-1953	1,500,000	Top 3
French-Indochina War in Vietnam	1946-1954	600,000	Top 6
Algerian War	1954-1962	443,453	Top 8
Vietnam War	1955-1964	523,259	Top 7
Eritrea Civil War	1964-1991	350,000	Top 9
Vietnam War	1965-1975	4,635,527	Top 1
Cambodia Civil War	1978-1998	217,200	Top 10
Afghanistan Civil War	1978-2001	804,073	Top 5
Iran and Iraq War	1980-1988	1,250,000	Top 4
Persian Gulf War in Iraq	1990-1999	44,271	
Taliban conflict in Afghanistan	2003-2008	24,250	
Sri Lanka War	2003-2008	20,129	
Iraq War	2004-2008	124,002	

Sources: Lacina and Gleditsch (2005) and Lacina, (2009b).

Table 1.3 indicates that most of the armed conflicts have occurred in low income countries. According to Collier and Hoeffler (2004b), poor infrastructure and shortage of medical service in these impoverished countries induce armed conflict related fatalities. This phenomenon is supported by the shockingly high fatal casualties caused by the Vietnam war. It was a tragic war in which more than 4million battle deaths were recorded over the period 1965 – 1975. These were followed by battle deaths in the Chinese civil war, Korean war, Iran and Iraq war, Afghanistan civil war, French-Indochina war in Vietnam, 1955 – 1964 Vietnam war, Algerian war, Eritrea civil war, and the Cambodian civil war.

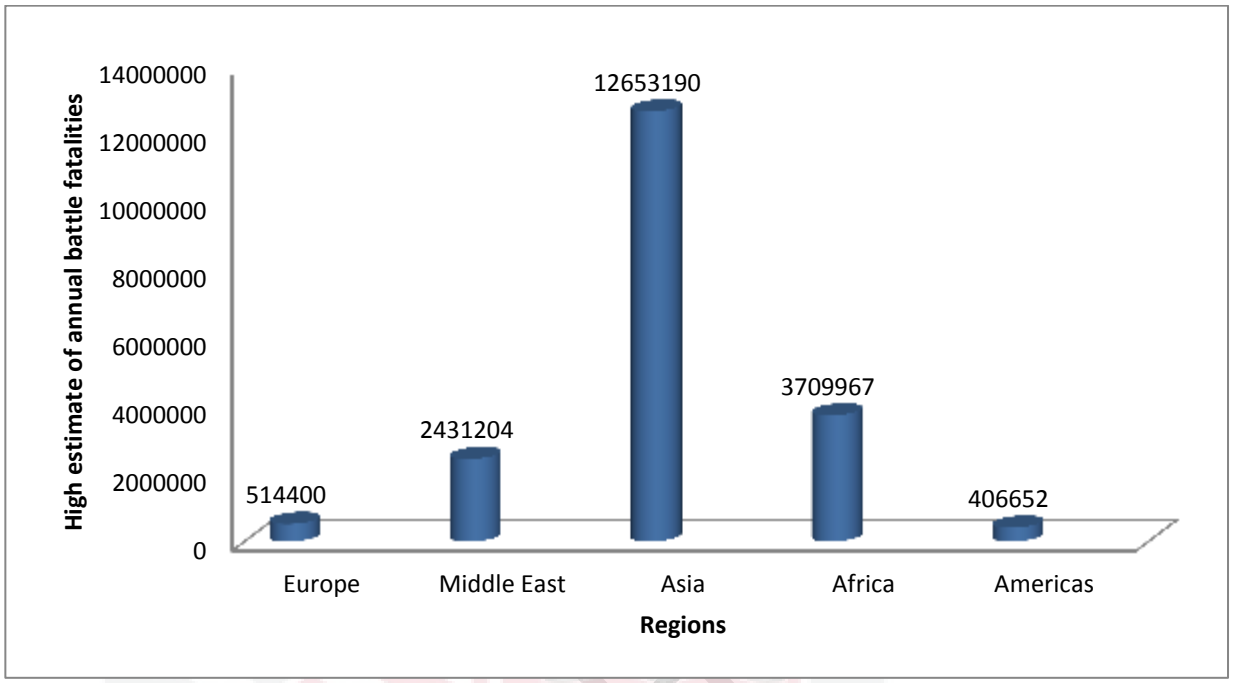

Figure 1.4: Estimates of annual battle fatalities by regions from 1946 until 2008.

Sources: Lacina and Gleditsch (2005) and Lacina, B. (2009b).

Figure 1.4 shows the estimate of battle fatalities annually by regions from 1946 until 2008. The highest battle fatalities were in the Asian region which recorded a total of 12,653,190 battle deaths. Apparently Asia is "deadlier" than the other regions. The African continent recorded the second highest number of batter deaths (3,709,967) over the same period, followed by Middle East (2,431,204), Europe (514,400) and the Americas (406,652). Murray et al. (2002) found that male and female of age 15-29 were most likely to be killed in military conflicts while women constituted nearly a quarter of fatality figures. Loss of human lives is one of the profound consequences of armed conflicts. And there are multiple other direct and indirect disastrous impact on society. Armed conflicts are increasingly recognised as serious global problems. Hence sustained attention and research to understand their various dimensions that would lead to the prevention of armed conflicts are imperative. Therefore what are the determinants of armed conflicts? In the next section, this study discusses the major factors that trigger armed conflicts.

1.6 The major determinants of armed conflicts

In the new global economy, armed conflicts have become a central issue for the world. It is recognized that low income countries with slow economic growth are most likely to experience internal armed conflicts. There is a close relationship between economic growth and armed conflict. Figure 1.5 shows the relationship between wealth of a nation and the probability of observing a new conflict derived

from World Bank econometric models. The probability of having a new conflict reduces from 15% to 6% when the gross domestic product (GDP) per person increases from $250 to $750. This illustrates the negative relationship between wealth of a nation and the probability of observing a new conflict. When GDP per person reachesUS$5000, the probability of conflict occurrence reduces to less than 1%, with all else being equal.

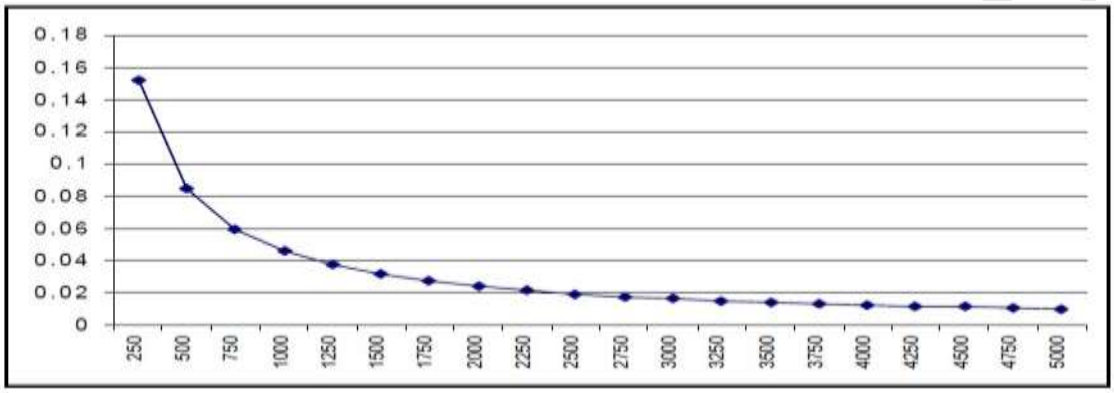

Figure 1.5: Probability of observing new conflict with GDP per capita.

Sources: Humphreys (2003), based on the data and model from Collier and Hoeffler (2002).

Humphreys (2003) suggests that in general, economic growth will lower the probability of observing a new conflict. According to the author, richer people are better able to protect their assets and therefore find violence less attractive (with a higher opportunity cost).

Economic growth is fast becoming a key instrument in reducing the probability a new armed conflict. According to Collier and Hoeffler (2002), faster economic growth will create more job opportunities in the market. With employment and stable income, there will be less incentive for people to take up arms against the state and thus the probability of conflict onset will be reduced. Likewise, researchers have concluded that slow economic growth and low income levels increase the risk of conflict (Fearon and Laitin, 2003; Collier and Hoeffler, 2004 and Hegre and Sambanis, 2006).

Collier and Hoeffler (2004) found that natural resources are one of the determinants of armed conflict. Using primary commodity exports to proxy for natural resource, the authors plotted the chart (figure 1.6) on the relationship between conflict risks and natural resources in low income countries. It was found that a primary commodity export of around 25 percent of GDP raises the risk of civil rebel to 30%. When primary commodity exports are around 5 percent of GDP, this risk decreases to 6 percent. This illustrates the positive relationship between natural resources and conflict risk in low income countries. Indeed, the effect of primary commodity

dependence is non-linear when the export at around 30 percent of GDP (Collier and Hoeffler, 2004).

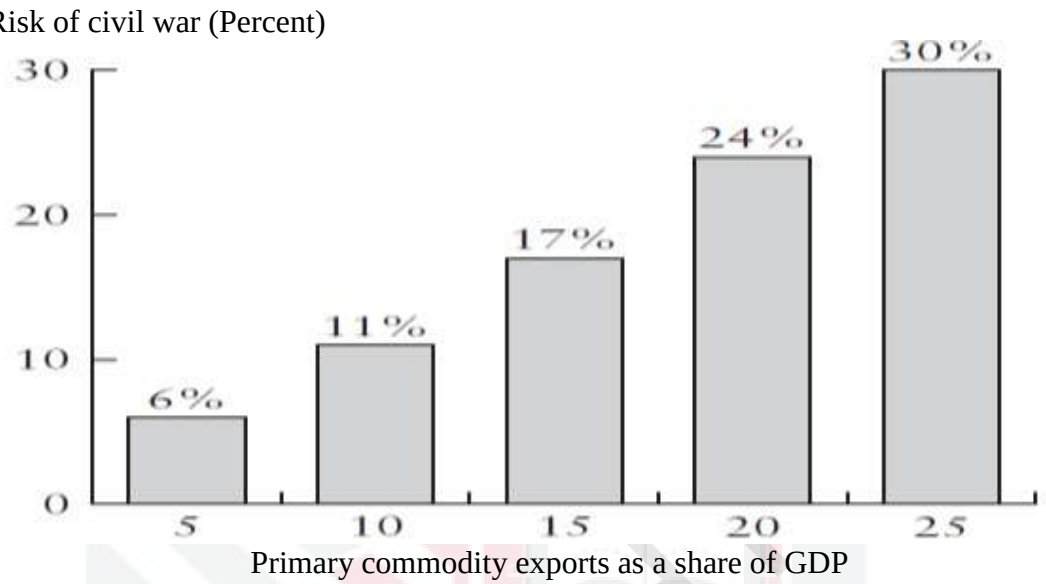

Figure 1.6: Natural resources and conflict risk in low income countries.

Source: Collier et al. (2003).

Collier and Hoeffler (2002, 2004) found that increase of primary commodity export to GDP raises the probability of civil war. They concluded that primary commodity exports are favor and attract rebels because "commodities provide for extortion" (Collier and Hoeffler, 2004: 588). In addition, Collier and Hoeffler (2004) concluded that rebels would be more motivated when the level of primary commodity exports to GDP increases. Moreover, armed conflict will cause many macroeconomic variables such as exchange rate volatility, governance imbalance, and biodiversity degradation. Therefore, this study attempts to investigate the causal mechanisms of these 3 variables with onsets of armed conflicts.

1.7 The importance of exchange rate

Exchange rate is an important component in the currency system, and plays a key role in the exchange of one currency with another. In other words, exchange rate is used as measurement of prices of foreign produced goods in terms of domestic currency. According to Aziz (2008), exchange rate determines the trade flow, capital flows and foreign direct investment, international reserves and remittances into an economy. Exchange rate is a significant macroeconomic variable for the country. For instance, exchange rate plays an important role in the performance of monetary policy rules and contributes to the welfare of agents when this factor is included in the policy reaction function (Ball, 1999 and Senay, 2001). In addition, exchange rate has significant effect in the maintenance of the trade balance of a country as explained by Bhattarai and Armah (2005:5),

"The exchange rate has been used as a tool for regulating flows of trade and capital by many developing economies, which tend to have persistent deficits in the balance of payments because of a structural gap between the volumes of exports and imports".

Exchange rate affects trade flow through exports and imports. Potentially, depreciation of exchange rate increases the trade balance (Ng et al., 2008). For instance, depreciation of exchange rate will lead to domestic goods becoming cheaper compared to foreign goods which will boost exports. But imports will become more expensive which as a result will fall. Consequently, depreciation of exchange rate improves trade balance.

1.8 The importance of governance

According to the Organisation for Economic Co-operation and Development (OECD) (1995), governance is about political power in control in a society in the management of its resources for social and economic development. The Commission of the European Communities (2001) defines that the principle of good governance includes the elements of openness, participation, accountability, effectiveness and coherence in the Europe Union. In other words, "governance is about power and how it is used. 'Good' governance ensures that this power is used to benefit all groups in society, including poor people" Department for International Development (DFID) (2006: 14).

According to the International Extractive Industries Transparency Initiative (EITI) Secretariat (2005), good governance leads to greater transparency and improves investment climate for investors and the international financial institutions. For instance, a country with good governance will create good climate for investment and trade through the provision of safety and security, infrastructure, roads, water and power (DFID, 2006). Good governance encompasses responsible decision making and implementation of decisions that reduces corrupt practices and other negative factors that affect society. As a result, a safe and stable environment will prevail in the country that is conducive for economic development for both local and foreign investors. Hence, good governance attracts more investment in a country.

According to DFID (2006), good governance improves the delivery of public services. For example, it is the primary responsibility of a government to provide public services such as enforcement of law and order, revenue collection, allocation of resources to meet specific demands, promotion of human rights, education, health care and social services to its people. It ensures peace and orderliness in society which promotes economic development and enhances the living standard of the people. A stable society is critical for sustainable human and economic development. Good governance provides stability and builds up strong state society relations in fragile states in order to maintain peace. International EITI Secretariat (2005) explained that improved governance will enhance economic and political stability.

1.9 The importance of biodiversity

Biodiversity refers to biological diversity which means "total variability of life on Earth" (Heywood and Watson, 1995: 5). Biodiversity includes variations of species, taxonomic, genetic level and variations in ecological functions. It is a balanced state of nature that supports the ecosystems to function and supply the benefits to the people. Biodiversity provides provisioning, regulating, and cultural support in the ecosystem services. According to United Nations Environment Programme (UNEP) (2007), in agriculture, biodiversity provides provisioning service (food, fuel or fibre being the end products), supporting service (micro-organisms cycling nutrients and soil formation), regulatory service (such as through pollination), and cultural service in terms of spiritual or aesthetic benefits or cultural identity. The importance and benefits of biodiversity to mankind in the aspect of provisioning service and regulating service are demonstrated in the following examples: the value of annual world fish catch that reached US $58 billion (provisioning service), value of anti-cancer agents from marine organisms which achieved up to US $1 billion per year (provisioning service), global herbal medicine market around US $43 billion in 2001 (provisioning service), honeybees as pollinators for agriculture crops achieved US $2 billion to US $8 billion per year (regulating service), and value of coral reefs for fisheries and tourism achieved US $30 billion per year (cultural service).

"As the basis for all ecosystem services, and the foundation for truly sustainable development, biodiversity plays fundamental roles in maintaining and enhancing the well-being of the world's more than 6.7 million people, rich and poor, rural and urban alike" UNEP (2007: 160). Accordingly, biodiversity plays an important role in the contribution to human welfare (Goldman et al., 2008). For instance, biodiversity provides the production of food through agriculture and health and nutrition to all mankind. Therefore, preservation of biodiversity is imperative for human well-being.

1.10 The conceptual framework

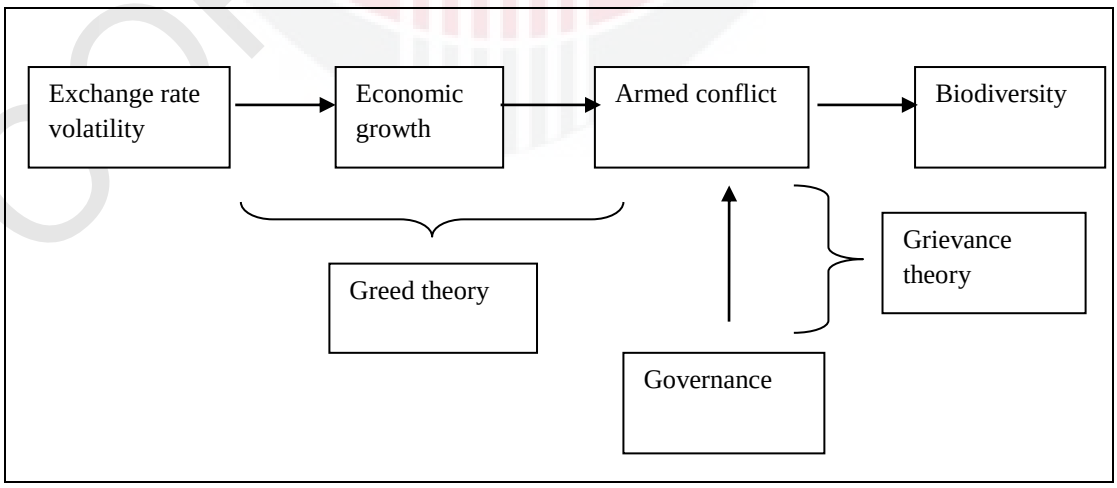

Figure 1.7: Linking between armed conflict with exchange rate volatility, governance, and biodiversity.

The relationship between armed conflict with exchange rate volatility, governance and biodiversity can be visualized in Figure 1.7. Exchange rate volatility will cause armed conflict through the greed theory. This can explain that exchange rate volatility may slow down economic growth which contributes the risk of armed conflict. Besides, Figure 1.7 indicates that governance may cause armed conflict. Based on the grievance theory, bad governance may create the feeling of unfair and anger in society. Therefore, bad governance may contribute the risk of armed conflict. On the other hand, the direct impact of armed conflict on biodiversity may destroy forest and indirect impact of armed conflict on biodiversity may displace persons. Thus, direct and indirect impact of armed conflict may cause biodiversity loss. Hence, the link between armed conflict and governance indicate in Figure 1.7.

1.11 Problem statement

In the new global economy, the determinants of armed conflict have become important issues and researchers are exploring the link between economic growths with armed conflict. This study will investigate the nexus between armed conflicts and the select factors of exchange rate volatility, governance and biodiversity.

Exchange rate volatility is the risks associated with unexpected movements of the exchange rate (Ozturk, 2006).Various researchers have investigated the relationship between exchange rate volatility and economic growth (Dollar, 1992; Bosworth et al., 1996; Belke and Kaas, 2004; Bagella et al., 2004; Bagella et al., 2006; Schnable, 2008; Schnable, 2009; Aghion et al., 2009). According to Bhattarai and Armah (2005), exchange rate volatility is a great barrier to economic growth for many African and Latin American economies. In addition, many past studies revealed that exchange rate volatility slows economic growth (Dollar, 1992; Bosworth et al., 1996; Belke and Kaas, 2004; Bagella et al., 2004; Bagella et al., 2006; Schnable, 2008; Schnable, 2009; Aghion et al., 2009). And sluggish economic growth increases the risk of conflict (Fearon and Laitin, 2003; Collier and Hoeffler, 2004 and Hegre and Sambanis, 2006). However, the impact of exchange rate volatility on armed conflict is still vague. In view of the complex causality mechanisms among armed conflicts and economic growth as outlined in earlier in this introduction, this study attempts to investigate to get a more definitive conclusion on the impact of exchange rate volatility on armed conflict.

There is increasing concern that exchange rate volatility is a disadvantage for international trade. It is argued that exchange rate volatility creates exchange rate risk for international trade. In addition, high exchange rate volatility will lead to higher cost for risk-averse traders and less foreign trade (Hooper and Kohlhagen, 1978). Exchange rate volatility will create unpredictable scenarios which will affect international trade and may cause investors to withdraw from the host country. This situation will lead to a slowdown of economic growth (Ito et. al., 1999), increasing economic hardship and poverty which will increase the risk of an armed conflict (Fearon and Laitin, 2003; Collier and Hoeffler, 2004 and Hegre and Sambanis, 2006). In addition, this study plots bar chart to compare the real exchange rate volatility in internal armed conflict and non-internal armed conflict for developing countries.

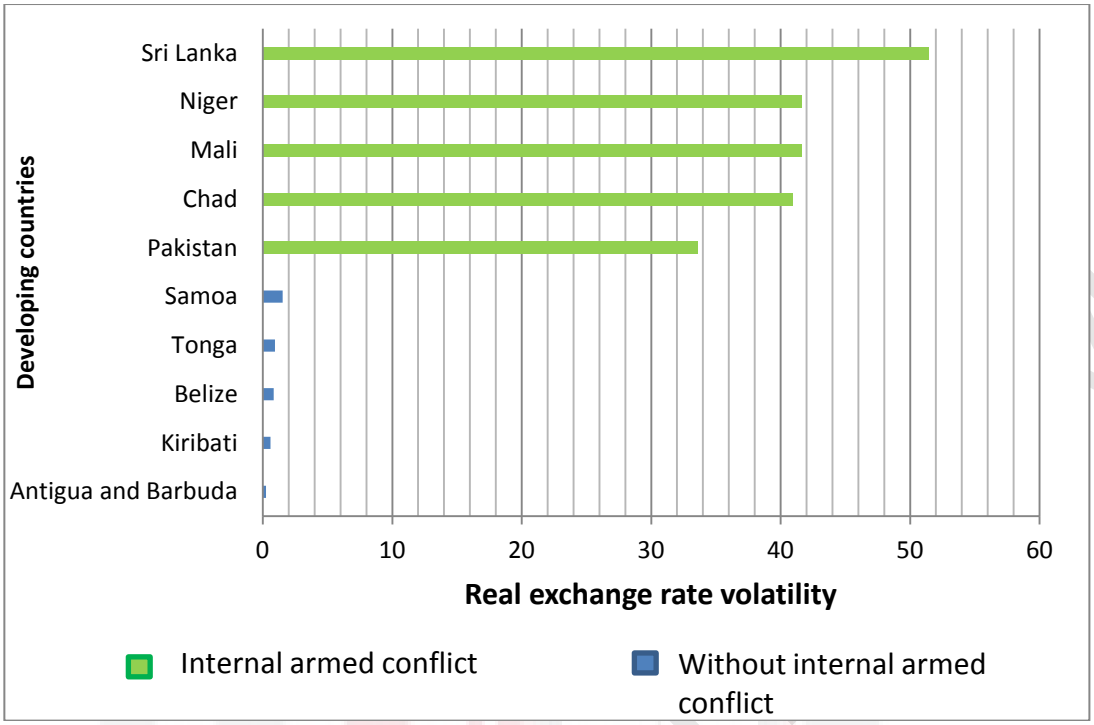

Figure 1.8: The real exchange rate volatility for 5 developing countries with internal armed conflict in 2008 and 5 developing countries without internal armed conflict in 2008.

Sources: Gleditsch et al. (2002) and UCDP/PRIO (2013).

Figure 1.8 provides the real exchange rate volatility for 5 developing countries with internal armed conflict in 2008 and 5 developing countries without internal armed conflict in 2008. This study finds that internal armed conflict countries face higher real exchange rate volatility compared to non-internal armed conflict countries. Based on the explanations spelt out above, this study investigates whether exchange rate volatility is one of the determinants of internal armed conflict.

The issue of governance and armed conflict is a rising concern and has been increasingly debated in recent years. DFID (2010) concluded that governance is central to achieving economic development and ending conflicts. Bad governance is seen to be a major problem for economic growth and improvement of welfare in poor countries (Moore, 2001). In fact, bad governance has severe impact on economic growth. Wilkin (2011) concluded that poor governance is correlated with development failure. For instance, Zimbabwe that was created by President Robert Mugabe since 1998 experienced bad governance which led to economic collapse (Collier, 2007). Inflation increased over 1,000 percent a year in Zimbabwe, causing great hardship and sufferings to the Zimbabwe people.

Bad governance does not improve the welfare of the citizen. On the contrary, it is detrimental to the wellbeing of the people. For example, in 2004, the Ministry of Finance in Chad a country mired in bad governance, investigated how much of the

money officially disbursed to health clinics was actually received by the clinics. Surprisingly, less than 1 percent of funds reached the clinics. The balance 99 percent failed to reach its destination (Collier, 2007). Corruption and incompetency of the authorities have denied the citizens of quality health care, affecting the living standard of the public.

This study focuses on governance and selects one of the dimensions of governance such as control of corruption in internal armed conflict for developing countries. Figure 1.9 shows the level of control of corruption in 5 developing countries with internal armed conflict and 5 without internal armed conflict in 2008. The data recorded in this graph reveal that the countries with internal armed conflict have lower control of corruption. On the other hand, the countries without internal armed conflict exercise higher level of corruption control. This suggests that lower control of corruption is a certain occurrence in countries with internal armed conflict compared with countries without internal armed conflict.

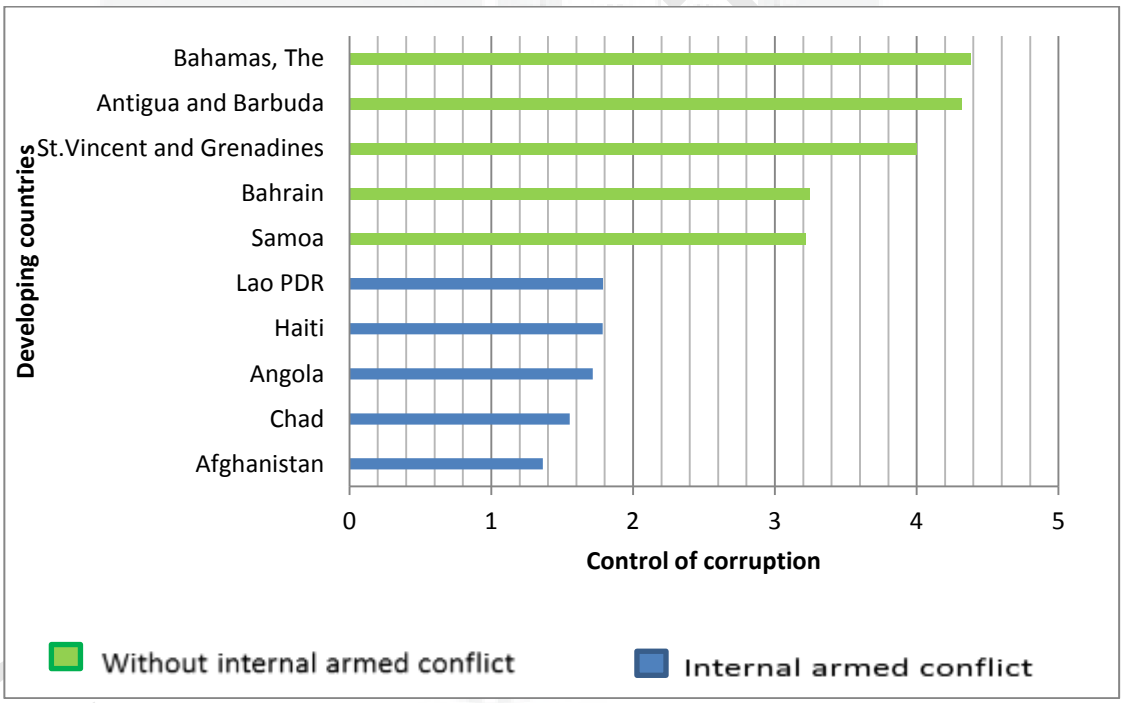

Figure 1.9: The control of corruption for 5 developing countries with internal armed conflict in 2008 and 5 developing countries without internal armed conflict in 2008.

Source: Worldwide Governance Indicators (2014)

As United Nation Children's Fund (UNICEF) (2004: 34) notes, "corruption and bad governance were among the causes of war. The majority of the people had no voice in the government and no opportunities in life and so they were easily provoked to violence". For instance, bad governance and lack of democracy prompted the conflict in the Democratic Republic of Congo (DRC). In 1994, the Rwandan genocide laid the foundation of conflict in the DRC (Shekhawat, 2009). Similarly, bad governance and the ambitions of power and wealth caused the civil wars in

Liberia (Bah, 2010). In 1989, Liberia faced the first violent civil war because of the invasion of the Charles Taylor's National Patriotic Front of Liberia. In 1997, Charles Taylor became the President of Liberia and in 1999, the country was plagued by the second civil war ignited by ethnic tensions, corruption, subjugation and poverty of the people (Annan, 2014). By the end of the second civil war, terrible acts of violence such as rape, torture, indiscriminate beating, killing and abduction were inflicted on the civilians (Vinck et al., 2011). A country run with poor governance will encourage corruption and injustice which could develop widespread poverty. Consequently citizens will come to bear with high grievances and the desire for redress, factors that trigger armed confrontation with the incompetent government. These insights from literature review show that opportunity and inclination to rebel are correlated. This study attempts to investigate the impact of governance on armed conflict which will contribute to better management of socioeconomic issues.

The Conservation of Biological Diversity discusses the national security in tropical forest countries and armed conflict on biodiversity which have become important issues in the world. According to McNeely (2003), the threat of armed conflict on biodiversity have emerged in many parts of Africa, Central America, Colombia, Indonesia, the Philippines, Sri Lanka, India, the Balkans and elsewhere. McNeely (2003) summarized the impacts on biodiversity inflicted by humans as follows:

"Biodiversity-rich tropical forest in Papua New Guinea, Indonesia, Indochina, Myanmar, Sri Lanka, Central and West Africa, the Amazon, Colombia, Central America and New Caledonia have all been the sites of armed conflict, sometimes involving international forces. While these conflicts have frequently, even invariably, caused negative impacts on biodiversity, peace is often even worse, as it enables forest exploitation to operate with impunity" (McNeely, 2003: 1).

This study focuses on total biodiversity threatened and total biodiversity threatened includes plant species (higher) threatened (PLN), mammal species threatened (MM), fish species threatened (FIS), and bird species threatened (BD). Figure 1.10 indicates the total biodiversity threatened for 6 developing countries with internal armed conflict in 2008 and 6 developing countries without internal armed conflict in 2008. This study finds that the countries without internal armed conflict encounter lower biodiversity threatened compared to non-internal armed conflict countries.

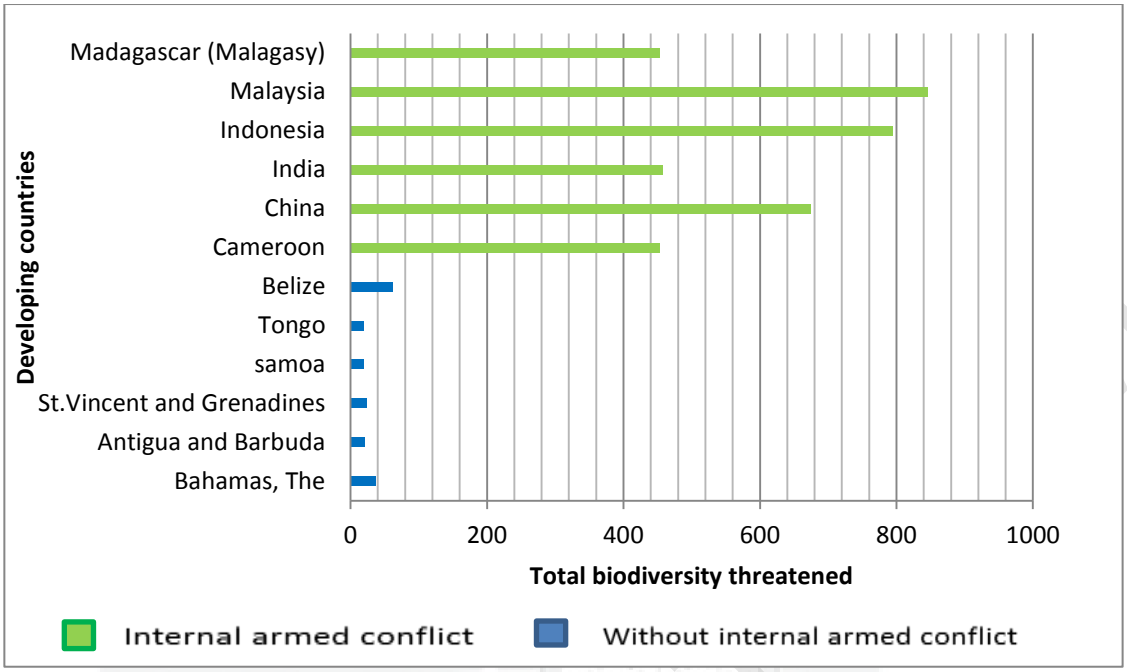

Figure 1.10: Total biodiversity threatened for 6 developing countries with internal armed conflict in 2008 and 6 developing countries without internal armed conflict in 2008.

Sources: World Bank (2015)

The modern tools of armed conflict include chemical and biological weapons which are tremendously destructive to humans and biodiversity. Consequently, modern warfare may destroy the system of biodiversity and this will directly affect food production, endanger/ worsen the health of people and destroy nature's life-supporting capacities for human. Undoubtedly, human welfare will be affected through the destruction of biodiversity system during armed conflicts.

There may be direct and indirect impacts of armed conflicts on biodiversity. The impact of armed conflict on biodiversity can be explained in one word, "ecocide". In fact, armies will direct hunt and destroy forests during armed conflict, resulting in enormous loss in biodiversity. For instance, the armies of the United States cleared 325 thousand hectares of land in Vietnam during the second Indochina war (Westing, 1982). These armies sprayed 72.4 thousand $m^3$of herbicides in Vietnam and these actions had strong impact on the biodiversity in the affected areas, reducing biodiversity rich forest into low biodiversity degraded forest (Nietschmann, 1990). In the same war, the United States armies released around 11.3 million tons of ammunition in Vietnam causing destruction and deterioration of farm land, freshwater sources and coastal fisheries.

The activities of refugees and displaced persons would also indirectly affect biodiversity during the armed conflict. During the decade long Vietnam war, there was massive dislocation of the population; about 10 million people were affected. Following the destruction of the countryside by the carpet-spraying of herbicides and

bombing that destroyed forest and farmland with enormous loss of biodiversity, millions of farmers were displaced to the urban areas. The massive influx of displaced rural population not only increased civic and social problems but also caused an even greater reduction of biodiversity in and around the cities. Vietnam encountered extreme impact on its biodiversity as a result of armed conflict which gravely affected the country's productivity. As a result the welfare of the people was destroyed and the economy of the country damaged. Therefore, this study investigates the impact of armed conflict on biodiversity.

1.12 General objective

The general objective of this study is to investigate the relationship between armed conflict and exchange rate volatility, governance, and biodiversity.

1.12.1 Specific objectives

The specific objectives of this study are:

1. To examine the impact of exchange rate volatility on armed conflict,
2. To determine the impact of governance on armed conflict, and
3. To investigate the impact of armed conflict on biodiversity.

1.13 Significance of the study

In recent years, there has been an increasing interest in armed conflict areas. Researchers have concluded that economic growth is a major determinant of armed conflict (Fearon and Laitin, 2003; Collier and Hoeffler, 2004 and Hegre and Sambanis, 2006). Besides, researchers have found that exchange rate volatility would slow economic growth (Dollar, 1992; Bosworth et al., 1996; Belke and Kaas, 2004; Bagella et al., 2004; Bagella et al., 2006; Schnable, 2008; Schnable, 2009; Aghion et al., 2009). In other words, exchange rate volatility will slow economic growth which will raise the risk of armed conflict. However, the impact of exchange rate volatility on armed conflict is still vague. To contribute to a better understanding of this topic, this study uses data from 74 countries during 1970 until 2012 to examine the effect of exchange rate volatility on armed conflict. The earlier discussion in this chapter from the perspective of exchange rate volatility based on observation and interpretation of historical data has demonstrated the significance of this factor on armed conflict. The results of this study will provide greater insight that will assist governments in policy drafting to avert development of internal armed conflicts.

Turning to the next potential variable, governance; most of the past studies on armed conflicts have not included this factor as a determinant. The omission could be due to the limited data available on governance which according to the Worldwide Governance Indicators, current data available is from the period of 1996 – 2013. However, this study only has data of 80 developing countries with internal armed conflict from 1996 until 2013. DFID (2010) concluded that governance is central to

achieving economic development and ending conflict. A more informed understanding of the impact of governance on armed conflict will assist policy makers in drawing up more effective policies in the better management of armed conflicts. Additionally, the presence of good governance will improve the standard of living in the country and decreases poverty.

The impact of armed conflict on biodiversity is still ambiguous. According to Goldman et al. (2008), biodiversity contributes to human welfare. It is essential in the natural food production process and provides nutrition that contributes to the good health of people. Conservation of biodiversity is of critical importance to ensure the sustainability of life form including the human species. While the outcome of destruction of biodiversity due to the ravages of armed conflicts is observable, the causal mechanisms of biodiversity and armed conflicts are still little understood. Therefore, this study proposes to examine and establish the processes of interaction involved so as to gain better insight and thus bridge the gap in the understanding of the effect of armed conflicts on biodiversity. This study uses 78 developing countries with internal armed conflict in year 2008 to investigate the impact of armed conflict on biodiversity. In addition, this information will be valuable to the Global Partnership for the Prevention of Armed Conflict (GPPAC) in raising the awareness of people on this subject.

1.14 Chapter summary

As noted in the preceding Introduction, armed conflicts invariably have devastating consequences. The aforementioned discussion has revealed the dire and damaging effect of the direct and indirect interactions between armed conflicts and the potential variables exchange rate volatility, governance and biodiversity which necessitates a better understanding of their causal mechanisms. Chapter 2 presents a literature review of past studies which serves to provide the basic understanding of the development and current status of research works on the various dimensions of armed conflicts. In Chapter 3, the methodologies that will be applied in this proposed study is set out with a discussion on the data employed. The empirical results as well as the discussion and interpretation of the results are presented in Chapter 4. And Chapter 5, the final chapter, concludes this study with a discussion on the implications on policies for the aversion and management of armed conflicts.

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