

“Determinants and characteristics of (post-)conflict growth.”

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## **Abstract**

There has not been much panel data investigation about the determinants of post-conflict growth. In this master thesis the determinants of (post-)conflict economic growth is investigated. The investigation sample contained in total 103 countries over the period 1960-2008. Based on the Solow Growth Model an empirical growth model is established to investigate the relationship of possible determinants on (post-)conflict growth. This model is tested with several regression methods, where first determinants of growth in conflict countries are established, where after interaction variables show changing relationships of determinants after a conflict. Finally a comparison is made between countries that have never been in conflict. Unemployment and ethnic diversity have a negative relationship with economic growth in the post-conflict period. There is no conclusive evidence found of the influence of military spending, human capital flight and foreign aid in conflict countries. Though not many conclusions can be based on this research, the results found in this provide a new starting point for future research.

## **Key words**

Civil conflict, PRIO, growth model, determinants of growth, panel data.

## **JEL Classification**

O11, D74, F10.

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# 1. Introduction

Civil conflict is an increasingly investigated topic in macroeconomics. According to a paper from Pettersson, T., & Wallensteen, P. (2015) there was an increasing number of conflicts in 2014, up to 40 (6 more than in 2013).<sup>1</sup> Though there is a decreasing trend in the number of conflicts in last 25 years, this number is much higher than the period right after the Second World War, and is increasing in the last few years. Though the impact of a conflict on a country itself is widely acknowledged, with globalization, the (economic) impact of civil wars changes.

The recent enormous flow of fugitives to Western Europe, caused by civil wars, highlights again the massive impact civil wars have not only on conflict countries itself, but also on their neighboring countries and even countries in other continents. Societies are disrupted, and economies all over the world are heavily affected by the consequences of a civil war. More and more a resolution is needed for a quick economic recovery after the ending of a conflict.

There has been emerging literature about the causes and consequences of civil wars.

It is widely researched that civil wars have a negative influence on the growth of economies, for example by the innovative paper of Rodrik (1999). These negative growth effects occur through the destruction of human capital, physical capital, resources and the impact on institutions and technology (Blattman and Miguel, 2010). However, there is not yet clearly determined what the main factors are which help stabilize these losses, and how a country itself or institutions like the UN could strengthen and fasten the recovery of a torn country. There is some empiric evidence that post-conflict growth tends to be high but subject to high deviations (Collier and Hoeffler, 2007). Therefore it is interesting to research which countries have a stable recovery after a conflict. Does it mainly depend on the nature and intensity of the conflict or is it because a country accepts foreign aid, or puts its focus on domestic production? And why do some countries fail with regards to a stable recovery? Furthermore it is interesting to look at the differences of countries in conflict from countries that have never been in such a conflict. Do the determinants of post-conflict growth significantly differ from non-conflict countries? Strong empiric evidence could help governments in difficult policy issues, increasing the chance of a stable and fast recovery and decreasing the change of future conflict. This research contributes to the

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<sup>1</sup>A conflict was defined by the Uppsala university as a contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths

[http://www.pcr.uu.se/research/ucdp/definitions/definition\\_of\\_armed\\_conflict/](http://www.pcr.uu.se/research/ucdp/definitions/definition_of_armed_conflict/)

literature in a way that it is one of the few papers that attempts to investigate the determinants of post-conflict growth in a panel data environment. There have been several case studies that cover this topic, but there is yet to be a large study macro-study that attempts to reveal the true economic drivers of recovery in the post-conflict period.

The paper will be organized as follows. In section 2, current literature regarding economic consequences of civil conflict will be discussed. This review will lead to some expectations of economic factors with regards to post-conflict growth. Section 3 describes and explains the empirical model that is used to estimate relationships of the economic factors with post-conflict growth. Section 4 contains a detailed data-inspection and elaborates on the sample selection. Section 5 gives an overview and interpretation of the results of the research. Section 6 consists of a general conclusion and a discussion, where limitations and possibilities for future research are discussed.

## **2. Literature review**

This section covers the existing literature on economic effects of civil war. Though the focus of this thesis lies on post-conflict growth, it is important to address other time periods of a civil war in order to understand economic flows after a civil war. Therefore existing literature on the outbreak of civil wars and economic consequences during a civil war are discussed in this section, just as the post-conflict growth literature of interest.

### **2.1 Existing literature on the outbreak of civil wars**

The focus of this research is not on the causes of the outbreak of a civil war. However, the cause of a civil war is important for it has influence on the duration, intensity and thus economic consequences. There is much literature about the causes of conflict. This literature often combines economic theories with political or social sciences. Existing theories suggest that conflicts more often occur in countries that are poorer or are subject to negative income shocks, have weak governments, are thinly populated rural areas, have more mountainous terrain (Blattman and Miguel, 2010).

However, the empiric evidence falls short in really determining and isolating causes of civil war. Fearon (2003) for instance finds that the onset of a civil war is more likely with a larger population, more rough terrain, a smaller age of a state and less per capita income. The latter is according to Fearon a proxy for the strength of insurgency countermeasures. He includes religious diversity and ethnic fragmentation, but these variables do not significantly influence the onset of a civil war. However, Collier and Hoeffler (2004a; 2007) find evidence that there is less chance of civil war with higher diversity, when groups are of equal size. When there is one dominant group, a country is more prone to insurgency and civil war. Collier and Hoeffler (2004a) also find that slow economic growth has a significant effect on the onset, such as the proportion of natural resources in total exports. However they don't find a significant effect of income inequality, ethnic fractionalization and democracy on the likelihood of a conflict.

Both find that past conflicts enhance the chance of new conflicts, and that higher capita per income lowers the onset. However, Collier and Hoeffler link capita per income to opportunity cost. The higher GDP per capita, the lower benefits are of enrolling in a rebel army. Fearon (2008) however finds that the higher per capita income relationship with the onset of a civil war is only indirect. It exists only due to the relationship of high income with harmful natural and social terrain for guerilla hiding, state capacity for repressing insurgency and the lack of possibility's to raise funds because of the higher mobility of capital. What the two papers undoubtedly have in common is that economic forces are the main drivers



and main causes of civil war. Bigombe, Collier and Sambanis (2000) and Cramer (2010) stated that unemployment is an important proxy for the opportunity costs of a potential rebel group. A higher unemployment rate decreases the opportunity cost for a rebel side, increasing the likelihood of a civil war. Low unemployment rates could therefore add to the stability of a country.

According to Acemoglu (2006) civil war could be incentivized by crises such as economic shocks or natural disasters. The opportunity costs of rebels diminish, what increases the likelihood of an onset of a civil war. Nevertheless, government strength and focus also change with economic shocks or natural disasters. It is yet to be determined which effect dominates.

However as stated in Miguel and Blattman (2010), the causality that is found in the papers above should be questioned due to endogeneity problems. The use of lagged economic growth is not enough to deal with these problems, because anticipated civil war or conflicts could affect the current economic environment. An instrument that tries to deal with these problems of reverse causality and isolates true growth effects on the onset of civil wars, would be the best treatment for endogeneity. A nice example of an instrument that is used in conflict growth is rainfall growth in Africa (Miguel, Shanker Satyanath and Sergenti, 2004/2011), which is theoretically correlated with income growth but not with the onset of civil wars. Therefore this instrument can be used to isolate the effect of income shocks on the onset of a civil war. With this method they find a significant effect of income shocks on the onset of civil war. However, it is theoretically arguable that rainfall has a direct effect on the onset, due to the diminished opportunity costs of rebels or the reduced strength of a government due to less income. Still this method supplies a theoretically argued way to deal with endogeneity, also in the research of post-conflict growth.

It can be concluded that lack of economic stability is an important condition for the incidence of a civil war. Therefore, for a countries recovery to be steady, (a relative stable) economic growth is a necessity.

## **2.2 Existing literature on the economic consequences of civil war**

A large number of studies show that instability or conflict have a negative effect on income, savings and growth. According to Rodrik (1999) a civil war or conflict reduces economic growth. Moreover, he argues that civil wars have been the main cause of growth failure since 1970. He uses an innovating model that shows that the manner in which conflict affects economic growth depends on the intensity of the conflict, latent social frictions and the quality of institution management. This contributes to this

thesis in a way that expected relationships of these determinants regarding economic growth are established. Barro (1989) already found that political instability (measured as number of revolutions a year and political assassinations) has a negative relationship with growth. Gyimah-Brempong and Traynor (1999) investigated this for sub-Saharan Africa and using a dynamic panel estimation they accounted for the endogeneity issues of political instability. They found evidence on both the causal effect of growth on political instability, as the causal effect of political instability on growth.

Murdoch and Sandler (2004) quantified the effect of economic growth on both home and nearby countries. They find that a civil war can reduce a host's countries growth with 85% in the short run and 31% in the long run. They also find that around 25% of the negative effect that arises in a host country with conflict is captured by neighboring or intensively trading countries.

Also, Cerra and Saxena (2007) investigated that for all disturbances civil wars and changes in government regimes are associated with the deepest and persistent recessions. Both physical capital as human resources are not embedded for production. Capital is used for arming and nourishing troops, and diseases and refugees tend to be much higher (Collier, 1999). Also there tends to be a shift from vulnerable but high growth activities to activities that provide for income more steadily, but have lower growth. Overall, taking into account the production, disease and proneness to future conflict, the average cost of a civil war is about \$65 billion (Collier and Hoeffler, 2007). However, Cerra and Saxena (2007) find that output decreases due to civil war recover far more quickly than output decreases due to financial crises. Half the loss is on average recovered after 4 years, but there are still losses after one century. They explain this finding by the fact that infrastructure is quickly rebuilt after the ending of a civil war. However, the destruction of infrastructure due to the civil war causes for steep output decreases immediately after a civil war. Moreover they find that lowest-income countries are relatively hit the hardest.

To exactly quantify and generalize the economic consequences of a civil war is hard, according to Miguel and Blattman (2010). They justly state that countries that are hit the hardest in a civil war lack reliable data, biasing the generalized economic consequences of a civil war towards zero.

However, in what manner exactly civil conflict affects growth, i.e. through which channels, is very difficult to establish. This is for instance due to the reverse causality issues discussed in section 2.1 and

the fact that it is difficult to isolate growth effects that directly come from the civil conflict or war itself. An instrument, or lagged values of determinants, could help solve these endogeneity problems.

First the theoretical determinants of growth should be addressed. When looking at the simple Cobb-Douglas production function,

$$(1) Y = AK^\alpha L^{(1-\alpha)}$$

It is found that growth (Y stands for output and can thus indicate growth) must be affected by labor (L), physical capital (K), technology (A), as well as the output elasticities captured by the  $\alpha$ . Under technology other factors as government policies and institutions are captured. This is the case because failing institutions are the economic equivalent of technology failure (Barro and Sala-I-Martin, 2003). The labor variable in this equation is not only determined by available labor force but also by the average human capital of a worker.

As stated, labor as well as human capital is an important factor in the neoclassical growth model. During a civil war, total population that belongs to the work force decreases immensely. This could be due to the killing of people, people that are deployed for fighting and the augmentation of refugees.

Moreover, labor force and human capital are immensely affected by the deployment of population to military service (on either the government or the rebel side). According to Hearst and Newman (1986), mortality in both conflict situations as post-conflict situations increases severely. Suicide and traffic accidents were significant higher, due to a raise for the military drafted group.

Not only mortality is a factor in human capital. There are also other long term effects of war-making on combatants. From a survey in Uganda, which has been in conflict for a large number of years, Annan, Horton and Blattman (2006) found that due to abduction, murder and other traumatic experiences school attainment is lower, than for others that did not experience such situations. So they conclude that in countries where the involvement of youth or adolescents in civil war is high, economic consequences are significant. A high school enrollment could thus benefit long-term post-conflict growth. It has however proven to be difficult to find empiric evidence of any causal effect on immediate post-conflict growth.

Besides human capital and labor force, physical capital is an important factor for growth (and thus recovery). In civil wars, household capital can be stolen or destroyed (Annan et al, 2006). Especially for

economies that hugely depend on for example agriculture, this could lead to a disruption in production and thus growth.

At a period of civil war or conflict it is usually the case that the focus of investments is not on production but on a stronger military force (Collier et al., 2003). During a civil war, an average government doubles the share of military expenditure with regards to GDP. This immediately decreases the public spending on infrastructure and other investments. These findings are supported by Kentor and Kick (2015), who claim that extra military spending inhibits the expansion of labor force. Moreover, the spending on military force is basically a spending on violence, which destroys current capital stock. Knight and Loayza (1995) found that there is a negative long term GDP effect because of the military spending. They found evidence that military spending has negative effects on growth both through the detraction of resources on production as the distortion of current production resources. They found this by estimating a growth model and calculated the peace dividend that rises from a cut in military spending.

Military spending tends to be high not only at the years of conflict, but also at the first post-conflict years (Collier et al., 2003). This tends to be a bit lower than during the conflict, but still significantly higher than its pre-conflict level. Overall, a decrease in military spending should increase post-conflict growth.

A very important consequence of civil war is capital flight. Pastor (1990) observed already that capital flight happens very often at times of political disturbances. He links the political disturbance with the possibility of a decrease in business activity. In his basic regression model Moreover, at times of a civil conflict investment tends to decrease severely because of the relative high risk and low returns compared to other countries (Collier, Hoeffler and Pattillo, 2004). From 1980-1998, capital flight is significant higher for Africa as a continent than other continents. Civil wars, which cause large increases in risk, have been more damaging on capital flight in Africa than in other regions.

Davies (2008) argues that capital flight rises due to a large increase in inflation rate during a civil war. Partly due to this rise in capital flight there is a decrease in economic growth. He argues that in the post-conflict period a reduction in capital flight, due to monetary policy that decreases inflation, should benefit economic growth.

The final main determinants of growth of output are captured by the A in function 1. When we look at the determinants of growth institutions cannot be forgotten. As investigated in Acemoglu, Johnson and

Robinson (2001), institutions are the main determinant of long term growth. Countries with good institutions performed significantly better compared to countries with weak institutions. There is little literature about how institutions change during a civil war. Subsequently, there is little literature about how these institution changes affect short and long term growth. However, the manner in what way institutions can be changed by the outcome of a civil war is investigated and discussed in the next section.

The strength of impact of a civil war on economic growth could also be influenced by ethnic diversity. It is widely argued that ethno linguistic fractionalization has a direct negative effect on economic growth (Montolvo & Reynal-Querol, 2005 and Bodenhorn & Ruebeck, 2003). Just like Fearon (2003), the higher likelihood of a conflict is used to explain this negative effect. The possibility of conflict decreases economic growth, because investments in a country are decreased by higher ethnic diversity and government spending (on non-contributing affairs) is increased.

Climate variance is also captured by the A in the formula (1). As stated in section 2.1, Miguel et al. (2004/2012) argue that rainfall growth is a proxy for economic growth in agricultural economies. A draught shock, that is unrelated to the presence of a civil war, should therefore lead to an economic shock. Koubi, Bernauer, Kalbhenn, and Spilker (2012) however find in their research that climate variability does not have an effect on economic growth in Africa. The contradiction is in the way climate variability is measured and the time period in the panel. However, there is no strong theoretical justification to reject the measure used by Miguel et al. (2004). Moreover, when the same time period is used (1981-1999), the coefficient of rainfall growth becomes positively significant for Koubi et al.(2012).

### **2.3 Existing literature on the ending of a conflict**

In general a conflict can be ended in two ways: first, one side conquers over the other side(s). Generally, this leads to a more secure peace (Collier and Hoeffler, 2007). However, often for victors to arise military spending and thus costs has to be increased. This could lead to more debt, and a less powerful government. When 2 equal groups reach a settlement consequences with regards to military spending are even more severe. These findings in together with the findings in 2.2 imply that post-conflict growth is affected by the way a conflict has ended.

De Ree and Nillesen (2009) found convincing evidence that foreign aid significantly reduces the probability of the prolongation of a war. They find that, by using GDP level of foreign country as an

instrument of aid, a larger flow of foreign aid reduces the duration of a war. They find that foreign aid is endogenous because of the predictions of a donating country. A donating country may optimize foreign aid because they can forecast changes in a war. They argue that foreign aid strengthens a domestic government, allowing them to gain more military force and end the war more quickly. Stedman (2002) also claims that the quality of a peace agreement depends on the level of support to that peace agreement by so-called third parties). Foreign aid should therefore benefit and stabilize post-conflict growth.

### **2.3.1 Intervention**

Moreover, the two ways of ending a conflict can be reached by intervention or not. Weinstein (2005) stated, from a political/sociological view, that intervention should not be a clear cut decision in order to strengthen the recovery of a post-conflict country. Each country should make cost-benefit analysis of intervention with regards to their situation. There are 3 trade-offs that should be considered for a country in conflict. The first is that an external intervention provides short-term improvements with the ending of battles, but reduces the capability of a country for true institutional and political change. In other words, for intervention to work there should be a long term policy which includes not only the stopping of a conflict, but also provides conditions for stable recovery. The second trade-off is that intervention often finds a midway between parties, instead of allowing for one strong victor to win. A strong victor reduces the chance of future conflict, as discussed above. However, strong victors may not be strong leaders, which can also increase the chance of future conflict. When there is autonomous recovery the only way for this recovery to be stable is that there are strong institutions that constrain the victors. The third trade-off consists of incentives for institution-building. With interventions this could be low because there is a constant flow of aid, so that there is no need to really build strong institutions. This is opposite for autonomous recovery, where funds are not that abundant so that efficient institutions building is a necessity. However, from a sociological kind of view, a strong government with effective institutions that is not a democracy is also not ideal.

Pickering and Kisangani (2015) also argued that intervention should be seen as complements to foreign aid. An intervention raises the foreign aid, and foreign aid decreases when troops leave. The effects on economic growth are left out of this research. It could therefore be interesting to investigate the effect of foreign aid combined with interventions on economic growth.

To conclude, intervention could only be beneficial to a foreign country when the winners of a conflict are provided resources to build strong new institutions without having too much liberty.

From this conclusion, it can be derived that interventions that lack further stimulations to the economy would slow growth and destabilize recovery. It is therefore interesting to compare post-conflict growth for conflicts that have ended with an intervention and conflicts that have not.

## **2.4 Existing literature on Post-conflict growth.**

After stating and expanding the economic consequences of a civil war during the war period, it is interesting to look at what has been researched about the post-conflict recovery of a conflict country. It has been stated above that there are long-term losses after the civil war ends (Cerra and Saxena , 2007).

According to Collier and Hoeffler (2007), post-conflict growth is typically high but very unstable and uncertain. This paper tries to examine factors that stabilize or destabilize post-conflict growth. In order to do so, factors that influence this growth have to be examined. But first, the prime condition for a stable recovery has to be discussed: durable peace. Then other factors that should contribute to a stable and quick economic recovery are discussed.

### **2.4.1 Risk of relapse**

Countries that have just ended a civil war are much more prone to a new conflict than other countries with the same characteristics but a history in harmony. Some factors tend to increase the proneness to relapse into a war situation. The most important factors are the legacy of an ended conflict and the long term proneness to civil war. When peace settlements are forced to a still relatively powerful rebel side the chance of relapse is high.

There are several other factors that increase the risk of a relapse. The most important factor that reduces the risk of a relapse is sustainable economic growth, implying the ambiguity of the relationship between economic growth and conflict (Collier, Hoeffler and Söderbom, 2008). As mentioned in section 2.1, the cause of most conflicts is severely related to possibility, opportunities and opportunity costs. A quick economic recovery increases the opportunity costs of a renewed rebellion, decreasing this possibility.

As stated in section 2.3, the level of post-conflict military spending is significantly higher than pre-war military spending. Collier and Hoeffler (2006) examined that the military spending increases the

likelihood of a renewal of the conflict severely. They argue that an increase in military spending ensures the rebel groups that the conflict is not really over. Low military spending thus, besides the arguments stated in section, should stabilize economic recovery through the lessening of proneness to a new conflict. However, military spending should not be too low: than rebel groups could find that they have great opportunity when renewing the conflict.

Cramer (2010) has, as stated in section 2.1, argued that a low unemployment level reduces the incidence of civil war. This finding, combined with the broadly accepted theory that a high level of unemployment decreases economic growth, raises the expectation that post-conflict growth is highly affected by unemployment.

Moreover, the international community could provide a lower risk to the renewal of a conflict. As implied in section 2.3.1 above, interventions could lower the risk provided that post-conflict settlements are clear and the intervening country continues with the rebuild and repairs. Collier, Hoeffler and Söderbom (2008) investigated that the risk of a renewal of a civil war decreases severely with the expenditures of the UN on peacekeeping. It has to be sad that these findings were not conclusive. Dahl & Høyland (2012) showed that with a slight different coding of variables and different conflict definition the results obtained by Collier, Hoeffler and Söderbom (2008) were not so robust. Dahl and Høyland even found negative implications of UN expenditure on peace(keeping), therefore concluding that this relationship is yet to be determined indecisively.

#### **2.4.2 Economic determinants of post-conflict growth**

Having discussed the conditions needed for sustainable peace, it is important to focus on the post-conflict economic recovery of a civil war country, which is the main interest in this thesis. The general finding is that a war period is followed by a period of relatively higher economic growth (Rodrik, 1999, Collier and Hoeffler, 2007/2008). However, the key factors that influence this economic growth are still debated, and need further investigation. Especially interesting are the main determinants for a stable and quick recovery. This has not been widely researched at the cross-section/panel data level, but merely in case studies.

However, some factors that contribute to growth, are investigated in the past. For instance, Collier and Hoeffler (2004B) investigated the augmenting effect of foreign aid on growth. They find that aid in the first period after the ending of a civil war is almost entirely responsible for the high growth directly after



a civil war. However, as they state themselves, their analyses have a lot of omitted variables that could make this relation less clear cut. The period of peace could just make sure that labor force and capital is used for production purposes, so that growth arises more autonomously. Moreover, they come to the conclusion using only 13 situations, so that the results have to be interpreted carefully. In a paper presented at the Copenhagen Consensus 2008, Collier, Chauvet and Hegre showed evidence that risk is lowered, and therefore growth is stimulated, with post-conflict aid and military interventions. They present a cost-benefit model that indicates that for instance 4 billion dollars of aid during 10 years post-conflict provides 10.7 billion dollars of benefits. Their estimates of the effectiveness of aid differ from the benefits 2.7 times the cost to 3.5. For peace keeping troops this is even more (10.7-53.7), in accordance with the findings of Collier, Hoeffler and Söderbom (2008).

Summarizing, keeping in mind the work of Pickering and Kisangani (2015), De Ree and Nillesen (2009) and Weinstein (2005), mentioned in section 2.3, it is expected that foreign aid could be an important factor in a stable recovery.

Collier and Hoeffler also find that key priorities for policy improvements at the ending of a civil war, which contribute to growth, should be social policies, followed by sectoral policies<sup>2</sup>. They argue that due to their findings of a negative relationship of macro policy scores with growth macro policies should have the least priority. However, the causal relationship of these scores is not convincing. It could well be that a high macro policy score is associated with less growth in the first period but ensures the sustainability of growth. This argument is strengthened by the fact that they find opposite relationships for non-post-conflict situations.

As mentioned in section 2.3, an important factor that contributes to growth is capital. There is usually a huge capital flight during the civil war (Collier, Hoeffler and Pattillo, 2004). This is due the high risk of a country. The main factor that indicates whether capital inflow restores quickly and stable after a civil war, is thus strongly related to the perceived risk of a country. This implies that a country that is perceived relatively safe obtains more capital inflow and thus grows more quickly after the ending of a conflict. Pastor (1990) already found that the capital flight is a proxy for political instability. Collier (1999) already found that capital inflow restores more quickly after a long war than a short one, because

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<sup>2</sup>Policies are rated by the CPIA, consists of an average rating of countries on 16 different criteria in 4 divisions, such as economic management, structural policies, policies for social inclusion and public sector management.

a peace agreement after a short war could be less stable than after a long persistent war. However, they do not find any empirical evidence on this hypothesis on duration. Collier does not find an empirical convincing argument for this phenomenon. He argues that in long civil wars capital flight has been so high that there must be a rise at the ending of a conflict.

Furthermore, according to Collier and Hoeffler (1999) the duration of a war is a main determinant in immediate post-conflict growth. They state that the longer a war has been continued, the more a factor such as described in formula (1) had have time to decrease below its post war optimal value. An ending of a war will raise the factor relatively more than when the war has been comparatively short. However, they have not provided proof that a longer civil war is an indicator for sustainable economic growth in the post-conflict period.

## **2.5 Summary**

Little research has focused on the key determinants of sustainable and quick economic growth in the post-conflict period. This thesis aims to fill this gap. It will do so by doing a panel data study that relates possible determinants of growth to post-conflict growth.

Based on the previous literature discussed in section 2 there are some expectations that can be formed with regards of possible determinants on economic growth. These expectations are summarized in Table 1. The next section describes the way in which these relationships with post-conflict growth will be tested.

**Table 1 Expected relationship possible determinants with post-conflict growth**

<b>Determinant</b>	<b>Relationship</b>
Military expenditure	Negative/no
Unemployment	Negative
Ethnic Diversity	Negative
Foreign aid	Positive
Intervention/peacekeeping	Positive
Human capital flight	Negative
Capital flight	Negative
Policy	Ambiguous
Duration	Ambiguous
Roughness terrain	Negative

### 3. Methodology

The aim of this thesis is to investigate the relationship of possible determinants on post-conflict growth. As suggested in the literature, growth models should be used (Rodrik, 1999 and Collier, 2007). However, such growth models are often biased due to endogeneity issues. In this section the growth model is discussed as well as some other regression techniques that could solve endogeneity issues.

#### 3.1 Model

As stated before the standard Cobb-Douglas output function is used as a base for the models used in this thesis:

$$(3.1) \quad Y = AK^{\alpha}L^{(1-\alpha)}$$

Where Y stands for output and can thus indicate growth, L for labor, K for physical capital K and A for technology. Under technology other factors as government policies and institutions are captured. Output elasticities are captured by the  $\alpha$ .

Following the approach of Mankiw, Romer and Weil (1992), who form an empirical growth model based on the Solow growth model. From 3.1, the steady state per capita income will be (after determining growth paths for K and L, and a steady state value  $k^*$ , and after taking logs<sup>3</sup>):

$$(3.2) \quad LN Y/L = \ln A(0) + gt + \frac{\alpha}{1-\alpha} \ln s - \frac{\alpha}{1-\alpha} \ln(n + g + \delta)$$

With,  $g$  as growth rate of technology,  $s$  as savings rate,  $n$  as population growth rate and  $\delta$  as depreciation. As stated above, the A does not only represent technology but also resources, institutions, climate and so on. Therefore A should be split into a natural growth rate  $a$  and shock term  $\varepsilon$ . This leads to the following specification:

$$(3.3) \quad LN Y/L = a + gt + \frac{\alpha}{1-\alpha} \ln s - \frac{\alpha}{1-\alpha} \ln(n + g + \delta) + \varepsilon$$

With the absence of shocks, (log) per capita income will be in their steady state. Shifts in population growth and saving rates, as well as other 'technology' shocks, will cause GDP per income to differ from the steady state value. As discussed in section 2, such shocks can be caused by conflict situations or the

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<sup>3</sup> For an extensive explanation of the Solow model, see Mankiw et al. (1992).

ending of a conflict. Therefore, from model (3.3), we can form the main empirical model that allows us to estimate determinants for (post-conflict) growth:

$$(3.4) \quad (\text{Post Conflict}) \text{ Growth}_{it} = B_0 + \alpha_1 n_t + \alpha_2 s_t + B_1 X_{it} + B_2 X_{i,t-1} + C_2 E_{it} + t_i + c_t + e_{it}$$

$$(3.5) \quad (\text{Post Conflict}) \text{ Growth Variance}_{it} = B_0 + \alpha_1 n_t + \alpha_2 s_t + B_1 X_{it} + B_2 X_{i,t-1} + C_2 E_{it} + t_i + c_t + e_{it}$$

Where  $c$  stands for some fixed effects in the cross-section,  $t$  for time-fixed effects,  $X$  for the vector of determinants, which are included for  $t$  or a lagged value,  $E$  for control variables and  $e$  for the error term. The  $n$  and  $s$  stand for respectively population growth and saving rate, following from the specification of Mankiw et al (1992). The small  $i$  and  $t$  stand respectively for country number and year. The  $B$  and  $C$  terms represent the relationship coefficient of variables  $X$  and  $E$  with regards to growth. This growth model could be used for the whole sample and different sub-samples, with different measurements for the determinants and different control variables. Formula 3.5 differs from 3.4 by investigating the variability of the growth instead of actual growth.

Formula 3.4 and 3.5 represents the basic model on which specifications are based. The first interest is to determine whether post-conflict growth differs significantly from growth during a conflict period. In section 4 this phenomenon will be shown and discussed. The main interest of this thesis is to establish why post-conflict growth differs from conflict growth. What are the main drivers behind this economic recovery?

As suggested in Collier (1999), an Ordinary Least Squares (OLS) model could be estimated to find the growth estimators, always with a growth measurement as the dependent variable.

Firstly, for several different measurement, there will be determined if growth is significantly different in the conflict period than in a peace period. This means that formula 3.4 will change to:

$$(3.6) \quad \text{Growth}_{it} = B_0 + \gamma_1 \text{Postconflict} + \alpha_1 n_t + \alpha_2 s_t + B_1 X_{it} + B_2 X_{i,t-1} + C_2 E_{it} + t_i + c_t + e_{it}$$

$$(3.7) \quad \text{Growthvariance}_{it} = B_0 + \gamma_1 \text{Postconflict} + \alpha_1 n_t + \alpha_2 s_t + B_1 X_{it} + B_2 X_{i,t-1} + C_2 E_{it} + t_i + c_t + e_{it}$$

The difference between 3.4 (3.5) and 3.6 (3.7) is that in the latter a post-conflict dummy is included. The major part of the research will be based on the expected difference of post-conflict growth with “regular growth”. The main purpose of this thesis is to establish determinants of post-conflict growth. Moreover, in what way does post-conflict growth differ from “regular” growth, and what are the driving factors behind this? Interaction variables for the determinants will be used to see whether the effect of the determinants of growth change when there is a post-conflict period. When the interaction variables are significant, this means that the effect of the variables change in the post-conflict period in comparison with a peace or prewar period. Different samples will be used. Differences will be investigated with regards to the ending of a conflict with an intervention, the intensity of a war, whether there are differences with regards to developed and non-developed countries and different time-measures for post-conflict periods.

The last part of this research will focus on the differences of countries that have been in conflict, and countries that have never been in conflict.

Significant relationships with regards to the independent variables with post-conflict growth are expected. However, it cannot be said with certainty that the found estimates of  $B_1$  are correct predictors of growth. This is due to endogeneity issues that could arise with this OLS regression. For instance, some determinants, as discussed in previous sections, are influenced by economic growth itself. This means that in a simple OLS regression estimates are likely to be biased due to this reversed causality. One solution for this is to use lagged values for these determinants. This way a more causal relationship can be discovered between determinants as discussed in the literature review and economic growth. For instance, the effect of unemployment, capital flight, human capital flight and foreign aid on GDP growth in period  $t$  can best be measured when the determinants are measured at  $t-1$ . This way the reverse effect of current GDP growth on those determinants is excluded. Still, when GDP growth in period  $t$  can be forecasted accurately by a population, this could affect behavior in earlier periods. ( $t-1$ ,  $t-2$ , ...). Other sources of endogeneity could also be present, and cannot be treated with lags. This could be the case with both measurement errors as omitted variables. In order to prevent endogeneity through these two sources, data is measured accurately from reliable sources and many variables are considered. For a perfect valid research other methods should be addressed.

### **3.2 Instrumental variable method**

Another approach to examine the effects of conflict on growth, as well as the so called “peace dividend”, is to use an instrumental variable approach that controls for endogeneity. It has been found very difficult to find a solid instrument that is correlated with economic growth but not with civil conflict. In his research, Miguel (2004) used an instrumental variable approach that uses rainfall growth as a proxy for economic growth, which was not correlated with the onset of a civil war. Rainfall growth is therefore argued to be a solid instrument for investigating the impact of economic growth on the onset of a conflict. For this research however, the ideal instrument would be an instrument that affects economic growth solely through another channel (so no direct impact on growth), and is not correlated with the error terms. Rainfall growth is therefore not usable as an instrument, because it would expect a significant relationship between rainfall growth and civil conflict (the main determinant which affects growth), which is both in theory and empirics not supported significantly. Other conflict research don't use quality Instrumental Variables. Consequently, though considered, a quality instrument approach cannot be used in this research.

### **3.3 Assumptions**

As stated, endogeneity could bias the coefficients of OLS regression methods. However, endogeneity is not the only problem that can arise with OLS regression methods. For the standard errors to be unbiased and efficient there are several other assumption that have to be met (Field, 2009).

One of those assumptions is that the sampling distribution of the mean is normal. However, a non-normal distribution does not necessarily mean that statistical testing becomes invalid. According to the Central Limit Theorem (CLT) the distribution of means approaches normality as the number of observations (=N) increase. The sample used in all regression methods is many times larger than the rule-of-thumb (N=30).

More severe problems could arise with heteroscedasticity and autocorrelation. These two problems cause the standard errors to be biased, which invalidates statistical testing. Heteroscedasticity arises when the variance of the error term is not constant throughout the sample. This means that the model uncertainty is not constant for each observation. Moreover, the size of the error is not similar across

observations. This could well be the case in panel data, with countries that the errors of a country are correlated over time. This particular case implies serial correlation.

With heteroscedasticity and serial correlation standard errors are erroneously calculated. A solution for possible heteroscedasticity and serial correlation in statistical testing is to use standard errors that correct these problems. The intuition behind this is that standard errors are often biased upwards, due to the fact that the variance of the error term is often larger when a variable is further from its mean. This causes OLS standard errors to be biased down. White heteroscedasticity-consistent standard errors (Robust standard errors) correct for this. Robust standard errors are therefore often smaller than OLS standard errors. This allows them to be used in any regression, preventing to judge a coefficient as significant when it is actually not the case.

### **3.4 Summary**

Summarizing, there will be a number of OLS regressions based on the model described in formula 3.4 and 3.5. Different samples and measurements will be used for this model. In order to ensure unbiased estimates and reliable statistical testing, lagged variables and white errors are used when necessary.



## **4. Data and Measurements**

In this section the data used in this thesis will be discussed and investigated, as well as the measurements used. First the main data and sample will be discussed. Hereafter the measurements will be clarified. In the latter part of this section a preliminary data-inspection will be performed to look for simple, clear characteristics of post-conflict growth.

### **4.1 Data collection**

For the empirical analyses of determinants and characteristics of post-conflict growth different existing datasets have been combined and formatted to one major, unique dataset. The combined conflict dataset contains a sample of 103 of countries that are or have been in conflict. For the comparison with conflict-free countries an extended dataset is used with 215 countries (all countries in World Bank data). However, for many (small) countries there is not enough available data to perform satisfactorily research. So the combined dataset consists of 161 countries. The timeframe of the investigation is 49 years, from 1960-2008. This timeframe is chosen because of data availability. More about the definitive sample in section 4.3.

The countries in conflict are obtained through the UCDP/PRIO Armed Conflict Dataset. This dataset contains information about conflict data from 1946-2008, covering location, duration and intensity. This information is used to determine (pre- and post) conflict years. A conflict is defined as “a contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths”.

For comparison also the ethnic war dataset from the Political Instability Task Force is used. This dataset contains 908-war years divided over 89 episodes from 1948-2014. Ethnic wars are defined as “episodes of violent conflict between governments and national, ethnic, religious, or other communal minorities (ethnic challengers) in which the challengers seek major changes in their status”. Every war in this database have had at least 1000 “combatants”, and at least 1000 fatalities, over the course of the ethnic war.

The Major Episodes of Political Violence dataset (MEPV) is used to obtain panel data on civil and interstate conflict data from 1960-2008). This dataset can be used for robustness checks.

## 4.2 Measurements

In this section the measurements of the dependent and independent variables, derived from the literature reviewed, are discussed and explicated.

### 4.2.1 Dependent variables

GDP growth per capita is the main dependent variable. It is derived from World Bank data and simply calculated as the annual percentage growth rate of GDP based on constant local currency, divided by midyear population.

GDP growth volatility is another dependent variable used. It is derived as the averaged 4 year standard deviation of GDP growth. So GDP volatility of 1977 of a country is calculated as the standard deviation of GDP growth per capita from 1974-1977.

### 4.2.2 Independent variables

#### *Duration*

Duration is simply the sum of the years between the beginning of a conflict and the end of a conflict. It varies from 1 to 32. If a conflict lasts for less than a year, the duration will be 1.

#### *Ethnic fractionalization*

Ethnic fractionalization is a measure of the cultural diversity of a country. Not the standard Herfindahl index is used<sup>4</sup>, but a newer measure constructed by Fearon (2003). This measure is a more veracious proxy for cultural diversity because it also takes into account linguistic differences. If in a country population groups are different but they speak the same language, cultural diversity is less than when these groups speak different languages. Because ethnic groups are expected not to change much over time, the groups are based on data of Atlas Narodov Mira of 1964 and are constant over the panel (Fearon, 2003). For robustness checks also ethnic fractionalization based on the paper by Fearon in 2003 that was presented at the Annual meeting of the American Political Science Association (APSA).

#### *Institutional quality*

Polity IV is used as a measure of the institutional quality of a country. It measures institutional quality by ranking countries on autocracy and democracy, where after it combines both scores. It measures both

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<sup>4</sup>  $EF = 1 - \sum_{i=1}^n S_i^2$ , where  $S_i$  is the share of group  $i$  ( $1, \dots, N$ )

on a weighted 10 point scale, accounting for openness of government and restrictive power, from -10 to 10. From the Polity IV dataset Polity scores for countries larger than 500.000 inhabitants are obtained. For countries that were temporary under foreign control, data is coded as “system-missing”.

### ***Human capital measures***

Refugees are used as a measure of human capital flight. U.S. Committee for Refugees and Immigrants (USCRI) has provided a World Refugee Survey series, panel data on numbers of "source" and "host" refugees.

Net migration is also used as a proxy for human capital flight. It is provided by the World Bank as a 5 year sum of total immigrants minus total emigrants. The measurement takes the average per year divided by population to obtain percentages.

Unemployment is also an important measure of labor force. Unemployment is taken as total unemployment as percentage of total labor force.

### ***Foreign aid***

Foreign aid is measured as: net official development assistance and official aid received. To correct for country size, foreign aid is divided by GDP. It is derived from World Bank data.

### ***Military Expenditure***

Military expenditure is measured as percentage of GDP and percentage of total government spending. It indicates the allocation of resources to military. It is derived from World Bank data.

### ***Capital flight***

There is still no consensus in an adequate measure of capital flight. One measure that is often used is the World Bank Residual. The World Bank defines the residual as “the change in stock not explained by any of the factors identified under debt stock-flow reconciliation”. Therefore, it can also be used as a proxy for capital shock, and thus capital flight. This measure is only available for development countries. Other measures of capital flight are those of Cline, Dooley and Morgan, which are obtained from Davies (2008).<sup>5</sup>

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<sup>5</sup> For an extensive description of those measurements see Davies, V (2008).

Another measure of capital flight is provided by the Political Economy Research Institute (PERI), which defines capital flight as “the difference between total capital inflows and recorded foreign exchange outflows, with adjustments for debt write-offs, trade misinvoicing, underreporting of remittances, exchange rates, interest rates and inflation”.

### ***Rough terrain***

As a proxy for rough terrain the same measure is taken as Fearon and Laitin (2003): the part of the country that has mountainous terrain. This is not an ideal measurement because it does not take other rough terrain like swamps and jungle into account. However, it is the most adequate measure that can be found due to data availability.

### **4.2.3 Other variables**

For some regressions only part of the data will be selected. For instance, for the instrumental variable estimation only countries with a certain level of agricultural activity are taken into account. These variables are briefly discussed in this sub-section.

### ***Intervention***

To measure whether a conflict has ended with an intervention the intervention dataset of Pickering and Kisangani (2009) is used. In this dataset conflicts are mentioned between 1946 and 2005 that have ended with an intervention. These conflicts are compared to the conflicts of the PRIO dataset, creating a dummy for conflicts that have ended with an intervention.<sup>6</sup>

## **4.3 Data analysis**

### **4.3.1 Overview countries.**

The final dataset consists of 161 countries with a time period of 1960-2008. Of all World Bank data countries (=215), 44 minor countries had to be dropped because of lack of quality data. Countries that are selected had to be present in the Polity IV database and the World Bank data in the chosen time period. This is because the presence in the Polity IV database is a decent predictor for the presence of sufficient data. The distribution of countries among continents is given in Table 2. For a list of countries in the sample see Appendix B.

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<sup>6</sup> Since the research is based on the fact that a country is or is not in conflict, the dummy is constructed for the ‘largest’ conflict (i.e. likely most impact on country).

**Table 2 Number of countries per continent**

<b>Continent</b>	<b>Number of countries</b>	<b>Percentage</b>
Africa	57	35.40%
Asia	38	23.60%
Europe	37	22.98%
North America	12	7.45%
South America	13	8.07%
Oceania	3	2.48%
<b>Total</b>	<b>161</b>	<b>100%</b>

This table provides a large diversity of countries in different continents, with Africa as largest part in the sample. Table 3 provides the country division per continent for all countries that have had a conflict in the chosen time period of 1960-2008.

**Table 3 Number of countries per continent for conflict data**

<b>Continent</b>	<b>Number of countries</b>	<b>Percentage</b>
Africa	48	46.60%
Asia	25	24.27%
Europe	9	8.74%
North America	10	9.71%
South America	11	10.68%
Oceania	0	0.00%
<b>Total</b>	<b>103</b>	<b>100%</b>

The distribution of countries in table 3 is somewhat similar to table 2. A huge difference is the drop of European countries in table 3. Relatively few European countries have been in conflict in the chosen time period, and relatively many African countries.

### 4.3.2 Descriptive statistics

The main interest of this research is to establish characteristics and determinants of post-conflict growth. One of the most basic assumptions is therefore that there is a difference between conflict and post-conflict growth. Therefore a basic independent samples T-test is performed to determine whether there is significant difference between GDP growths per capita in different periods. Table 5 shows that there is a significant difference between the means of countries in conflict and peace. Moreover, there

is a significant “peace” dividend. When post-conflict growth is significantly higher than non-post-conflict growth, this implies that there is an even greater difference between conflict growth and post-conflict growth. Figure 1 illustrates this with a graph. As is shown, the mean of post-conflict growth from year 1 to year 10 since the ending of the conflict is always higher than conflict growth in the first 10 years of conflict. Moreover, the peak in growth or contraction is in the second year. This strengthens the suspicion that lagged values of economic factors are needed in the research.

It is also interesting to look at the differences of post-conflict growth with countries that have never been in conflict. Table 4 shows that there is basically no difference between the means of GDP growth per capita. However, table 5 shows that there is indeed a large difference in growth volatility between stable countries and countries that have been in conflict.

**Table 4 Comparison of means GDP per capita growth**

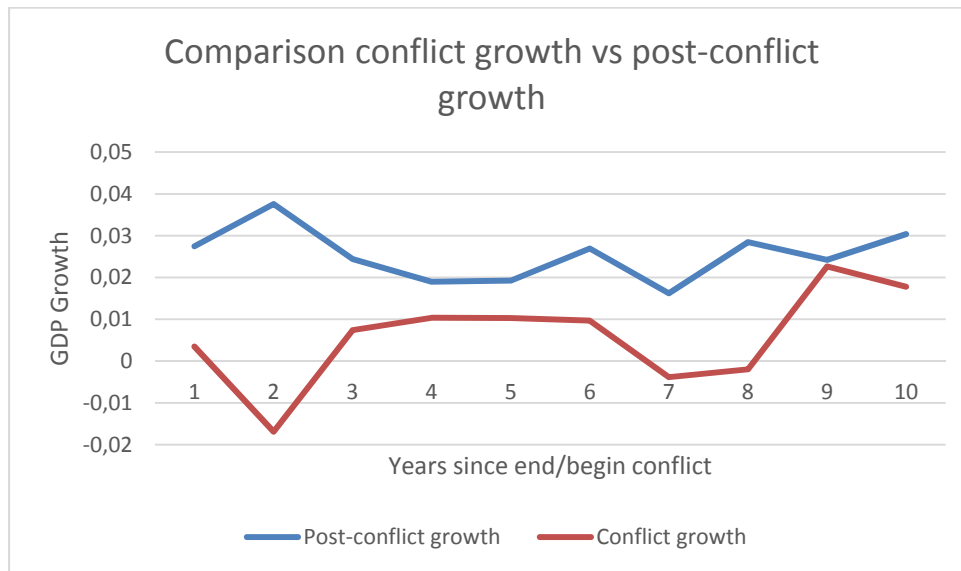
*\* = significant at 10%-level, \*\* = significant at 5%-level, \*\*\* = significant at 1%-level.*

<b>Selection variable</b>	<b>Value</b>	<b>N</b>	<b>Mean</b>	<b>T score equality of means</b>
Conflict Dummy (0 for peace period, 1 for war period)	<b>0</b>	2864	0.023	<b>4.688***</b>
	<b>1</b>	1026	0.010	
Post-conflict Dummy (0 if not, 1 if post-conflict year)	<b>0</b>	2892	0.017	<b>2.869***</b>
	<b>1</b>	998	0.026	
Post-conflict(1) vs never conflict(2)	<b>1</b>	998	0.026	<b>0.20</b>
	<b>2</b>	2015	0.029	

**Table 5 Comparison of means GDP volatility**

<b>Selection variable</b>	<b>Value</b>	<b>N</b>	<b>Mean</b>	<b>T score equality of means</b>
Conflict Dummy (0 for peace period, 1 for war period)	<b>0</b>	2626	0.041	<b>1.154</b>
	<b>1</b>	964	0.043	
Post-conflict Dummy (0 if not, 1 if post-conflict year)	<b>0</b>	2623	0.041	<b>0.989</b>
	<b>1</b>	967	0.047	
Post-conflict(1) vs never conflict(2)	<b>1</b>	967	0.043	<b>9.411***</b>
	<b>2</b>	1833	0.029	

Figure 1 Post-conflict growth vs. conflict growth



Overall these tables and figures confirm the suspicion that there is indeed a difference between post-conflict growth and conflict growth or “normal” growth. Looking at these tables however we cannot say anything about the driving factors behind the differences.

Table A-1 and A-2 in Appendix A display the descriptive statistics of the main variables of interest, for the whole sample and for the countries that are of have been in civil war, respectively.

There is a large variation in the number of observations due to data availability. Most of the variables have more than 1000 observations. Only military expenditure as part of government expenditure and residual/GDP<sup>7</sup> have less. The mean of the per capita growth of GDP for the whole sample equals 2.2%. This is only slightly more than the per capita growth of GDP for the conflict sample. This could be due to the fact that according to the PRIO criteria, wealthy countries like France, the United Kingdom and the United States have been in conflict, though less severe than other (less wealthy) countries. The number of negative GDP per capita growth observations equals 1573 and for the smaller sample 1154. The relative difference (26.6% vs. 29.7%) implies that there is slightly more negative growth for conflict countries than for non-conflict countries.

<sup>7</sup> The number of observations for the proxy of capital flight is not ideal but it is the best measure due to data availability. Therefore other measures like those Cline (1995) and Dooley (1988) are used in this research.

Table 6 and 7 display the main descriptive variables of our interest. They show a comparison of the variables investigated for this period for the conflict period, and the post-conflict period. These tables give somewhat surprising values of different economic variables. It shows that GDP growth is significantly less in a conflict period than during conflict, just as shown in table 4. However, unemployment levels, refugees and capital flight are higher on average in the post-conflict sample. Just as the polity score is lower. This is not in compliance with the expectations formed in section 2. However, these findings should be interpreted carefully. Because these statistics show the values for different sample, it does not prove that for individual countries, unemployment levels, refugees and capital flight rise with the ending of a conflict. More specified testing in section 5 is needed to determine true relationships. The average level of both military spending and one other capital flight (RKF) measure are lower at the post-conflict period. The second possible reason that the difference of the levels of the variables are not as clear-cut as expected is that maybe the absolute levels do not vary for different periods, but the relationship it has with growth and GDP growth volatility does. Again, to examine this, more specified testing is needed.



**Table 6 Descriptive statistics during conflict**

	<b>Mean</b>	<b>Median</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Std. Dev.</b>	<b>Observations</b>
GDP Growth	0.010	0.020	0.538	-0.650	0.079	1026
GDP Growth Volatility	0.043	0.028	0.522	0.003	0.051	964
Ethnic fragmentation (sovjet)	0.522	0.600	0.925	0.005	0.274	1235
Ethnic fragmentation (apsa)	0.572	0.625	1.000	0.039	0.232	1235
Polity score	-0.545	-1.000	10.000	-10.000	6.458	1177
Unemployment (% of GDP)	0.090	0.083	0.435	0.003	0.057	310
Foreign Aid(% of GDP)	0.088	0.032	1.580	-0.008	0.140	918
Mountainous territory	0.229	0.126	0.822	0.000	0.229	1235
Military expenditure (% of GDP)	0.036	0.028	0.396	0.001	0.040	498
Military expenditure (% of government expenditure)	0.159	0.142	0.651	0.036	0.087	212
Refugees originated in country (% of population)	5.85E-06	1.31E-07	0.000	0	1.72E-05	1185
Refugees hosted by country (% of population)	2.40E-05	3.50E-07	0.001	0	7.16E-05	1185
Residual (WB)	0.014	0.003	0.148	-0.022	0.026	121
Nominal Capital flight (PERI, % of GDP)	6.09E-08	3.41E-08	7.96E-07	-2.56E-07	1.21E-07	261
Real Capital flight (PERI, % of GDP)	8.80E-08	5.61E-08	1.44E-06	-3.07E-07	1.80E-07	261
Capital flight (WB)	0.010	0.006	0.593	-0.438	0.070	465
Capital flight (Dooley)	0.009	0.004	0.544	-0.438	0.082	465
Capital flight (Cline)	-0.006	0.000	0.346	-0.441	0.066	465
Capital flight (Morgan)	0.007	0.002	0.346	-0.441	0.063	465

**Table 7 Descriptive statistics post-conflict**

	Mean	Mean larger than conflict (Y/N)	Median	Maximum	Minimum	Std. Dev.	Observations
GDP Growth	0.026	Y	0.024	0.917	-0.473	0.074	1008
GDP Growth Volatility	0.042	N	0.027	0.510	0.001	0.049	977
Ethnic fragmentation (sovjet)	0.471	N	0.534	0.925	0.005	0.285	1090
Ethnic fragmentation (apsa)	0.550	N	0.551	1.000	0.039	0.254	1090
Polity score	-0.743	N	-2.000	10.000	-10.000	6.701	1098
Unemployment (% of GDP)	0.103	Y	0.090	0.595	0.006	0.073	326
Foreign Aid(% of GDP)	0.101	Y	0.051	1.896	-0.006	0.151	953
Mountainous territory	0.201	N	0.126	0.822	0.000	0.214	1090
Military expenditure (% of GDP)	0.025	N	0.018	0.221	0.001	0.022	537
Military expenditure (% of government expenditure)	0.107	N	0.084	0.414	0.014	0.075	252
Refugees originated in country (% of population)	0.000	Y	7.07E-06	2.91E-07	2.46E-04	0.00E+00	1067
Refugees hosted by country (% of population)	0.000	N	6.27E-06	0.00E+00	3.44E-04	0.00E+00	1067
Residual (WB)	0.011	N	0.004	0.335	-0.091	0.039	124
Nominal Capital flight (PERI, % of GDP)	4.05E-08	N	2.14E-08	9.75E-07	-3.84E-07	1.24E-07	258
Real Capital flight (PERI, % of GDP)	5.89E-08	N	3.83E-08	1.35E-06	-4.91E-07	1.73E-07	258
Capital flight (WB)	0.019	Y	0.013	0.649	-1.497	0.114	447
Capital flight (Dooley)	0.016	Y	0.010	0.615	-1.533	0.126	447
Capital flight (Cline)	-0.004	Y	0.000	0.623	-1.566	0.116	447
Capital flight (Morgan)	0.014	Y	0.008	0.647	-1.530	0.115	447

For all variables and samples Jarque-Bera statistics are calculated to test for normality. Brooks (2008) expects that large samples almost always violate the normality assumption. It consequently followed that all Jarque-Bera test-statistics were so high for all variables that normality is rejected (all P-values were below 0.01). However, as stated in section 3, this does not mean that testing becomes invalid, because of the large number of observations included in all samples.

## 5. Results

In this section the results of the actual research performed in this thesis will be presented. The regression models used are as described in section 3, using the data discussed in section 4. Subsequently the results found will be discussed and compared to earlier literature, discussed in section 2.

The main empirical growth model is described in formula 5.1.

$$(5.1) \quad Growth_{it} = B_0 + \gamma_1 Postconflict + \alpha_1 n_t + \alpha_2 s_t + B_1 X_{it} + B_2 X_{i,t-1} + C_2 E_{it} + t_i + c_t + e_{it}$$

Where c for country-fixed effects, t for time-fixed effects, X for the vector of determinants, which are included for t or t-1, E for control variables and e for the error term. The small i and t stand respectively for country number and year.

First growth for (post-)conflict countries are analyzed intensively. Hereafter, growth of conflict countries will be compared to countries that have never been in conflict. Throughout the regressions, different samples and measurements are used for each regression. This is due to the fact that for some determinants different measurements are available, and for some determinants there is a lack of data available.

### 5.1 Economic growth of conflict countries

Table 8 represents results of the regressions with per capita GDP growth as dependent variable, regressed on possible determinants and control variables, and different measurements for the control variables.

**Table 8 Regression results**

Regression output of different independent variables, lagged values and continent dummies on GDP growth and GDP growth volatility. Time-fixed effects to control for year effects. The t-statistics are displayed in brackets below the coefficients. \* = significant at 10%-level, \*\* = significant at 5%-level, \*\*\* = significant at 1%-level.

	(1) GDP growth (main model)	(2) GDP growth (including capital flight) <sup>8</sup>	(3) GDP growth (only 5 post- conflict years)	(4) GDP growth (different measures)	(5) GDP growth (only dev. ent countries)	(6) GDP volatility (main model)
<b>Pop growth</b>	-0.123 (-0.52)	-0.00589 (-0.02)	-0.0330 (-0.13)	-0.147 (-0.47)	-0.0450 (-0.21)	0.118 (0.40)
<b>Saving Rate</b>	0.077*** (3.71)	0.0510 (1.16)	0.081*** (3.60)	0.082*** (3.60)	0.082*** (3.69)	0.044* (2.09)
<b>Polity</b>	-0.001* (-1.86)	0.000 (0.12)	-0.000 (-1.48)	-0.000 (-1.63)	-0.001*** (-3.68)	-0.000 (-1.16)
<b>ELF (Sovjet)</b>	-0.015*** (-4.53)	-0.011 (-1.20)	-0.013*** (-3.89)		-0.015*** (-3.90)	-0.002 (-0.33)
<b>ELF (APSA)</b>				-0.005 (-0.95)		
<b>AID (% of GDP)</b>	-0.002 (-0.08)	-0.019 (-0.36)	-0.017 (-0.55)	-0.011 (-0.29)	0.011 (0.48)	0.078*** (2.91)
<b>Mountainous</b>	-0.001 (-0.20)	-0.004 (-0.39)	-0.000 (-0.05)	0.000 (0.12)	-0.002 (-0.40)	0.011 (1.72)
<b>Refugees (% of pop)</b>	-157.9 (-0.59)	-254.2 (-0.34)	-137.4 (-0.50)		-297.1 (-0.70)	
<b>Net migrat (% of pop)</b>				-0.013 (-0.02)		
<b>Unemp (% of pop)</b>	-0.029** (-2.16)	-0.008 (-0.19)	-0.041*** (-2.90)	-0.029** (-2.26)	-0.028* (-1.80)	-0.070*** (-4.47)
<b>Mil Exp (% of GDP)</b>	-0.053 (-0.69)	0.121 (1.25)	-0.049 (-0.60)	-0.061 (-0.72)	-0.004 (-0.03)	0.109** (2.47)
<b>Real capital flight</b>		-0.015 (-0.75)				
<b>Conflict dummy</b>	0.003 (0.80)	0.002 (0.04)	0.003 (0.91)	0.003 (0.85)	0.002 (0.55)	0.009*** (3.44)
<b>Post-conflict dummy</b>	0.007** (2.63)	0.005 (1.52)	0.008** (2.21)	0.009*** (3.10)	0.005* (1.90)	0.011*** (5.28)
<b>Asia</b>	0.004 (0.70)	0.009 (1.24)	0.001 (0.27)	0.006 (1.01)	0.005 (1.16)	-0.012*** (-4.89)
<b>Europe</b>	0.009 (1.09)	0 (.)	0.006 (0.56)	0.010 (1.16)	0.018 (1.52)	0.021** (2.51)
<b>S-America</b>	0.006 (1.09)	0.009 (0.88)	0.007 (1.07)	0.005 (0.87)	0.008 (1.41)	-0.001 (-0.50)
<b>N-America</b>	0.001 (0.48)	0.006 (1.13)	0.003 (0.71)	0.003 (0.70)	0.005 (0.99)	-0.017*** (-5.24)
<b>C</b>	0.028*** (4.55)	0.022 (0.99)	0.028*** (4.56)	0.029*** (3.67)	0.026*** (3.54)	0.013*** (3.28)
<b>N</b>	1248	423	1087	1165	953	944

<sup>8</sup> Different measures are taken for Real capital flight. In this regression the WB residual is shown. Other measures as discussed in section 4 did not alter the results significantly. For the Real capital flight, as measured by PERI, the regression yielded too little results for statistical testing.

As we can see in the most regressions, GDP growth is significantly higher in the post-conflict period than in a time of either peace or war, judging from the significant post-conflict dummy statistic. This is in coherence with the general belief that peace should be followed by a period of higher economic growth than before. Also can be seen that in a conflict period growth is much more volatile than in a peace period. This too is in accordance with earlier research about growth in conflicts (i.e. Collier and Hoeffler, 2007)

The significant positive post-conflict coefficients strengthen the hypothesis that there is some kind of peace dividend, just like is found in the literature in section 2. Though not the main purpose of this research, it is interesting to look at the determinants of growth in conflict countries. We can see that for most regressions the model, which states that economic growth per capita is saving rate and “technology” factors, gives some interesting outcomes. The GDP per capita growth is not influenced by population. This is solely because of the fact that *per capita* growth is measured here. Because population growth is, though being a huge driver, most of the time higher than GDP growth, total growth *per capita* decreases<sup>9</sup>.

Furthermore, we can see that for countries that have been or are in a war, especially unemployment, and ethno linguistic fractionalization (ELF) are important determinants of growth. This is very much in line with previous conflict literature. Though there is never evidence found that ELF influence the onset of a civil conflict (Collier and Hoeffler, 2004), Collier, Hoeffler and Söderbom, (2008) did find that ethnic differences strengthen the chance of relapse, and therefore decrease economic growth.

Just like ELF, unemployment has a significant negative effect on economic growth. This is in accordance with our expectations. Unemployment is found to be a (partial) cause of the incidence of civil conflict. Moreover, it is widely argued that high unemployment decreases economic growth. That unemployment also has a negative relationship with volatility, is somewhat surprising, and is not in coherence with previous literature.

It is surprising to see that military expenditure does not have a significant relationship with economic growth in this sample. Based on previous literature, military expenditure should decrease economic

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<sup>9</sup> When GDP growth is taken, population growth total is highly significant correlated to GDP growth.

growth because it leads resources like labor and capital away, and should increase GDP volatility. The latter effect is also found for this study. That military expenditure has no significant effect on economic growth, could be caused by the fact that this effect is captured by other variables. When we for instance exclude unemployment, military expenditure does have a highly significant, negative relationship with economic growth. It could be that unemployment rises due to investments from the government in expensive (military) capital, so that it military expenditure has only an indirect effect.

It should be stated that in the second regression though, there is no evidence of a peace dividend. Moreover, unlike expected in the literature discussed and general economic literature, there is no evidence that capital flight has a negative effect on economic growth. A possible explanation for this difference is that in this sample there are all developing countries that have a very unstable environment (lots of war periods, quickly followed after each other). The average capital flight in this sample is much higher in periods of peace (pre-war/post-war), then it is in the conflict period itself. The post-war capital flight is even highest. This can be seen in table 9 and could be because there is low confidence in a stable economic recovery during the post-conflict period, since risk of relapse is high. This is in accordance with Collier, Hoeffler and Söderbom, (2008).

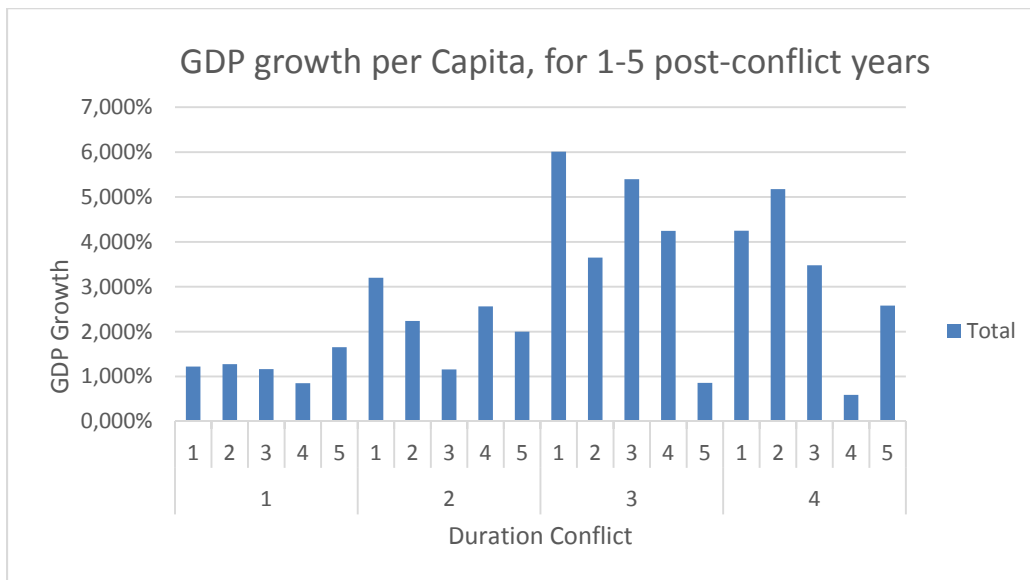
**Table 9 Capital flight**

Conflict (0=no, 1=yes)	Post-conflict period(0=no, 1=yes)	Average of Capital flight (%GDP)
0	0	1.637%
	1	1.954%
1	0	0.959%
<b>Grand Total</b>		<b>1.532%</b>

Table B1 in the Appendix represents similar regressions as table 9, but just for post-conflict periods (so without dummy). This table also does not highlight differences in the post conflict period, but just highlights determinants for post-conflict periods. It should be stated that, because of the lack of observations, interpretation of these results should be very cautious. Therefore it could not provide a truly significant contribution regarding the topic of post-conflict growth. These regressions merely elucidate that ethno linguistic fractionalization and unemployment have a large negative effect on post-conflict growth. Also the effect of duration of the previous war on growth could be added with this set-up. However, for actual statistical testing this yielded to few results. Still, some things can be said about the duration and post-conflict growth. In total conflicts are in this sample with a duration of 1-36 years.

However, by far the largest part of post-conflict years are after a conflict with a duration from 1-4 years (76%). Figure 2 shows that our sample coincides with the general believe that peace dividend increases if a conflict increases in duration, in a short term view (1 to 4 years). Though growth drops for the 5 year conflicts, we see especially a difference between post-conflict growth in the first 5 years for conflicts with duration of 1-2 years, and 3-4 years. The ‘longer’ conflicts will provide a higher peace dividend, simply because the impact of the war, and thus peace, on the economy was higher. However, because the duration of the civil war was not extreme long, the foundings of the economy could remain unaffected, causing a large grow in the first 2 years post-conflict.

**Figure 2 Duration vs GDP growth per Capita**



In the literature it was from a sociological way argued that interventions could be beneficial for economic recovery, if some conditions were met. It was mostly argued that intervention, in order to be successful, should be accompanied with foreign aid and the willingness to build quality institutions. Unfortunately, there is too little data available to review the effect of an intervention on conflict data with regression statistics. According to the database of Kisangani and Pickering (2009), only 56 civil conflicts were ended with an intervention<sup>10</sup>. An important indicator of the success of an intervention lies within the fact that it is the beginning of a sustainable peace period. Only in a few particular cases

<sup>10</sup>More conflicts ended with an intervention. However, in some cases this was not the end of a conflict period (other conflicts started the same or next year), more conflicts or intra-state wars were hitting the region.

intervention seemed the beginning of a longer period without civil conflict<sup>11</sup>. This is too little data for testing. However, if this data is a little more deeply investigated, we can see some interesting results. Looking at the interventions by Kisangani and Pickering and combining these with the PRIO dataset, very often interventions are followed by relative short peace periods.

We do see that in the case of a ‘successful’ intervention indeed the polity score often improves significantly during the peace period. This strengthens the idea that institution building is an important factor with interventions. In 5 cases a small country, or combination of small countries, intervened. In 8 cases a world power intervened, and in 4 cases it was a supervising organization (UN peacekeeping troops). This does not seem a decisive factor. More detailed research (on combined case study level) is needed to truly analyze the success or failure of an intervention. For conclusive panel data research just too little data is available.<sup>12</sup>

## **5.2 Economic growth of conflict countries with interaction variables**

Now that there is a founded conclusion that post-conflict growth differs significantly from growth in a “regular” peace or war period, it is interesting to look at where the differences come from. Table 10 highlights the main question of this thesis: what are the determinants that cause post-conflict growth to differ from regular growth? In order to investigate this interaction variables of possible determinants with the post-conflict dummy are used. The regressions are based on the regressions of table 9, but with interaction variables. Very little previous research is done in this way, by investigating whether a relationship of a factor with economic growth changes between the conflict and peace period. As stated before, a significant interaction variable implies a changed relationship of a determinant with growth during a post-conflict period. Therefore this method will research the main goal in this thesis.

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<sup>11</sup> These were: Bolivia (1968), Bosnia (1995), Ivory Coast (2004), Dominican Republic (1965), Ecuador (1995), El Salvador (1992), Equatorial Guinea (1979), Gabon (1964), Gambia (1981), Lesotho (1998), Moldova (1992), Mozambique (1992), Nicaragua (1989), Panama (1989), Serbia/Yugoslavia (1999), Sierra Leone (2000), Tanzania (1978)

<sup>12</sup> The usage of ethnic wars only (instead of all conflicts), only altered the results in a way that the ethnic diversity was an important factor for economic growth. However, the results of these regressions have to be very carefully interpreted due to lack of results (for instance post-conflict years were too few for including the post-conflict dummy in the regression)



**Table 10 GDP-growth with interaction variables**

*Regression output of different independent variables, lagged values and continent dummies on GDP growth and GDP growth volatility. Time-fixed effects to control for year effects. The t-statistics are displayed in brackets below the coefficients. \* = significant at 10%-level, \*\* = significant at 5%-level, \*\*\* = significant at 1%-level.*

	(1) GDP growth (main model)	(2) GDP growth (including capital flight)	(3) GDP growth (only 5 post- conflict years)	(4) GDP growth (different measures)	(5) GDP growth (only dev countries)	(6) GDP volatility (main model)
<b>Pop growth</b>	-0.220** (-2.42)	-0.226 (-1.49)	-0.203 (-1.30)	-0.288*** (-3.27)	-0.119 (-0.65)	0.344 (1.31)
<b>Pop growth*PC</b>	0.398 (0.59)	2.622 (1.35)	0.907*** (2.71)	1.003 (1.00)	0.844** (2.53)	-0.333 (-0.90)
<b>Saving Rate</b>	0.082*** (3.61)	0.098* (2.21)	0.090*** (5.69)	0.083*** (3.47)	0.099*** (5.70)	0.018 (1.17)
<b>Saving Rate*PC</b>	-0.011 (-0.30)	-0.083 (-1.01)	-0.020 (-0.74)	-0.004 (-0.10)	-0.032 (-1.28)	0.049 (1.61)
<b>Polity</b>	0.000 (0.05)	0.000 (0.90)	0.000 (0.15)	0.000 (0.12)	-0.000 (-1.28)	-0.000 (-0.98)
<b>Polity*PC</b>	-0.002** (-2.56)	-0.002 (-1.53)	-0.003*** (-3.78)	-0.002* (-2.05)	-0.002*** (-2.62)	-0.000 (-0.17)
<b>ELF (Sovjet)</b>	-0.012*** (-3.21)	-0.006 (-0.54)	-0.007 (-0.98)		-0.009 (-1.19)	-0.000 (-0.06)
<b>ELF (Sovjet)*PC</b>	-0.012 (-1.48)	-0.054 (-1.50)	-0.024* (-1.83)		-0.025** (-2.25)	0.011 (0.93)
<b>ELF (APSA)</b>				-0.000 (-0.05)		
<b>ELF (APSA)*PC</b>				-0.036** (-2.21)		
<b>AID (% of GDP)</b>	-0.007 (-0.47)	-0.008 (-0.38)	-0.005 (-0.23)	-0.0132 (-0.60)	0.003 (0.12)	-0.005 (-0.64)
<b>AID (% of GDP)*PC</b>	0.015 (0.35)	-0.144 (-1.09)	-0.009 (-0.29)	-0.002 (-0.04)	0.013 (0.37)	0.050 (1.63)
<b>Mountainous</b>	-0.003 (-0.52)	-0.004 (-0.42)	-0.002 (-0.27)	-0.001 (-0.21)	-0.005 (-0.53)	0.012*** (4.49)
<b>Mountainous*PC</b>	-0.002 (-0.16)	-0.0497 (-1.23)	-0.001 (-0.05)	0.004 (0.03)	0.015 (0.97)	-0.015 (-1.41)
<b>Refugees (% of pop)</b>	20.41 (0.15)	-303.4 (-0.98)	7.632 (0.07)		27.71 (0.16)	104.9 (0.97)
<b>Refugees *PC</b>	-327.1 (-0.45)	940.9 (0.78)	-260.4 (-1.36)		-388.8* (-1.73)	626.8** (2.72)
<b>Net migrat (% of pop)</b>				-0.042 (-0.19)		
<b>Net migrat *PC</b>				-0.221 (-0.18)		
<b>Unemp (% of pop)</b>	-0.066** (-2.78)	-0.055 (-1.12)	-0.058** (-2.08)	-0.058** (-2.56)	-0.058* (-1.89)	-0.012 (-0.75)
<b>Unemp (% of pop)*PC</b>	0.0972 (1.54)	0.237 (1.79)	0.106** (1.96)	0.112 (1.56)	0.081 (1.62)	-0.076*** (-3.35)
<b>Mil Exp (% of GDP)</b>	-0.081 (-1.22)	0.152 (1.30)	-0.063 (-1.11)	-0.069 (-1.20)	-0.098 (-1.28)	0.077** (2.88)
<b>Mil Exp (% of GDP)*PC</b>	0.165	-0.352	0.144	-0.062	-0.0685	0.193

	(0.54)	(-0.59)	(0.58)	(-0.18)	(-0.28)	(1.29)
<b>Conflict dummy</b>	0.001	0.003	0.002	0.000	0.000	0.007***
	(0.26)	(0.62)	(0.41)	(0.06)	(0.07)	(4.10)
<b>Asia</b>	0.003	0.004	0.003	0.005	0.006	-0.010***
	(0.65)	(0.49)	(0.57)	(1.40)	(1.28)	(-4.00)
<b>Europe</b>	0.014	0	0.011	0.017	0.026***	0.018***
	(1.48)	(.)	(1.47)	(1.48)	(3.20)	(3.61)
<b>S-America</b>	0.005	0.008	0.007	0.005	0.010	0.001
	(0.95)	(0.83)	(1.23)	(0.86)	(1.62)	(0.70)
<b>N-America</b>	0.004	0.012	0.007	0.006	0.006	-0.003
	(0.91)	(1.37)	(0.96)	(1.38)	(0.60)	(-1.17)
<b>Real capital flight</b>		-0.120**				
		(-2.36)				
<b>Real capital flight*PC</b>		0.135**				
		(2.69)				
<b>C</b>	0.022***	0.003	0.017**	0.017*	0.016**	0.013**
	(3.44)	(0.30)	(2.21)	(2.10)	(1.97)	(2.49)
<b>N</b>	1162	421	1012	1086	949	1150

As can be seen in Table 11, not many interaction variables are significant throughout the regressions.

The findings with regards to saving rate and population growth do not change. This means that the relationship with regards economic growth do not change between periods. Still, a higher level of saving rate in the post-conflict period increases economic growth, as expected in general economic theory.

A very interesting and somewhat surprising result is found with the Polity IV score. At first sight a positive interaction variable is expected, since in the post-conflict period 'better' institutions should lead to higher economic growth (Acemoglu, Johnson and Robinson, 2001). However, exactly the opposite is found here. This indicates that in the short term a low polity IV score is associated with a higher economic growth in the short term post-conflict. A possible reason for the different result is due to the fact that worse countries with worse institutions have a higher change to obtain large growth, just because previous growth has been much worse. The ending of a war (and of possible tyranny), does not reflect directly in the polity score. Moreover, the polity scores are based on the openness and restrictions on rulers. However a worse score could imply more decisiveness and less bureaucracy, what of course is beneficial for economic growth. An open and transparent government could lead to less effective measures in the short term. These results indicate that effectiveness of government is very important in the short-term post-conflict period.

The conclusion above also reflects in the results with regards to ethno linguistic fragmentation. As previously discussed, ethnic diversity is expected to have a negative effect on economic growth. This

negative effect could already be found in section 5.1. However, interesting to see is that the negative effect of ELF even increases in the immediate post-conflict period. Though not widely researched, this result seems in coherence with previous economic literature. The post-conflict period is a period of recovery. However, with a high ethnic diversity, decisiveness is lower (because of possible different interests) and the risk of relapse is much higher. Therefore the negative effect of ethnic diversity increases in the post-conflict period.

When we look at capital flight, the relationship with economic growth becomes significant. A higher capital flight leads to a decrease in economic growth. This is as expected by all of the literature. Interesting to see to, is that this relationship becomes less negative (even slightly positive) in the post-conflict period. This indicates that capital flight becomes less an issue in the post-conflict (peace) period. Contrary to the reduction of the negative effect, the positive effect is not expected. An explanation for this could be that capital flight becomes less important due to the allocation of own resources to economic recovery. Another explanation could be due to the fact that in this dataset the averages of capital flight were higher in the post-conflict period. Since the post-conflict period is associated with higher economic growth, higher capital flight is in this case associated with higher economic growth. Davies (2008) finds a reason for this. He claims that since post-war economic growth is associated with a high inflation, and an increase in inflation is associated with increasing capital flight, capital flight could be associated with higher economic growth in the post-conflict period (so only a spurious relationship is found here). This results does show that there should be a focus on lowering inflation during the post-conflict period, in order to reduce capital flight.

Another interesting result is the positive sign for the interaction variable of unemployment with the post-conflict dummy, when a smaller post-conflict sample is taken (only 5 years). A logical explanation for this is that firstly, unemployment numbers for conflict periods are often unknown/unreliable. When high unemployment numbers are recorded in the first post-conflict years, when economic growth is often also high (Collier, 1999), this could wrongly suggest that high unemployment benefits economic growth. In a larger period, where economic growth decreases unemployment and vice versa, this relationship cannot be found.

For the other determinants the relationship itself does not change significantly. Again there is no significant proof of the effect of military spending and foreign aid on economic growth. This is a large difference with previous economic literature. For military expenditure it could well be that this

difference is caused by the fact that in the regressions a lot of correlating factors are taken into account. Therefore the effect of military expenditure could already be captured in other factors.<sup>13</sup> Dunne (2015) also shows that, though military expenditure often harms economic growth, for certain countries (for instance countries that receive few aid), there is no effect visible.

Summarizing, tables 9 and 10 demonstrate, combined with the descriptive variables and table B1 in the Appendix, that there are two channels by which the determinants can have a different effect on the size of growth in the post-conflict period compared to peace periods: the level of the variable and the size of the effect. It seems that saving rate, the polity score, ethno linguistic fragmentation and unemployment are the key determinants of economic growth in countries that are or have been prone to civil conflicts.

In conflict periods these variables (except for ethno linguistic fragmentation and the Polity IV score in the short term) change if a civil conflict is ended. Less unemployment and a higher saving rate increase economic growth in the post-conflict period.

### **5.3 Economic growth of non-conflict countries**

Now that there is established what are key determinants for growth in conflict countries, it is interesting to compare these findings with countries that have never been in a civil conflict. As predicted by literature and shown in the results so far, 'conflict'-countries have growth that is severely affected by consequences of conflict (extra unemployment, capital flight, human capital flight. Also is shown that ethnic differences play a dominant role in economic growth. It is expected that countries that have never been in a civil conflict have different determinants of growth. It is already shown in the comparison of means that on average growth and determinants that influence growth positively are higher for countries that have never been conflict. It is too easy to say that this is mainly caused by the lack of war, but it is logical to say this has to do something with it. In order to investigate this more closely the effects of the same determinants on countries that have never been in a civil conflict should be investigated.

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<sup>13</sup> When fewer economic factors are used, the effect of military expenditure does decrease economic growth. There remains no evidence of a changing relationship in the post-conflict period. This strengthens the idea that there does exist a negative relationship between military spending and economic growth.

Table 11 Economic growth for non-war countries

	(1) GDP growth (main model)	(2) GDP growth (including capital flight)	(3) GDP growth (different measures)	(4) GDP growth (only dvmnt countries)	(5) GDP growth (only dvlpd countries)	(6) GDP volatility (main model)
<b>Pop growth</b>		-0.542	-0.822***	-0.242	-1.223***	-0.409***
	(-3.71)	(-0.43)	(-3.28)	(-0.57)	(-6.66)	(-3.84)
<b>Saving Rate</b>	0.084***	0.099	0.088***	0.138**	0.044**	0.013
	(3.75)	(1.00)	(3.55)	(2.36)	(2.39)	(0.70)
<b>Polity</b>	-0.000	0.002	-0.001	-0.000	-0.002*	-0.001***
	(-1.30)	(1.11)	(-1.46)	(-0.62)	(-1.97)	(-4.84)
<b>ELF (Sovjet)</b>	0.011	-0.188		0.033	0.015	0.009***
	(1.03)	(-1.27)		(1.06)	(1.62)	(3.01)
<b>AID (% of GDP)</b>	0.069	0.200*	0.070	0.114	0.468*	0.107***
	(1.34)	(2.12)	(1.30)	(1.34)	(1.78)	(5.85)
<b>Mountainous</b>	-0.014*	-0.013	-0.0160**	0.012	-0.031***	-0.011***
	(-2.02)	(-0.09)	(-2.76)	(0.76)	(-5.72)	(-3.30)
<b>Refugees (% of pop)</b>	92.90	0	123.3	281.7	0	263.8
	(0.22)	(.)	(0.29)	(0.48)	(.)	(0.45)
<b>Unemp (% of pop)</b>	0.152***	-0.139	0.148***	0.288***	0.001	0.020
	(5.19)	(-0.58)	(5.51)	(4.52)	(0.02)	(0.95)
<b>Mil Exp (% of GDP)</b>	-0.194	-1.832**	-0.223	-0.668**	-0.176	0.288***
	(-0.96)	(-2.42)	(-0.94)	(-2.13)	(-0.95)	(4.33)
<b>Asia</b>	0.016***	-0.014	0.016**	0.020*	-0.002	0.002
	(3.16)	(-0.29)	(2.40)	(2.03)	(-0.46)	(0.79)
<b>Europe</b>	0.012**	0	0.013*	0.046***	-0.001	0.004
	(2.53)	(.)	(2.03)	(3.56)	(-0.39)	(1.36)
<b>S-America</b>	0.011*	-0.003	0.013	0	-0.007	0.003
	(1.92)	(-0.18)	(1.74)	(.)	(-1.20)	(1.19)
<b>N-America</b>	0.008	-0.087	0.008	0.020	-0.009*	0.003
	(1.28)	(-1.71)	(1.25)	(1.12)	(-1.77)	(1.52)
<b>WB residual</b>		0.174*				
		(1.86)				
<b>ELF (APSA)</b>			0.005			
			(0.45)			
<b>Net migrat (% of pop)</b>			0.048			
			(0.23)			
<b>C</b>	-0.004	0.138	-0.001	-0.056*	0.042***	0.016***
	(-0.39)	(1.27)	(-0.11)	(-2.09)	(2.92)	(4.39)
<b>N</b>	723	77	676	236	487	705

Table 11 represents the effect of the determinants of post-conflict growth on economic growth of countries which have never been to war. This presents some interesting findings. The first clear finding is that in this case a high unemployment is associated with a high economic growth. This is completely contradicting with the main finding that in conflict countries unemployment highly decreases economic growth and the general literature about conflict and economic growth (for instance Okun's Law). A simple explanation can be found in the fact that the total world sample of countries that have never been to war is dominated by European countries. Though Europe has on average by far the largest economic growth numbers in the sample period, its unemployment average is twice as high as for instance Asia. If Europe is taken out of the regression, the unemployment relationship becomes negative.

Though not the aim of the research, it is interesting to investigate the reason behind this result. Reliable data of unemployment only exists since 1990 (data for unemployment in Europe is only available after 1990). In the period 1990-2008, the countries that endured the highest growth per capita on average, are not the large economic powers, but upcoming economies like Georgia (9.9%), Lithuania (8.4%), Latvia (7.6%) and Estonia (7%). However, in these countries a relative high unemployment was still in place (relative to stable growing economies like the Netherlands, Germany and Belgium). Employment often becomes a driver of economic growth in a later stage (as a consequence of policy measures that increase consumption in the first period). So although there is for most countries a decreasing trend of unemployment with a rising economic growth (as expected by Okun's Law), this is not presentable in regression table 12.

It is interesting to see that for countries that have never been in a civil conflict, there is a negative significant relationship of military expenditure and economic growth. This could well be due to the fact that the allocation of these resources to the military, by these non-conflict countries does not contribute to domestic growth (or less than a different allocation). Unlike the civil war sample, this coincides completely with the previous literature (for instance Knight, Loayza and Villeneuve, 1996).

A very interesting finding is the (non-)significance of the ethnic fractionalization variable. This is very opposite in comparison with conflict countries, though it is not hard to deduct where this difference is coming from. Previous literature claims that there is no higher risk of the onset of a civil conflict when

there is a higher ethnic diversity (Fearon, 2003). Though the strength of a civil conflict increases by higher ethnic diversity and recovery is negatively influenced (as found in this paper, as Montolvo & Reynal-Querol, 2005 and Bodenhorn & Ruebeck, 2003), the finding by Fearon would imply that for non-conflict countries civil conflict does not play a significant role. This is exactly what is found in table 12.

Another important difference is that the roughness of terrain (measured by the percentage of mountainous terrain), has a significant negative association with economic growth, as would be expected by economic literature. It could well be that the difference arises from the fact that, for relatively stable countries the roughness of terrain becomes a larger factor for economic growth, compared to countries that are very unstable. Unstable countries could be influenced by other factors in a greater way (as discussed in 5.1 and 5.2). The same train of thought exists for the (though less) significant value of foreign aid. Another addition to this is that in stable countries foreign aid could indeed be deployed for economic growth. This is according to many economic literature the primary condition (among others), for the effectiveness of foreign aid (for instance Dalgaard, Hansen, & Tarp, 2004).

There are also some similarities with the results of conflict countries. The savings rate, as widely researched in many economic literature, remains an important factor in economic growth in this sample as well. In this case there is no difference between conflict and non-conflict countries.

To summarize, there indeed are differences between growth in 'peace' countries and countries that have endured a civil conflict in the period 1960-2008. The changed relationship of economic growth with for instance military expenditure is something to think about with regards to policy measures.

## **5.4 Summary of results**

As discussed in table 1 in section 2.5, there were some expectations with regards to results, based on generic economic literature and specific 'conflict' literature. This section briefly shows an overview of the results with regards to this expectations, as already more intensively discussed in section 5.1 to 5.3.

**Table 12 Summary of results**

<b>Determinant</b>	<b>Expected Relationship with economic growth</b>	<b>Conflict countries (total period)</b>	<b>Post-conflict period change</b>
Military expenditure	Negative/no	No, but increases volatility	No
Unemployment	Negative	Negative	Yes (only for some samples)
Ethnic Diversity	Negative	Negative	Yes, more negative
Foreign aid	Positive	No	No
Intervention/peacekeeping	Positive	Indecisive	Indecisive
Human capital flight	Negative	No	Yes, increases volatility
Capital flight	Negative	No	Yes, from negative effect (in conflict, insignificant), to neutral effect, significant.
Policy	Ambiguous	Negative	Yes, from no effect (in conflict), to negative effect
Duration	Ambiguous	Ambiguous	Indecisive
Roughness terrain	Negative	No	No

As can be seen in table 13, the most remarkable results (different from economic literature), are the policy score effects on economic growth and the lack of proof of the importance of foreign aid, military spending and the roughness of terrain on economic growth.

Also can be seen in table 13 that the policy score, unemployment and ethnic diversity have most often a significant relationship with economic growth and volatility. These are important factors to recognize, for policy implications, in both conflict situations and in the post-conflict period.

The most important differences for countries that have never been to war, compared to post-conflict countries, lies in the significance of military expenditure (negative significant effect for 'peace countries), ethnic diversity (no effect for peace countries), unemployment (because of the in 5.3 explained data selection) and the roughness of terrain (important for non-war countries).





## 6. Conclusion

This paper investigates the determinants of (post-) conflict growth. The focus in this research is on the differences between conflict and post-conflict periods. Panel data over the period 1960-2008 are used to perform several regression analysis with time-fixed effects and cross-sectional dummies, with the aim of establishing significant relationships with possible determinants with both economic growth and the volatility of growth.

The most notable outcomes regards the very significant (negative) relationships of unemployment and ethnic diversity with growth in conflict countries. Though these findings are not new in growth literature, the way these are presented is new and could provide further strengthening that the focus of recovery should lie on employment and decreasing ethnic diversity effects. This could therefore be a starting point for further research, to examine how unemployment and ethnic diversity exactly decreases economic growth in the (post-) conflict period. When for example these ethnic diversity effects are further investigated, appropriate measures could be taken with regards to policy. This could be done by zooming in on the specific reasons that cause ethnic diversity to reduce growth in conflict countries. A starting point for this has already been given by Montalvo and Reynal-Querol (2005), but the specific instrument to decrease growth is not provided. This could be lying in unwillingness to work together, but also in inability to work together. If these channels are correctly identified, policy can be adjusted for this.

Other clear significant relationships of determinants with growth could not be presented. Though the effect of duration and whether a war is ended with an intervention is somewhat investigated, deeper investigation with more data should be done to establish more clear relationships of the effects on post-conflict growth.

As with all panel data research there are limitations to this research. The first limitation is that the ideal situation that all data for all countries in all periods can be collected could never be matched. Many data for countries are either missing or could be somewhat unreliable (especially for conflict countries).

Another limitation is the possible presence of endogeneity in this research. Though recognized that there could be endogeneity due to data errors and reverse causality, the ideal solution (a proper instrument), could not be found. Lagging independent variables did not seem a valid solution for solving

this possible endogeneity. Though some measures are taken (for instance time-fixed effects and cross-sectional dummies), there is most likely some form of endogeneity still in the research.

It should also be noted with interpreting this research, that the measure of conflict is taken from PRIO: “a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths” (UCDP, 2015). Therefore it could well be that, in the ‘Never war’ samples, countries that have been in intensive war with other countries are taken into account. This is another reason to interpret the results carefully.

However, the main advantage of this research, how it is constructed (as many countries/conflicts as possible), also puts the largest restriction on this research. As mentioned before, it is almost impossible to generalize so many different conflicts, with different causes and factors. Therefore it is very important to be cautious with interpreting the results. To point future, more specific research of post-conflict growth into the direction of ethnic diversity and unemployment is therefore the most that can be stated with this research.

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## A. Appendix A

**Table A1 Descriptive statistics total sample**

	<b>Mean</b>	<b>Median</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Std. Dev.</b>	<b>Observations</b>
GDP Growth	0.022	0.023	1.824	-0.650	0.070	5905
GDP Growth Volatility	0.037	0.025	0.909	0.001	0.047	5423
Ethnic fragmentation (sovjet)	0.418	0.419	0.925	0.001	0.276	7399
Ethnic fragmentation (apsa)	0.482	0.509	1.000	0.002	0.259	7399
Polity score	0.298	-1.000	10.000	-10.000	7.494	6839
Unemployment (% of GDP)	0.089	0.076	0.595	0.002	0.065	2051
Foreign Aid(% of GDP)	0.091	0.039	1.896	-0.008	0.134	4657
Mountainous territory	0.176	0.090	0.943	0.000	0.217	7399
Military expenditure (% of GDP)	0.027	0.019	0.901	0.001	0.036	2736
Military expenditure (% of government expenditure)	0.107	0.076	1.834	0.006	0.101	1313
Refugees originated in country (% of population)	7.15E-06	0.000	5.38E-04	0.000	3.65E-05	6179
Refugees hosted by country (% of population)	6.71E-06	0.000	6.25E-04	0.000	3.17E-05	6179
Residual (WB)	0.000	0.003	0.335	-5.711	0.246	553
Nominal Capital flight (PERI, % of GDP)	4.46E-08	3.06E-08	1.32E-06	-3.84E-07	1.18E-07	1202
Real Capital flight (PERI, % of GDP)	7.35E-08	5.67E-08	3.35E-06	-6.22E-07	1.97E-07	1202
Capital flight (WB)	0.014	0.008	0.680	-1.497	0.085	2056
Capital flight (Dooley)	0.010	0.006	0.680	-1.533	0.106	2056
Capital flight (Cline)	-0.012	-0.002	0.623	-1.566	0.095	2056
Capital flight (Morgan)	0.009	0.004	0.647	-1.530	0.086	2056

**Table A2 Descriptive statistics "Conflict" sample**

	<b>Mean</b>	<b>Median</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Std. Dev.</b>	<b>Observations</b>
GDP Growth	0.020	0.021	1.824	-0.650	0.078	3890
GDP Growth Volatility	0.041	0.027	0.909	0.001	0.055	3590
Ethnic fragmentation (sovjet)	0.482	0.534	0.925	0.005	0.274	4743
Ethnic fragmentation (apsa)	0.557	0.553	1.000	0.039	0.242	4743
Polity score	-1.155	-4.000	10.000	-10.000	6.751	4395
Unemployment (% of GDP)	0.095	0.083	0.595	0.003	0.065	1096
Foreign Aid(% of GDP)	0.092	0.041	1.896	-0.008	0.132	3578
Mountainous territory	0.202	0.110	0.822	0.000	0.224	4743
Military expenditure (% of GDP)	0.030	0.021	0.396	0.001	0.032	1705
Military expenditure (% of government expenditure)	0.123	0.098	0.882	0.006	0.097	755
Refugees originated in country (% of population)	9.65E-06	0.000	5.38E-04	0.000	4.23E-05	4088
Refugees hosted by country (% of population)	5.27E-06	2.08E-08	2.46E-04	0.000	1.63E-05	4088
Residual (WB)	-0.002	0.005	0.335	-5.711	0.304	360
Nominal Capital flight (PERI, % of GDP)	4.79E-08	3.24 E-08	1.32E-06	-3.84E-07	1.21E-07	1024
Real Capital flight (PERI, % of GDP)	7.86E-08	6.00 E-08	3.35E-06	-6.22E-07	2.03E-07	1024
Capital flight (WB)	0.015	0.010	0.649	-1.497	0.082	1666
Capital flight (Dooley)	0.012	0.008	0.615	-1.533	0.097	1666
Capital flight (Cline)	-0.007	0.000	0.623	-1.566	0.089	1666
Capital flight (Morgan)	0.010	0.005	0.647	-1.530	0.084	1666



**Table A3 Countries classified on income**

**Low**

Afghanistan  
Azerbaijan  
Bangladesh  
Benin  
Bhutan  
Burkina Faso  
Burundi  
Cambodia  
Central African Republic  
Chad  
Comoros  
Congo, Dem. Rep.  
Cote d'Ivoire  
Equatorial Guinea  
Eritrea  
Ethiopia  
Gambia, The  
Ghana  
Guinea  
Haiti  
India  
Kenya  
Korea, Dem. Rep.  
Lao PDR  
Lesotho  
Liberia  
Madagascar  
Malawi  
Mali  
Mauritania  
Mongolia  
Mozambique  
Myanmar  
Nepal  
Nicaragua  
Niger  
Nigeria  
Pakistan  
Rwanda  
Senegal  
Sierra Leone  
Solomon Islands  
Somalia  
South Sudan  
Sudan  
Tajikistan  
Tanzania  
Togo  
Uganda  
Vietnam  
Yemen, Rep.  
Zambia

**Low-middle**

Albania  
Algeria  
Angola  
Armenia  
Belarus  
Bolivia  
Bosnia and Herzegovina  
Bulgaria  
Cabo Verde  
Cameroon  
China  
Colombia  
Congo, Rep.  
Cuba  
Djibouti  
Dominican Republic  
Ecuador  
Egypt, Arab Rep.  
El Salvador  
Fiji  
Georgia  
Guatemala  
Guyana  
Honduras  
Indonesia  
Iran, Islamic Rep.  
Iraq  
Jamaica  
Jordan  
Kazakhstan  
Kosovo  
Macedonia, FYR  
Moldova  
Morocco  
Namibia  
Papua New Guinea  
Paraguay  
Peru  
Philippines  
Romania  
Russian Federation  
Sri Lanka  
Suriname  
Swaziland  
Syrian Arab Republic  
Thailand  
Tunisia  
Turkey  
Turkmenistan  
Ukraine  
Uzbekistan

**Upper-middle**

Argentina  
Botswana  
Brazil  
Chile  
Costa Rica  
Croatia  
Czech Republic  
Estonia  
Gabon  
Hungary  
Latvia  
Lebanon  
Libya  
Lithuania  
Malaysia  
Mauritius  
Mexico  
Oman  
Panama  
Poland  
Saudi Arabia  
Serbia  
Slovak Republic  
South Africa  
Trinidad and Tobago  
Uruguay  
Venezuela

**High**

Australia  
Austria  
Bahrain  
Belgium  
Canada  
Cyprus  
Denmark  
Finland  
France  
Germany  
Greece  
Ireland  
Israel  
Italy  
Japan  
Korea, Rep.  
Kuwait  
Luxembourg  
Netherlands  
New Zealand  
Norway  
Portugal  
Qatar  
Singapore  
Spain  
Sweden  
Switzerland  
United Arab Emirates  
United Kingdom  
United States

## B. Appendix B

Table B1 Post conflict-growth

	(1) GDP growth (main model)	(2) GDP growth (only 5 post- conflict years)	(3) GDP growth (different measures)	(4) GDP growth (only dev. ent countries)	(5) GDP volatility (main model)
<b>Pop growth</b>	-0.445 (-1.55)	-0.733 (-1.50)	-0.413 (-1.05)	1.043* (1.90)	-0.652 (-1.37)
<b>Saving Rate</b>	0.152*** (2.92)	0.098 (1.50)	0.157** (2.80)	0.024 (0.70)	0.155** (2.31)
<b>Polity</b>	-0.000 (-0.56)	-0.003* (-1.88)	-0.000 (-0.04)	-0.001 (-1.33)	-0.001 (-0.71)
<b>ELF (Sovjet)</b>	-0.027* (-2.03)	-0.031 (-1.35)		-0.008 (-0.56)	-0.034* (-1.91)
<b>ELF (APSA)</b>			-0.052*** (-3.07)		
<b>AID (% of GDP)</b>	0.017 (0.44)	0.036 (0.75)	0.018 (0.49)	0.069 (1.35)	0.0293 (0.71)
<b>Mountainous</b>	-0.000 (-0.03)	-0.006 (-0.24)	0.003 (0.16)	0.035 (1.42)	0.006 (0.34)
<b>Refugees (% of pop)</b>	289.0*** (2.87)	192.2 (0.70)	213.3 (1.55)	758.1* (1.95)	63.19 (0.18)
<b>Net migrat (% of pop)</b>			0.484 (0.98)		
<b>Unemp (% of pop)</b>	-0.106** (-2.32)	-0.145 (-1.67)	-0.101* (-2.03)	-0.030 (-1.55)	-0.140** (-2.42)
<b>Mil Exp (% of GDP)</b>	-0.119 (-0.48)	-0.002 (-0.01)	-0.137 (-0.55)	0.250 (1.32)	-0.050 (-0.15)
<b>Asia</b>	-0.005 (-0.53)	0.007 (0.45)	-0.006 (-0.60)	-0.019** (-2.41)	-0.007 (-0.47)
<b>Europe</b>	0.039** (2.59)	0.044* (1.94)	0.038** (2.19)	0.026*** (3.33)	0.039* (2.01)
<b>S-America</b>	-0.003 (-0.27)	0.020 (0.89)	-0.004 (-0.36)	-0.005 (-0.62)	0.000 (0.02)
<b>N-America</b>	-0.006 (-0.47)	0.014 (0.56)	-0.004 (-0.32)	0.000 (0.01)	0.012 (0.59)
<b>C</b>	0.031 (1.62)	0.047 (1.35)	0.042* (1.84)	-0.002 (-0.14)	0.035 (1.53)
<b>N</b>	194	97	186	191	152