THE REVIEW OF ARMED CONFLICT MEASUREMENT USING LOGIT MODEL AND PROBIT MODEL IN DEVELOPED AND DEVELOPING COUNTRIES

Tismazammi Mustafa⁂

Faculty of Business and Administration, Universiti Teknologi MARA Cawangan Kelantan
tisma372@.uitm.edu.my

Asma' Rashidah Idris

Faculty of Business and Administration, Universiti Teknologi MARA Cawangan Negeri Sembilan

Abstract: The purpose of this study is to analyse the armed conflict in both developed and developing countries. The factors of governance, GDP per capita, and other control variables are selected to investigate their effects on armed conflict from 1970 to 2014 in 126 selected countries. By using Logit Model and Probit model, the response of armed conflict on seven measurement of governance namely investment profile, corruption, internal conflict, religious tension, law and order, democratic autocracy, and bureaucracy quality are determined. The population, human capital, and communication are included as control variables. In general, the GDP per capita results revealed that there is a positive relationship with the armed conflict. All governance indicators showed a significant effect on armed conflict except for law and order, and bureaucracy quality.

Keywords: Armed conflict, governance, logit and probit models

1.   Introduction

The meaning of armed conflict has been developed with numerous points of view that served as an assortment of philosophies. There are organizations that have committed terror in their attempt to satisfy national objectives, in which they wished to accomplish political power for the group they claimed to speak for and there are groups for whom conflict ascended from their religious beliefs and a desire to drive those religious standards on individuals at certain range.

Armed conflict has played a basic part on both national and worldwide stages for decades, but it is one of the most troublesome social phenomena to define. Security organizations, statesmen, lawmakers, media, and lay individuals have attempted to define armed conflict. Definitions came from various groups of people assenting to their own points and characteristics about conflict. Haberfeld and Von Hassell (2009) defined people who act as militant or individuals who have some sort of grievance against larger society in which they live either physically or identify with conceptually. They represent the minority who do not have or claim not to have. Bennets (2007) classified four keys of recognizing conflict: i) It is planned, arranged in progressed, and not conducted as an imprudent act of rage; ii) It is political, planned to alter the existing political arrange; iii) It is pointed at civilians, not military staff or office; and iv) It is carried out by subnational bunches not a country's armed force.

Since the beginning of the 21st century, the global trends in armed conflict activities have increased rapidly. Figure 1 shows the growth of incidences of armed conflict and the number of killings worldwide as recorded by the Global Conflict Database of the University Maryland from 1970 to 2014.

⁂ Corresponding author: UITM Kelantan, Machang, Kelantan. tisma372@uitm.edu.my
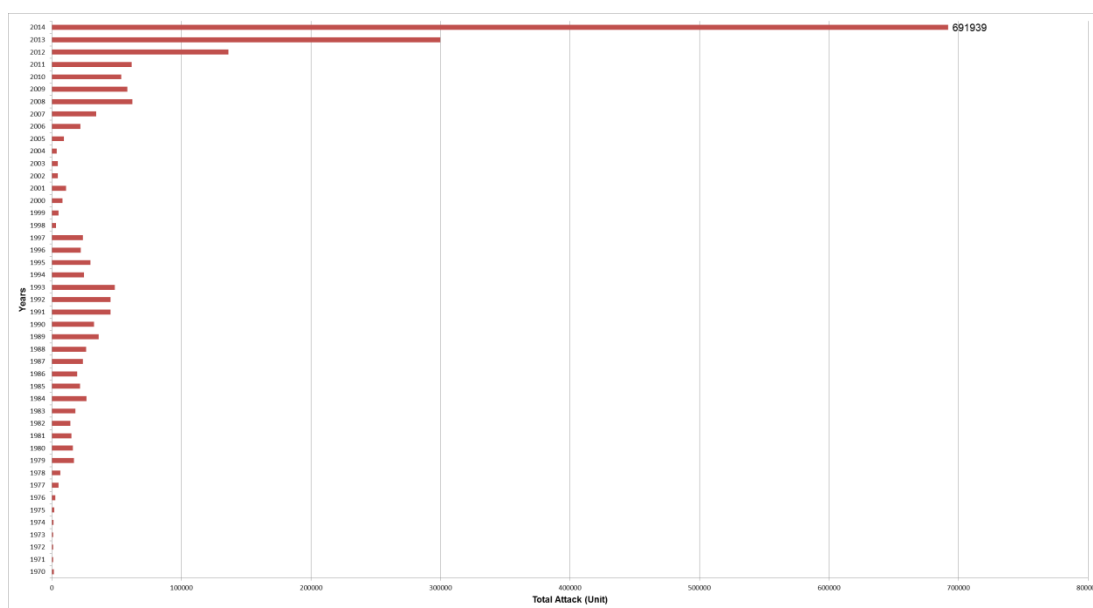
Figure Error! No text of specified style in document.: Global Armed Conflict Accidents (1970-2014)

In Figure 1, during the 1980s and 1990s, the trend showed a general rise in armed conflict incidences and was at its peak in the early 1990s, which later dropped tremendously until the turn of the century. Although it is difficult to establish the main cause of the decline in armed conflict incidences between 1990s and the beginning of the 21st century, that periods seem to coincide with major world events such as the collapse of communism and the disintegration of the Soviet Union. During the 21st century and particularly in the second decade, the data illustrated a huge increase in armed conflict while the data analysis of 15 years from 2000 to 2014 showed an increase from 8,225 to 691,939 attack incidents. Therefore, it is urgent and significant to do research and find out the influencing factors on the armed conflict.

Thus, the purpose of this article is to explore and investigate the factors of armed conflict In this paper, the effect between the Gross Domestic Product per capita and the governance factors on armed conflict in developed and developing countries were examined. Logit model and Probit Model analysis were adopted, and the panel data of 126 countries from 1970 to 2014 are employed to be analysed in this research.

2.   Literature Review

Ghatak (2016) pointed out that the discrimination in the economy and politics lead to the vulnerability of domestic conflict. In his study, the issue of global economic integration and limited political openness facilitation give effect to rebel to some citizens. He used a cross-national data set of 172 countries for the period of 1970–2007. The results from this analysis showed that the economic globalization and weak institutionalized democracy in the presence of discrimination increase the domestic violence. He also found that political exclusion as well as economic discrimination increases the level of domestic conflict. Several studies investigating the armed conflict have been carried out on the connection between political instability and increased risk of armed conflict. Vreeland (2008), Hegre (2001), and Muller and Weede (1990) revealed that political instability and level of democracy have the connectivity to the civil war.

In addition to this, Muller and Weede (1990) claimed that political elections in countries using a system with little tradition for democratic rules of the government are associated with enlarged levels of uncertainty. Thus, this will increase the social tensions including those emerging from anti-governmental movement. The group of anti-government is most likely to manifest themselves through the conflict.

Written with the standpoint of governance, Krieger et al. (2016) analysed the effect of income inequality on conflict and found the evidence that conflict happens when the countries have a weaker governance and unfair distribution of wealth. These consequences directly make the society feel

frustrated. The democracy is very connected and vulnerable to conflicts due to the society respecting their civil liberties.

Contradict results between governance and armed conflict are seen in surveys conducted by Krieger et al. (2012) who found that armed conflict is less likely to happen in developed countries when the political and socio economic situations are at a high level. The relationship between armed conflict and governance is not significant when the institutional framework of the countries is stable. A relationship exists between political freedom and the domestic conflict in developing countries but they do not have a relationship with transnational conflict. One of the reasons for this is that for richer nations, most of these countries are used by terrorists to get aid on their resources. This case study was done by Bandyopadhay (2011).

Nel (2008) researched on the volume in risk of violent civil among the society by using 187 political units with 8203 observations and found that there is a significant difference between regimes. The mixed regimes combination observations are used by time series method from 1950 to 2000. The mixed regimes combination here means that the countries that are not fully autocratic and not fully democratic. Even partial democratic provides a medium of voice freedom, but it is still dominated by the elite power who failed to respond to the poorer protest. This leads to the significant correlation between conflicts in these countries. Meanwhile, for the regimes that partial autocracies, there are less conflicts to the prevalent countries because these autocracies are quite successful in addressing the protest issues among the society due to income inequality for example, in South Korea.

In addition, lack of economic opportunities and economies with slow GDP growth have a strong tie with violent activity. The study by Robinson (2006) found that lack of economic growth reduces people's support for the government. The consolidated democracies and authoritarian systems have caused an unstable impact on the country and a decline in political legitimacy would easily trigger people to act violently.

Additionally, Collier (2003) first remarked on the similarity, connection between economic instability, and stagnation would trigger conflicts. Food insecurity and loss of livelihood are possible consequences of adverse climatic changes in many parts of the world resulting in poverty at the national level as well as at the individual level. According to Fearon and Laitin (2003), it was found that the conflict in poor countries is explained as much by unusually favorable conditions such as poor counter-insurgency capability, limited infrastructure, and lack of local governance. They also stressed that the weakening capacity of the state to counter the terrorism is the immediate result of failing national income.

Estada et al. (2015) published a paper in which they described how changes in poverty rate and per capita GDP are correlated with change of armed conflict. The country Pakistan was analysed between 1989 and 2013. By using the time series data and the conflict vulnerability evaluation model (TAVE model), the results showed that change in income per capita and poverty rate affect the pattern of countries conflict. The GDP showed a negative significant relationship. This analysis indicated that for Pakistan, the strong economy is important to antidote the problems of conflict. Contradict results between GDP growth and conflict activities were found in a study by Bandyopadh et al. (2011) which found GDP per capita is positively significant with the increasing of armed conflict. It is in cases of the countries that experienced transnational conflict. The higher GDP growth countries are exposed to recruiting militants since the militant groups have the purchasing power.

Krieger et al. (2016) conducted a crossed country analysis and found that per capita income is associated with the armed conflict. The countries that have a higher GDP per capita are exposed to the armed conflict because of the inequality distribution of income in the countries that causes the society to rebel. By using the negative binomial model with the deprivation theory in cases of conflict from 1985 to 2012, the linkage of income equality and armed conflict is highly connected. The poorer socio economic of the country may cause the people to get involved in anti-government group. High per capita income leads to rebellion activities because it will reflect on greater state capacity as stated by Fearon and Latin (2003). State capacity is one of the defining characteristics of political system. Insurgency and underground violent will be striking as a state capacity goes higher.

3. Methodology

This paper implements Logit and Probit regression tests. The purpose of this method is to determine the determinant factors of armed conflict. In this study, the model can be specified as follows:

ARCON= f(GDP, IP, COR, IC, RET, LAW, DEA, BUQ, HHC, POP, TEL)

where ARCON is armed conflict dummy, GDP is GDP per capita (constant 2010), the seven dimensions of governance are investment profile (IP), corruption (COR), internal conflict (IC), religious tension (RET), law and order (LAW), democratic autocracy (DEA), and bureaucracy quality (BUQ). HHC stands for human capital, POP stands for population, and TEL stands for telecommunication.

For empirical analysis, armed conflict model specifies in a stochastic form. Since the dependent variable is binary, the logistic regression equations are as follow:

$$Logit_{it}=L(\frac{P_{it}}{1-P_{it}})=\beta_1 + \beta_2 LGDP_{it}+\beta_3 LIP_{it}+\beta_4 LCOR_{it}+\beta_5 LIC_{it} + \beta_6 LRET_{it}$$

$$+\beta_7 LLAW_{it}+\beta_8 LDEA_{it} + \beta_9 LBUQ_{it} + \beta_{10} LHHC_{it} + \beta_{11} LPOP_{it}+\beta_{12} LTEL_{it}+\varepsilon_{it}$$

Where $Logit_{it}$ represents logit, P_{it} is the probability of armed conflict occurring, (1-) is the probability of no armed conflict occurring, and L denotes variables in logarithm. i=1,…, N refers to countries, t=1…T refer to the period of time, and ε_{it} is the error term. The Logit model and Probit model are applied to investigate the effect of GDP per capita and governance on armed conflict. In conducting the analysis, annual panel data set of 126 countries for the period covering from 1970 to 2014 is employed. Armed conflict data are measured by the total armed conflict annually. Data of seven governance variables are obtained from ICRG (International Country Risk Guide). The governance data are measured by the value of the rating, hence the higher the value of the rating, the higher the institutional quality level, which is awarded out of 100 points based on expert opinion and experience from corporate surveys that are directly involved with the country. GDP per capita (constant 2010), human capital (education of tertiary school enrolment), population and telecommunication data (the telecommunication is measured by the internet user per 100) are obtained from World Development Indicator (WDI) database published by the World Bank.

4. Empirical Results

The results of the Logit model and Probit model are presented in Table 1. The results indicate that Gross Domestic Product per capita [constant 2010] (LGDP), Investment Profile (LIP), Corruption (LCOR), Internal Conflict (LIC), Religious Tension (LRET), Democratic Autocracy (LDEA), Human Capital (LHHC), Population (LPOP), and Telecommunication (LTEL) are significant. However, the results for Law and Order (LLAW) and Bureaucracy Quality (LBUQ) are not significant at the conventional level.

Table 1: Results for Logit model and Probit model from 1970 until 2014

Variables	Model 1 (Logit)	Standard Error	Model 2 (Probit)	Standard Error
LGDP	0.450***	0.943	0.260***	0.547
	(0.000)		(0.000)	
LIP	-1.093***	0.274	-0.607***	0.158
	(0.000)		(0.000)	
LCOR	-0.448*	0.239	-0.268*	0.140
	(0.061)		(0.056)	
LIC	-2.980***	0.506	-1.788***	0.293
	(0.000)		(0.000)	
LRET	-1.469***	0.284	-0.834***	0.158
	(0.000)		(0.000)	
LLAW	0.193	0.266	0.038	0.156
	(0.942)		(0.807)	
LDEA	0.501***	0.161	0.303***	0.095
	(0.002)		(0.001)	
LBUQ	0.163	0.241	0.926	0.140
	(0.498)		(0.511)	
LHHC	0.447***	0.126	0.249***	0.736
	(0.000)		(0.001)	
LPOP	0.525***	0.045	0.317***	0.264
	(0.000)		(0.000)	

LTEL	-0.249***	0.451	-0.139***	0.256
	(0.000)		(0.000)	
Constant	4.642	1.184	2.67	0.685
Number of obs	1551		1551	
Countries	126		126	
Pseudo R^2	0.247		0.246	

Notes: LGDP is log Gross Domestic Product per capita. LIP is log Investment Profile, LCOR is log Corruption, LIC is log Internal Conflict, LRET is log Religious Tension, LLAW is log Law and Order, LDEA is log Democratic Autocracy, LBUQ is log Bureaucracy Quality, LHHC is log Human Capital, LPOP is log population and LTEL is log Telecommunication. Figures in the parentheses () are p-values. Asteriks ***,* denote statistically significant at 1%,10%.

The results in Table 1 shows that the armed conflict is higher when Gross Domestic Product per capita is significant, An increase in GDP per capita would cause an increase in armed conflict for approximately 0.45% in Logit model and 0.26% in Probit model. The study performed by Collier (2003) and Fearon and Latin (2003) revealed similar results. A faster economic growth will create more openness of the country and the channel of recruiting people act conflict will develop. On the other hand, the militant groups have great purchasing power in countries that have higher GDP growth and experienced transnational terrorism as noted in Bandyopadh et al. (2011). Similarly, Krieger et al. (2016) found that per capita income is related to conflict. Countries with higher GDP per capita may be exposed to rebellion for the reason of inequality distributions among its population, hence causing rebellious actions by its people. In addition, the poor socio-economic of a country may encourage its people to join in anti-government group.

Meanwhile, the armed conflict is higher when Investment Profile, Corruption, Internal Conflict, and Religious Tension are highly negatively significant; and lower countries conflict when Democratic Autocracy is positively significant. The negative sign of governance reveals bad governance increase the risk of armed conflict and violence. The unfair welfare will trigger people to rebel against the governance. Similar findings by Vreeland (2008), Hegre (2001), and Muller and Weede (1990) found that political instability and level of democracy have the connectivity to the rising of civilian conflict. A positive significant level of democracy suggests that when more democracy is applied in the countries policies, its citizens can express peaceful to their government.

The result on human capital is significant, which means an increase in education will lead to armed conflict of 0.477% for Logit model result and 0.249% for Probit model result. In previous research, Maleckova and Stanisic (2014) widely assumed that the effect of gender and education are related to the occurrence of international conflict. Their results showed that the demographic characteristics of the group of respondents are relevant for the occurrence of conflict where women with tertiary education who justify suicide bombing and have an unfavorable opinion towards the countries that are potential targets of international conflict have a significant impact on the occurrence of violent acts. The results of their analysis suggested that there is a significant link between highly educated women who both support conflict and have a negative opinion of targeted countries and the occurrence of conflict.

Their findings challenged counter-terrorism policy in two respects; firstly, its strong focus on young men, and secondly, the expectation that increasing education will by itself decrease the number of conflicts. Moreover, a longitudinal study of armed conflict and education by Krieger et al. (2012) reported that the impact between these two are different depending on certain countries. The authors analysed countries with higher economic and less economic performance. The authors justified that the higher education in a country that has strong institution of government, economic, and development may reduce the case of conflicts and violence, while, in less developed countries, education does not reduce the case of conflicts if the structure of institutional, socioeconomic and political issued are weak.

Next, population showed a positive significant relationship with armed conflict. Armed conflict is increased about 0.525% in Logit model and 0.317% in Probit model as population increases. A study by Krieger et al. (2016) proved that population size has a positive relationship and is one of the predictors of armed conflict. This may be due to the reduction of policy cost counter terrorism efficiency as a result of an increase in population. For other countries, the authors investigated and found that the countries with higher population are popular and become potential for civilian conflict activities hub and target for conflict. Furthermore, Choi and Piazza (2014) carried out investigations on the population of migration that are likely to expose high experience to the suicide attack. Higher population of migration people could increase the number of suicide attack because it is much easier for the conflict

group to recruit members. The increasing number of local ethnics from countries that are facing internal conflicts migrated to other countries would also encourage suicide bombing.

Countries that have high population particularly those aged above 15 years are considered to have strong relationship with armed conflict. Those aged 15 years and above are highly exposed to the activities of violence and predictors when they live in countries that have high level of frustrations in economic condition, political instability, high level of unemployment, and urban overcrowding. This was explained by Nel (2008) in his research on the conflict of the countries using political unit data between 1950 and 2000 and it was found that the results of unemployed youth is significantly related to the conflict.

The telecommunication result reveals that an increase in telecommunication would cause the decrease in armed conflict. The results were 0.249% for Probit and -0.139% for Logit. The growth of ICT technologies is a great transformation that can help to reduce conflict. The empowerment of internet communication can be used in the context of humanitarian relief such as International Federation of the Red Cross and Red Crescent Societies. The post conflict countries make people around the world become aware and give help to refugees. The internet communication such as social media like Facebook, Twitter, Instagram, and YouTube are ways of communication that engage people to raise their voices. This was supported by Tellidis and Kappler (2015) who identified the role of ICT as a potential to reduce conflict because it is a tool of mediators promoting peace building around the world. A recent study by Jensen (2015) reported that the rapid evolution of technologies has proven to be a double-edged sword, which is able to facilitate communication, recruitment, logistics, and danger among civilians. On the other hand, the technologies advancement also allows the authorities to gradually develop more sophisticated techniques to identify and characterize threats.

Therefore, technology is preventing people to wreak greater degrees of havoc while at the same time making the world more transparent. Abaas et al. (2014) conclusively stated that the internet or Information and Communication Technology (ICT) are related to overcome issues of armed conflict. The ICT technologies help to control armed conflict, which have been used by intelligent bodies in most countries. The electronic information can help to prevent violence or recover from violence. As the technology grow rapidly, the homeland security should be capable to improve the infrastructure and expertise of intelligence officers in monitoring the network activities.

5.   Conclusion

The key factors that are associated with high armed conflict level have been explored. The main conclusion is that out of seven governance pillars, five of them namely Investment Profile, Corruption, Internal Conflict, Religious Tension, Democratic Autocracy are significant factors that drive the countries conflict. Therefore, the governance or governmental institutions should take further actions to reduce corruption, tackle the internal conflict among civilians, greater acceptance in freedom of speech, and make its system accountable and transparent. Next, the relationship between armed conflict and GDP per capita may be reduced provided that the government distributes income fairly. In summary, a considerable policy should improve socio-economically.

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